GEOGRAPHICAL SEGMENT DISCLOSURES: USEFULNESS IN FORECASTING TURNOVER AND PROFITS OF U.K. MULTINATIONALS

Volume I

CLARE BARBARA ROBERTS

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University of Glasgow

Department of Accounting and Finance

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ABSTRACT.

There is a considerable quantity of evidence regarding the usefulness of segmental information on a line of business basis. However, there is very little evidence available regarding the value of geographical segment information. The objective of this study is, therefore, to investigate the usefulness of the geographical segment information currently provided by U.K. multinational companies.

The uses that geographic segment information may be put to are many and varied. Accordingly, this study examines only one possible use of such information. Namely, whether it can be used to make forecasts of turnover and earnings. One year ahead forecasts of turnover and earnings were made for the years 1981 to 1983 for a sample of 109 U.K. multinational companies. These forecasts were based upon consolidated information, segmental turnover and segmental earnings data. The relative accuracy of the forecasts were then compared using four error measures which were both non-truncated and truncated at 100%.

The forecasting models used were six naive consolidated models which represent all the major classes of naive models that evidence on the time series properties of earnings suggests might be useful and six segment based models. The segment models were based upon forecasts of changes in the GNP of individual countries which were then aggregated into segment forecasts with the weights based

upon the size of total GNP in each country. Four of the forecasts were based upon various assumptions concerning the importance of inflation and two were based upon ex-post changes in GNP. Forecasts of earnings using the segmental disclosures were developed in two ways. Firstly, upon segment turnover data combined with the the average earnings to turnover margin and, secondly, upon segment earnings data.

Using the models to forecast turnover it was found that the consolidated models significantly outperformed the segment turnover based models. When forecasting earnings it was found that, again, the segment turnover based models did not outperform the consolidated models. However, the segment earnings based models significantly outperformed the segment turnover based models and, in most cases they also outperformed the optimal consolidated model, especially in respect of the non-truncated error measures. Thus, the results are very different from those from prior research into the usefulness of line of business information. For line of business information it was found that segment turnover based models significantly outperformed consolidated models and that the addition of segmental earnings information provided little or no improvement. Several possible reasons for the differences between these results and those found previously for line of business information are suggested.

PART 1: GEOGRAPHICAL SEGMENT DISCLOSURES: USER NEEDS AND CORPORATE DISCLOSURES.

Chapter 1.

INTRODUCTION.

1.1 INTRODUCTION

This study examines the usefulness of the geographical segment data currently reported by U.K. multinational companies in their annual report and accounts. There have been several studies concerned with line of business information but very little work has been done on geographical information. This appears to be a serious omission given that such information is required by legislation which affects a very large number of companies. It appears to be assumed by the legislators as well as other groups that such information is of use to users of accounts. Whether or not this is really the case requires investigation. This study examines one aspect of the usefulness of such data, namely the predictive ability of geographic segment data. Specifically, it uses the geographic turnover and earnings data disclosed by 109 of the largest U.K. multinational companies to predict one year ahead forecasts of both turnover and earnings for the years 1981 to 1983. The accuracy of these forecasts are then compared with those generated from aggregate turnover and earnings data. Whilst this is not the only way in which the usefulness of such information can be assessed it will be argued that predictive ability is one of the most important aspects of usefulness.

1.2. THE ENVIRONMENTAL FRAMEWORK.

The issue of geographical data provision is only of more than passing interest if there are a significant number of companies that operate overseas and so might be expected to report such information. It can be demonstrated that this is an issue that is, at least potentially, of importance, if the importance of multinational companies in the context of the U.K. economy is examined.

There has been a very long history of foreign direct investment by U.K. companies. Much of the early overseas investment was in the service sector, especially insurance and banking (Buckley and Roberts 1982, Yannopoulos 1983). Much of this investment followed the pattern of colonial expansion and a substantial proportion of the present investment dates from pre World War II (Channon 1973). For example, even in 1960 61% of net foreign investment excluding banking, insurance and oil was in the Commonwealth countries (Dunning 1985). By the end of 1983 U.K. direct foreign investment totalled a gross value of approximately £150 billion or a book value of £63 billion. This investment consisted of approximately 10,000 subsidiaries, affiliates and branch offices of over 1,000 parent companies, although many of these investments are very small (Stopford and Turner, 1985). Parallel to this long history of overseas investment was the development of increasingly larger and more diversified non-multinational companies. This increasing size, power and complexity of companies gave rise to what Hannah (1976) terms the "corporate economy".

Whilst this suggests that, for many companies, overseas operations are important it is necessary to examine this issue in somewhat more detail. In particular, it is necessary to gain an idea of the relative importance of U.K. and overseas operations for the largest companies as well as an idea of the importance of overseas operations in the context of the U.K. economy.

Stopford and Dunning (1983) provide some evidence based upon the data provided in the World Directory of Multinational Enterprises 1982-1983 (Stopford, 1983). The Directory provides information on the top 500 multinational companies in 1981. These are defined as those manufacturing or mining companies with at least 25% of their voting equity held in at least three foreign countries, at least 5% of assets or sales attributable to foreign investments and at least $75m. sales from overseas manufacturing. Of these companies 67 were U.K. based. For these companies foreign sales including exports accounted for $156 billion or 54% of total production in 1981 whilst foreign production (i.e. excluding exports) accounted for $123 billion or 45% of total production. North Americe and Europe accounted for the majority of sales. There is also limited evidence that the importance of overseas turnover is a function of the type of industry, varying as it does from a high of 70% for pharmaceuticals to only 38% for food companies. It also appears that the relative importance of the various regions as manufacturing bases is even more dependent upon industry (see table 1 below). These figures clearly show that, at least for this relatively small number of very multinational companies, foreign manufacturing and sales can be considered to be of major significance. This in turn implies that disclosure of geographical segment information is likely to be of importance to users of the accounts. Whilst this sample is a small one in terms of the number of companies it covers, Stopford estimates that the Directory companies together account for at least 80% of the total stock of foreign direct investment. Additional evidence is provided by Dunning and Pearce (1981), based upon 866 companies in 1977, these being the largest Fortune companies, of which 75 were U.K. based. Of the U.K. companies that provided the necessary information it was found that, on average, nearly 42% of total sales were manufactured overseas and 54% actually sold overseas. These findings are similar to that provided by examining a much larger group of companies, namely all those included in the FT Actuaries Index that, according to Extel (1984), reported geographical segment sales for either 1982 or 1983. Of these 289 companies the simple average of foreign sales was nearly 59% and the weighted average 52%.

Table 1.

THE EXTENT OF OVERSEAS OPERATIONS BY MAJOR U.K. COMPANIES.

INDUSTRY	NUMBER of COS.	FOREIGN SALES as % of TOTAL	% of FOREIGN SALES		
			NTH.AMER.	EUROPE	REST
Office equipment (incl. computers)	1	45	4	47	49
Electronics & elect. appliances	3	46	17	25	58
Pharmaceuticals & consumer chemicals	3	70	15	37	48
Automobiles	3	49	11	37	52
Industrial & agricultural equip.	2	66	36	21	43
Food	8	38	65	9	26
Tobacco	3	63	37	31	32

Source; Stopford and Dunning, 1983, Tables 4.13 & 4.14, pp80-81.

Several limitations of this data must be noted. Firstly, it is based upon information provided by the companies themselves. This means that, at least potentially, it is likely to provide a conservative measure of the importance of overseas operations. This is because some companies may have been omitted as they do not provide the required information. Secondly, each company has been allocated to one industry only so all sales are apportioned to the major line of business. In the case of very diversified companies this must be a major limitation. This means that any sectoral comparisons can provide only a crude guide and so must be treated with caution. Finally, it implicitly assumes that all the companies follow the same accounting methods and that these are consistently applied on both a cross-sectional and temporal basis. Because of these limitations the exact figures generated cannot be treated as being completely accurate. However, they do provide a guide to the importance of overseas operations. In spite of these limitations these findings are sufficient to support the assertion that, for many U.K. companies, a significant proportion of turnover is generated overseas. Also that foreign direct investment by publicly quoted U.K. companies is of importance.

This evidence should also be placed in the wider context of the role of multinational companies in the U.K. economy. The purpose here is not to provide a complete or detailed analysis of their role, but simply to provide a fairly crude indication of their importance. The evidence looked at will be only limited and somewhat incomplete.

Exports accounted for approximately 26% of total sales of manufacturing industries in the period 1978 to 1983 and 21% of sales plus imports (see table 2 below). Whilst these figures include all companies and not just multinationals it seems likely that the majority of exports came from multinational companies.

Table 2.

EXPORTS AS A PERCENTAGE OF TOTAL SALES BY U.K. COMPANIES.

	1978	1979	1980	1981	1982	1983
Exports/Sales	26.3	25.3	26.7	27.3	27.5	26.6
Exp./Sales+Imports	20.8	19.7	21.1	21.4	21.1	20.0

Source. C.S.O. Monthly Digest of Statistics, HMSO April 1985.

A better indication of the importance of multinational companies can be provided by examining statistics on the size of inflows and outflows from foreign direct investment. The OECD estimates that UK private investment overseas varied from 2.88% of GDP in 1978 to 5.01% in 1981, amounts which cannot be considered as insignificant. Additional evidence is provided in table 3, which provides data on the size of inflows and outflows and the amounts reinvested from earnings of foreign subsidiaries for the years 1977 to 1980. Whilst these figures are somewhat out of date there seems to be no reason to suspect that such flows have not increased since then. Thus, they provide a conservative guide to the current situation.

Table 3.

SELECTED INFORMATION ON THE SIZE OF FDI BY U.K. COMPANIES.

Current $ mill.	1977	1978	1979	1980
Outflow of fdi.	3,289	5,246	5,915	6,107
Inflow of fdi.	2,310	2,501	3,881	4,886
Inflow of earnings from fdi.	1,745	2,081	2,495	3,137
Earnings reinvested in host countries.	2,556	2,414	3,487	3,215
Earnings reinvested in U.K.	1,458	1,385	2,764	2,078

Source: UN. Transnational Corporations in World Developement,1983

These figures relate to the flows from and to investments and not to the stocks of foreign investments held, which must obviously be much larger. It can be seen from this limited analysis that the amounts of foreign investments held by U.K. companies is significant. Specifically, there are a fairly large number of U.K. companies with significant overseas operations and that they are an important group in the context of the wider U.K. economy. This provides support for the assertion that the issue of geographical information disclosure is important.

1.3 THE REGULATORY FRAMEWORK

The first Companies Act was the Joint Stock Companies Act of 1844 which required the preparation of a Balance Sheet. However, these requirements were short lived, lasting only until the 1856 Act (although the requirements were not repealed for banks and insurance companies). The 1856 Act included only a model or voluntary Balance Sheet (Nobes and Parker 1979). The next major piece of legislation was the 1907 Companies Act requiring the filing of an annual Balance Sheet, although it was still possible to provide minimal and misleading information (Edey 1979). The Profit and Loss Account was not required until the 1929 Companies Act and the next major piece of legislation was the 1948 Companies Act. This Act recognised, for the first time, the existence of subsidiaries and holding companies. It required the publication of group accounts as well as many other new items of disclosure. One interesting aspect of the Act was that for the first time it included many recommendations made by the accounting bodies.

Company legislation forms a framework for disclosure. It requires companies to disclose certain items of information. In addition, companies are also affected by pronouncements of the accounting profession. Such professional accounting standards largely concentrate upon how the information required by the Companies Acts should be produced.

The first local professional accounting body was set up in Edinburgh in 1854, this formed the basis of the Institute of Chartered Accountants of Scotland. Several other local bodies were also formed shortly afterwards, whilst the ICAEW was formed in 1880 (Zeff 1972). These groups were the first professional accounting bodies anywhere and preceded the formation in the U.S.A. of the American Association of Public Accountants in 1887 (renamed the American Institute of Certified Public Accountants in 1957). Despite the early formation of these professional bodies the profession in the U.K. did not become involved in issuing authorative accounting statements until relatively recently. The ICAEW set up, in 1942, the Taxation and Financial Relations Committee which was responsible for issueing 29 Recommendations on Accounting Principles between 1942 and 1969. However, these were only recommendations and there was no means of forcing companies to comply with them. This situation changed in 1970, largely due to the effects of three important financial scandals during the 1960's. In 1964 John Bloom's Rolls Razor Ltd collapsed shortly after issuing the annual accounts which gave no indication of any potential problems. Then, in October 1967, during the contested GEC-AEI takeover AEI issued a profit forecast of £10million for the year (which only had ten weeks still to run). The actual earnings for this period instead turned out to be a loss of £4.5 million. Finally, in 1969 Leasco Data Processing Equipment Corporation bid for Pergamon Press Ltd on the basis of reported profits for 1968 and a profit forecast for 1969. Later they withdrew this offer following serious doubts about the correctness of these profit figures. These three cases in particular led to very severe criticisms of the existing accounting legislation and the adequacy of the professional recommendations. Such criticisms were expressed not only in the press but also by the Government which appeared to be prepared, if necessary, to take the initiative for tighter legislation itself (Zeff 1972). This led to the ICAEW forming, in 1970, the Accounting Standards Steering Committee (renamed the Accounting Standards Committee in 1976, by which time all the professional bodies in the U.K. were members). This body is responsible for issuing statements of standard accounting practice which must be followed by all companies with failure to comply leading to a qualified audit report. Initially membership of the ASC was limited to members of the professional institutes, however, in 1982 representatives of the users of accounts were also included (Bromwich 1985). The objective of these standards is to narrow the areas of difference and variety in accounting practices by incorporating 'best' accounting practice into the standards (ASC 1978).

Thus, the accounting regulation process in the U.K. can be characterised by the dual authorites of the government through company law legislation, and the profession through the standard setting process. The third body involved in the process is the Stock Exchange which also requires listed companies to disclose certain information.

Mueller (1967) describes such a system as 'accounting as an independent approach', a description that he also applies to the U.S.A.. Such a system is in sharp contrast to the greater government control that is common in most other European countries. However, there are important differences between the U.K. and the U.S.A. where the powerful body of the Securities Exchange Commission plays a major role in accounting regulation. These differences have led many authors to describe the two systems as essentially different (AAA Committee 1976, Da Costa, Bourgeois and Lawson 1978, Frank 1979, Nair and Frank 1980). Nobes (1984) argues that the two countries both influence the accounting systems in other countries (similar to Seidler's (1967) sphere of influence classification), but that in turn both are essentially pragmatic systems (similar to Mueller's classification).

The effects of the increase in the size and complexity of multinational companies and the regulatory system existing in the U.K. for controlling the information provided by these companies both help to explain the developments, or lack of developments, in the issue of segmental reporting. In particular, these two factors may be viewed as the more important parts of, what Burchell Clubb and Hopwood (1985) term, the accounting constellation.

1.4. THE GEOGRAPHIC SEGMENT REPORTING ISSUE.

The Stock Exchange was the first body in the U.K. to require geographical segment data when, in 1965, they required disclosure of turnover information. Although the Jenkins Committee on Company Law Reform recognised, in 1962, that such information was desirable they felt that this was not an area appropriate for legislation. It was not until the 1981 Companies Act, based upon the E.E.C. Fourth Directive (EEC, 1978), that any geographic information was required by law. The accounting profession has recognised the desirability of such information (A.S.C. 1975). An exposure draft is currently under consideration, but the A.S.C. has not yet issued a standard in this area. This relative lack of interest in the subject of geographical segment data is difficult to explain and is in marked contrast to the position in the U.S.A.. Interest was first shown in the mid 1960's (Skousen, 1970) and the S.E.C. required the provision of geographical information in registration documents in 1969. In 1974 such information was also required in annual accounts. The profession has also become involved in this issue. In December 1976 the FASB issued FAS14 which required geographical data not only on the basis of turnover but also information on transfers, profits and identifiable assets. Requirements for at least some geographical segment information exists not only in the

U.K. and the U.S.A. but also many other countries. Canada (CICA, 1979) and Australia (AAS16, 1984) both have requirements similar to those in the U.S.A. whilst most of the EEC countries have requirements similar to those of the U.K.. In addition, there is an international standard, similar in its requirements to FAS14 (IAS14, 1981) and support for such information from both the OECD (1976, 1979) and the UN (1977).

There have been quite a number of studies concerned with segment information on the basis of line of business. These studies generally fall into one of two categories. Predictive ability studies have generally found that line of business turnover data leads to more accurate profit forecasts than does consolidated earnings, but segment profit data has little or no additional predictive content (Kinney 1971, Collins 1976, Emmanuel and Pick 1980). The second approach has been to examine the stock market effects of such information. For example, Horwitz and Kolodny (1977) and Simonds and Collins (1978) examined the abnormal returns of companies when the SEC 10-K requirements were issued. Collins (1975) examined the returns that could have been made if segmental information had been available to an investor. Ajinkya (1980) examined the risk return characteristics of portfolios prior to and after the SEC 10-K requirements. The general conclusion of such studies is that line of business data does have information content as measured by stock market reaction to such information.

Very little empirical work has been carried out using geographical information. Prodhan (1986) examined the geographical disclosures of U.K. companies and concluded that such data is useful as evidenced by a stock market reaction.

There thus appears to be a fairly large gap in our knowledge regarding the usefulness of geographical information. There have been several studies asking users about their perceptions of the usefulness of geographical data (e.g. Buzby 1974, Chandra 1974, Chandra and Greenball 1977, Firth 1978, 1979, 1980). However, there are several major problems with such an approach, in particular problems of ignorance and gaming. As a result it is very difficult to derive conclusions or generalisations from such studies.

1.5 HYPOTHESES.

In an attempt to help explore this area further the following research question will be addressed;

To what extent do geographical turnover and earnings data, as currently reported by U.K. multinational companies, aid in making more accurate forecasts of next year's results than are possible from consolidated turnover and earnings data?

From this initial research question several more specific, and testable, hypotheses can be derived. Specifically, the following hypotheses will be examined.

Hypothesis 1: Geographical turnover data enables more accurate forecasts of next year's turnover to be made than does consolidated turnover data.

Hypothesis 2: Geographical turnover data enables more accurate forecasts of next year's earnings to be made than does consolidated earnings data.

These two hypotheses are based upon the premise that geographical data allows country specific information to be incorporated into forecasts rather than having to rely solely upon the company's past consolidated results. This should make possible more accurate forecasts as a company's performance should depend inter alia upon the performance of the economies it operates in.

Hypothesis 3: The relative accuracy of forecasts based upon geographical data will be greater for companies that disclose finer geographical segments.

The aggregation of country specific forecasts into forecasts applicable to the reported segments introduces a major source of potential errors. This is because assumptions must be made regarding the relative importance of each country to the company's performance. The finer are the segmental disclosures then the less aggregation of country economic forecasts is required. It would be expected that the fewer countries, at least potentially, which are represented by a segment then the more accurate will be the segment economic forecasts and consequentially more accurate the company forecasts based upon such economic forecasts.

Hypothesis 4: The relative accuracy of forecasts based upon geographical and consolidated data will depend upon the size of earnings.

It would be expected that if earnings are very near zero in any year then the relative accuracy of the various forecasting techniques may vary from the situation pertaining when there are instead large earnings.

Hypothesis 5: Geographical earnings data enables more accurate forecasts of next year's earnings to be made than does either geographical turnover data or consolidated earnings data.

This is based upon the assumption that the profit margin will vary across segments. If this is so then it is likely that knowledge of segment profit margins would be useful for forecasting purposes.

1.6 METHODOLOGY

The sample used comprises 109 U.K. multinational companies. These were all the U.K. based quoted industrial companies listed in the Times 1000 1981/1982 which also met the following criteria:

1. Annual accounts were available for the years 1973 to 1983. This was necessary as the data required was not available from any other sources.

2. The company disclosed at least geographical turnover data for the years 1980 to 1983.

3. The company had a consistent year end between October and March for the eleven year period. This is necessary to ensure that the company's financial year approximaetly coincides with the period covered by the economic forecasts used.

One year ahead forecasts of both turnover and earnings were derived for these companies for the years 1981 to 1983. The segment based earnings forecasts were of two types, depending upon segment turnover and segment earnings data. These forecasts were based upon published forecasts of the growth in GNP of individual countries which were then combined to form a weighted forecast applicable to each of the segments disclosed by the companies. Six forecasts were developed for each company. Four of these were based upon differing assumptions regarding the importance of inflation and two were based upon ex-post GNP data.

To gauge the relative success of these forecasts the errors generated were compared with those derived from six forecasting models based upon consolidated turnover or earnings. These models were chosen to reflect the major time series models suggested in the literature as adequately modelling the time series properties of earnings. In addition, because there is no consensus regarding the best way to measure the forecast errors four different error measures were employed. Each of these errors were also considered in both a non-truncated and a truncated form. The forecasts were then compared on the basis of the relative ranks of the errors generated. In addition, the significance of differences in forecast accuracy were assessed by t-tests on each pair of errors.

1.7 LIMITATIONS OF THE RESEARCH.

There are several limitations inherent in this reseach, the most important ones are;

1. Only one aspect of usefulness is examined, namely forecasting ability. Geographical data may be useful for other purposes as well. Of particular importance is whether it helps in assessing the risk rather than the the expected returns from investing in a company.

2. Potential usefulness rather than the actual use made of such information is examined. This study examines whether or not geographical data can be used to predict future earnings. Consequently it does not examine whether or not any users of accounts use this data for this purpose. In addition, it does not examine the effects of this information upon, for example, the stock market.

3. Only U.K. company disclosures are used and the sample comprises only large companies. This means that the results found may not be representative of those that would apply to either other, generally smaller, U.K. companies or to companies from different countries. In addition, the study covers forecasts made for the years 1981 to 1983. If, for any reason, the accuracy of economic forecasts for this period are different from those for other periods the results may also be time specific.

4. Only segment turnover and profit figures are used. Other data provided in some cases such as segmental capital or employees may also aid forecasting. In addition, the study is purely cross-sectional. Company specific information such as line of business data, the list of main subsidiaries and qualitative information may also aid forecasting.

5. The costs of providing such information are not examined, nor are questions such as the best way define the segments or to report segment results, the optimal number of segments to report or how exports, intra-company transfers or common cost allocations should be dealt with. Thus, whilst this approach allows statements to be made regarding the usefulness of the information currently produced it is unable to say whether such information should be produced from a cost-benefit perspective. Nor can statements be made regarding the optimal amount of geographical information that should be disclosed.

6. The hypotheses tested are, at least partially, joint tests of not only the usefulness of the information currently provided and the forecasting methodology used but also the economic forecasts used. Limited testing of an alternative economic forecast was carried out which suggests that the choice of economic forecast was not crucial to the results found. However, there may be alternative sources of GNP forecasts that would allow significantly more accurate forecasts of earnings to be made.

1.8 OUTLINE OF THE STUDY

Before attempting to answer the research questions described above two related questions are explored. Firstly, what information do U.K. companies currently provide? Secondly, what are the a priori or theoretical arguments that support the assertion that geographical segment disclosures are useful?

Chapter 2 examines the legislative and professional requirements in the U.K. and other countries, especially the U.S.A. as well as the requirements of international bodies, specifically the I.A.S.C., O.E.C.D. and U.N.. In addition, evidence regarding the extent that U.K. companies provide geographical data is presented.

Chapter 3 examines user information needs with reference to geographical segment information. The user group considered is the shareholder group and, by extension, their professional advisors, the investment analyst group. Whilst many other users also need financial information the annual report and accounts is primarily designed to meet the needs of shareholders. Research in this area may be classified into two main categories, namely accounting theory and surveys of users. Accounting theory approaches cover attempts at developing a theory of what information companies should disclose. Surveys of users covers empirical work, mainly through questionnaires, of what information is required by users. In addition, some behavioural studies covering work on how an individual's cognitive characteristics affect their decision making and consequently their demand for information are also examined.

Chapter 4 concentrates upon one aspect of the potential benefits of geographical information, namely the extent to which such information may be useful for risk assessment. Two types of risk are particularly relevant, namely political and financial risk. Financial risk covers the area of the potential benefits of international diversification by both private individuals and by companies through foreign direct investment. This chapter then examines what is meant by political risk and the extent to which geographical information, as currently normally provided, is likely to aid in an assessment of the extent to which companies face such risks.

Chapter 5 provides a review of prior studies into earnings time series modelling and studies of the stock market effects of line of business disclosures. Time series modelling studies are of several types. Annual earnings streams have been studied by examining the time series properties of earnings and by modelling the process and then assessing the predictive ability of both naive cross-sectional models and company specific models. Quarterly earnings have been examined mainly through the use of company specific models. In addition, predictive studies using line of business data and studies into the relative accuracy of forecasts made by models, managers and financial analysts are examined.

Chapter 6 describes the methodology used in this study. Based mainly upon the analysis of chapter 5 this chapter explains both the derivation and characteristics of the consolidated and segment models and the error metrics that will be used. In addition it examines the more important assumptions that are necessary and the problems involved in the forecasting techniques employed.

Chapter 7 describes the sample of companies used. It explains how the sample was selected and describes the most important characteristics of these companies. An assessment is made of how similar these characteristics are for the sample companies and the rest of the population of companies which were excluded due to the unavailability of the necessary data. From this an attempt is made to assess the external validity of this study. In addition, the consistency of the disclosures made are examined. Such consistency is of two types, cross-sectional and inter-temporal consistency.

Chapter 8 examines hypothesis one, namely the accuracy of turnover forcasts. Chapter 9 examines hypothesis two, that is forecasts of earnings using consolidated earnings and segment turnover data for the entire sample of 109 companies. Chapter 10 examines hypotheses three and four. Firstly, 17 companies that disclose only U.K. and overseas segments are excluded, secondly the sample is further reduced by excluding companies with negative or small profits. As there is no agreed definition of what is meant by small profits four alternative filter rules are employed. In addition, a small number of companies are used to examine the effects of using a different source of economic forecasts. Chapter 11 examines hypothesis five, namely the relative accuracy of forecasts based upon geographical earnings data. Finally chapter 12 draws together this study, it provides a summary and derives general conclusions and implications from the results found.

1.9 SUMMARY OF RESULTS

Forecasts derived from a total of twelve different models were compared over three years. In addition, the errors generated were measured in four ways as well as being both truncated and non-truncated. Four of the consolidated models employed were multiple form models with a maximum of ninteen alternative forms or weightings of the components of the forecasts. The optimal form of each of these models which were then compared to the other models were chosen in three alternative ways. Firstly, the form that generated the smallest error on average over all three years was used, secondly, the best ex-post form for each year was used and thirdly, the best form of the model for the preceding year was used. This means that the results found often differed over the various years, error measures or alternative rules for selecting the best form of the multiple form models. This means that it is difficult to summarise the conclusions found and that such a summary must be somewhat of a simplification. Providing these limitations are remembered the main conclusions can be briefly summarised.

There was virtually no evidence to support the first hypothesis. In the vast majority of cases forecasts of turnover based upon consolidated turnover were more accurate than those based upon segmented turnover. The best model was a model that included a positive drift term, or in the case of the segment models, an adjustment for expected U.K. inflation.

Hypothesis two, that earnings forecasts based upon segmented turnover are more accurate than those based upon consolidated earnings was clearly rejected.

There was limited evidence to support both hypotheses three and four, although the results were not conclusive. When 17 companies that disclosed only U.K. and overseas segments were removed the forecasts were often more accurate. Similarly, the use of four alternative filter rules to exclude companies with very small or negative earnings had some affect upon the relative accuracy of the models.

Hypothesis five stated that earnings forecasts based upon segmented earnings outperform forecasts based upon either segmented turnover or consolidated earnings. In general this hypothesis was supported by the evidence. Segment earnings based models clearly and significantly outperformed those based upon segment turnover data. In most cases they also outperformed the random walk model, which had been found to be the best consolidated model. However, in quite a number of cases the difference in the accuracy of the models was not significant.

There were, in addition, some differences in the results for truncated and non-truncated errors. In particular, the use of a truncation rule had the effect of damping down a few very large outliers which made the results more consistent across the different errors and years. It also appears that the results found and the conclusions derivable are often error specific. In particular, the choice of a denominator of either actual or forecasted earnings or turnover was often a crucial determinant of the results found. This finding that the conclusions are often dependent upon how the errors are measured is of particular importance. Many of the studies on the time series behaviour of earnings have used different error measures as well as deriving different conclusions. However, there has not been any attempt to assess the extent to which these different conclusions may have been dependent upon the choice of error measure.

Chapter 2.

USER INFORMATION NEEDS.

2.1 INTRODUCTION.

This chapter examines the information needs of users of accounts with special reference to segmental information. However, this is a very large area especially if it is taken to include all stakeholders, or those groups with a reasonable right to information. Therefore, to limit the analysis to manageable proportions a more restricted view is taken. Namely that of the perspective of existing and potential shareholders. Whilst it is possible to argue about the relative importance of the various stakeholder groups it is undoubtedly true that the major user group is the shareholder group and the information disclosed by companies in their annual report and accounts is mainly aimed at this group. There are several approaches that can be applied to an analysis of the question of the information needs of shareholders and there is no consensus as to which approach is the best. However, to a large extent this question is irrelevant because each method of analysis throws light upon only one aspect of the question. What is required is an eclectic approach that uses all the possible methods and attempts a synthesis of the findings. This chapter briefly examines the major methods that have been used in prior studies. The most important ones in this context are accounting theory and the empirical analysis of demands for information by users of accounts.

It will be seen that neither of these approaches provides a complete or even unequivocal answer to the question of what information is useful to shareholders. Both approaches provide some evidence to suggest that segmental information is likely to be of value to users. However, even when taken together no categorical statements can be made regarding the value of segmental information. Some behavioural studies are also examined. Of particular importance are those studies that suggest that the value of segmental information cannot be considered in isolation from the specific user of that information. Instead, the cognitive characteristics of the individual may affect both their demand for information and the use they are likely to make of that information.

2.2 SCOPE OF THE PROBLEM.

It is generally accepted that the role of accounting is to provide information that is useful for decision making (e.g FASB November 1978). However, this basic statement provides little help in deciding what information companies should report. This is because it fails to provide any guidance on who are the legitimate users of accounts and what information such users need for decision taking purposes. Even if answers to these two questions are unequivocally accepted, problems still remain with respect to whether it is the role of the company to provide such information and, if it is, what is the best medium to use and what form such disclosures should take.

To make the problem under consideration more manageable it is necessary to limit its scope by restricting the role of accounting and the definition of disclosure as they are considered here. Information can be, and is, provided by companies in a number of different mediums. A company can provide information not only in its annual report and accounts but also in interim statements, special one-off mailings to shareholders or other specific user groups, newspaper advertisements or by interviews with, for example, financial analysts or trade union leaders. However, this study will consider only information that is freely disclosed to all members of a user group, specifically, information disclosed to all existing and potential shareholders and their advisors rather than that disclosed in private meetings with investment analysts. This means that it is possible to ignore such problems as insider trading which can occur if disclosure to a more limited group takes place. Also the additional problems involved in ad hoc or one off reporting will be ignored. Such reports may have a different effect upon user perceptions and consequently the use they put such information to. This is because it may be assumed by many users that such disclosures signal specific, unknown events dissimilar to those implied by the regular disclosure package. More specifically only annual general purpose reports and accounts will be considered. This is because such reports are the most important means that companies have for disclosing information and most companies provide more information, both statutory and voluntary, by this means than through any other single vehicle.

The Corporate Report (A.S.C. 1975) was the first major attempt by the U.K. profession to examine the problem of what should be disclosed in a general purpose annual report and to which stakeholder groups such reports should be addressed. It listed six main user groups which have a right to information from organisations whose "activities have significant economic implications for the community as a whole" (para. 1.2). These groups were the equity investor group defined also to include potential investors, the loan creditor group, the employee group, the analyst advisor group, the government and the public. It is immediately apparent that each of these groups are interested in making different decisions about a company, and so, although some information needs will be common between some or all of these groups, many of their requirements will differ. Financial accounting traditionally saw its role as providing information upon the stewardship function to the owners of companies (Birnberg 1980). Even if the wider view of the functions of accounting, with its emphasis upon stakeholder groups and decision orientated information, is accepted external reporting is still mainly concerned with the information needs of the equity investor or shareholder group. This study will be solely concerned with their needs, although the results found may also be of relevance to other user groups. For example, a number of researchers have argued that many of the employees' information needs will be similar to those of shareholders (e.g. Walton and McKersie 1965, Gray and Maunders 1980, Maunders 1981) and the needs of investment analysts will likewise be similar to those of shareholders.

Ideally information should only be reported if it is useful, that is if it is capable of being constructively employed in decision making so that it leads to better decisions (however defined). The benefits also need to exceed the costs of such disclosures. In an ideal world cost/benefit analysis would be carried out upon all potential types of information disclosures. However, it should be recognised that it is virtually impossible to calculate the costs of many disclosure items given that such costs include not only the direct costs of data collection, manipulation, and dissemination but also many indirect costs. These include the opportunity costs of the resources employed in reporting and the far more nebulous costs of potential competitive disadvantage, i.e. the losses due to dissemination of competitively useful information. These costs and the related benefits of disclosure should include not only those attributable directly to the reporting entity but also any social welfare gains or losses. Social welfare gains may be due to, for example, more efficient use being made of limited resources as the operations of companies are made less opaque. Social welfare losses may occur to the population of one country if increased disclosure encourages foreign companies to take over domestic ones and consequentially, for example, decreasing employment. In practice, due to the impossibility of obtaining such information, the literature on information disclosure has concentrated upon one very small part of the cost/benefit analysis, namely the benefits to individual users, rather than to society as a whole. This is not the ideal way to assess the benefits of disclosure, indeed it implicitly assumes that social welfare maximisation can be achieved by maximising shareholder welfare, a concept that is, at best, very debatable (Beaver 1981). However, given the current state of knowledge such a simplification is inevitable and this approach is still capable of generating useful conclusions providing this limitation is kept in mind. This question of usefulness has been approached in many different ways which vary in the emphasis given to decision usefulness. At one extreme are approaches that have implicitly used this criterion. At the other extreme are those that have used it as their sole explicit criterion, in the extreme arguing that information should only be disclosed if it has been demonstrated to be useful and that this is best done simply by asking users, i.e. companies should report that information which users have asked for.

2.3. ACCOUNTING THEORY.

One way of assessing what should be reported might be to go back to accounting theory which attempts to explain both the nature and scope of accounting and then to apply these findings to the question of disclosure. Unfortunately there is no agreed upon body of theory or even statements of objectives or principles that are generally accepted. Instead there are a very large number of, often conflicting, approaches to this question, only some of which can and have been applied to the question of information disclosure.

Belkaoui (1985) divides attempts at theory formulation into two types, traditional and non-traditional, which may also be characterised as pre and post late 1960s. Of these theories the only ones that will be considered here are those that can be directly applied to the question of what information to disclose.

The most important traditional approach is the deductive approach. This has been employed by such authors as Paton (1922), Sweeney (1936) Edwards and Bell (1961), Moonitz (1961), Sprouse and Moonitz (1962) and Chambers (1966). The deductive approach starts with a specification of the objectives of financial statements, and from there works down to specifying principles and postulates and finally to the lowest level, that of specific techniques. This means that if the objectives are agreed upon and the internal logic consistent then the techniques derived must also be true. This approach has mainly been used to derive the type of valuation system that should be employed, i.e. whether and how changes in both the general price level and specific price changes should be treated e.g. the stabilised accounts of Sweeney and Chamber's continuously contemporary accounting. However, it can also be used at a more micro level, for example, given the valuation system employed then at what level should information be disaggregated? As will be seen later the FASB conceptual framework is essentially of this type. It starts with stating the basic objectives of financial statements and from these derives certain types of information that should be reported.

The major problem with this approach is that generating a logically consistent theory is not the same as gaining general acceptance of its conclusions or of proving that certain types of information are actually useful or proving that the benefits of disclosing such information outweighs the costs. The main reason for this is that the first step is to list the objectives of the accounting system. If these are disagreed with then the techniques derived will also be disagreed with. Whilst this is a problem of any method that is dependent upon statements of objectives it appears to be especially a problem with this approach as the statement of objectives is so crucial to it. The deductive approach has generally lost its popularity as it was seen that theories derived using this method singularly failed to gain widespread support. Thus, there has been a general move away from approaches that may be characterised as perceiving accounts as maps to purpose-designer approaches (Laughlin and Puxty, 1983). More specifically, there has been a move to methods that are more closely linked to either the information demands or needs of users whether perceived, derived implicitly or derived explicitly.

One of the earliest attempts to derive a rule applicable in assessing what information to report which employed a usefulness criterion was the predictive ability criterion as developed by Beaver, Kennelly and Voss (1968). They argued that;

> "alternative accounting measurements are evaluated in terms of their ability to predict events of interest to decision makers. The measure with the greatest predictive power with respect to a given event is considered to be the "best" method for that particular purpose." (page 675)

This does not simply mean that if a particular piece of information appears to have predictive ability it should be reported. Such an ability may be illusory due to random factors, or may not continue into the future. Instead, the alternatives being considered for disclosure must firstly meet the tests of logical consistency and a theory linking them to the event of interest must also exist. Even with this necessary limitation to its applicability, problems still remain in operationalising the concept. For example, it is still necessary to "discover" what items are of interest to users. Also testing of the criterion will necessitate the specification of a prediction model and operationalising the variables of interest. Different prediction models or specifications of the variables may lead to different conclusions regarding the desiribility of a piece of information. There has been some criticism of this concept of usefulness. For example, Greenball (1971) completely refutes this approach. He instead argues that an accounting method is not a predictive tool, but rather it plays a feedback role which does not explain or predict anything. This type of criticism can be refuted as it assumes too narrow a role for accounting. The problems of operationalising the concept are often likely to be very great, and for certain types of information these problems make the concept impossible to apply. However, if there is general agreement regarding the importance of specific 'events of interest to decision makers' the validity of this approach appears evident.

A similar approach was advocated by Sorter (1969) which he called the events approach. This implicitly uses the predictive ability criterion. He argues that companies should disclose information about relevant events so that users can generate their own output values. This means that the information disclosed should be much more disaggregated than is now normally the case. It is still necessary to have an idea of users' decision models or needs so that the types of information to disclose can be decided upon. But much less knowledge is required than that needed for alternative approaches as the users are left to generate their own data or values. The predictive ability criterion is recognised in this approach, for example;

> "Each event shall be described in a manner facilitating the forecasting of that same event in a future time period given exogenous changes." (page 16).

Apart from the difficulty of deciding what events are relevant there are also other problems with this approach as recognised by Johnson (1970). Of particular importance, the problem of deciding what level of disaggregation is relevant still remains. Whilst information will be more disaggregated than is currently the case, for external reporting purposes the level of aggregation must still be relatively high. Also Sorter seems to ignore the use of certain information to predict other types of events in the future. These criticisms can also be levelled at the suggestion of Beaver, Kennelly and Voss. However, both of these approaches suggest that disaggregated or segmental information is likely to be of value to users of accounts.

Probably the most important attempt at generating a conceptual framework or theoretical foundation for accounting was developed by the F.A.S.B.. They began work in 1973 on developing a set of qualitative standards for financial reporting, and this was later extended in 1976 to include a conceptual framework as well. The first statement, "Objectives of Financial Reporting by Business Enterprises" (F.A.S.B. November 1978) essentially agreed with the Corporate Report (A.S.C. 1975) regarding the with the Corporate Report (A.S.C. 1975) regarding the major objectives of financial reports.

> "Financial reporting should provide information that is useful to present and potential investors and creditors and other users in making rational investment, credit and other decisions." (Para. 34)

It further narrowed this definition by concluding that the variable most of interest to such users was future or potential cash flows from the business. These in turn are related to the enterprise cash flows so that;

> "Financial reporting should provide information to help assess the amounts, timing and uncertainty of prospective net cash inflows to the related enterprise." (Para. 37)

The statement then argued that such expectations are in turn at least partially based upon the enterprise's past performance and that;

> "The primary focus of financial reporting is information about an enterprises performance provided by measures of earnings and its components." (Para. 43).

This emphasis on the Income Statement rather than the Balance Sheet and the recognition that the constituent elements of income are of vital importance to an adequate assessment of the likely future performance of the enterprise may help provide some justification for the provision of segmental information. However, whilst this suggests that such information may be of use, by itself it does not appear to provide a sufficient justification for such information.

The second statement (F.A.S.B. May 1980) examined the characteristics that financial statement information should possess. This statement argued that to be useful for decision making purposes the information should be relevant, reliable, comparable, consistent and material. Apart, possibly, from the requirement for relevance these are necessary rather than sufficient conditions for the inclusion of information. The statement defines relevance in terms of predictive ability. However, even this criterion cannot be used directly to argue for the inclusion of any specific piece of information. Instead it means that additional research is required to measure such predictive ability. Statement 3 (F.A.S.B. December 1980) defines and describes the basic elements of existing financial statements whilst statement 5 (F.A.S.B. December 1984) sets up criteria for when to recognise and report these basic elements.

The F.A.S.B. conceptual framework project is the most ambitious attempt of this nature so far. It had the advantage of following on from several earlier attempts (e.g. Paton 1922, Paton and Littleton 1940, Committee to Prepare a Statement of Basic Accounting Theory 1966, the Trueblood Report AICPA 1973), and so should have been able to learn something from these. In addition it had far more resources at its disposal than were available to earlier studies. Whilst it has generated some useful insights it has failed, in spite of these advantages, to either gain widespread support or to generate any conclusions that can be applied directly and unambiguously to the question of what specific information should be included in financial statements. The F.A.S.B. themselves recognised that they could not provide a complete panacea to the problems of financial reporting;

> "To establish objectives and concepts will not, by itself, directly solve financial accounting and reporting problems. Rather objectives and concepts are tools for solving problems." (F.A.S.B. 1985 p.5)

Indeed, there are arguments that such an approach is doomed to failure. Such attempts at developing an accounting theory implicitly assume that it is possible to somehow derive accounting methods or lists of items that should be disclosed that will be generally accepted and that will unequivocally benefit all of society's members. It seems far more plausible to argue the opposite, that accounting is a political process and trade-offs between the interests of different groups should be explicitly recognised and dealt with. Such an argument can be supported from the perspective that accounting should be political as it is concerned with the public need for information (Hope, 1979). Alternatively, it may be argued that accounting can only be political. Demski (1973) argues that no accounting principles such as relevance or objectivity can be used to rank accounting alternatives in an optimal manner for all members of society. Indeed, even in a single person setting there is no guarantee that any set of principles will single out the most preferred alternatives. Whilst, for example, Cushing (1977) and Bromwich (1980) both criticise the restrictive assumptions made and the finality of the conclusions drawn by Demski they both support the argument that generally a choice between the preferences of different users will be required. For example, in a submission to the A.S.C. on their Consultative Document on Setting Accounting Standards, Bromwich states that

> "Decisions concerning the use of accounting systems require some type of comparison of the welfare of those who gain and those who are harmed." (1979, pg. 499)

2.4. SURVEYS OF USERS.

An alternative approach to determining which items of information should be disclosed is to ask users what information they require. This has been done many times by different researchers. For example, financial analysts have been surveyed by Singhvi and Desai (1971), Buzby (1974), Chandra (1974), Chandra and Greenball (1977), Belkaoui, Kahl and Peyrard (1977) and Firth (1980). Similarly, bank loan officers have been surveyed by Benjamin and Stanga (1977) and Firth (1978), whilst ordinary shareholders have been surveyed by Baker and Haslem (1973), Chenhall and Juchau (1977) and Baker, Chenhall, Haslem and Jachau (1977). However, this approach appears to have lost its popularity in recent years as it has several major limitations.

In particular, there is the problem of deciding what items to look at. Indeed these surveys have differed greatly in both the number and type of items. The surveys can be categorised into two types, those that only include information that might be currently found in annual reports and those including all items potentially useful to the investment decision. This would include items that are external to the company as well as non-financial information. This lack of agreement upon the number and scope of items considered makes any generalisations extremely difficult as the relative importance of any item will depend not only on any intrinsic value that it might have but also upon the other items being considered. This problem is compounded by the fact that the surveys have covered a variety of different types of users in different countries over different time periods. This means there are an insufficient number of directly comparable studies to make generalisations with any degree of confidence. For example Chang, Most and Brain (1983) in a study of individual shareholders, institutional investors and financial analysts in the U.S.A., U.K. and New Zealand found that in most cases the relative importance of line of business information in buying and hold/sell decisions appeared to differ significantly across all three countries for all three types of users.

Whilst these are criticisms of the work so far done in this area a more important criticism can be made of the validity of this type of approach. Two problems are especially important, one is that users often only have a very limited knowledge of both the potential uses of, and limitations of, information that is not currently generally available. This means that the weighting given to such information is likely to differ from that given to it had the users been familar with it. Thus it will be it had the users been familar with it. Thus it will be undervalued if they are unaware of its potential benefits or overvalued if unaware of any limitations in its applicability. Secondly, it has been found that users are unable to adequately state what information they currently employ in decision making or to assign the correct weights to reflect the relative importance of it in decision making (see Slovic 1969, Hofstede and Hughes 1977, Libby 1975, Zimmer 1980). This means that the answers given are likely to be based upon custom, fashion or beliefs about what answers the researchers want. It should also be recognised that data does not have any intrinsic and fixed information value but that its usefulness will be a function of the specific decision being taken, any prior beliefs, what other information is also available and the utility functions of the information users. Another problem with this approach is that the setting is hypothetical and ignores any incentives to misrepresent preferences. No direct costs of information provision are incurred by the users of such information which in turn implies that there are incentives to overvalue the usefulness of any information disclosures (Ball and Foster 1982). Finally, even if these problems were solved the problem still exists that in general it is impossible to derive a group preference function from a multi-person setting, i.e. the Arrow impossibility theorem (Lev, 1976). In spite of all of these limitations the surveys may provide a useful insight into user needs although, obviously, the conclusions cannot be automatically accepted as a guide to action unless additional assumptions or value judgements are made regarding the objectives and purposes of information disclosure. An additional problem with examining the importance of segmental disclosures by questionnaires is that the importance of such information is a function of exactly what information is given. It would be expected that if the information was of a very general nature and highly aggregated it would of considerably less use than very detailed or disaggregated information. Unfortunately none of the surveys went as far as stating the level of disaggregation of the segmental information.

Inspite of these limitations it is still useful to briefly look at some of the results as they relate to segmental disclosures. Unfortunately most of the surveys, and all of those that looked at individual shareholders, ignored segmental information. Buzby (1974) surveyed financial analysts with respect to 39 items which appear in at least some annual reports, these being based upon the items included by Cerf (1961) in his index of disclosure items. He received replies from 131 analysts who rated the items from 0 if considered unnecessary to 4 if considered of vital importance. Sales revenue and net income from foreign operations were ranked third equal with a score of 3.77. This finding differs markedly from that found by Chandra (1974) who surveyed accountants and security analysts. The survey consisted of 58 items which might be useful for the investment decision, i.e. it also included non-company specific information. From 498 responses it was found that security analysts ranked a geographical breakdown of sales, income and investments thirty-second whilst the accountants ranked such information thirty-fifth. Chandra and Greenball (1977) sent the same questionnaire to executives who ranked the information thirty-ninth. The only other surveys, which are more compatible with Buzby, and which included disaggregated information were carried out by Firth (1978, 1979 and 1980). He surveyed U.K. financial directors, auditors, financial analysts and bank loan officers with respect to 75 financial items. The geographical location of assets was considered relatively unimportant, being ranked from 38th by auditors and financial analysts to 25th by financial directors. Exports were ranked from 36th by auditors to 13th by bankers whilst sales by product, customer or geographical location was considered essential, being ranked from 7th by bankers to 1st by financial analysts. Similarly segmental earnings were considered essential being ranked as the most, or second most important item.

It appears that both work on developing accounting theory or a conceptual framework for accounting and surveys of users provide support for the provision of segmental information. If any conclusions can be drawn from studies of the perceptions of users, they are that if only the information found in annual reports is considered then segmental information, especially turnover and earnings data, is considered to be very important. If instead, all types of information are considered, then such disclosures are considered to be relatively much less important. However, none of these authors looked directly at the information needs of shareholders with respect to segmental disclosures. Investment analysts were surveyed theough, and it would be expected that they would have similar needs. It was also shown that several attempts at developing an accounting theory or conceptual framework of accounting have come to similar conclusions. In particular, there is agreement that companies should disclose information that is useful for predictive purposes and that disaggregated information is generally more valuable than aggregated information.

2.5 BEHAVIOURAL STUDIES.

Whilst the research into user information needs does help to throw light on to what information companies should disclose, all the studies implicitly assume that all users of the same type will have the same needs for information. Whilst it appears logical to assume that all users that make similar decisions, such as the buy/hold/sell decisions of investors, will have the same needs for information this need not be the case. The information processing abilities of individuals and the ways in which they make decisions differ and this may affect their information needs. If this is the case then the usefulness of any information will vary across different individuals. To assess the evidence regarding this some behavourial studies will be briefly examined.

Cognitive analysis is concerned with how characteristics of decision makers affect how they process information. The earliest studies, starting with Driver and Lintott (1973) were typically concerned with how individual decision styles affect information processing and so ignored task characteristics in the analysis. Because of this lack of consideration of interrelationships many of the conclusions of individual studies appear contradictory and are situation specific. In spite of this the evidence appears to be that cognitive style does affect information processing although exactly how and in what ways it does so are still far from agreed upon. For example, Dermer (1973) found that subjects that were intolerant of ambiguity collected more information and there was limited evidence that they also concentrated upon quantitative information. Driver and Mock (1975) found that abstract decision makers prefer and effectively use more complex feedback than decisive decision makers who were easily overloaded. San Miguel (1976) similarly found that the amount of information required was a function of both the the degree of flexibility and intellectual efficiency of decision makers. However, Vasarhelyi (1977) Weber (1978) and Otley and Dias (1982) all failed to find any linkage between performance and cognitive style. This lack of linkage between decision characteristics and cognitive style is probably not due to there being no such linkage, but is more likely to be due to the complexity of the problem and there being too many intervening variables for the current methodology to be successful in finding the relationships (Libby and Lewis 1982). The Otley and Dias study is of particular interest as it was concerned with the effects of aggregation of data on decision making. Their findings suggest that the level of aggregation cannot be considered in isolation from the information content of such data. However, if the information content was not affected then performance increased as the level of aggregation increased. This contrasts with earlier finding of Barefield (1972) who found that performance was better if the level of disaggregation was higher, although the results were generally not conclusive.

2.6 CONCLUSIONS.

It was shown that whilst there is evidence to support the disclosure of segmental information it is rather limited. The surveys of users of accounts seem to suggest that, if only information in the annual report and accounts are considered, segmental information is relatively important. However, there are several major problems with this approach which limits the faith that can be placed in the conclusions drawn. Attempts at providing a complete theory of accounting have not considered this question of segmental disclosures. Many of the attempts have been concerned with the characteristics of an ideal valuation system rather than specifically with disclosure issues. However, there have also been several studies suggesting that the purpose of reports is to provide information for prediction purposes. They have argued either for items that help predict future events of interest or items that specifically aid in predicting future cash flows or income. Whilst both user surveys and theory attempts have tried to answer questions regarding what items might be useful to readers of accounts both have failed to consider the conclusions of behavioural studies. Such work suggests that the value of any item of information may be person specific. The value will depend upon such factors as their information processing abilities and decision making or cognitive styles. This is an important limitation that should be kept in mind when considering the usefulness of any information.

No a priori answers are available when considering the benefits of segmental disclosures. Chapter three therefore examines some other possible justifications or uses of geographical segment information. Such indirect evidence is useful in either supporting or rejecting the case for such information but, by their very nature, they cannot provide a conclusive answer to such a question. Direct testing of the usefulness of geographical segment information is also required. This chapter has examined some of the ways in which such evidence might be generated. The approaches considered here have problems. Surveys of users suffer from many severe problems. In particular, users often have little knowledge of information they are unfamiliar with, do not adequately understand their own decision making processes and have incentives to misrepresent the value of information. Such problems mean that the results found are often of very limited value. Therefore, the second alternative of predictive ability will be used in this study. Although the objectives of accounting information are not completely agreed upon it appears that one objective for which there is a reasonably high level of agreement is that information should be disclosed that has predictive value. Again, whilst there are disagreements regarding the specific future events that are relevant to users of accounts some events are relatively uncontentious. One such event of interest is future earnings. Thus, this study will assess the usefulness of geographic segment data in the context of the prediction of future earnings.

Chapter 3.

REGULATION AND THE EXTENT OF GEOGRAPHICAL SEGMENT DISCLOSURES.

3.1 INTRODUCTION.

It has been shown that multinational companies are important in the context of the U.K. economy. In addition, there are a number of large companies which derive a considerable proportion of their turnover from overseas. The extent to which these companies disclose geographically segmented information can be assessed in two ways. Firstly, the existing legislation can be examined. This approach is based upon the assumption that all companies will disclose what is required by law, an assumption that may not be valid. Although important, this answers only part of the question concerning the amount of information that is disclosed by U.K. multinational companies. In particular, it provides no information on the extent of voluntary disclosure in excess of such requirements. This chapter attempts to provide an initial answer to the question of the extent of geographical disclosures by U.K. based quoted companies. This will be done by firstly, examining the legislation in this area and, secondly, by examining the evidence regarding the disclosure practices of such companies.

This is important as the initial step in any empirical study must be an assessment of both the feasibility and potential importance of the study. Both feasibility and importance are multi-faceted concepts encompassing many characteristics. The feasibility of this study is dependent upon several factors. Of particular importance are the availability of sufficient information of adequate quality and the practicality of the proposed methodology. Similarly, the importance of the research question can be assessed using several alternative criteria. In particular, to be potentially of importance it must be concerned either with phenomenon that occur more than very occasionally or it must have implications for relatively common phenomena. Whilst neither the question of feasibility nor importance can be definitively answered at this stage, evidence is available which can be used to assess whether or not certain minimal requirements are met. It has already been shown that many U.K. companies are multinational and that they are an important group of companies. This suggests that the initial condition for meeting the criteria of importance has been met. Feasibility can be initially measured in terms of data availability. That is, if there is evidence that the disclosure of geographically segmented information is relatively common then this study may be considered as at least potentially feasible.

In an attempt to provide answers to the questions of what information these companies disclose this chapter, firstly, examines the legislative requirements in this area. It can be argued that the disclosure practices of many U.K. companies may also be influenced by the quasilegislation of supranational bodies, in particular the U.N. and the O.E.C.D., as well as legislation in other countries, in particular the U.S.A.. Because of these possible influences, especially upon the largest and most multinational companies, these requirements are also examined. As explained above, this provides only a partial answer to the question of the amount of information disclosed. In addition a review of empirical work concerned with the actual extent of geographical segment disclosures by U.K. companies is also made.

3.2 LEGISLATION AND CODES OF PRACTICE.

3.2.1. REQUIREMENTS IN THE U.K.

The first recognition by any legislative or standard setting body in the U.K. of the increasing complexity and geographical spread of public companies and, therefore, the commensurate need for disaggregated information came in 1962 in the report of the Jenkins Committee (HMSO, 1962). This committee was set up to examine existing company legislation and to recommend future legislation. Whilst it recognised the desirability of segmental disclosures it did not believe that this was an area suitable for legislation;

> "It has been suggested that accounts should show, by geographical area and by industry, how profits are derived and their relationship to assets employed. In many cases this information would be valuable to shareholders and a lot of companies already provide it in some measure. We

would welcome an extension of this practice but we do not think it should be imposed by law on every company." (Para 832)

The 1967 Companies Act (HMSO, 1967) was largely based upon the recommendations of the Jenkins committee but it went beyond their recommendations in the area of line of business disclosures although it ignored the issue of geographical information. It required disclosure in the Director's report of the proportion of turnover and extent, or approximate extent, of the contribution to profits of industry segments if a company carried on two or more classes of business that "in the opinion of the directors differ substantially from each other." (Part I, 17.2.b).

Companies quoted on the U.K. Stock Exchange were first required to provide some information on a disaggregated basis in 1965 when the Stock Exchange introduced a listing requirement for companies to disclose both geographical and line of business analysis of turnover and trading results (Stock Exchange, 1965). Whlst this may be considered as a step in the right direction it is not a very onerous requirement, as the guidance notes (Stock Exchange, 1979) demonstrate:

> "A broad geographical analysis of turnover by way of figures or percentages, not necessarily given country by country will be acceptable. In respect of trading results an appropriate statement should be included where, for a proper appraisal of the business of a company (or group) shareholders should be aware of significant contributions derived from activities carried out in any one territory." (Para.10(c) note 40).

The guidance notes then go on to require disclosure of revenue if foreign operations accounted for at least 10% of total revenues. Such disclosures should be on a continent by continent basis unless a continent accounted for at least 50% of all revenues, in which case a finer disclosure set should be used. Profits need only be disclosed if the contribution from any area is "abnormal", i.e. if the profit rate substantially differs from the average rate earned by the company. Whilst the Stock Exchange requirements do not have the force of law behind them all quoted companies have to comply with them to maintain their listing. Therefore, for such companies the effect is much the same as that of legislation. However, the Stock Exchange does not have an adequate enforcement mechanism so that compliance is not guarenteed. As can be seen from appendix 4.1-4.4 most companies that disclose such information have followed the Stock Exchange requirements and do disclose geographical information on a continent by continent basis. Although this, obviously, may not be the only, or even the major, reason for the choice of this basis of disclosure.

The first time that the Government seriously considered the introduction of legislation requiring geographically segmented information disclosure was in 1977 when the then labour government issued a consultative document or green paper, "The Future Of Company Reports" (HMSO, 1977). The objective of this report was to set out the government's views on a number of specific proposals for additional disclosures in the annual report. This document can be viewed largely as a response to increasing demands for companies to assume a wider responsibility not only to shareholders but also to the much larger group of all relevant stakeholders. It also recognised that the traditional view of the stewardship role of reporting, which views reports solely as a means of reporting on management's stewardship to the shareholders or owners of the company, is a very narrow view of the needs and rights of shareholders for information. Thus this document followed the wider view of the role of companies, and therefore of reporting, which had earlier been reflected in reports by, amongst others, the C.B.I. (CBI, 1963), the Bullock Committee (HMSO, 1977) and the Accounting Standards Committee (ASC, 1975). The green paper argued that in the area of segmental information the 1967 Act suffered from two serious weaknesses. Firstly, the information was included in the Directors' Report and so was not subject to audit. Secondly, too much was left to the discretion of the directors in deciding what constitutes substantially different classes of business. The report proposed that instead such information should be included in the notes to the accounts and so be audited and that companies should disclose turnover, profit, capital employed and the number of employees by both line of business and geographical area (para. 41). Also included should be an indication of any special dependence upon a single market. Problems of allocating costs, dealing with intra-group transactions and other accounting problems should be left to an accounting standard as also might be the question of what constitutes a reportable segment. However, largely as a result of a change of government, none of the proposals contained in the green paper were acted upon.

The next government consultative document was published two years later (HMSO, 1979) by the new conservative government. This was mainly concerned with implementation of the E.E.C. Fourth Directive (EEC, 1978). It proposed that companies should disclose turnover by both geographical and line of business segments in the notes and so be audited. However, it still failed to tackle the problem of what constitutes a reportable segment and left companies with total discretion over how much detail to provide;

> "To allow for flexibility it is proposed that .. the classification of geographical markets should be left to the discretion of the directors as would be the overriding provision that information which would be seriously prejudicial to the interests of the company need not be disclosed." (para. 22)

This requirement is derived from the Fourth Directive which also provided little guidance on segment identification, merely stating that the notes should include;

> "the net turnover ... broken down by categories of activity and into geographical markets in so far as, taking account of the manner in which the sale of the products and the provision of services falling within the company's ordinary activities are organised, these categories and markets differ substantially from one another." (Art. 43.1.8).

The requirements of the Fourth Directive were legislated for two years later in the 1981 Companies Act which states that;

> "If in the course of the financial year the company has supplied markets that, in the opinion of the directors, differ substantially from each other, the amount of turnover attributable to each market shall also be stated." (Sch.1 pt.III.55(2)).

This information has to be included in the notes to the accounts. The Act goes on to say that if the markets do not differ substantially they may be treated as one and if any market is immaterial (however defined) it may be combined with another. It also provides companies with even more leeway in deciding whether or not to disclose such information by stating that if disclosure is "seriously prejudicial to the interests of the company" then such information need not be disclosed. Instead it is sufficient to state that such disclosures have not been made. The Act also leaves ambiguous the definition of turnover, as it fails to explicitly state if companies should disclose the amount manufactured in each segment or the amount sold to customers in each segment. It appears that the latter interpretation is the more common. However, both definitions of turnover are used by companies. The question of how to define the turnover of a segment is important as the definition employed may affect the ability of users to make inter-company comparisons especially as the requirement to disclose exports was dropped in this legislation. The lack of definition of what constitutes a reportable segment may be considered a major omission. Lack of guidance may mean that companies are able to report deliberatly misleading information, or, at least, information that is not as helpful as it should be (Emmanuel and Gray 1977). However, Emmanuel and Garrod (1987) suggest that this is not as major a problem as might at first appear. They instead found that there were generally good reasons for the choice of segments and that they generally reflected the operations of the companies in a consistent manner.

The E.E.C. Seventh Directive proposal (EEC 1976) as first introduced in 1976 would have led to changes in the law in this area. It required disclosure of turnover and "the amount contributed by each category and market to the group's results for the year must be indicated". (Art.20.7). However, the amended 1983 Directive requires only the disclosure of turnover and so calls for no new information.

Perhaps surprisingly, in view of the increased interest in and demand for segmental information, no U.K. accounting standard has yet been issued in this area although an exposure draft is now under preparation. The only statement the profession has issued so far concerning this subject was in the Corporate Report (ASC, 1975) a discussion paper issued by the Accounting Standards Committee in 1975. This was an attempt to define what a general purpose report issued for general use by all stakeholder groups should contain. It was argued that there was an implicit responsibility on companies whose "results have significant economic implications for the community as a whole" (para.1.2) to report general information useful to all potential users of information. Whilst the basis for their conclusions were not stated they argued for improved implementation of the existing legislation. Again they failed to tackle the problem of segment identification;

> "We approve of the concept of dissaggregation while recognising that the difficulties that any comprehensive system would impose on large organisations. We believe that an important step forward in this area would be improved implementation of the relevant provisions of the 1967 Companies Act ... Our suggestion is that the basis of division of activities stated should be the one that in the opinion of management will most fairly represent the range and significance of the entity's activities. The division should be based upon groups of products or services, group companies, operating or geographical divisions, markets served or any combination of these which would assist fair presentation..." (Para. 6.51, 6.52)

The report called for the presentation of segmental information on turnover, value added, profit or loss before taxes, capital employed and the number of employees. Whilst this document may have influenced the voluntary disclosures made by some companies it appears to have had no effect upon either legislation or the setting of a standard by the profession. To that extent it may be considered as an interesting exercise in the identification of an improved reporting system but its tangible results appear to be negligible.

3.2.2. REQUIREMENTS IN OTHER COUNTRIES

3.2.2a. THE U.S.A.

Another important influence on the disclosure practices of many multinational U.K. companies may be the requirements in other countries, especially the U.S.A.. These companies may be influenced directly if they have an American stock market quote or indirectly as U.S.A. requirements for disclosure are seen as a desirable model to be followed for voluntary disclosures. Interest in the issue of segmental reporting first surfaced in the U.S.A. in the mid 1960s following the setting up in September 1964 of hearings by the Subcommittee on Antitrust and Monopoly of the Senate Committee on the Judiciary which was concerned with the economic concentration of American industry (Skousen 1969). Following calls to this committee for segmental information the Securities and Exchange Commission first suggested in May 1966 that this was an area which it intended to investigate (FASB May 1974). This led to requirments concerning segmental information disclosures when the SEC in August 1969 required line of business information to be included in registration documents. In the following year this was increased to include similar disclosures in the annual Form 10-K (Buckley, Buckley and Plank, 1980). The 10-K requires disclosure of five years information on total sales or revenues, income before tax and extraordinary items for each line of business segment which, during either of the last two accounting periods either contributed at least

10% of the company's total revenue or sales or 10% of income before tax and extraordinary items excluding any losses made by any segments or a loss equal to at least 10% of the company's income. Also if companies "engage in material operations in foreign countries, or if a material portion of sales or revenue is derived from customers in foreign countries" (Form 10-K para. C.2.d) the company should disclose the importance of that part of the business and any attendant risks and, if practicable, information on the volume and relative profitability. In January 1974 the SEC also required this information to be included in the annual reports of all companies that file accounts with the SEC.

The SEC was by no means the only body interested in the segmental disclosure issue. Indeed before the SEC requirements were published the Accounting Principles Board of the AICPA issued a statement calling for companies to voluntarily disclose "supplemental financial information as to industry segments of the business", (para. 11, APB September 1967). In addition to the APB the Financial Executives Institute issued a policy statement recommending voluntary disclosure of line of business information by all companies that disclosed such information to the SEC (FEI, May 1971). This recommendation was also endorsed by the New York Stock Exchange (NYSE, December 1973), and was followed by similar recommendations by the Financial Analysts Federation (FAF, March 1972) and the National Association of Accountants (NAA, June 1972). This interest in segmental disclosures resulted in the FASB also becoming involved in the area when, in April 1973, they selected segmental reporting as one of the initial seven areas to be considered by the new body. This resulted in FAS14 being issued (FASB, December 1976). This required companies to disclose not only line of business information but also geographical information. In particular it required the disclosure of geographical information either by segment, or just by domestic and overseas operations, if either foreign sales accounted for at least 10% of total sales or foreign identifiable assets accounted for at least 10% of total identifiable assets. If any geographical segment met either of these two criteria it should be separately disclosed. Thus, the statement identifies significance or the level at which such information should be disclosed. However, it fails to define "geographical areas". The definition is left to each company. Rather it states that:

> "foreign geographical areas are individual countries or groups of companies as may be determined to be appropriate in an enterprise's particular circumstances. ... Factors to be considered include proximity, economic affinity, similarities in business environments and the nature, scale and degree of interrelationships of the enterprise's operations in the various countries."
> (Para. 34)

In spite of the strict criteria for defining reportable segments the discretion that companies have in identifying geographical areas means that companies still have considerable discrertion in deciding how much information to report.

Companies have to report the revenue from unaffiliated customers, intra-group transfers, operating profit or loss or net income, or some other profitability measure and identifiable assets of each significant segment. This statement has been amended several times (FAS18, FAS21, FAS24, FAS30). However, these later statements were concerned with interim reports, which companies FAS14 applies to and information on major customers.

3.2.2b. OTHER COUNTRIES.

Several other countries also have major disclosure requirements. In Canada segmental information has been required since CICA Accounting Regulations Section 1700 was issued in April 1979. Under the 1978 Securities Act these regulations are mandatory for all quoted companies. This requirement is similar to FAS14, in that geographical segments are not defined, but this is instead left up to the individual companies "based on the similarity of factors that are most important in particular circumstances". (Para. 1700.3B) However, it does define a reportable segment as one whose external sales are at least 10% of the consolidated total. Companies are required to disclose, for each segment, the location, external and internal sales, operating profit (or any more appropriate profit figure) and year end identifiable assets. Very similar requirements also exist in Australia

(ASA14 1984) so that, again the requirements are greatly in excess of those existing in the U.K..

As explained above the U.K. legislation regarding geographical segment disclosures are mainly a result of the E.E.C. Fourth Directive. All the E.E.C. countries should have incorporated this Directive into their own company law legislation by 1981. However, for a variety of reasons several countries have still not done so (Oldham 1987). With the exception of these countries the requirements for segmental disclosures in the rest of the E.E.C. are very similar to those existing in the U.K.. It is expected that the other E.E.C. countries will shortly introduce legislation which will include segmental disclosure requirements.

3.2.3. REQUIREMENTS OF INTERNATIONAL BODIES.

3.2.3a. THE I.A.S.C.

Although the accounting profession in the U.K. has not yet issued a standard on segmental reporting the I.A.S.C. has, namely IAS14 (IASC, October 1981) which came into effect in January 1982. This requires disclosure of line of business and geographical information on turnover or other operational revenues with internal and external revenue shown separately (a practice not generally followed in the U.K.), plus operating results and identifiable assets (either in absolute or relative terms), with a reconciliation statement presented also. This standard closely follows the requirements in the U.S.A. One major problem or limitation of this standard is that it, again, fails to tackle the problem of segment identification;

> "Industry and geographical segments may be determined in many ways for reporting purposes. It is the responsibility of management to exercise its judgement in determining how the enterprise activities are to be grouped for reporting as segments." (para.11)

3.2.3b. THE O.E.C.D.

Other important influences on the disclosures of U.K. companies may be the U.N and O.E.C.D. codes of conduct for multinational companies, although these have no legal force being only voluntary codes of "good conduct". The O.E.C.D. guidelines (OECD 1976) were first issued in 1976 and call for the disclosure of the geographical areas where operations are carried out and information about the principal activities in each area, plus geographical disclosures of turnover, operating results, significant new capital investment and the average number of employees. After receiving comments on the 1976 guidelines a review of them was issued (OECD 1979). This stated that;

> "Problems were also raised with respect to segmentation of information. In particular a number of companies expressed doubts as to whether disclosure by 'geographical area' was always the most appropriate method of segmentation. These problems of geographical breakdown should, however, not be exaggerated...It has to be emphasised, however, that the Guidelines reflect the value member governments place on geographical segmentation of information." (para.48d).

The only official recognition of these guidelines in the U.K. was a white paper (HMSO, 1976) which reprinted the guidelines and stated that

> "Her Majesty's Government commend the the guidelines to U.K. companies. We are confident that they will lead the way in observing the standards set." (para.8)

3.2.3c. THE U.N.

The U.N. set up the Committee on Transnational Corporations in an attempt to promote a greater understanding of the effects of, and nature of, the activities of multinational companies. The committee found a lack of both financial and non-financial information in a sufficiently usable and comparable form (Gray, 1984). Therefore, in 1976 they set up the Group of Experts on International Standards of Accounting and Reporting to prepare a list of items of financial and nonfinancial information required as a minimum to be issued in general purpose reports (UN, 1977). This called for disclosure of geographically segmented information on external sales, internal transfers, operating results and, to the extent identifiable, either total assets, net assets or total assets and total liabilities, with at least separate identification of gross property, plant and equipment, accumulated depreciation and long term assets, also investments, the principal activities, the basis of accounting for transfers, the total number of employees and a description of any exposures to exceptional risks (pp 66 & 76). In 1982 the U.N. issued a report listing the items so far agreed upon (UN, 1982). This stated that the disclosure of turnover had been agreed upon, and that there "may be circumstances" where companies should disclose significant new investments in land, buildings, plant and equipment and the average number of employees. It also stated that some delegates considered that companies should disclose intra-group sales, operating results, total or net assets or total assets less total liabilities, investments, principal activities, the basis of accounting for transfers and any exceptional risks. However other delegates considered these requirements excessive. (page 38).

3.3. THE EXTENT OF DISCLOSURE OF GEOGRAPHICAL INFORMATION BY U.K. COMPANIES.

It is now necessary to examine the second question, namely what evidence is there that U.K. companies have disclosed geographical segment data. As explained in section 3.2.1 the UK legislation is such that there is no automatic guarantee that companies will disclose such information, especially information regarding earnings over any extended time period. This means that rather than relying upon companies meeting legislative requirements it is necessary to examine empirical work in this area. The ICAEW issues an annual survey of company reporting which is concerned with the methods and extent of financial reporting by the largest UK companies. Before examining their findings it should be noted that although up to "Financial Reporting 1982-1983" it covered 300 of the largest companies the sample is not consistent over the years. This means that comparisons of changes in disclosure can only provide a crude guide to the changes that actually occurred. The latest edition (1984-1985) excluded segmental analysis and the previous year involved both a major change in the criteria for the choice of companies and asked very different types of questions so that this year has also been excluded from table 1. As can be seen from this table the majority of companies for which such disclosures appear relevant have disclosed both line of business and geographical information for the period from 1975/76. For geographical information, between 60% and 75% have disclosed either turnover or profits by either country or continent and in addition between 12% and 17% disclosed such information on a UK plus overseas basis. If 1975/76 is ignored the former figures rise to between 69% and 75%. So it appears that a large group of companies have provided segmental information over a relatively long time period. However, the survey fails to provide any more information than this. In particular it fails to provide information on the extent of other types of geographical disclosures, the degree of disaggregation provided or the extent to which such disclosures are on a consistent basis from one year to the next. So far these questions have not really been examined in the literature. Gray and Radebaugh (1984) do provide some evidence concerning the extent of additional information and the degree of disaggregation. They examined the differences in the information disclosed by UK and USA companies in their 1978 annual reports. Using a sample of 35 of the most multinational UK companies it was found that a sizeable minority of them disclosed more than just sales. In particular 26 (74%) disclosed profit and 13 (37%) disclosed assets employed and the same number disclosed employees, whilst 9 (26%) disclosed the size of investment made.

Table 4.

THE NUMBER OF U.K. COMPANIES DISCLOSING SEGMENTAL INFORMATION

Line of Business	75/76	76/77	77/78	78/79	79/80	80/81	81/82
Turnover & profit	174	177	189	184	198	199	194
Turnover only	12	16	14	21	23	14	18
Profit only	5	2	4	3	3	7	5
Total	191	195	207	208	224	220	217
Single class	62	61	72	50	29	62	27
No comment	47	44	21	42	47	18	56

Geographical	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Turnover &/or profit by country/ continent	173	60	192	69	194	73	183	75	188	75	193	75	190	75
UK & o'seas	41	14	33	12	33	12	35	14	42	17	38	15	39	16
Total	214	74	225	81	227	85	218	89	230	92	231	90	229	91
No analysis	73	26	53	19	40	15	27	11	20	8	28	10	23	9
Not relevant	13		22		33		55		50		41		48	

It was also found that on average 6 segments were disclosed (ranging from 3 to 9) and that generally these segments were on a continent by continent basis. Thus although the evidence available is rather sketchy it does demonstrate that there are a significant number of companies which disclose geographical segment data.

Chapter 7 examines the information disclosed by the 109 companies used in this study. However, it is useful to briefly summarise here the results relating to geographical segment disclosures. It was found that the majority of the companies disclosed data on a continent by continent basis. Several companies used a finer classification for some continents, especially Europe where individual countries were used by some companies. Several companies combined the less significant continents, for eample, Australia plus Asia and Africa plus Middle East. Nearly 50% of the companies also reported a segment entitled 'other' or 'rest'. Only 17 companies reported two segments of U.K. and overseas. The average number of turnover segments reported in 1981 was 4.7 and the maximum number was 13. The average number of profit segments reported was lower at 3.6, however, this includes 19 companies that reported no profit data. Only 84 companies reported profit segments for the four year period 1980 to 1983.

Most companies varied the amount of segment information given over the entire eleven year period. Only 41 companies (38%) did not change the number of turnover segments and 26 companies (34%) reported consistent profit segments. If disclosures for the period 1980 to 1983 are instead considered the respective figures become 50 (46%) and 38 (49%), figures that are still very low.

3.4 CONCLUSIONS.

Before an empirical study using the geographical segment data provided by U.K. companies is carried out it is essential to first assess the extent to which the necessary information is provided. Accordingly, the objectives of this chapter were twofold. Firstly, to examine the legislation concerned with segmental disclosures. Secondly, to examine the extent to which companies appear to disclose geographical segment information.

It would be expected that most companies will disclose at least that information required by legislation, although they need not disclose such information if it is seriously prejudicial to the interests of the company. Therefore, an examination of the legislation should indicate the minimum amount of information that companies are likely to disclose. Legislation in other countries and prior empirical work on the information actually disclosed by U.K. companies should provide an indication of the maximum amount of information that is likely to be disclosed.

When the legislative requirements were examined it was seen that the amount of disclosure required for U.K. companies is relatively limited and there appears to have been relatively little interest in this subject. Only since the 1981 Companies Act, which followed the E.E.C. Fourth Directive, have segmental disclosures been required in the notes to the accounts and so been audited. The requirements are far less onerous than those suggested by supranational bodies such as the U.N. and the O.E.C.D., the requirements issued by the I.A.S.C. and those in the U.S.A. These requirements may have impacted upon companies' decisions to disclose more than is currently required.

There is relatively little evidence regarding the amount of geographical segment information that companies disclose. It was shown that it appears that very many companies have disclosed at least either turnover or profit information for a considerable number of years. There is also evidence that at least some companies disclose much more information than is required by legislation. An examination of the disclosures made by the companies included in the sample employed in this study showed that most companies disclosed profit information. In addition, the number of segments disclosed are, on average, fairly high, namely 4.7 for turnover and 3.6 for earnings in 1981. Only 17 companies disclosed only U.K. and overseas segments whilst most companies disclosed segment information on a continent by continent basis as required by the Stock Exchange listing requirements.

PART II. RISK ASSESSMENT AND PREDICTIVE ABILITY RESEARCH.

Chapter 4.

PRIOR RESEARCH ON SEGMENTAL INFORMATION AND RISK ASSESSMENT.

4.1. INTRODUCTION.

It was shown in chapter two that a case can be made for the disclosure of geographical segment information. Accounting theory suggests that disaggregated information is often more useful than aggregated information. In addition, many users perceive segmental information as being valuable. It was shown in chapter three that geographical segment information is required by legislation both in the U.K. and many other countries. In addition many companies appear to disclose more information than is required by law.

Given that this is the case it is necessary to investigate the reasons why geographical information is perceived as being of value, in particular, to shareholders. An investor in a company is primarily interested in two facets of the performance of that company, the expected returns from the investment or the company's earnings and the risk of that investment. This chapter explores the issue of risk, specifically, what constitutes the risk for the shareholder and whether or not geographical segment data might be useful in assessing that risk. The next chapter then examines the issue of the prediction of earnings.

The sources of the risk of any investment can be divided into two types. Those due primarily to economic events and those due to political events. This is often a somewhat arbitrary classification as political and economic causes often cannot be entirely separated from each other. But this clssification does have analytical power and is important because the types of information required for assessing economic and political risks are generally different.

Economic risk encompasses the risk that returns will differ from those expected due to economic factors. This will include, for example, differences between predicted and actual demand, unexpected price changes that affect costs and changes in the macro-economic performance of the economy which in turn affect the company. Thus, these risks are the normal risks of doing business. They will affect all companies to varying degrees depending upon such factors as the industry they operate in and the amount of internal slack available to absorb such external shocks, (e.g. Cyert and March 1963, Cohen and Cyert 1965, Hofstede 1968).

Political risk covers all the risks that may be considered attributable to government policies designed specifically to affect a subset of companies (often foreign) and are imposed primarily for political or ideological reasons.

Obviously such actions will have economic consequences and so the effects may be the same as those for economic risks. However, for assessing risk the causes as well as the consequencies are important. Political risk would include, from one extreme the risk of expropriation, to the other extreme, relatively minor controls on dividends or the employment of foreign nationals. These risks are not therefore inherent in the operations of a business but may be considered as discrete events due to actions that are designed specifically to affect the operational policies or cash flows of specific companies or groups of companies.

This distinction is important as only economic risks affect all companies and therefore the decisions of all investors. The information requirements necessary for prediction purposes will also differ between the two types of risk and the actions taken by shareholders to minimise risk may also depend upon the type and causes of such risk. Because of these differences the two types of risks should be considered separately. This chapter will show that both types of risk are of interest to shareholders and, additionally, it will be shown that companies can provide much of the information needed by investors to assess economic risk. However, due to the specific nature of political risk company reports are likely to provide a relatively small amount of the information required to assess such risk.

4.2 THE POTENTIAL BENEFITS OF INTERNATIONAL PORTFOLIO DIVERSIFICATION FOR SHAREHOLDERS.

An investor can decrease the risk or variability of expected returns by investing in shares whose expected returns are less than perfectly correlated with his existing portfolio. Such risk reduction will continue until the market portfolio is held (Sharpe 1963). This means that in valuing a share the relevant risk measure is the risk that is undiversifiable or systematic and is due only to movements in the general market index. If this analysis is extended from a purely domestic setting to an international one then the potential may exist for additional diversification and consequent risk reduction by investment in an international portfolio. A necessary, although not a sufficient, condition for this to be the case is that national stock indices are less then perfectly correlated. If this is the case then the potential may exist for risk reduction for any given level of expected returns in a manner directly analogous to domestic share diversification.

One of the earliest attempts to extend the work of Tobin (1958) and Markowitz (1959) concerned with risk reduction in the domestic setting into an international setting was by Grubel (1968). He examined the monthly rates of return of ten major stock exchanges and calculated the correlation of these with U.S.A. returns for the period 1959-1966. In addition he constructed ex-post optimally efficient market portfolios and concluded that international diversification would lead to either a higher rate of return at any risk level or lower risk for any given level of return. A similar approach and similar conclusions were also found by Levy and Sarnat (1970) and Miller and Whitman (1970). Grubel and Fadner (1971) extended the analysis by considering returns over periods of a week, a month and three months for specific industries. They found that the correlations increased both as the time period increased and as the extent of foreign operations of companies increased (measured as the industry ratio of exports plus imports to output). For all holding periods and all industries there appeared to be a significant potential for reaping international diversification benefits. Lessard (1973) examined the degree of commonality amongst returns within four South American countries and concluded that common intra-country movements were not reflected in inter-country movements. This means that even in developing countries within one geographical region there appears to be the potential for significant risk reduction by international diversification. This result is particularly significant given that most studies have examined only the behaviour of the stock markets of the developed countries whilst many companies invest in developing countries as well.

These early studies can be criticised on several counts. Of particular importance is the fact that the relevant question should not be the correlations of share price movements. Of much greater relevance is the question of whether or not ex-ante internationally diversified portfolios outperform domestic portfolios. McDonald (1973) attempted to answer this question by examining the behaviour of French mutual funds that were internationally diversified. He concluded that, for this sample of companies, there were risk/return advantages available to shareholders and so, for these companies, the French stock market appeared to be inefficient in the semi-strong form. However, the results found are more likely to be due to other reasons such as segmentation of the French capital market or the effects of taxation.

These studies only examined the potential for gains by investors. The extent to which such benefits can actually be reaped by investors is a function of the degree to which the various stock markets are either integrated or segmented. If stock markets are fully integrated there are no barriers to investors from one country investing in the companies of other countries. In this case the potential benefits are pure diversification benefits and are readily obtainable. If, instead, the stock markets are segmented then the advantages of diversification will depend upon the ratio of expected returns to risk available in each national market. For example, Cohn and Pringle (1973) argued that if market imperfections are lifted the returns on internationally diversified portfolios would be expected to decline and the equilibrium risk-return exchange should decline in most countries.

An alternative approach to the same question is to use spectral analysis to examine the extent to which share prices move together. This was first done by Granger and Morgenstern (1970) who examined the weekly price movement of the market indices of eight exchanges for the period August 1961-August 1964. They concluded that there was generally little or no relationship between the movements of the indices which implies the lack of a world factor. However, they recognised that this may not be the case if "a world-wide financial crisis occurred" (p. 226). This suggestion was explored by Hillard (1979) who examined daily price movements of ten exchanges for the period July 1973-August 1974, a period that covered the first OPEC oil embargo. He again concluded that no world-wide factor appeared to exist but that there did appear to be continent-wide factors. Specifically, he found that for both North America and Europe there were significant intra-continent commonalities and prices appeared to move simultaneously. This finding was also supported by Tai (1985) who examined daily price movements for nine Asia Pacific countries for the period 1980-1984. He concluded that the coherence of the series were generally high. These studies suggest that diversification inside one region or continent may be insufficient and that to gain the maximum benefits diversification should occcur across continents. These studies also suggest that the results found may be dependent upon the specific time period examined and on whether daily, weekly or monthly price changes are considered (although Grubel and Fadner (1971) found higher correlations as the time period increased).

Finding less than perfect correlations in the share price movements in different stock markets does not imply that the maximum possible gains from international diversification are achievable unless there is inter-temporal consistency in such correlations. Maldonado and Saunders (1981) tested whether or not the pattern of correlations between returns on the U.S.A. and four other stock markets were stable over a period of 22 years. They concluded that whilst there was a relatively predictable pattern in the correlations for a period of up to two quarters, over a longer time horizon than this the correlations appeared to follow a random walk pattern. However, Pilippatos, Christofi and Christofi (1983) severely criticised their methodology. In particular the use of Box-Jenkins with insufficient data, the consideration of correlations with the U.S.A. rather than the full correlation matrix and a sample of countries unrepresentative of all developed countries. Using a different methodology they concluded that the relationships were stable for periods in excess of two years, for periods less than this the outcomes were contradictory with no clear conclusions. This conclusion appears to confirm the earlier work in this area (Panton, Lessig and Joy 1976, Watson 1980) which reached similar conclusions.

Another wave of empirical studies concerned with the same question employed the CAPM model. The rationale for this approach is that gains from diversification are not simply a function of the correlation of market indexes. Instead, the correct measure is the covariability of any share's returns with the market index. That is, the important factor is the contribution that any share makes to the risk of the entire portfolio of shares that the investor holds. The first study to employ such an approach was carried out by Agmon (1972). He examined the behaviour of American, British, German and Japanese shares but was unable to reject the hypothesis of an integrated world capital market. In this study he employed a single world market index. This may be contrasted with Lessard (1974a) who regressed returns not only upon a common or international factor but also on an orthogonal national factor for sixteen countries for 1959-1973. Solnik (1974a) used a similar approach. Similar conclusions were found in both studies, namely that both national and international factors appear to be reflected in a portfolio's risk/return performance. All of these studies supported the conclusion that an internationally diversified portfolio is less risky than a domestic one. Solnik (1974b) estimated that such a portfolio was approximately one half as risky as a similarly sized American one with equal returns.

There are major problems with drawing any conclusions from these studies beyond the rather general and vague statement that the potential appears to exist for investors to reap advantages from international portfolio diversification. The major problem occurs in operationalising the concept of an international factor. There appears to be an unambiguous definition of what constitutes a relevant domestic index. However, there is little agreement on either a theoretical or empirical level, on what constitutes a relevant international index or an international risk free asset. For example, Lessard (1976) examined the proportion of variance in national stock indexes that could be explained by a world index. He found that for many countries, but especially the U.S.A. with the world's largest stock market, the answer depended upon whether the index was weighted equally or by the size of stock exchange. Taking this type of reasoning much further Adler and Dumas (1983) argued that when investors' purchasing power units vary by nationality then they will differ in their concept of what an effecient portfolio is unless all investors have logarithmic utilities. This implies that at market equilibrium the market portfolio is not effecient in the sense meant by Roll (1977). This would also be compounded by any segmentation of national capital markets. This means that it is not possible to infer the extent that risk reduction can be achieved by analysing the structure of stock market data alone.

The domestic CAPM is based upon three important assumptions that no longer hold in the international context. These are that returns are denominated in a numeraire good whose price is fixed, all investors have the same opportunity set and identical tastes and consumption patterns (Stulz 1984). In an international setting inflation rates differ across countries, as does the investment opportunity set, the amounts and type of locally produced non-traded goods and the percentage of internationally traded goods consumed. As these basic assumptions do not even approximately hold it is not possible to directly apply the domestic CAPM in an international setting to create a directly analogous IAPM. Since the mid 1970's there have been few studies of this type. This has probably been due to the general realisation that such an approach, whilst possibly capable of indicating that potential gains may exist, is able to say little regarding the relative benefits of international and interindustry or purely domestic diversification.

4.3 THE EXTENT OF MARKET SEGMENTATION.

The extent to which investors can invest in foreign securities depends upon the degree to which such markets are segmented. Market segmentation is not a uniquely international phenomenon. Domestic segmentation has also received attention from Rubinstein (1973b) and, more extensively, Lintner (1977). They showed that if there is sufficient segmentation then the separation properties generally fail to hold. In particular, portfolio separation by investors and the independence of financing decisions and capital budgeting decisions for companies. Whilst it is generally agreed that for domestic markets such segmentation can be ignored this is probably not the case at the international level. For example numerous institutional barriers exist. Of particular importance are interest equalisation taxes, foreign exchange controls and witholding taxes on dividends to foreigners plus the cost of, and difficulty of, obtaining information on foreign stocks (Cohn and Pringle 1973). However, it should be noted that the risk of exchange rate changes is not a cause of segmentation, as the possibility exists for hedging operations (Adler and Dumas 1983).

An empirical assessment of the extent of capital market segmentation would provide much useful information. Unfortunately such an assessment is far from easy. Stehle (1977) attempted to empirically test whether or not the U.S.A. capital market is fully integrated or fully segmented, i.e. whether stocks on the NYSE were priced in a national or international context. The analysis was based upon the concept that if there is complete segmentation then the relevant index is the NYSE index. Whilst if there is complete integration the relevant index is the world index. However, the empirical results were inconclusive. Solnik (1977) argued that this should be expected given the methodology employed. He argued that empirical tests of this kind are very inefficient in discriminating between integration and segmentation. In addition, the relevant question is very unlikely to be which of these two extremes holds, but rather to what extent does segmentation exist, what causes such segmentation and what are the implications of differing causes and degrees of segmentation. Stulz (1981) has suggested one possible approach to examining the degree of segmentation. He argued that if it was costly to hold foreign securities some would remain untraded. In addition, there would be seperate security market lines for all domestic assets, for foreign securities held long and those held short and untraded foreign assets would plot on a line between those foreign securities held short and held long. However, this remains a theoretical model with no empirical testing at this stage. Errunza and Losq (1985) used a similar approach to test for mild market segmentation. Specifically, that which occurs when U.S.A. investors are prevented from investing in the stock markets of certain L.D.Cs due to government restrictions but investors from these countries are free to invest in the U.S.A.. Using a segmentation index they concluded that the evidence found was consistent with mild segmentation. The eligible securities were priced as if there was no segmentation whilst the ineligible securities commanded a risk premium with the required return being different from that suggested by the CAPM.

4.4 THE ROLE OF MULTINATIONAL COMPANIES IN SEGMENTED CAPITAL MARKETS.

In the domestic context with an efficient capital market investors will generally be indifferent to interindustry diversification by companies if the objective of such diversification is solely to reduce the overall risk or variability of the company's profits. This will always be the case if the effects of the possibility of bankruptcy and sub-optimal, risk averse behaviour of managers are ignored. Whilst the extent to which markets are segmented internationally is still the subject of debate, it is clear that they are at least partially segmented. This means that there may be benefits to shareholders of companies diversifying internationally with the objective of reducing the variability of profits. This is either because companies can obtain the benefits more cheaply or because such diversification cannot be carried out by shareholders at any cost. This, of course, also depends upon the extent to which dividends and share prices are dependent upon short term fluctuations in company profit levels. This argument has led to various attempts at quantifying the effects of international diversification by companies.

Adler (1974) and Adler and Dumas (1975a) constructed models of the behaviour of companies when markets are segmented. They took a very simple model, that of two countries and two companies, with country 1's shareholders and company able to invest in country 2. The general conclusion of both studies was, as would be expected, that the proposition of indifference no longer holds. More importantly the actual behaviour of companies appears to depend upon the type of competition that is assumed. For example if monopsonistic behaviour in country 2 is assumed the optimal amount of foreign investment will only be approximately one half as much as if perfect competition is assumed. These studies only examined the effects on investors of the home country and the behaviour of companies in the host country. Lee and Sachdev (1977) extended the analysis and found that where companies act as pure competitors in the home market rather than as monopolists then international diversification should maximise the welfare of home country investors. However, host country investors are probably worse off than if the markets were completely segmented. This is due to adverse changes in the risk/return payoff available to them (a result similar to that hypothesised by Cohn and Pringle (1973)). Adler and Dumas (1975b) and Stapleton and Subrahmanyan (1977) both found that the effects on shareholders of international investment by companies depended upon the type and degree of segmentation that exists. For example, if investors have access to international money markets but not share markets then companies, in the aggregate, can make an optimal investment decision and may provide a perfect substitute to international diversification by shareholders.

These studies provide some insights into the optimality of international investment decisions of companies and demonstrate that with the segmentation of capital markets shareholders will generally no longer be indifferent to the investment and financing decisions of companies. Any conclusions drawn can be taken little further than this. This is because the approach taken, that of model building, rests upon many simplifying assumptions. Especially important is that the analysis is based upon two countries and two companies with only the company in country 1 investing in country 2 and the firms of that country not retaliating in any way. The specific results found are also probably dependent upon the type of utility function that shareholders are assumed to have (Adler and Dumas 1975a). Although Stapleton and Subrahmanyan (1977) employed a numerical analysis of eight companies and twenty shareholders, again, it is unclear to what extent their conclusions are applicable to the multi-person, multi-company, multi-country real world with various types of segmentation, types of competitive behaviour and multi-directional investment flows.

A further problem occurs when assessing the full implications of the conclusions reached both by these studies and those concerned with the behaviour of share returns. Whilst individual investors may be able to invest in many countries, albeit not costlessly, some of the countries that companies are able to invest in are likely to be completely closed to portfolio type investment by individuals. If this is the case then any comparisons of the relative benefits of company and individuals' investment must provide, at best, an incomplete picture. In particular, with the exception of Lessard (1973), all the empirical studies have examined only the western world, or those countries with highly developed capital markets. Similarly, the model building approach has always assumed that investors in country 1 are free to invest in country 2. This may not be such a problem when the behaviour of American companies is being considered. However many U.K. based companies have invested substantial amounts in the less developed countries of

Africa, Asia and the Middle East. In these cases the question of whether investment by companies is more efficient than investment by individuals is at best a redundant one. Instead, the relevant question is simply whether or not investment in these countries is of greater benefit than alternative domestic investment would be.

4.5 SHAREHOLDER RECOGNITION OF THE DEGREE OF MULTINATIONALITY OF COMPANIES.

Given the current state of knowledge it is clear that it is very difficult to draw any firm conclusions regarding the relative advantages of international diversification by companies or individual investors. A more realistic alternative, therefore, appears to be to examine the benefits of indirect diversification by shareholders through investment in companies that invest overseas. If there are advantages in international diversification for shareholders then it would be expected that there are also advantages in investing in companies that are themselves internationally diversified.

The objective of most foreign investment by companies is to obtain control over revenue generating resources and, therefore, such investment differs from portfolio investment. There are very many theories of why companies invest overseas, but it is generally recognised that foreign direct investment is not carried out primarily because of imperfections in the capital market, but instead because of imperfections in the markets for knowledge, management, research and technology (see e.g. Kindleberger 1968, Caves 1971, Williamson 1975, Dunning 1977, 1981). Despite these differences in the underlying motives for investment multinational companies can still be viewed as a tool for international diversification by shareholders. The shares of such companies can be viewed as partially internationally diversified share portfolios so that such companies may offer shareholders the opportunity to replicate the diversification possible from investing in purely domestic companies resident in several countries.

Hughes, Logue and Sweeney (1975) examined this question. They argued that if capital markets are fully integrated then all assets will be priced correctly in an international setting and multinationals should not outperform domestic companies. However, if shareholders recognise the benefits of multinational companies as tools for international diversification then their risk/return performance should exceed that of domestic companies when a domestic index is used. They examined this by studying the behaviour of 46 U.S.A. multinationals and a matched sample of domestic companies. They concluded that such diversification benefits exist. However, a potentially serious problem with this study is that they considered the performance of individual shares rather than portfolios which may have led to measurement problems. This problem was rectified by Agmon and Lessard (1977) who instead regressed portfolios of shares with varying degrees of overseas sales on both the NYSE index and a world index. They also concluded that shareholders recognised the diversification benefits as the degree of multinationality was correlated to the relative importance of the world factor. This result was also supported by Yang, Wansley and Lane (1985) who applied a very similar methodology to a different sample (based upon overseas' profits) and a different time period (1965-1978). Jacquillat and Solnik (1978) instead regressed share returns upon the stock indexes of 7 foreign countries and concluded that the foreign betas were generally small and insignificant. In addition they carried out regressions on an aggregate foreign index and a domestic index and again concluded that the influence of the foreign factor was much smaller than would be expected. Yang, Wansley and Lane (1985) argue that the different conclusions may be due to the differing approaches used. In particular, whilst Agmon and Lessard constructed the world index to be orthogonal to the domestic index the indexes employed by Jacquillat and Solnik were correlated to each other which may have biased the foreign betas downwards. In spite of this criticism of Jacquillat and Solnik the conclusions of this study were also supported by Senchak and Beedles (1980) who used various sized portfolios of all multinational companies, those with at least 25% overseas sales, those reporting overseas profits and those with at least 25% overseas profits. They found that in all cases such portfolios were more risky than domestic portfolios and only for the most multinational companies were portfolios of such companies plus domestic companies less risky than the purely domestic portfolios. With the exception of Hughes et.al.(1975) these studies examined only risk rather than risk/return behaviour. This was rectified by Brewer (1981) who used a domestic price index and examined the returns of equal beta portfolios of domestic and multinational companies. He again failed to reject the conclusion of no difference in the behaviour of the two types of firms. Fatemi (1984) instead found that multinational companies (defined as those with at least 25% foreign operations) had significantly lower betas and risk adjusted abnormal returns than domestic companies. However, these differences were due to two industries only, conglomerates and rubber plus plastics and chemicals. He suggested that these industries are least likely to have monopolist or oligopolist advantages overseas and are therefore less likely to earn monopoly profits to compensate for the increased costs of foreign operations. This idea of monopoly rents was also examined by Errunza and Senbet (1981). They regressed monopoly rents (defined as market value of common equity less net worth standardised by annual turnover) upon the standard deviation of total stock returns, foreign involvement and its growth and industrial concentration. The findings were that international involvement was significantly related to excess value even when the domestic market structure and risk were adjusted for. In a later study (Errunza and Senbet 1984) similar results were still found when in addition size and the P/E ratio were both controlled for. These results are important because, especially in conjunction with those of Fatemi, they suggest a serious problem with the methodology employed to study the recognition of multinationality by shareholders. In particular they suggest that these studies may have only demonstrated a relationship between risk/return and the extent to which a company can obtain monopoly rents rather than a relationship with multinationality per se.

All of these studies considered two groups of companies, those companies that are multinational and those that are not. An alternative approach was used by Prodhan (1986) who examined two groups of U.K. multinationals, those that disclosed geographically segmented data from at least 1973 and those that disclosed such information from December 1977. A major advantage of this approach is that both groups of companies should be equally affected by monopoly rents which means that only the effects of foreign operations are being considered. The sample consisted of 36 companies and monthly share prices were examined for the ten year period 1973-1983. He concluded that the cumulative frequency distributions of the two groups differed significantly and that only before disclosure did the sample group have significantly larger betas than the control group. It therefore appears that the disclosure of geographically segmented information and, by extension, the degree of multinationality of a company does affect its risk/return characteristics and so has information value to shareholders. However, this conclusion is dependent upon the assumption that investors' did not have knowledge regarding the extent of foreign operations before December 1977. This may well not be the case given the level of qualitative and non-financial information disclosed in annual reports. The study also fails to consider the effect of differing degrees of foreign operations. The sample was of companies with at least 10% overseas sales. This suggests that the importance of such operations may have differed considerably within the sample.

Another problem with these studies is the way in which the concept of multinationality has been operationalised. Whilst Errunza and Senbet (1984) used proxies not only of foreign sales but also for the number of foreign subsidiaries, a geographical diversification index and absolute foreign sales most other studies have simply used the percentage of foreign sales. This is, at best, only a very crude proxy of the variable of interest. What is likely to be of interest to a shareholder is how many countries a company operates in, which specific countries they are and what proportion of revenue is generated in each country. The use of the percentage of foreign sales could rank as equal, for example, two companies one of which operates only in one developed foreign country and one that operates in many countries spread all around the world including both developed and less developed countries. Therefore, it would seem that a better proxy for multinationality would be a diversification index, although even this ignores the specific countries that a company operates in.

Drawing firm conclusions from these studies is very difficult because of the severe methodological problems that occur in this area. Studies of the correlation of share price changes on various stock exchanges can only give an indication of the benefits that may be available from international diversification. The evidence available appears to strongly support the assertion that the potential for such gains exists. Studies of the size of such gains are more ambiguous. This lack of agreement is probably due to the major problems inherent in operationalising the concept of an international asset pricing model. In spite of this there appears to be evidence that gains are achievable and may be relatively large. The extent to which such gains may actually be achieved will depend upon the extent of market segmentation. Again the evidence is inconclusive. However, it seems fairly certain that some degree of segmentation does exist (Errunza and Losq op.cit.). This means that diversification by companies is no longer a perfect substitute for individual shareholder diversification. In this situation company investment decisions may often be suboptimal from the shareholder perspective. But the extent of this suboptimal behaviour is a function of both the type and degree of segmentation and the market structure. Again more research needs to be carried out before any definite conclusions can be reached. All of this does imply though that the extent of foreign operations of companies is relevant to the shareholder investment decision. Research into the extent that shareholders recognise the degree of multinationality of companies is also fraught with difficulties mainly because of problems in using a world index. The evidence is again somewhat contradictory, but it does indicate that the extent of foreign operations is probably of interest to shareholders. There is also evidence that as companies become more multinational they do offer some, although imperfect, opportunities for shareholders to diversify internationally and that such benefits are valued by investors.

4.6 POLITICAL RISK AND THE NEED FOR GEOGRAPHICAL DISCLOSURES.

Another possible use of information dissaggregated on a geographical basis is for an assessment of the degree of political risk faced by a company's foreign operations. To see if this may provide a reason for such disclosures it is necessary to firstly examine precisely what is meant by political risk, then to assess how significant such risks are likely to be for multinational companies and finally to examine the extent to which the information typically provided by U.K. companies can be used to evaluate the extent of such risks.

4.6.1 THE DEFINITION OF POLITICAL RISK.

The Iranian revolution in 1979 provided a major impetus to an extensive literature on how companies should make political risk assessments and the actions that they can take to minimise such risks. Much of this work focuses upon the extreme cases of the complete expropriation of a company's assets, with or without compensation, due to major changes in the political climate of a country following revolution or the overthrow of the existing government, or upon major violence as has occurred in parts of South America and the Lebanon. For example;

> "American factories have been bombed in Bolivia, expropriated in Ethiopia and shut down completely in El Salvador. American executives have been kidnapped in Argentina and assassinated in Mexico."
> (Dun's Review, March 1980, page 49).

However, as will be examined below, such major, dramatic shifts appear to be the exception rather than the rule. Instead a broader definition of political risk is required which also embraces much more minor changes in the environment facing multinational companies.

The definitions of political risk fall loosely into two main categories (Kobrin 1979, 1982). The first group of definitions define political risk in terms of government interference with the operations of foreign companies, (e.g. Aliber 1975, Lloyd 1971, Smith 1971). Typical definitions employing this viewpoint are as follows;

> "that uncertainty stemming from unanticipated and unexpected acts of governments or other organisations which may cause loss to the firm." (Greene, 1974)

> "Political risks arise from the actions of national governments which interfere with or prevent business transactions, or change the terms of agreements, or cause the confiscation of wholly or partially foreign

owned business property." (Weston and Sorge, 1972, p.60)

The second group define political risk in terms of events, i.e. political acts or constraints imposed upon companies, (e.g. Green and Cunningham 1975, Nehrt 1970 and Zink 1973). A typical definition of this type is that supplied by Root;

> "possible occurence of political events of any kind (such as war, revolution, coup d'etat, expropriation, taxation, devaluation, exchange control and import restriction) at home or abroad that cause a loss of profit potential and/or assets in international business operations." (1972, p.355)

Or, alternatively;

> "risk or probability of occurence of some political event(s) that will change the prospects for the profitability of a given investment," (Haendel, West and Meadow, 1975 p.xi).

These authors illustrate the fact that political risk can be viewed from two perspectives. Whilst interdependent they have different implications for how risk should be measured or assessed. What is relevant is the events themselves that have a potential to cause a loss to foreign companies or, alternatively, the political factors that lead to such events occurring. They also illustrate the fact that political risk is not just confined to major discontinuities in the political climate of host countries and major changes in the profitability of foreign operations. Rather, political risk encompasses all changes in the business climate facing foreign firms that can be mainly attributed to political factors in the host country. However, they provide little more than a check list of the possible causes of such risks. Of more help in the assessment of political risk is the work of Robock (1971) who provides a crude but potentially useful classification of political risk into macro and micro risk. Macro risk is defined as environmental changes that are directed at all foreign operations in any particular country and micro risk as those changes that are directed at certain industries or companies. He also notes that political risk is not the same as political instability and that an unstable political environment may not imply any greater risk for foreign companies. This is in contrast to much of the literature which appears to, at least implicitly, equate risk with uncertainty. Whether instability can be equated with risk is a function of the socio-cultural framework. Countries with similar levels of instability may have very different degrees of risk associated with investments in them. This means that any risk measure based upon instability is likely to lead to very erroneous conclusions. It may be that the traditional risk measures such as instability and economic development need to be combined with cultural factors such as measures of the power distance and uncertainty avoidance levels in particular countries (Hofstede 1980,1984). This approach has, as yet, not been used. In addition much of the literature tends to give the impression that all companies that operate in any particular country face the same degree of risk. This is normally far from the case as recognised, for example, by Kobrin;

> "empirical work suggests that the relationship between political events and foreign direct investment is complex, it is specific changes in government policy rather than dramatic systematic events such as revolution that account for most impacts on firms. While there are exceptions, vulnerability to political risk appears to depend as much on project characteristics as it does on political events." (1982, pxi).

It has been shown that many of the definitions of political risk are overly simplistic giving the impression that most risks are of the major kind such as expropriation caused by major political shifts in a country. Instead a much wider definition should be employed. Indeed even such apparently economic changes as the introduction of price and wage controls in an attempt to curb inflation are the outcome of political as well as economic factors. Also most political risks are micro risks which affect companies to varying degrees depending upon such factors as the entry conditions, the ownership pattern, the type of product line and type of operations, the government instruments of both host and home countries, and management style, philosophy and negotiating skills (Sethi and Luther, 1986). To illustrate this wider perspective it is worth quoting Kobrin at some length;

> "the area of interest should be defined in terms of the current and potential impact(s) of the political environment upon the operations of the firm where:
>
> 1. The political environment is circumscribed in terms of events which, however they are manifest, are motivated by or have as their objective the maintenance or modification of power or authority relationships at the governmental level.

2. The impact of political events upon the firm is defined in terms of both effects upon the magnitude of cash flows or returns and upon the business risk associated with them in the context of a specific project.

3. A significant impact on business operations cannot be assumed to be an inherent property of any political event.

In operational terms we are concerned with the probability that changes in the political environment will reduce returns to the point where the project would be no longer acceptable on the basis of ex-ante criteria." (1979, p.77).

Political risk assessment seems to depend upon the implicit assumption that business government relationships are best described in terms of conflict or an adversary relationship (e.g. McGraw, 1984). Whilst this may be an accurate reflection of U.S.A. multinationals and the governments in many less developed countries, especially South America, it can be contrasted with differing views of the relationship. For example, Lindblom (1977) talks of the "privileged position of business" and argues that governments are dependent upon business to provide goods and services and in return the relationship can be best described in terms of mutual dependence and partnership. He argues that:

"public affairs in market orientated systems are in the hands of two groups of leaders, government and business, who must collaberate and that, to make the system work government leadership must often defer to business leadership." (page 175)

This view of business suggests that, especially for companies investing in the developed market based economies, political risk may not be a constraint upon a company's activities. Instead, large multinationals may have special opportunities and offer extra advantages to shareholders not obtainable from smaller and therefore, less important, competitors.

4.6.2 THE IMPORTANCE OF POLITICAL RISK.

Before any conclusions can be reached concerning the usefulness of geographical information for assessment, by shareholders, of political risk it is also necessary to see the extent to which companies have faced such risks in the past. Whilst there has been some work in this area such literature is generally both somewhat out of date and, more seriously, concentrates upon the more easily quantifiable and dramatic, but probably less important, area of expropriation and nationalisation. In spite of this major limitation in the availability of information it is more useful to examine this work than just to accept the implicit assumption of an increasingly large number of authors that such risks are a significant consideration to companies involved in overseas operations.

Whilst it is undeniable that virtually all companies do face at least some political risk the few well publicised cases of expropriation, major political disturbances and kidnappings can give a biased impression and the empirical evidence suggests that such major risks are faced by only a minority of companies. Instead, companies are far more likely to be faced by the more minor risks of such things as restrictions on new projects, profit repatriation restrictions, discriminatory taxation, limitations on imports and other governmental restrictions on their ability to operate as they would like.

Looking firstly at studies of expropriation or nationalisation of a company's assets, probably the most extensive survey was carried out by Kobrin (1980), who studied 1,500 instances of expropriation in 76 less developed countries between 1960 and 1976. He found that the vast majority of such expropriations were selective involving specific industries or even companies, with only 8 countries staging mass or politically motivated expropriations. In the remaining 68 countries such actions appeared not to be politically motivated as a result of conflict or instability inside the country. This means that the majority of such actions could not be predicted by an examination of indices of instability as offered as a commercial forecasting service by several companies. Instead they may have been predictable if the current economic policies of the country were examined. When the industry that such companies operated in was considered major differences in the risks faced by certain industries were found. In particular, companies operating in sensitive areas were at the greatest risk, especially those operating in the extractive or natural resources, banking, insurance and utilities sectors. This is also supported by Wells (1977) who found that between 1960 and 1974 over one half of all American companies that were nationalised were in the non-oil extraction, mining or agricultural sectors. Also if the technology employed was mature and readily available the risk of expropriation greatly increased as then the specialist knowledge held by the foreign company is no longer unique to that company and is instead available to the host country government from other sources. Bradley (1979) also found that if companies were not vertically integrated the risks increased substantially, as the subsidiary could then be run as an independent company. Size is also an important determinant. For example, Bradley found that for his sample of companies the chances of expropriation were fifty times greater for a company with assets of over $100m. than for companies of less than $1m. However, as Truitt (1970) notes, reliance on the number of cases of expropriation may be misleading with many companies involved being, as he describes in the case of Uganda, little more than "one man and his dog". Bradley also found that joint ownership does not necessarily decrease the risks (although it may increase the chances of obtaining compensation). In his sample the chances of being expropriated if a company was 50/50 owned with the host government were ten times greater than for 100% U.S.A. owned companies, although joint ownership with host country nationals seemed to decrease the risks. Finally Kobrin calculated that 5% of American companies had been faced with at least one case of expropriation in his sample of less developed countries.

Thus it can be seen that expropriation is probably not as great a risk as might be expected, it is normally not indiscriminate, but instead seems to be sector, company and even project specific and is not normally the result of political instability.

Other forms of political risk, probably because they are neither so dramatic nor so easily measurable, have not been so extensively studied. Instead, all that is available are limited case studies or anecdotes which provide no help in assessment of their importance or frequency. There have been a few studies of the relationship between political instability and either the flow or stock of foreign direct investment, (e.g. Bennett and Green 1972, Green and Cunningham 1975, Kobrin 1976). Generally these studies have failed to find any significant relationship. This is hardly surprising, not because such a relationship is unlikely, but because of the limitations of these studies. In particular, the implicit assumption that instability is the same as risk, and consequently the inadequate operationalisation of the concept of political risk, the use of a composite index of instability, the use of cross sectional data rather than longitudinal, and the failure to break down investments by sector or type of company.

4.6.3 THE USE OF GEOGRAPHICAL DISCLOSURES FOR POLITICAL RISK ASSESSMENT.

Having examined both what is meant by political risk and the limited empirical work concerned with the extent that companies face such risks it is now possible to assess whether or not the provision of geographical disclosures are likely to help in the assesment of political risks. Even it is possible to predict the political risks inherent in operating in any particular country, this does not necessarily imply that the current disclosures made by U.K. companies can be used for such a purpose.

The majority of U.K. companies disclose only segmental profit and turnover with little additional information supplied (see chapter 7). The important points to note in this context are twofold. Firstly that the disclosures made are typically either of geographical or line of business information with very few companies disclosing such information on a matrix basis. So that unless the company is engaged in only one line of business (which is very unusual for multinational companies) the users of such reports have litle idea of which activities occur in each segment. This limitation is very serious as most political risks are industry or even project specific, as well as being dependent upon such factors as the size of the project and extent of local ownership. This means that without far more detailed knowledge concerning the specific projects undertaken in each area little information regarding the risks faced by companies is obtainable. Secondly, most segmental disclosures are of a fairly crude type, typically on a continent by continent basis, for example, Africa, South America or Asia. If this information is to be used in risk assessment some assumptions must be made either regarding the actual countries that the company operates in (which may not be easy given the inadequecies of many lists of the principal subsidiaries), or an assessment of the average risk of each segment must be made (something which is likely to be of very little help).

Thus it can be seen that the disclosures typically available to shareholders offer only limited help in political risk assessment. They fail to disaggregate segments sufficiently and fail to provide adequate information on the types of projects in each segment. The information provided may be used for a crude assessment, for example a company operating primarily in South America may well face more risk than one operating primarily in Western Europe, especially if it operates in essential industries. However, it would seem that generally such assessments will offer little of value, especially for companies that operate in many sectors and many countries.

4.7 CONCLUSIONS.

This chapter has attempted to examine some of the possible reasons why shareholders might require geographical segment information. Companies invest overseas for a large number of reasons, not simply to improve their risk/return profiles by international diversification. However, it can be argued that from the perspective of shareholders, one potential benefit that multinational companies offer is the opportunity to indirectly diversify on an international basis. The evidence in this area is limited and often contradictory with many methodological problems. In spite of this some tentative conclusions are possible.

When the risk-return behaviour of different stock markets are considered the evidence appears to suggest that there are potential advantages from international diversification. The extent that such benefits can be reaped cannot be calculated though, mainly because the assumptions behind the domestic CAPM do not hold in the international arena. The extent to which such advantages can be obtained by shareholders also depends upon the degree of market segmentation that exists. There is limited evidence that at least some market segmentation exists. When multinational companies invest in countries with segmented capital markets the benefits of such investments depend upon the extent and causes of such segmentation. In this case shareholders will no longer be indifferent to the investment and financing decisions of companies and such companies appear to provide at least a partial vehicle for shareholder diversification. There is also limited support for the conclusion that shareholders do recognise that multinational companies offer diversification benefits. Most of the evidence is inconclusive but it does suggest that shareholders will be interested in information on the extent that companies operate overseas. However, this provides no evidence on exactly what information would be most valuable to shareholders. It should also be recognised that any analysis of this type is only partial. It looks only at the value of information to shareholders. If such disclosures also affect the decisions or actions of other groups such as host governments, employees or trade unions then the disadvantages of disclosing this information to these groups may outweigh the advantages of the information for the shareholders.

Another potential reason for shareholders being interested in geographical information may be for an assessment of political risks. It was shown that political risks cover not only major discontinuities in the operating environment but also relatively minor changes. Such risks are often very situation specific. They vary from country to country, they also depend upon the type of industry or project being undertaken, the size of project and percentage of local ownership. This implies that geographical disclosures can, at best, provide only a very crude indication of the political risks that a company faces. Given the uniqueness of political risks it appears that this cannot be used by itself to provide a sufficient justification for the disclosure of geographical information.

It therefore appears that shareholders will be interested in both the extent of multinationality and the specific countries that any company operates in. However, given the methodological problems involved in the area of risk assessment, it is not yet clear to what extent geographically segmented information is relevant for risk assessment, although it is obviously of some benefit.

Chapter 5.

PRIOR RESEARCH ON SEGMENTAL INFORMATION AND THE PREDICTION OF EARNINGS.

5.1 INTRODUCTION.

It was argued in the previous chapter that shareholders are primarily interested in the risk and expected returns of investing in any company. It was shown that geographical segment information appears to be one of the pieces of information relevant for risk assessment. This chapter examines the second factor that investors are interested in, the prediction of earnings. There have not yet been any studies that have adequately examined the use of geographical segment data as an input into forecasts of earnings. However, considerable work has been carried out on the predictability of earnings using both consolidated past earnings and line of business data. These studies are examined in this chapter.

This study is concerned with the predictability of earnings using geographical data. An evaluation of the success of such forecasts entails a comparison of forecasts based upon geographical data with forecasts based upon consolidated data. The main objective of this chapter is to examine earnings forecasts based upon consolidated data. This is important as the models based upon consolidated data that will be used in this study must have support from the existing literature on time series modelling of earnings. The models used must be those that the available evidence suggests are the best possible models. Therefore, the analysis of consolidated models provides an essential input into the development of the models used in this study, as described in the next chapter.

A case can be made for the assertion that it would be expected that forecasts based upon geographical data will be more accurate than those based upon consolidated data. This is not only because geographical data is finer but also because it allows the use of additional external information as well. Line of business data is another source of disaggregated data and it also allows the use of external information for forecasting purposes. Whilst the types of external information relevant for line of business data are different from that which can be combined with geographical data both permit the use of external forecasts about an important factor that is likely to affect the earnings of a company. Thus studies using line of business data are also examined. Not only are these studies helpful when deciding upon what geographical forecasting models to use in this study but also if it has been found that line of business data has information content then this provides further support for the assertion that geographical data should have information content.

There are several approaches that can be used when predicting earnings. One of the simplest is time series modelling of annual earnings. This normally involves applying relatively naive models to the past earnings stream to estimate future earnings using a cross-sectional sample of companies, (normally just industrial companies) or to companies in specific industries. Because only relatively few years data can be used only cross-sectional models are appropriate. If instead, quarterly data is used then more complex techniques, in particular company specific models, can be employed. Thus studies concerned with quarterly earnings are also considered. One important question to be answered here is whether or not the optimal quarterly model resembles the optimal annual model, also whether or not the more sophisticated techniques now available lead to better predictions. Two other questions are also important when consolidated based models are considered. Firstly, whether there are ways to improve the forecasts, that is, whether information about the errors can be employed to improve the forecasts. Secondly, whether or not the optimal models appear to be specific to certain industries or types of companies.

Once consolidated based models have been examined the next stage is to examine segment based models. These studies have involved the use of line-of-business disclosures and fall into two categories. Firstly, the relative forecasting ability of segment based models and, secondly, whether or not such data appears to have information content from a stock market perspective. It will be shown that the general answer to both of these questions is that line of business disclosures are useful. The final section examines the relative predictive ability of external forecasts, namely those made by managers and financial analysts. It appears that such forecasts are not generally significantly better than time series models, especially once the advantages of timing differences are controlled for.

5.2 AGGREGATE TIME SERIES MODELS OF ANNUAL EARNINGS.

There have been two main approaches employed in studies of the predictive content of reported earnings figures. Firstly, to test for a pattern in the past income stream by, for example, testing for autocorrelations or employing a runs test. Secondly, using various time series models and then measuring the accuracy of the predictions generated by these models. Such attempts at modelling have differed greatly in complexity from simple a-priori models to company specific Box-Jenkins models applied to quarterly income.

5.2.1. TESTING FOR PATTERNS IN PAST EARNINGS STREAMS.

There have been several empirical studies designed to examine whether any consistent patterns exist in companys' earnings streams. However, it should be realised that finding such a pattern is not the same as saying that the past income stream can be used for prediction purposes. This is because there is no guarantee that any such pattern will persist into future periods. In spite of this limitation such studies can still serve a useful purpose and can provide valuable evidence upon the time series characteristics of past earnings streams. Accordingly, studies of earnings patterns will be examined to see whether or not any common conclusions emerge.

One of the earliest attempts at such a study was by Little and Rayner (1966) who used data from 441 large U.K. companies for the years 1951 to 1961. The main measure of earnings employed was pre tax earnings per #1 of equity capital. They found no evidence of any systematic patterns when the results for each company were plotted or when the results of the best quartile of companies, the second quartile etc. were plotted. In a slightly more sophisticated test they tested for correlations in the growth rates of different years and also regressed earnings in period t against earnings in period t+x. Again, they found no evidence of any consistent patterns and so concluded that there were no consistently good or bad performers. They also recognised that both company and industry factors may play a role in the consistency or pattern of earnings over time and accordingly ran the tests for industries as well as the entire sample. However, again they failed to find any consistent patterns.

This conclusion of no pattern was, to an extent, refuted by Beaver (1970). He examined the behaviour of earnings/common share-holders' equity for 57 NYSE listed companies for the period 1949 to 1968. He found a small but significant positive correlation for this series and a significant negative correlation in the first difference of the series when a runs test was employed to test for serial correlations. A runs test has the advantage over a direct test for serial correlation in that it involves no assumptions about the type of distribution of the series being examined. However, it is also a weaker test as the probability of increases and decreases in income must be generated from the series itself (Roberts, 1966). This result was also supported by an analysis of the high and low rate of return companies. Some evidence of a mean reversion process was found with the minimum difference occurring after eleven periods although complete convergence never occurred. This study differed from that of Little and Rayner in several important respects. Firstly, it examined U.S.A. companies not British ones. However, given that the economic systems and the competitive environments in the two countries are similar there is no a priori reason to believe that this should lead to any systematic differences in the earnings patterns of companies in the two countries. Secondly, Beaver employed a rate of return measure rather than an eps measure, so that earnings were deflated by the size of the investment base. There is some evidence that the two series may behave in different ways. Most importantly a rate of return measure should remove any trend in earnings due solely to an increase in the size of the investment base. If such a trend is not removed it may mask any other patterns occurring in the detrended data. However, Beaver's results, although significant in certain instances, are generally not sufficient to allow any firm conclusions to be drawn. This is especially so when they are compared with other, apparently conflicting, results such as those found by Ball and Watts (1972). This study was wider in its scope in that it examined not only e.p.s. but also net income and net income deflated by net assets. They examined 714 companies using Compustat data for the years 1947 to 1966, and studied the serial correlations of the series, mean squared successive differences and a runs test. They concluded that net income, eps and deflated income all behaved as submartingale processes.

One difference between Beaver's study and the other two is that Beaver controlled for survivorship bias to the extent that he chose companies in existence in the middle of the time period rather than only those surviving at the end of the period. If the companies that failed were consistently different from those that survived with respect to the earnings stream pattern then the choice of companies may bias the results and so reduce their general applicability. In particular, a sample consisting only of companies that have survived is less likely to include companies that have experienced a reduction in earnings. This may lead to over-estimating the stability of the earnings process. Some evidence of this is provided by Saloman and Smith (1977) whose sample of companies consisted of those quoted at the beginning rather than the end of the period under examination.

Even after allowing for any possible differences due to survivorship bias the results of Beaver and of Ball and Watts appear to be inconsistent. Beaver found a moving average process with an underlying mean reverting process whilst Ball and Watts found an autoregressive model to be the best description of the time series characteristics. Whilst Beaver's results are inconsistent with an autoregressive process both results could be explained by some form of moving average process. A moving average process could occur under either of two situations. The underlying process could be mean reverting, as suggested by Beaver, but the errors averaged either due to accounting conventions or to deliberate smoothing actions by management. There appears to be some evidence that such smoothing occurs (e.g. Barefield and Comiskey 1972, Barnea, Ronen and Sadan 1976, Ronen and Sadan 1975), although methodological problems mean that no firm conclusions regarding this can be drawn. Alternatively, the process is actually an autoregressive one for companies inside any given risk class but companies change risk class over time. If accounting rates of return reflect market risk, and market risk is mean reverting, this could be an explanation of Beaver's findings.

Lookabill (1976) tested for these two possibilities by modifying Beaver's high-low test to instead plot both the average market beta and accounting rate of return of companies in the food, chemicals and steel industries. He found that the average change in market beta was not reflected in changes in accounting rate of return and so concluded that the observed moving average series was not due to mean reversion of market betas.

Further evidence has been found in both Australia (Whittred 1978, Praetz 1979) and New Zealand (Firth 1982). These studies used a similar methodology to that employed in prior studies, i.e. serial correlation and runs tests and all three concluded that the behaviour of earnings could be well approximated by a random walk.

Thus the evidence from studies of the patterns of past earnings are generally fairly inconclusive. There is some evidence of a moving average process, but most studies appear to support a submartingale process, in particular a random walk. However, these results have to be viewed with a certain amount of suspicion as they have certain limitations which may have affected the results. One particularly important limitation is that most of these studies looked at a group of heterogeneous companies, (normally all industrial companies) and did not break the samples down into industries. If different models apply to different companies or the same company at different times such an approach is likely to lead to the erroneous conclusion of a random walk model. In particular, it seems likely that different industries may exhibit different earnings patterns, in particular with respect to the variablity of earnings over time and their autocorrelation. This is because different industries face differing operating environments in terms both of the type of product produced, and therefore the type of market served, and the type, and level, of competition faced. Also companies have different operating characteristics. For example, the ratio of fixed to variable costs may affect the variablity of earnings. Lev (1983) found evidence to support these contentions, in that he found that the autocorrelation of earnings, earnings/assets and sales were all significantly related to both product type (i.e. durables and non-durables) and barriers to entry (i.e. high and low). Also capital intensity, as measured by depreciation plus fixed capital charges to sales, was significantly related to the autocorrelation of earnings. Similarly, the variability of earnings was significantly related to both product type and the size of the company. These results provide support for the argument that industrial companies should not be considered as a homogeneous group but rather should be grouped on the basis of certain economic or operating characteristics. Brooks and Buckmaster (1976) provide additional evidence that this is the case. They found that "extreme" companies, as characterised by the distance of one years' income from the normal income or from last years income are not best characterised by a submartingale process. Rather there is evidence of a mean reversion process.

These results held for each of three stratification rules and two error metrics. In a later study (1980) they found evidence that such companies were experiencing only a temporary shift which occurred for between one and three periods before reverting to the more common submartingale.

5.2.2. NAIVE PREDICTION MODELS.

Predictive studies using only annual data fall into two main categories. Either those that examine individual companies to assess if any common models emerge or those applying common models to a group of companies to assess the average applicability of such models.

Predictive model testing consists of taking a sample of companies over several years and fitting various, often a priori, models to the historical data then using the parameters generated in this manner to predict future earnings over one or more years. The success of these predictions are then measured using one or more error metrics and the model that generates the smallest error is said to be the best model. These tests can differ in certain important respects which tend to make comparisons of different research studies difficult. One of the major differences is in the criteria employed for choosing companies, either those from specific industries or all companies. However, the sample is usually restricted to industrial companies as there are good reasons to believe that non-industrial companies, such as banks and insurance companies may behave in a different manner. In the U.S.A. there is also some evidence that public utilities or regulated companies behave differently from industrial companies (see e.g. Ruland 1980). Secondly, different definitions of earnings are employed, these are primarily either an absolute earnings figure or a rate of return measure (often ordinary earnings/common shareholders equity). However, many other earnings measures have also been employed. The choice of earnings is an important one as reported earnings are a function of the size of the investment base, and the investment base is likely to increase in most companies over time so causing an upward trend in earnings. Rate of return is detrended at least to the extent of this being caused by a trend in the investment base. Thus these two measures are quite likely to lead to different conclusions regarding the applicability of various models. Thirdly, the error metric employed also differs. Ideally, the error metric should reflect the cost to the decision maker of making an incorrect decision. However, there is no general agreement as to the most suitable error metric. There is some evidence that different error measures will lead to different conclusions regarding the relative desirability of various models. Finally, these studies differ with respect to the sample size and number of years data employed. In certain instances this has important implications for the statistical validity of the results derived.

One of the earliest attempts at model fitting for predictive purposes was by Elton and Gruber (1972). They employed ten models as follows;

1. Exponentially weighted moving average

$$Y_t = aY_{t-1} + (1-a)(Y_t - Y_{t-1})$$

Y_t is income in period t

Y_{t-1} is income in period t-1

0 a 1

Exponentially weighted moving average adjusted for various trends, recognising that earnings tend to increase over time, i.e.

2. multiplicative trend
3. additive trend
4. multiplicative trend with trend
5. additive trend with trend

Simple moving average using:

6. four years
7. the optimal number of years, which was found to be not much different from one year.

8. Linear regression
9. Log linear regression i.e. a multiplicative trend.

For each of these regressions the optimal number of years was five.

10. Constant change model

Earnings per share were predicted for 180 companies for one, two and three years ahead. For one year ahead forecasts it was found that the exponential moving average with either an additive or multiplicative trend performed the best. For two and three years ahead forecasts the exponentially weighted moving average group of models were again significantly better than any of the others. One advantage of this study is that they employed a larger number of models than most studies. However, the range of models employed rather than just the number must be considered. If the models actually used are considered it can be seen that four different formulations of a trend applied to the same underlying process were used. As might be expected these models did not produce very different results. Because of this later researchers have generally been content to employ just one of this class of models. They also failed to adequately consider the large class of models of the submartingale type, and indeed only used one, the constant change model. This omission was largely rectified by Gonedes (1972) who examined the performance of seven submartingale models as follows:

1. random walk or strict martingale

Simple average using:

2. 5 years
3. the optimal number of years

Constant absolute change using:

4. 5 years
5. the optimal number of years

Constant percentage change using:

6. 5 years
7. the optimal number of years

Where the optimal number of years is up to a maximum of five years.

Of these models he found that the random walk consistently outperformed the other models for one year ahead predictions of net income/common equity for the years 1953, 1960 and 1968. Carey (1978) used essentially the same models as those employed by Gonedes. He applied one to four years of past data to predictions of e.p.s. He found that there was no significant difference between using simple and weighted measures (the weights as per the sum of digits method) and no significant differences between all the models. However, for growth models it appeared that using either two or three years past data was sufficient. When the total sample of 332 companies was split down into different industries he found some evidence that different models might be applicable to different industries. In particular, some industries could be characterised as growth industries and others could not. Unfortunately, the analysis of industries was not carried out in enough detail to be of much use as a basis for further studies. This idea of high and low growth industries or, as Carey puts it, industries in different parts of the life cycle, was further explored by Ruland (1979). He employed two mean regression models i.e. a simple average and a linear regression, a random walk and four submartingale models based on past changes and a regression of past changes, and finally the exponential smoothing model found to perform the best by Elton and Gruber. Interestingly, he failed to confirm Elton and Gruber's results but instead found the random walk model to outperform the others (a model not used by Elton and Gruber). This result held when both six and eleven years data were used to predict one year ahead. The random walk model was found to be the best not only for the whole sample but also for companies with the highest and lowest change in net assets size and capital intensity and for all industries except one which was a regulated industry (airlines). It was also the best model for companies experiencing the lowest change in earnings and the highest positive change. However, those with the highest negative change were better described by either of the two mean reversion models. This last result tends to support that of Brooks and Buckmaster (1976, 1980). Therefore, it does appear that some companies do behave, at least temporarily, in a different manner from the majority of companies.

5.2.3. LEADING INDICATORS.

All of the studies so far examined have been simple time series studies. The major assumption behind these models is that future earnings are a function of, or can be predicted from, past earnings only. Even though they recognise that different companies may follow different patterns and so the models may not be equally applicable to all companies this is still a very important assumption that is open to major criticism. When it is recognised that earnings are not just a function of decisions and actions taken by a company operating as a closed system but are dependent upon the external environment that a company faces it can be seen just what a major assumption this is. Lev (1983) recognised this interdependence by hypothesising that, for example, barriers to entry and product type may affect the applicability of different models. However, the dependence of a company, and therefore its earnings, on the external environment could be recognised in a more direct way. One way of doing this may be through the use of leading indicators. Whilst this approach does not recognise the effects of many external influences such as wage demands or competitors actions i.e. micro influences, it does recognise the influence of many macro factors, in particular the growth of the economy. This approach seems intuitively appealing as if, for example, the economy is fast growing companies earnings will generally be growing at a faster rate than if the economy is stagnating. The earliest writer on time series models to recognise the possibility of using models based on external variables was Collins (1976). He compared the predictive ability of a GNP model with that of a random walk, average growth model, pure mean reversion, moving average on a mean reversion (i.e as suggested by Beaver, 1970), double exponential smoothing and a linear regression model. He found that the GNP model consistently outperformed the other models. The study can be criticised on several grounds such as the use of income before tax and extraordinary items, a choice that appears to be unique to Collins and the use of only four years past data (although there is some support for the small number of years). In spite of these limitations it does provide clear evidence that such an approach should be examined in greater depth using different samples, different earnings definitions and different variables to reflect external influences. This was subsequently done by Chant (1980). He compared three time series models with three economic models i.e. a random walk, average growth (using a nine year average) and an exponential smoothing model (ten years with the smoothing constant chosen to minimise error as suggested by Brooks & Buckmaster 1976 and Ball & Watts 1972) with a money supply model;

$$Y_{t+1} = Y_t(MS_t/MS_{t-1})$$

MS is seasonally unadjusted M1
Y_t is income in period t

a stock index model (using Standard and Poor's 425 industrial index) and a bank loan model (total $ size of commercial and industrial loans by major banks). Data from 1958 to 1967 were used to predict one year ahead forecasts of e.p.s for 218 companies for the years 1968 to 1977. He found that the money supply model consistently outperformed all other models. If only time series models were considered the best model was the random walk model and then the average growth model. Thus, whilst he does not use the GNP model of Collins this study does avoid most of the limitations of Collins' study and combined they provide clear evidence that models based on external factors may provide better predictions than do time series models. These studies are based upon the historical growth of economic variables and are not therefore true leading indicator models.

Even if a company's earnings are a function of the external environment and a model based upon external variables is a better approach to prediction (both of which there are evidence for) the approach of Collins and Chant still has a major limitation. These studies, like those of the time series literature, are based upon past data and therefore assume that the past will continue into the future. This hardly seems an adequate assumption for forecasts based upon economic data. In particular, it is well known that economic life is characterised by cycles and that, for example, real GNP has had both periods of growth and decline. Therefore, it may be possible to further improve these models by using a leading indicator series. A leading indicator series is one that precedes the series one is interested in, so that it consistently peaks and troughs before the series of interest. Therefore, it can be used to predict turning points in the series of interest. Apart from the ability to predict the points at which an extrapolative series will fail this approach has the major advantage of being relatively cheap and easy to use. However, it also has the disadvantage of being only a very short term prediction tool, especially when it is realised that reporting and recognition lags will reduce the amount of time by which one series leads another one. It must also be recognised that this approach is unable to predict or cope with the effects of structural changes such as changes in government economic policy or competitors' actions. A major study of leading indicators in the U.K. since the second world war was carried out by O'Dea (1975). He examined the behaviour of various statistics of the labour market, output, production, capital expenditure and investment, stocks, prices, costs and profits, money, credit and foreign trade to assess if any consistently peaked or troughed prior to other series. He concluded that although they do tend to give false alarms at times they have successfully signalled all post war recessions and recoveries. Whilst he recognises that in practice such a lead may be very short he concludes that they should be useful especially when combined with other approaches. This conclusion appears to be too optimistic especially when leading indicators are used for the prediction of annual earnings. When both the reporting and recognition lags are incorporated even the best leading indicators typically have a lead of only three or four months. This suggests that such an approach is potentially useful only for quarterly predictions. The only time that such an approach was used in the accounting literature was by Heathcotte and Apilado (1974), who attempted to predict stock prices. However, they met with little success.

5.2.4. BOX-JENKINS MODELS

Time series modelling using the Box-Jenkins method employs a generalised class of models (Box and Jenkins 1970), which can be applied to a company's earnings stream to obtain the best model for that specific company. This can be compared to the traditional approach of applying a limited number of prespecified models to a cross sectional sample of companies. Thus it has several advantages over the traditional approach. Most importantly it is a generalised model which, therefore, includes all specific combinations of moving average and autoregressive models, it is also possible to add a seasonality component so that an even larger class of models is included. It then provides a rational and structured approach to finding the best model (Mabert and Radcliffe 1974). This means that it should be able to generate a better model than the traditional approach which is largely based upon trial and error and intuition. So if there is any model that applies to a company's earnings stream this approach is more likely to discover it.

One of the first times that this methodology was employed in the accounting literature for modelling the earnings stream was by Dopuch and Watts (1972). Whilst this was not concerned with the predictive ability of such models it does provide some conclusions of importance to such a question. They argued that a change in accounting methods is important if it leads to changes in the parameters of the best time series model. This argument was employed on a sample of eleven companies that changed from straight line to accelerated depreciation. They found that if earnings were defined as net income eight of the changes were significant, whilst if rate of return was employed only one change was significant. Obviously, this study is not conclusive. For example, they took published data and did not adjust for any other changes in accounting methods. However, it does suggest that changes in accounting methods should be considered in time series studies.

Watts and Leftwich (1977) used Box-Jenkins techniques to assess the behaviour of attributable earnings for thirty two companies in the railroad, petroleum and metal industries (following the approach of Watts (1970)). They found that only for the railroad industry was one type of model clearly the most common (first order autoregressive) and that generally no conclusion could be made regarding the earnings process. When Box-Jenkins forecasts were compared with forecasts based upon the random walk and random walk with a linear trend they found that the random walk with linear trend significantly outperformed the others. This result is rather surprising given the great difference in sophistication of the two approaches and so was further tested by Albrecht, Lookabill and McKeown (1977) to see if it was a company, industry or time specific result. The sample was the same as that used by Lookabill (1976). This sample has the advantage that it consisted of companies in industries with very different degrees of capital intensity and so industries that may be expected to have different types of earnings patterns. There was indeed some evidence to support industry specific models especially as regards non-deflated earnings. In particular, the steel industry was dominated by companies with autoregressive models, the chemical industry by either random walk or random walk with a trend whilst the food industry showed no clear pattern and the models were generally more complex. For deflated earnings the lack of dominance of the Box-Jenkins models was even more apparent. When these company specific models were compared with random walk with and without a trend it was found that, for deflated earnings, the random walk plus trend was clearly the worst whilst for ordinary earnings random walk was clearly the worst, but generally Box-Jenkins forecasts failed to outperform the other models.

These two studies support the findings from cross sectional studies. They suggest that whilst there is evidence of both intracompany and intraindustry differences either a random walk or a random walk plus trend appears to be the best predictive model in very many cases. This is especially true for non-deflated earnings streams.

So far this review has implicitly accepted the fact that the Box-Jenkins methodology applied to annual data is an appropriate method. However, this is not necessarily the case. Box and Jenkins (1970) state that at least 50 observations are required or else systematic biases will occur. This need for such a large amount of data may lead to major problems especially when annual data is used. Over such a long period of time there are bound to be major changes in the accounting methods used to measure income. As seen above, this may have consequences for the stability of the time series parameters. Also structural changes are likely to have occurred. For example, major mergers and takeovers, companies that have changed the types of products or industries that they operate in, and companies that have been faced with major changes in the operating environment. All of these are likely to change the earnings generation process to the extent that a time series model will not be stable over such a long time period. Therefore, it is necessary to assess the practical significance of this data requirement. This was done in the context of predictive ability testing by Lorek and McKeown (1978). They found that as the data base becomes smaller it becomes more difficult to differentiate random noise from serial correlation and there appears to be a significant linear relationship between the size of the data base and the predictive ability of the models. They concluded that for practical purposes a data base of more than 24 points was required and that below this level predictive results were significantly poorer. Even using 24 data points rather than 50 is likely to lead to major problems for the reasons described above, and, in the U.K., difficulties in generating the required data. However, although such an approach may have only very limited use in studies employing annual data its most important role is in the analysis of quarterly data as it means that, at a minimum, only six years data is required, and this is where this approach has been used the most.

5.3. TIME SERIES MODELS OF QUARTERLY EARNINGS.

5.3.1. COMPANY SPECIFIC FORECASTS.

Studies of the time series behaviour and predictive content of annual earnings streams using Box Jenkins techniques or ARIMA (autoregressive intergrated moving average) models have all employed company specific models.

These studies have generally failed to find a single class or type of model that is applicable to a group of companies, but instead have found very great diversity of models both within and across industries. Some authors (e.g. Albrecht, Lookabill and McKeown (1977)) have argued that this failure to find one or more models that predominate is because there may be very different underlying time series processes due to differences in the competitive environment, industry wide factors and company specific characteristics. When it comes to examining quarterly earnings streams an alternative approach has generally been more popular, this is to find a cross sectional or representative Box-Jenkins model. Amongst the arguments for fitting a model to a representative sample of companies are those put forward by Foster (1977), who argues that much of the diversity found in company specific modelling is induced by sampling phenomenon and Griffin (1977) who argues that it is largely due to overfitting and overusing data. These arguments that such results are an artifact of the methods used plus the feeling that such research was failing to, and indeed seemed likely never to, find any representative model were largely responsible for attempts to find a parsimonious Box-Jenkins model. A parsimonious model in this context being one that applies to cross-sectional data, performs well when compared with individual models and is simple, so that, for example, it has a small number of lags or differences. This approach when applied to quarterly data has led to three models being contenders. These were suggested by Griffin (1977) and also by Watts (1975), Foster (1977) and Brown and Rozeff (1979) and have come to be known by the names of these authors.

A convenient way to describe a Box-Jenkins model is in terms of its three components (pdq) or for a quarterly model that has a seasonal component also (pdq) x (PDQ) where p,P are the autoregressive and seasonal autoregressive parameters, d,D the consecutive and seasonal differencing and q,Q the moving average and seasonal moving average parameters. A quarterly model differs from an annual model in that it contains two multiplicative stochastic processes rather than just one. These are a seasonal component and a seasonally adjusted series. Griffin, studying 94 large companies, found that the process could best be described by a model of the form (0,1,1) x (0,1,1) i.e. a multiplicative first order moving average of first differences of the seasonal difference in the series, and that this adequately described all but 5 of the companies in the sample. Foster argued that the best model was of the type (1,0,0) x (0,1,0) i.e. a single autoregressive parameter and a seasonally adjusted series. He found that this outperformed company specific models when forecasting one period ahead. Brown and Rozeff instead argued for a similar but more complex model (1,0,0) x (0,1,1) i.e a single autoregressive parameter with a seasonally adjusted moving average series. They argued that this outperformed both of the other two models as well as company specific models when forecasting more than one period ahead.

This situation reflects that found when only annual data is considered, that is three studies coming to three different conclusions. However, the models suggested by Brown and Rozeff and by Foster are not very different and it can be argued that Foster's model is a special case of the more sophisticated model of Brown and Rozeff. There are other points of agreement also. They all agree that a parsimonious model can be found that outperforms company specific models and that such a model has two components, a seasonal and a seasonally adjusted series. Also that, unlike many of the studies using annual data, a submartingale or a strict martingale is not the best description of the time series process, and that, except for the seasonality component, successive differences in the series are not independent.

Griffin only assessed the fit of his model not the predictive ability, whilst Foster only assessed the predictive ability for one period into the future. One possible way to resolve these differences in order to see if one model is clearly the best would be to assess the extent that the models are sample or time specific, i.e to rerun them for different samples or for the same samples but over different time periods. Another approach would be to consider the limitations of the testing that the authors carried out on the models and to improve upon these techniques. The latter approach was taken by Lorek (1979) who also compared them with company specific models and various naive benchmark submartingale models. He used them to predict up to four periods ahead and found that

Griffin's model significantly outperformed Foster's for all periods whilst Brown and Rozeff's was the worst for predicting four periods ahead. However, company specific models significantly outperformed all the other models and, of the parsimonious models, only the Griffin/Watts model outperformed the naive models. If this study is accepted it does, to an extent, help in deciding which model is most appropriate. This is because Lorek agrees with Brown and Rozeff that Foster's model does not adequately explain the seasonal component. However, he disagrees with their conclusion that their model outperforms Griffin/Watts. There is some evidence that the results found may be a function of how many periods forward are forecast, but there is insufficient evidence to be very definite on this point. Although this was indirectly suggested and tested by Lorek it was not pursued. To an extent this study also makes the situation more complex, in that it finds specific Box-Jenkins models outperform the parsimonious models and even finds that naive models outperform two of the parsimonious models. This finding is contrary to most of the findings using annual data and is also one that Griffin, Watts, Foster and Brown & Rozeff all argued was, a priori, unlikely to occur. The finding of company specific models outperforming parsimonious models was not, however, supported by Hopwood and McKeown (1981) who forecasted the earnings of 267 companies four quarters into the future. They found that Foster's model performed the worst and Brown and Rozeff the best of the three models whilst company specific models did not outperform these models, in spite of evidence that all three models were misspecified. Bathke and Lorek (1984) also support the conclusion that the Brown-Rozeff model outperforms the other two models and random walk with drift. In addition they also found that it most closely approximated the market's expectations of earnings. Thus it seems from all other evidence available that Lorek's findings regarding company specific models is not a result that can generally be expected and rather must be due to the specific characteristics of his sample.

Hopwood, McKeown and Newbold (1982) also employed the Griffin/Watts and Brown and Rozeff models. However, they did not directly compare the predictive ability of them. Instead they assessed whether or not predictions based upon quarterly earnings outperformed those based on annual earnings even when they employed no new information. To do this they compared predictions using the two quarterly models and the annual models implied by each of them and the random walk model. They did indeed find that there was a significant gain from using the quarterly models. They failed to directly compare the two quarterly models or their implied annual models. However, from the results reported, there does not appear to be any significant difference in the predictive ability of the two models.

One thing that these studies have in common is that whilst most have been concerned with predictive ability rather than just model building they have generally only considered Box-Jenkins models, either company specific or cross-sectional. So they have ignored the large group of simpler naive models, which have the clear advantage of being much easier to use in practice. Whilst there is clear agreement that quarterly earnings streams are made up of two components and that apart from the seasonality component successive changes are not independent so that a random walk benchmark model is inappropriate, this does not imply that other naive models might not outperform Box-Jenkins models. This is especially the case when it is realised that such models have generally outperformed company specific models when annual data is used. To an extent this limitation was rectified by Deschamps and Mehta (1980) who employed company specfic models and three naive models, i.e. random walk plus drift, stable growth and a mixture of constant growth and submartingale, (the exponentially weighted moving average model is inappropriate for quarterly data). They found some support for a parsimonious Box-Jenkins in that most specific models required first level differencing at the seasonal level, so that the only dominant non-stationary factor was a linear trend. However, this was the only common factor. Again, as might be expected, they found that the worst model was the submartingale and that both this and the stable growth models were clearly misspecified. No simple model was found to clearly outperform the rest.

Some general conclusions can be drawn from these studies. Firstly, it is apparent that, unlike the situation for annual series, the submartingale is an inadequate representation of the underlying time series process of quarterly earnings. However, it does appear that other possible naive models have been inadequately examined. Also the two approaches to Box-Jenkins modelling, i.e company specific and parsimonious modelling appear to give results that do not greatly differ. Very often company specific modelling yields very different company specific models which makes any generalisations regarding the underlying time series processes very difficult. In addition, obviously, such an approach is much more difficult, time consuming and expensive. Therefore, cross sectional modelling appears to be a more fruitful approach. It has been seen that these models are of two types. This is because Foster's can be considered a special case of Brown and Rozeff's and also because it appears to be consistently outperformed by the other two models. But there is no agreement on which of these two is the better model. There is some evidence that this may be both time specific, i.e. dependent upon the number of periods being predicted and also sample specific. Finally, it does appear that quarterly models outperform annual models even when no new information is used.

Whilst the findings regarding of the applicability of a parsimonious model are interesting ones and suggest that such an approach may also be profitably applied to annual earnings such an approach has not been employed. Whilst Hopwood, McKeown and Newbold (1982) annualised the quarterly models thay found that such models were not similar to any found to be useful in studies of annual data. This coupled with the fact that they were consistently outperformed by the quarterly models does suggest that such an approach may not be so productive when annual time series processes are being considered. This conclusion is reinforced when it is remembered that the Box-Jenkins methodology is inapplicable to annual series, or at least should be applied with very great caution, because of the large number of data points required. Generally it does appear that quarterly series are very different from annual ones because of the addition of a seasonal factor. Therefore, it appears that research on quarterly time series processes has little to offer to research on annual processes.

5.3.2. NAIVE MODELS USING QUARTERLY DATA

Company specific ARIMA models seem ideally suited to studies of the predictive ability of quarterly earnings and to modelling the underlying time series processes. This is because of their additional sophistication over naive models. In spite of this the earliest studies of the predictive ability of quarterly data used naive models. The first of these studies attempting to measure the additional predictive ability of quarterly over annual data was by Green and Segall (1966). However, they employed only a random walk model with inappropriate seasonality assumptions, and unsurprisingly, failed to find that quarterly data had any extra information content in this context. This research was later developed further by Coates (1972) who employed company specific rather than cross-sectional models. These were all submartingale models repeated for differing assumptions with respect to the degree of correlation of the quarterly earnings. He found that as one to three quarters information was added to the models the accuracy of the predictions significantly and consistently improved. A similar result, although the improvements were less, was found by Barnea, Dyckman and Magee (1972), who extended this work to predict annual earnings that were totally in the future. This type of research using naive models was superceded by the Box-Jenkins methodology. However, it does show that even when inappropriate models are applied to quarterly earnings the use of such quarterly data does significantly improve the predictions.

5.4. METHODS OF IMPROVING FORECASTS

One way in which forecasts may be improved is to use the information contained in the forecast error to improve any future forecasts. The forecast error may be attributable to three causes: misspecification or bias in the mean, misspecification or error in the slope so that the error is systematically negative for high predictions and positive for low predictions, and random error. It should be possible to disaggregate the error term into its component parts and use the information so obtained on the systematic components to improve the forecast models. This was done by Brandon and Jarret (1979) who used Thiel's optimal linear correction and the Bayesian revision procedure to improve the forecast of the EPS of 50 companies over four years when seven simple models, all in the submartingale class, were used. As expected, they found that such corrections improved the forecasts across all time periods for all models and all companies when Thiel's method was employed. Also most forecasts were improved, although by a lesser amount, when the Bayesian revision technique was employed. Although this result is an unsurprising one it does provide clear evidence that the normal approach of using a naive model to predict earnings can be improved upon. If this is done the findings that such naive models are generally not outperformed by company specific ARIMA models should hold in even more cases.

All the models so far described have one common feature. This is that they are all univariate models: that is, only one variable, namely earnings, however defined, is used as both the independent and dependent variable. These models assume that current or future earnings are a function of past earnings only. This is in spite of the recognition by many authors that the earnings process is likely to depend upon exogenous factors. This idea of external factors playing a role can be further developed and recognised explicitly by the use of a market or industry index model. The rationale for this approach is that there are cross sectional dependencies between companies. In particular all companies, or all companies in one industry, are affected by external events such as government economic policies and the recognition of these should improve predictions. The first time this approach was used for earnings prediction purposes was by Gonedes (1973) who developed a market index model from all the companies in his sample (316 companies). This market index model was of two types: the average of the accounting series being predicted, and the weighted average (weighted by the size of the common equity). He used this model and also first differences of it to predict net sales/common equity and net income/common equity and compared the predictive ability of these models with six submartingale models. He found that whilst there was evidence that the market index models were misspecified, the equity weighted first differenced model was the most descriptively valid and was also at least as good a predictor as any of the other models including the naive models.

This approach has the advantage that it does use a proxy for market wide or industry wide factors which time series models do not. However, to achieve this it ignores all company specific factors and any time series behaviour. It is impossible to say a priori which approach is potentially more fruitful for predictive purposes. If, as seems likely, company specific or micro factors, industry, and economy wide or macro factors affect the earnings patterns of companies then rather than arguing about which set is more important (something that is likely to be both company and time specific) a more fruitful approach should be to combine the two sets of factors into one model. This approach has been attempted by Hopwood (1980) and Hopwood and McKeown (1981). Whilst their results are not conclusive they are sufficiently promising to suggest that this might indeed be a profitable approach to earnings predictions. Hopwood developed a bivariate model or a transfer function which used both the past earnings stream and either a market or industry index. Thus, it was a more generalised ARIMA model than the Box-Jenkins approach, though essentially of the same form. This was employed to predict the quarterly earnings of 30 airline companies so that a market model (Standard and Poor's composite index) could be compared with an industry model (S & P's air transportation industry index). He found that overall such composite models failed to outperform the univariate ARIMA models. However, if a multivariate model outperformed the univariate model in the first three periods it was highly likely to outperform it in the remaining periods when ten periods earnings were predicted. He concluded from this study (and from similar results obtained from the food and chemical industries) that there was insufficient evidence to conclusively prove that that such an approach was better than univariate modelling. Rather the improvement may have been solely an artifact of the modelling process employed. Hopwood and McKeown employed a similar transfer function model and found that it generally outperformed company specific Box-Jenkins models. Thus although the evidence is inconclusive at the least it does support the view that Box-Jenkins ARIMA models can be improved upon and that bivariate modelling may be one way of doing this. A similar approach was taken by Welch (1984) who compared parsimonious Box-Jenkins models of quarterly earnings with a distributed lag with a model based upon macro-variables. This model was an autoregressive time series regression model with two exogenous variables, namely gross private domestic investment and M2 money supply. Whilst this model failed to consistently outperform Box-Jenkins forecasts it should be seen as a first attempt at developing such a model which can probably be improved upon and so provide better forecasts in the future.

5.6. INDUSTRY SPECIFIC FORECASTS.

It was shown above that the earnings streams of all companies cannot always be modelled in an optimal way by using only one model. As Brooks and Buckmaster (1976, 1980) found, companies at certain times may experience a financial disaster or may be unusually successful, and after this their income flow tends to follow a mean reversion process. It has also been found that, at least sometimes, company specific models outperform parsimonious ones (e.g. Albrecht, Johnson, Lookabill and Watson 1977). Although this latter conclusion has not remained unchallenged it does suggest that the earnings time series patterns of all companies are not identical. In addition, some studies have concentrated upon companies in particular industries (e.g. Watts 1970, Watts and Leftwich 1977). However, these studies have failed to capitalise upon their research design to pursue the question of systematic industry differences.

The idea that the earnings patterns of different companies may behave in consistently different ways has not been sufficiently explored. In particular, it seems likely that the variability of earnings is likely to depend upon several factors. One of the most important is likely to be the industry that a company primarily operates in. Certain industries are likely to be more stable than others (e.g industries supplying essential goods or services versus those supplying non-essential or luxery items). Also the larger a company is the more likely it is to be able to stabilise its earnings and revenues. Similarly the more diversified a company is both in terms of product lines and geographical spread the more stable its earnings are likely to be.

If these factors do indeed affect earnings flows in any systematic manner then an obvious approach to modelling earnings should be to segregate companies into groups based upon these factors, but this has not been done. This problem has been explored to at least some extent in the context of the ability of financial analysts and managers to forecast future earnings and revenues. In particular, there have been some studies which have examined the determinants of the relative success of such forecasts.

With regard to the size of a company, Bhaskar and Morris (1984) in a study of U.K. brokers' forecasts found that there were significant differences in their accuracy. This finding differs from that of earlier studies. In particular Dev and Webb (1972) in a study of U.K. prospectuses found no significant differences with respect to their accuracy for companies of different sizes. This is also supported by U.S.A. research (Jaggi 1978 (a)) which failed to find that size explained differences in the relative accuracy of managers' as compared to analysts' forecasts. Whilst the evidence for size differences is inconclusive the evidence for industry differences is more conclusive. Dev and Webb found significantly less variability in the forecast error within industries than across industries. Jaggi found that for the high variability industries of chemicals and services there were significant differences in the accuracy of management and analysts forecasts, but that this was not the case for the low variability industries of banking, utilities and manufacturing. Similarly Richards, Benjamin and Strawser (1977) found that financial anaysts' forecasts for banks were significantly more accurate than those for computer and office equipment manufacturers. Bhaskar and Morris also found industry differences, with forecasts for the service sector being the most accurate.

These studies were concerned with the accuracy of published forecasts and not with the problem being considered here, namely the time series behaviour of earnings. But they do help to throw some light on to such processes. In particular, they provide evidence that the accuracy of forecasts is a function of the industry a company operates in and, secondly, that the relative accuracy of management or internal forecasts as compared with external or analysts forecasts is also a function of industry. These two conclusions appear to support the contention that certain industries have more stable earning patterns and so any mechanical models of such processes may also differ on an industry by industry basis. The same conclusion appears likely on the basis of other factors also, but these have either not been explored, or, as in the case of industry size, the results are too inconclusive to enable any definite conclusions to be drawn.

5.6. LINE OF BUSINESS BASED FORECASTS.

5.6.1a. FORECASTING ABILITY.

There have been relatively few attempts at assessing whether or not line of business information leads to more accurate forecasts of either sales or profits than forecasts based only on aggregate or consolidated data. Instead, most interest has focused upon the stock market effects of such disclosures. The first attempt to use such information in predictive ability tests was by Kinney (1971) who forecasted the earnings of a small sample of 24 companies for the years 1968 and 1969. He employed four models which were as follows;

Model 1. Consolidated earnings x forecasted change in G.N.P.

Model 2. Linear trend of consolidated earnings by double exponential smoothing using a base period of 8 to 10 years and a smoothing constant of 0.4.

Model 3. Expected segment sales x consolidated profits ratio, with segment sales forecast as current years sales x expected increase in industry sales, and the profit rate being a three year average.

Model 4. Expected segment sales x 3 year average segment profit ratio, with expected sales being forecast as in model 3.

He found that model 4 was significantly better than either models 1 or 2 and better, although not significantly, than model 3. However, this study was very much an exploratory one and is subject to many severe limitations so that generalisations from it would be of doubtful validity. As Kinney recognised, it suffered from a self selection bias, in that he only looked at companies that voluntarily disclosed such information. These companies may differ systematically from the much larger group of non-disclosures, especially as, at the time, segment information was only provided by a small minority of companies. The sample was very small, being based upon the 32 companies reported by Pacter (1968) as being voluntary reporters. Probably of greater importance are the limitations inherent in the models employed. The results found may be due to the fact that disaggregated sales information does improve predictive ability. But, equally plausible is the explanation that the results found are due to misspecification of the consolidated models employed and so what was compared were line of business based forecasts and suboptimal consolidation based models. He employed only two consolidation based models; expected change in G.N.P. and double exponential smoothing. More seriously, he appears to have chosen these in an arbitrary manner without apparently consulting the fairly extensive literature on time series forecasting available at the time. The work on time series models then available does not support the models chosen. This conclusion of model misspecification is further supported by the fact that no reason is offered for the choice of the smoothing constant. Also he found that all the models were consistently biased downwards, with model 2 showing the most bias, again suggesting misspecification.

Collins (1976) attempted to remedy these limitations. The problem of self-selection bias was rectified by considering only companies that reported segment sales and revenues in the Form 10-K for the years after 31/12/1970, as mandated by the SEC. This resulted in a random sample of 96 companies, i.e. a sample considerable larger than that used by Kinney. He forecasted actual earnings and sales and first differences of both. This was because the levels tend to be highly serially correlated implying that some form of the martingale class of models is applicable, whilst the first difference series not being so correlated imply a different specification such as a linear regression model. Also, unlike Kinney, a consistent definition of earnings was employed rather than using the various different earnings streams that companies voluntarily disclosed. Each dependent variable was forecasted using each of the following models, which are generally well-founded in the time series literature.

Consolidated models;

1. Linear regression.
2. Strict martingale.
3. Submartingale.
4. Pure mean reversion.
5. Moving average of a pure mean reversion.
6. Kinney's double exponential smoothing.
7. Kinney's G.N.P.

Segment models;

Sales; based upon expected industry sales of each segment.

Earnings;

1. Expected segment sales x prior year consolidated profit margin.
2. Expected segment sales x prior year segment profit margin.

Forecasts were made for the years 1968 to 1970 and the mean absolute error for each forecasting method calculated. The hypothesis that such errors were the same for each model was then tested.

For sales it was found that the segment model significantly outperformed all the aggregate models with the exception of the GNP model, whilst for first differences of sales again the segment model outperformed all except model 1, the linear regression model. For both the level and first difference of earnings the segmental models were both significantly better than all the consolidation models, although the addition of segmental profit margins instead of a consolidated margin only led to a marginal improvement in predictive ability.

Silhan (1983) extended these studies to examine the effects of quarterly disclosures of segmental information. He did this by creating multi-segmental companies by merging 60 single industry companies into 2 to 10 segment firms. He then applied Box-Jenkins forecasts to consolidated earnings, consolidated sales x consolidated margin, segmental sales x consolidated margin, segmental sales x segmental margin and segmental earnings. For annual forecasts the conclusions of Kinney and Collins were found to hold. For one quarter ahead forecasts he found the segment based forecasts outperformed the consolidated based forecasts and again, the addition of segmental earnings failed to improve upon the forecasts achievable from segmental turnover information only.

All of these studies examined companies from the USA, and such companies may differ systematically from UK companies, so that it is necessary to apply such an analysis to UK companies also. This was done by Emmanuel and Pick (1980). They forecast sales and earnings of 39 of the largest 100 UK companies for the years 1973 to 1977. They used only one consolidated model, the strict martingale. Whilst this model is defensible in that it has often been found to be the best single predictive model, the time series literature is by no means in agreement that this is the only, or even the best, consolidated model to use. This means that consideration of other likely alternatives could have strengthened their findings. So whilst these results help to clarify which are the best segment models and whether or not the addition of segmental profit margins improves forecasts, they add relatively little to the debate over consolidated versus segment models. The segment models employed were as follows;

Sales;

1. Expected industry growth x current segement sales
2. Model 1 adjusted for the expected change in the GNP.
3. Past industry growth rate x current segment sales.

Earnings;

The best prediction of sales from the models above x

1. Past year company profit ratio.
2. Past year company profit ratio adjusted for a one year percentage trend in earnings.
3. Past year segment profit ratio.
4. Past year segment profit ratio adjusted for a one year trend in earnings.

They followed the testing procedures employed by Kinney and Collins by testing for any mean differences in the mean absolute error of each model. For sales they found that all four segment models were significantly better than the consolidated forecasts, with model 2 being the most accurate and model 3 the second best. For earnings they found that models 1 and 3 were significantly better than the consolidation based models at the 99% level and model 2 significantly better at 95%. Thus they lend support to the prior conclusions of Kinney and Collins that subentity or segment data aids in the predictions of sales. However, whilst they found that segmental earnings data was of no additional benefit for predictive purposes both of the prior studies found them of some marginal benefit.

It should also be noted that all of these studies are based upon the static assumption of constant market shares and so do not deal with companies expanding or contracting at a different rate from the industry average. This assumption is obviously likely to be invalid so that more work needs to be done with more years data to build models that can cope with changes in market shares. However, if this simplifying assumption is removed the apparent superiority of segment based models should increase rather than decrease as they become more realistic.

These studies have also employed only one error metric and one, arbitrarily chosen, rule for the treatment of outliers. As explained in chapter 7, the choice of both error metric and truncation rule may affect the conclusions found. Another simplifying assumption made in all these studies is that all the models employed are equally applicable to all the sample companies. That is, there are no company characteristics that consistently make one or more of the models more applicable. In practice this assumption is unlikely to hold true. One such factor is likely to be the degree of diversification of the companies. Garrod and Emmanuel (1983) attempted to rectify this limitation by classifying companies into whether or not they were diversified and assessing whether different models performed better for different types of companies. They argued that if a company's performance followed the economy's performance closely then line of business disclosures will provide little relevant information, whilst if the company followed the performance of the industries it operates in then such disclosures would be of importance. They employed four forecasting models as follows;

1. Expected industry growth x segment sales x inflation adjustment.
2. Expected major industry growth x consolidated sales x inflation adjustment
3. Strict martingale x inflation adjustment
4. GNP forecast x consolidated sales x inflation adjustment

Again the criticism applies that only one consolidated model was employed. They looked at three industries, motor vehicles, paper and other manufacturing and then classified companies as being fully diversified if both the correlation coefficient of company earnings and the economy and company earnings and the industry were greater than 0.9. Companies were classified as unknown if both correlations were less than 0.5, and the reminder were either classified as partially diversified if the correlation of company and country exceeded that of company and industry, and as integrated if the reverse held. Only three companies were used in each category so that this is very much an exploratory study and the results achieved cannot be considered statistically valid. They found that for the unknown category the industry based models performed the best and that segmental data was useful. For integrated companies, again segmental information appeared to be of value. However, for partially diversified companies segmental information provided no improvements in predictive ability. For fully diversified companies all four models performed equally well. So this study provides some evidence of the differential advantages of segmental disclosures. Although, obviously, more companies need to examined before firm conclusions can be drawn. In addition, it would be useful to know how robust the results are to changes in the sizes of the coeffecients used to categorise the companies.

All of these works have several limitations in common. Firstly, they all rely upon a very limited number of years segmental information to build the models and similarly apply them to a small number of years. This means that they have employed static assumptions and are unable to cope with growth patterns involving a longer time series. Also, generally, the consolidated models have been insufficiently grounded in the literature of time series modelling, so that there is a real danger that suboptimal consolidated models are being compared to the segmental models. They also ignore the fact that different numbers of segments are reported by different companies, so that no consistent definition of what is considered to be material is employed. Barefield and Comiskey (1975) looked indirectly at this question. They studied the accuracy of Standard and Poor's forecasts of earnings for 26 companies from 1967 to 1970 and found that the accuracy of such forecasts was significantly associated with the extent of voluntary disclosure, but that this relationship was significantly reduced once the number of segments reported was controlled for. Also the use of reported segments involves the use of data containing many arbitrary allocations especially of such items as common costs. This can be a major problem where there are significant internal transfers. These factors may cause problems in using the data for cross-sectional studies. Thus it would be desirable to remove such arbitary allocations, and also to study the effects of differing the number of segments reported by considering companies operating in differing numbers of industries. Both of these things were done by Silhan (1982). He constructed simulated multi-segment companies comprising 3, 5, 7 and 10 segments. This provided sufficient data to compute both consolidated and segment based predictions of earnings for both the next quarter and year using the Box-Jenkins forecasting methodology. However, the results found were inconclusive. For the quarterly forecast the segment based method was generally better if the error was measured using the mean absolute error and consolidated based forecasts were better if the mean relative error was used. For predictions of the annual earnings neither method was clearly better whichever error metric was employed. Annual forecasts were more accurate than forecasts of just the one quarter ahead and the forecasts were more accurate for the companies with the largest number of segments.

Not only might the number of segments employed influence the relative predictive ability of segmental information but other factors may also be significant. For example Salamon and Dhaliwal (1980) argue that increases in the amount of financial disclosure by companies tends to decrease the cost of capital and, in addition, small companies rely less upon public financing than do larger companies. Therefore, voluntary disclosure of segmental results is likely to be of less use to such companies. This argument implicitly assumes that the accuracy of segment forecasts is not a function of company size. Silhan (1984) tested this relationship directly by using simulated mergers of single activity companies. He found that the gain in predictive ability due to the addition of segmental information was more common for smaller companies. In addition, only for such companies were segment based forecasts more accurate across all the companies irrespective of the number of segments disclosed. Silhan argues, in a similar manner to Garrod and Emmanuel, that this finding should be expected as smaller segments are less likely to mirror either the economy or each other. It is difficult to directly apply these results to actual disclosures as these may suffer from practical problems of cost allocations etc. that do not occur for simulated mergers. Because of this it is desirable to directly compare the results of simulated mergers with those found from actual disclosures. Therefore, Silhan and McKeown (1985) applied the models employed by Kinney and by Collins to both simulated mergers and actual companies. They found that the results of both samples were similar. This supports the validity of using simulated mergers and the conclusions found using such an approach.

5.6.1b. CONDITIONS NECESSARY FOR THE SUPERIORITY OF SEGMENT BASED FORECASTS.

All of these studies seem to support the conclusion that segment data, especially turnover information, does lead to more accurate predictions than are possible from just consolidated information. This means that the relevant question to ask is no longer "does line of business information improve forecasts?", but instead "under what circumstances does such information lead to more accurate forecasts?". This means that it is also necessary to examine research into the conditions under which disaggregated forecasts, in this case segmental or additive forecasts, will yield better forecasts than aggregate or consolidated forecasts.

For this analysis the simplifying assumption is made that a company is made up of two divisions only. Whilst this is obviously unrealistic, it means that the analysis is easily manageable and it does not affect the general validity of the results when they are applied to multi-divisional or segmented companies. Also it is assumed that either sales or earnings are forecast either for the total company or for each division and then summated. Thus the problem is; when will the aggregate forecast X_{at} be superior to the disaggregated forecast $X_{dt} = X_{1t} + X_{2t}$?

The conditions for this were generated by Ang (1979) and by Barnea and Lakonishok (1980). The methodology employed differs but the conclusions reached are essentially identical. They both found that the relative forecast accuracy was a function of two variables. Firstly, the relative accuracy of the forecasting techniques used and, secondly, the magnitude of the correlation between the actual disaggregated series employed compared with the correlation of the forecast errors of the disaggregated series. Both of these works clearly point to the conclusion that disaggregated forecasts of, for example, segmental variables will not necessarily be more accurate than those generated by a consolidated forecast. Instead which is better depends upon the specific characteristics of the segment variables being considered. An alternative approach was taken by Hopwood, Newbold and Silhan (1982). They argue that if the time series can be described as an ARIMA process then disaggregated forecasts will not be superior if two conditions are met. Firstly, that the parameters of each of the models are identical and, secondly, no disaggregated series lags the aggregate series. Whilst this approach to the problem does provide sufficient conditions for disaggregated information to be of no additional benefit it fails to demonstrate whether these conditions are necessary or whether in certain circumstances the conditions may be less restrictive.

Having derived the conditions under which disaggregated data should provide superior forecasts each of the authors then also tested them to see if, in practice, disaggregated forecasts outperform consolidation based forecasts. Hopwood et. al. followed the procedure used by Silhan of forming n-segment companies from 35 undiversified companies. They fitted Box-Jenkins models, a strict martingale and a moving average model to each company and found that generally the random walk model was the best. This means that the first requirement was not met. Secondly, they tested for a leading series by lagging all the series for one to four periods and found that the second requirement was not met either. Ang's analysis is not directly applicable to the question being considered here as he examined subtractive models, i.e. Earnings = Sales - Operating Expenses. However, for aggregate industry data from twenty industries he found that for only two of them, lumber and tobacco, was the component forecast more accurate. Barnea and Lakonishok combined the first five companies on the Combined Tapes into ten two segment companies and forecasted the net income by exponential smoothing. They found that for only four of these simulated companies was the correlation coefficient of the segment results larger than the correlation coefficient of the segment forecasts, a necessary condition for the segment forecasts to be the more accurate. Only in three cases were the segment forecasts found to be actually more accurate.

These results are too limited in the number and type of cases considered to make generalisations entirely satisfactory, but they clearly support the previous conclusion that line of business information does not necessarily improve forecast accuracy.

All of the studies examined so far have considered only the effects of segmental disclosures upon mechanical forecasts. An alternative approach is to consider their effect upon the actual forecasts made by users of the accounts. Baldwin (1984) employed this approach by examining the impact of such disclosures upon the forecasts of earnings per share as made by financial analysts and reported by Value Line in the years 1969 to 1973. He examined the forecasts for companies that had voluntarily disclosed earnings prior to the SEC requirements of 1971, those that had not disclosed such information and a control group of single segment companies. He found that the accuracy improved and the variability decreased during the period for all three groups, a result he was unable to explain, but that the greatest improvement occured for the non-disclosure group. These findings again support the conclusion that line of business disclosures lead to improved forecasts.

5.6.2. STOCK MARKET EFFECTS.

The second, and more common, approach to the problem of assessing whether or not line of business disclosures have information content is to examine the stock market effects of such disclosures. These studies are essentially of two types, the market reaction to such disclosures and assessment of whether or not knowledge of segmental information would have led to a better investment decision.

The earliest market reaction studies involved an indirect test of the predictive content of such disclosures. This approach is based upon the argument that if they can be used for predictive purposes there should be a higher correlation between past changes in the share price and current changes in eps for disclosing companies than for nondisclosing companies. To test this Kochanek (1974) studied a sample of 37 diversified companies, and by constructing an index of disclosure, classified them into good and bad disclosures. He found that the hypothesis concerning eps was supported, but that for the second hypothesis, that disclosure should lead to a decrease in the variability of the share price, there was only limited support. However, as discussed above, results by Barefield and Comiskey (1975) based upon 26 of the companies employed by Kochanek suggest that the significance of these results may be overstated when the number of segments disclosed is controlled for.

A more popular method of examining market reaction has been the more direct method. This is to study the effects of introducing complusory disclosure requirements, such as the SEC Form 10-K, by testing whether or not this led to abnormal returns for those companies that were affected and started disclosing line of business information for the first time. Horwitz and Kolodny (1977) were the first to employ this approach. They studied 50 companies which had to disclose such information in the 10-K and a similar sized unaffected or control group, which were to an extent matched by industry. However, the control group were consistently smaller than the experimental group and so may have behaved in a consistently different manner. They found that there was no significant difference in the change in market beta for the two samples for the periods 1965-1970 and 1972-1973. They also found no significant differences in unexpected returns in terms of either size or growth for the two groups at the time of disclosure (1971) or for the disclosure group for the disclosure period and other periods. This study can be criticised for several reasons. Firstly, as argued by Simonds and Collins (1978), the sample selection process ignored the fact that some of the companies may have been voluntarily disclosing such information in proxy or registration documents before the 10-K requirements were enforced. Also Horwitz and Kolodny estimated beta for each company and then tested for differences using the F-test. This procedure can involve very large estimation errors which means that the F-test is unlikely to find any significant differences. Simonds and Collins ran the same types of tests but controlled for these two problems by adjusting the definition of the sample companies and by calculating the beta for each portfolio and testing for differences by the Chow test or ANCOVA. They found that the disclosure of l-o-b information for the first time did lead to a significant reduction in beta. Again, their results have been criticised. Horwitz and Kolodny (1978) argue that the ANCOVA test is incorrect as it assumes that beta is constant in all periods except that being tested, also they may have examined the wrong month and that there is no reason why a decrease in beta should be expected. Further testing by Collins and Simonds (1979) when a moving beta test was also employed found essentially the same result, that companies who had disclosed no information or limited information (i.e. no profit) prior to 1970 experienced a significant shift in beta. Though even these results can be criticised (eg. Hughes (1979)), it appears that the market does react to such disclosures. This conclusion was also supported by Dhaliwal (1980) who also observed a downward shift in beta following the initial disclosure of line of business information. Ajinkya (1981) suggested that these results may be due to differing initial beta levels amongst the four sample groups or beta instability within the two periods examined. Therefore, he split the sample groups into sub-samples with high, medium and low betas during the initial estimation period, a midpoint period and a post requirement period before carrying out the procedures employed by Simonds and Collins. Although he again found a significant downward shift in beta for the two treatment groups he also found a similar shift for the multisegment control group plus a tendency for high initial betas in the control groups to show mean reversion tendencies. These findings of beta reversion and non-stationarity suggest that the findings of Simonds and Collins may be incorrect.

Rather than examining the effects on beta of segmental disclosures an alternative approach is to examine the relationship of beta to the specific segmental disclosures made. Such an approach was followed by Kinney (1972) who attempted to use segment disclosures to study the market assessment of company diversification. He argued that accounting risk is the covariability of segment returns, which can be proxied by the covariability of segment earnings, i.e. the variance of company earnings/sum of variance of segment earnings. This research is based upon the assumption that a company should attempt to reduce its accounting risk by investing in segments which, ideally, have a negative earnings correlation. He compared this measure of company diversification with the market risk or beta of 25 companies that disclosed geographical information and 26 companies that disclosed other types of segmental information for the years 1965 to 1969. He found that the two measures were significantly correlated at the 5% level for geographical disclosures but not for other types of disclosures. This would seem to support the conclusion that market risk is at least partly a function of the covariability of geographical segments, but not of line of business segments. However, any firm conclusions on this would be premature for several reasons. The results may be due solely to the inadequacies of the particular disclosures examined, as no attempt was made to control for the number, or degree of materiality of the segments, and more importantly, their quality. This criticism can be made of most of the research concerning segmental disclosures. If the quality of the information is ignored so that companies disclosing information consistent with either the industries they operate in or their organisational structure are combined with companies that create artificial segments merely for disclosure purposes the likelihood of discovering an effect must be reduced. This is because if the market is sufficiently knowledgeable it may ignore the artificial disclosures and only use the disclosures made by some companies. Similarly, forecasting studies may, in effect, be combining good and bad segment forecasts which will reduce the likelihood of finding that such forecasts are superior. This may be at least partially responsible for Kinney's results. He grouped together all non-geographical disclosures, which may include segments of different types, and therefore of different degrees of usefulness, e.g. line of business, customers and divisional. Also, as Holtzmann and Gressis (1974) argue, Kinney only looked at the variablity of earnings and assumed that companies would attempt to reduce this by investing in segments with negative covariance. However, investment in segments with less than perfect correlation would be a sufficient condition. Also it is likely that companies will invest in segments that may increase their total risk if this leads to a sufficiently large increase in expected earnings to compensate for this increase in risk. Mohr (1983, 1985) employed an improved methodology to examine a similar question. This work was based upon the analysis by

Rubinstein (1973a) who developed a theoretical model which decomposed the operating component of a company's beta into elements reflecting segmental or activity involvement. In particular, Mohr employed segmental information to estimate the relative investment of companies in each activity and used these weights to compute a weighted beta which was regressed upon the unlevered or equity beta for 56 companies. She found a highly significant positive linear relationship between the two measures, especially when industry involvement was measured using asset disclosures as required by SFAS 14.

The other main approach used in examining the effects on share prices of l-o-b disclosures involves a direct examination of the investment decision. More specifically, this involves comparing the returns contingent upon an investment strategy based solely upon aggregate information with one based upon segmental information. The first of these types of studies was carried out by Collins (1975). His sample consisted of 92 companies quoted on the NYSE that first issued l-o-b earnings information after the 10-K requirements. The sample was further subdivided into 57 companies that had disclosed earnings information prior to this and 35 companies that had given no voluntary information. The average monthly abnormal returns conditional upon knowing the difference between the actual earnings and a consolidation based forecast of such earnings for the periods April 1968-March 1969, April 1969-March 1970 and April 1970-March 1971 were then compared with the abnormal returns from a segment based strategy. This strategy consisted of buying shares if the segment based forecasted earnings exceeded those from a consolidated model, and selling short if the reverse holds. Seven consolidated models were employed which covered most of the models suggested in the time series literature. He found that the investment strategy based upon a consolidation based forecast yielded positive abnormal returns in 1968 and 1969 but negative abnormal returns in 1970. The segment based strategy failed to yield abnormal returns over the entire period, but if 1970 was removed it yielded significant gains of between 1.44% and 1.51% per month for companies that previously disclosed no information, and insignificant returns for those companies that had disclosed turnover previously. These results support the tests of predictive ability which found that only segmental turnover information provided additional information and earnings information was of only marginal extra benefit. A similar study was carried out by Foster (1975) of insurance companies which reported underwriting results, investment results and losses on marketable securities for the period 1965-1972. Two investment strategies were followed, one based upon aggregate information and one on segmental information. The latter rule was to purchase the share if the change in all three segment results were positive and sell short if all three negative. The results found support those of Collins in that he was able to reject the null hypothesis of no difference in returns at the 8% level.

Both of these were studies of the initial effects of the disclosure requirements. Ajinkya (1980) argued that it is important to look for longer term effects so that any learning effects could be controlled for. To avoid any possible learning effects he examined the average monthly market risk equalised returns of portfolios for periods prior to and after the SEC requirements. The portfolios were made up of four types of companies, those that disclosed no information prior to the 10-K requirement (56 companies), those disclosing revenue only (52), those disclosing revenue and earnings (35) and single segment companies (29). Each portfolio was further split into those companies with a negative earnings forecast error and those with a positive one. The forecast method employed was last year's earnings plus the average change over the last three years. He found a greater correlation between the mean returns of the portfolios for the post disclosure period than the pre-disclosure period, i.e. there appeared to be a greater consensus in risk-return assessments at the aggregate level. However, he failed to find any differences in the level of the mean returns between the two periods. These findings are consistent with those of Dhaliwal (1978) who employed multiple regression techniques to examine changes in a return variance measure and a return dispersion measure following the SEC requirements. He found evidence of a reduction in dispersion, which again implies increased consensus amongst market participants following the compulsory disclosure of line of business information.

Twombley (1979) employed a similar research technique. He argued that companies use such voluntary information as a signalling device, in particular that excess profits are not being earned in industries with a high concentration ratio and so there is no case for FTC intervention. He constructed portfolios of randomly selected companies, companies that disclosed no segmental information, companies that disclosed sales only and those that disclosed both sales and earnings for the years 1968 and 1969. He further subdivided the portfolios with respect to the degree of concentration of the industry. He failed to find any consistent share price behaviour when daily returns were examined and concluded that l-o-b disclosures have no information value either by themselves or in conjunction with information on the four-firm concentration ratio of their primary industry. However, this study is subject to many limitations. No convincing reason is provided for the type of signalling he describes, and equally plausible explanations can be provided. It is also unclear that the concentration measure chosen is a satisfactory one, and, more importantly, criticism of the choice of control group can be made (see McDonald (1979) and Berg (1979)). In particular, too little information is provided to assess the suitability of the control group used. These criticisms are sufficiently important to mean that this study, at least by itself, cannot cast into too serious doubt the conclusions of other studies that such disclosures do appear to affect share price behavour and so can be said to have information content.

5.7. MANAGERS' AND FINANCIAL ANALYSTS' FORECASTS.

5.7.1. INTRODUCTION.

So far this review of the predictability of time series models of earnings has concentrated upon an assessment of whether or not any single model or group of models has, in the past, consistently resulted in more accurate predictions than those generated from alternative models. Whilst it is important to know whether or not any model appears to be consistently superior to other models this is only a part of the information necessary for an assessment of the usefulness of such models. If other sources of earnings forecasts are readily available and are generally more accurate than the premier time series models then, for investors, the usefulness of time series models can be questioned.

In practice such alternative forecasts are of two main types: external forecasts from, in particular, financial analysts which are either publicly available or can be purchased from subscription services and internal or management forecasts. Empirical results concerning the relative predictive ability of these two types of forecasts and how they compare with time series forecasts will be discussed below. Before this is done certain limitations which restrict the generalisability of any findings should be noted. Firstly, the majority of these studies are American relying upon, in particular, publicly available forecasts in the Value Line, Standard and Poor's

Earnings Forecaster and The Wall Street Journal. These results do not therefore necessarily also apply to the U.K. where such forecasts are not so readily available. Thus even if it is found that in the U.S.A. time series models are inferior to other types of forecasts they may be the only practicable alternative in many cases in the U.K.. A second more major problem also occurs, which was also found when empirical work on time series models was examined. This is that the empirical studies use different, often overlapping, time periods, different length time periods, different sample sizes (including some sufficiently small to cast doubt upon their statistical validity), different sample selection criteria, different sources of external forecasts and different time series models. All of these factors, but in particular the sources and types of forecasts examined, the sample selection criteria and the time periods examined may affect the relative accuracy of the three types of forecasts in ways that may be either consistent or inconsistent. However, because there are only a limited number of empirical studies which generally vary in terms of more than one of these factors, and the conclusions of which also vary, it becomes very difficult to draw any firm conclusions concerning whether or not any one type of forecast consistently outperforms the others in a given set of circumstances.

To structure and simplify the analysis empirical studies comparing managers' forecasts and time series models will be examined first, then analysts' forecasts and time series models and then managers' and analysts' forecasts.

5.7.2. MANAGERS' FORECASTS VERSUS MODELS.

One of the first empirical studies in this area was by Green and Segall (1966, 1967). They were mainly concerned with the relative accuracy of annual and quarterly based forecasts, but in addition also compared their quarterly models with managers forecasts. The models used were naive ones, namely, four times the first quarter, constant percentage change of the first quarter, the last three quarters of the prior year plus the first quarter and a linear regression of annual on the first quarter earnings per share. The annual models were of similar types. Of the 44 companies examined 13 also provided a forecast in the Wall Street Journal for 1965. Of these 13 forecasts only 5 were specific forecasts and of these 4 were made after at least six months of the financial year had elapsed and only one was more accurate than the best naive model. Copeland and Marioni (1972) replicated these studies for 1964 and 1965 as well as for the first fifty earnings per share forecasts in the Wall Street Journal for 1968. The differences in these studies was sample size (25 for 1964 and 1965) and sample selection criteria (random selection of companies irrespective of whether a manager's forecast was available versus companies who produced such a forecast). They found that managers forecasts were more accurate. However, as they recognised, accuracy was assessed in terms of absolute not relative error, the time series models were not necessarily the best ones then available and no recognition was given to the timing differences of the two types of forecasts. These models were again employed by Nichols and Gromer (1979), the only differences being sample size (87 companies), time period (1968 to 1970) and the use of an additional filter, namely that the managers forecast horizon was at least six months. They found that whilst the managers forecasts were more accurate than some of the naive models they failed to outperform them all. The managers forecasts were also compared with Elton and Gruber's (1972) exponentially weighted moving average with no trend in trend model and they found that Elton and Gruber's model was the best forecaster. The results of Copeland and Marioni seem more intuitively appealing than those of Green and Segall, and are also supported by Ruland (1978) and Hagerman and Ruland (1979) who compared managers forecasts in 1968 to 1973 with a time horizon of between 8 and 14 months with a regression model and four naive models.

Whilst most of these empirical studies support the assertion that managers forecasts outperform naive models it could be argued that, with the exception of Elton and Gruber's optimal model all the models employed were very simple. Imhoff and Pare (1982) compared 46 companies for 1971 to 1974 with firm specific Box Jenkins and the parsimonious models of Foster, Griffin/Watts and Brown and Rozeff. They also employed several different error metrics, namely absolute, relative and normalised. They found that generally, especially when absolute error was not used there was little difference between the accuracy of the various forecasts.

Thus, the evidence supports the conclusion that managers forecasts outperform naive models but are no better than more sophisticated Box Jenkins models. However, insufficient attention has been paid to timing differences which may mean that managers forecasts are based upon more up to date information than that employed by the models, rather than the difference being solely due to managers being able to employ a larger information set.

In the examination of the relative accuracy of managers' forecasts the fact that not all companies disclose such forecasts was ignored. If the characteristics of the group of disclosing companies differs in a consistent manner from the group of non-disclosing companies then conclusion regarding their relative accuracy may not be applicable to the much larger group of non-disclosing companies. This would mean that any conclusions regarding managers forecasts can tell us little or nothing about the desirability of such forecasts being published by the non-disclosing companies. There is some evidence that this is indeed the case. Imhoff (1978), Ruland (1979) and Jaggi and Grier (1980) found that companies issuing managers' forecasts had less variable earnings, higher systematic risk and were larger than non-disclosing companies. Cox (1985) supports the conclusions regarding earnings variability and size, but failed to find any differences with respect to systematic market risk. In addition Ajinkya and Gift (1984) found no evidence to support the hypothesis that companies disclosed such forecasts because they believed that analysts' forecasts were very wrong and so there would be a large share price change when the actual results were known.

5.7.3. FINANCIAL ANALYSTS' FORECASTS VERSUS MODELS.

In general terms the empirical studies comparing financial analysts forecasts and time series models come to very similar conclusions to those for managers forecasts and models. Looking firstly at comparisons with simple or naive models, Richards, Benjamin and Strawser (1977) comparing 92 companies for 1972-1976, Brandon and Jarrett (1977) with 27 companies for 1970-1974, Crichfield, Dyckman and Lakonishok (1978) with 46 companies for 1967-1976 and Fried and Givoly (1982) with between 95 and 173 companies for 1969-1979 all agree that, generally, financial analysts' forecasts outperform the models. The models employed being the more common martingale and submartingale models, moving average, exponentially weighted (with arbitrary weights) and mean reverting (for companies that experienced an unusually large change in earnings per share). Looking at more sophisticated models the results are less clearly in favour of the analysts' forecasts. Brown and Rozeff (1978) found that analysts outperformed individual Box-Jenkins models for one to five periods ahead, whilst Elton and Gruber (1972) found no significant differences when they used their optimal exponentially weighted moving average forecast and Imhoff and Pare (1982) also found no significant differences when they employed individual Box-Jenkins and the parsimonious Box-Jenkins models of Foster, Griffin/Watts and Brown and Rozeff. Thus it appears that financial analysts are at least as accurate as time series models and are generally superior to naive models. However, this conclusion of superiority may not be as clear cut as first appears for a number of reasons. As Imhoff and Pare recognised, the analysts forecasts were made after the quarterly announcement date and so may be based upon more up to date information, rather than the differences being based upon their ability to use a wider information set, a possibility that the other studies tended to inadequately control for. Evidence by Ruland (1978) also suggests that some of their superiority may be due to their ability to use managers' forecasts, in that he found that analysts' forecasts were only superior to regression model forecasts if they were made after managers forecasts. Again the other studies failed to adequately control for this possible explanation of their superiority. Also thay failed to adequately consider when the forecasts were made. For example, Crichfield, Dyckman and Lakonishok found that the accuracy of analysts forecasts improved as the time horizon decreased. Cragg and Malkiel (1968) also found that the forecast horizon can affect the relative accuracy of the different forecasts, in that they found that analysts were unable to make forecasts of earnings per share for five years in the future as well as the optimal growth rate model was able to.

Givoly and Lakonishok (1984) argue that most of this early research on the accuracy of financial analysts forecasts suffers from severe methodological flaws. Of particular importance is their argument that all the studies employed a null hypothesis that financial analysts performed no better than the naive models, whilst if the alternative hypothesis that they outperformed such models had been employed most of the tests would not have been able to refute the null hypothesis.

5.7.4 FINANCIAL ANALYSTS' FORECASTS VERSUS MANAGERS' FORECASTS.

There has been relatively little attention paid to the differences in accuracy of forecasts made by management and those made by financial analysts. Basi, Carey and Twark (1976, 1977) found little difference in their relative accuracy, and although this work was criticised by Albrecht, Johnson, Lookabill and Watson (1977) this result appears to be valid. This conclusion was also supported by Imhoff and Pare (1982), Schreuder and Klaassen (1984) and Kodde and Schreuder (1984) who examined confidential Dutch forecasts. In addition the results of Jaggi (1978, 1980) support those found by Ruland (1978), in that management forecasts that occur after financial analysts forecasts are superior to analysts, whilst if analysts forecasts occur after managers there are no significant differences in their relative accuracy.

5.7.5. FORECAST BIAS.

The evidence is, therefore, that managers and analysts forecasts are usually at least as accurate as forecasts generated by naive models and are very often superior. Some of this superiority may be due to timing differences, and in the case of analysts, their ability to also utilise managers forecasts. There is also some evidence of consistent bias in such forecasts. For example, Niederhoff and Regan (1972) examined forecasts of analysts for the best and worst performing companies on the NYSE and found that, as might be expected, they consistently under and overestimated the future results. Kodde and Schreuder (1984), Schreuder and Klaassen (1984) and Ajinkya and Gift (1984) also found that forecasts were consistently overoptimistic and that the level of uncertainty was underestimated. However, Crichfield et.al. (1978) failed to find that forecasts were improved by applying a linear correction to them which implies no consistent bias. This was also supported by Givoly (1985) who, with a sample of over 6000 forecasts over 10 years, found that the forecasts were generally unbiased, the errors were not significantly serially correlated and they appeared to exploit the time series properties of the earnings stream.

5.7.6. THE INFORMATION CONTENT OF FORECASTS.

Most of the research in this area is consistent with both analysts and managers forecasts having value to shareholders, and that share prices do react to such information. With regard to financial analysts forecast revisions Givoly and Lakonishok (1979, 1980) found that significant abnormal returns could be made by following an optimal trading strategy and that they were still in existence some two months after the revisions which implies that the market is inefficient with respect to such information. This conclusion differs from that found by Abdel-Khalik and Ajinkya (1982) and Imhoff and Lobo (1984) who support the conclusion of semi-strong efficiency. With regard to managers' forecasts Patel (1976) found that the market reacts to all such forecasts with a significant positive change in share prices. This conclusion has however been refuted by Waymire (1984) who split companies that disclosed bad news forecasts into those that reported other good news at the same time and those that did not. When this additional classification was made he found that the market reacted in the manner expected. In addition Jaggi (1978) found that it was possible to earn significant abnormal returns if an optimal investment strategy was followed and Penman (1980) and Ajinkya and Gift (1984) both found that such forecasts do appear to contain relevant information that is compounded into share prices.

Other research in this area has been concerned with the relative accuracy of the forecasts of different analysts, (Richards 1976, Richards and Fraser 1977) which found no significant difference in the accuracy of forecasts that were freely available and those only available from subscription services. In addition, the use of quarterly results by analysts to revise their forecasts was examined by Abdel-Khalik and Espejo (1978), Brown, Hughes, Rozeff and Vanderweide (1980) and Abdel-Khalik (1983). It was found that generally quarterly results were employed to revise annual forecasts.

5.8. CONCLUSIONS.

Looking firstly at the studies concerned with the prediction of annual earnings there are several problems which make generalisations difficult. As explained above, one major difference in many of these studies was in the choice of earnings measure and there is evidence that different models may be applicable to absolute earnings and rate of return measures. There are also differences in both the sample selection criteria and time periods covered and, more importantly, the models employed. However, generally the results appear to support the use of a submartingale model and more specifically, the random walk model (for example, Gonedes 1972, Ruland 1979). There is also evidence for some companies to show a mean reversion tendency at least immediately following a large change in profits (Beaver 1970, Brookes and Buckmaster 1976, 1980).

The main alternative to the use of naive models is Box-Jenkins modelling which allows the use of company specific models and the use of a much wider range of models. These studies again appear to support the use of a submartingale model for annual earnings forecasts (Watts and Leftwich 1977, Albrecht, Lookabill and McKeown 1977). However, Box-Jenkins is not really suitable for annual earnings predictions as it requires more data than is feasible (Lorek and McKeown 1978). This means that the major use of this technique has been for predicting quarterly earnings. The major conclusion appears to be that no consensus exists. There is agreement that the submartingale group of models are no longer applicable. Instead a seasonal component is also required. A generalised cross-sectional model appears to often perform at least as well as company specific models with the major contenders being the models of Brown and Rozeff (1979) and Griffin (1977).

It also appears that all of these forecasts can be improved upon. Brandon and Jarrett (1979) showed that it is possible to improve naive forecasts by the use of a correction procedure whilst Hopwood (1981), Hopwood and McKeown (1981) and Welch (1984) all provide evidence that a transfer function which also includes an external variable may outperform Box-Jenkins forecasts. Collins (1976) and Chant (1980) provide some evidence that models based upon external factors outperform cross-sectional time series models.

An alternative approach is to look at segmental information, specifically line of business segments. Here the results are more conclusive. Both Kinney (1971) and Collins (1976) found that segment turnover led to better forecasts whilst the addition of segment profits led to only a marginal improvement. These results are also supported by Silhan (1983) and Emmanuel and Pick (1980) who, however, found that segment profits led to no additional improvement in forecast accuracy. Such benefits may only apply to some companies, though, and in particular smaller companies (Silhan 1984). These studies support the conclusion of the improved predictive ability of segment based forecasts but there is some evidence that this is not always the case. Ang (1979), Barnea and Lakonishok (1980) and Hopwood, Newbold and Silhan (1982) demonstrated the conditions necessary for the superiority of segment based forecasts and provided evidence that these conditions are often not met.

The alternative to testing the predictive ability of segment models is to test whether or not such information appears to have caused a market reaction. There is some disagreement over this issue, but the majority conclusion is that such information causes a market reaction (Simonds and Collins 1978, Collins and Simonds 1979), that better investment decisions can be made if such information is disclosed (Collins 1978) and that more concensus existed in the market once segment disclosures were made (Ajinkya 1980, Dhaliwal 1978).

The final area examined was the prediction of earnings by management and financial analysts. It appears that generally both management (Hagerman and Ruland 1979, Ruland 1978, Copeland and Marioni 1972) and financial analysts (Brandon and Jarrett 1977, Richards et.al. 1977, Crichfield et.al. 1971 and Fried and Givoly 1982) outperform naive models. In addition, when the timing differences are controlled for then there is little difference in the accuracy of managers' and analysts' forecasts (Imhoff and Pare 1982, Schreuder and Klaassen 1984 and Kodde and Schreuder 1984).

It was shown that geographical segment disclosures are likely to be one of the inputs required by shareholders in assessing the risk of investment in a company. However, severe methodological problems make the testing of this proposition very difficult. Shareholders are also likely to require such information for prediction purposes, especially the prediction of future earnings. This chapter has shown that there has been considerable work done concerning the prediction of earnings. Such studies have used both consolidated and line of business data. No work has yet satisfactorily considered the use of geographical data. Evidence has been presented which shows that it is possible to forecast earnings. In addition such forecasts are generally more accurate if they are based upon disaggregated line of business data. This supports the assertion that it would be expected that the same would be the case for geographically segmented data, and that this is an issue which is worth studying.

An analysis of forecasts base upon geographical data must be rooted in the existing evidence regarding earnings behaviour. This is essential as many of the methodological problems encountered in such a study have been encountered in prior studies which offer possible solutions to such problems. The accuracy of forecasts based upon segmental earnings needs to be compared with those generated from consolidated models. Thus the analysis of this chapter provides an essential input into the development of both the consolidated models that will be used and the problems involved in forecasting earnings. The next chapter, therefore, describes the models that will be used as well as explaining some of the other problems involved in testing the accuracy of forecasts.

PART III. THE EMPIRICAL STUDY.

Chapter 6.

FORECASTING METHODOLOGY.

6.1. INTRODUCTION.

The objective of this study is to assess the usefulness of geographic segment turnover and earnings data for making one year ahead forecasts of turnover and earnings. This will be done by comparing the accuracy of forecasts of turnover based upon geographical and consolidated turnover data and the accuracy of earnings forecasts based upon consolidated earnings, segmental turnover and segmental earnings data. To do this a sample of 109 U.K. based multinational companies that have disclosed segmental turnover data for the years 1980 to 1983 are used. As not all of these companies also disclose segmental earnings data as well a subsample of 78 companies will be used to assess the accuracy of segmental earnings based forecasts. The objectives of this chapter are, therefore, twofold. Firstly to describe and explain the derivation of the forecasting models that will be used and, secondly, to explain how the accuracy of the forecasts generated from these models will be measured.

To do this firstly the derivation of, and assumptions behind, the segment models will be described. Of particular importance is the question of the treatment of inflation. Differing answers to the question of whether real or nominal GNP forecasts should be used results in four forms of the basic segment forecasting model being developed. In addition two ex-post segment models are also developed. Secondly, this chapter describes the six consolidated models which will also be used. Once the models have been developed a way of comparing the accuracy of the forecasts has to be decided. Therefore, this chapter also describes the ways that the errors could be compared and explains the rationale for the basis of comparison adopted.

6.2. SEGMENTAL MODELS.

There are two types of approaches that can be used to build forecasts based upon segmental information. Each individual segmental series can be treated as a time series and so the same models applied to them as applied to the aggregate or consolidated information. Alternatively, the unique information contained in such a series can be employed to develop a different kind of forecasting methodology.

6.2.1. DISAGGREGATED TIME SERIES MODELS.

The available data has to meet certain minimum criteria before disaggregated time series models can be employed. The most important criteria is that the data must be of an acceptable quality in terms of consistency over time and be available for a sufficient number of time periods. Although only fairly unsophisticated time series models will be employed even these need to be based upon variables that are consistently defined over the entire time period. This means that not only must companies disclose either turnover or profit information on a geographical basis for each of the eleven years, but the segments used and the definitions of turnover and profit must be consistent. Looking at the available data, it can be seen that in most cases these requirements are not met. Appendices 4-1 to 4-4 give the segment definitions used by all companies in the sample for the years 1973-1983 for both turnover and profit. From these it can be seen that only 41 companies (37.6%) have used the same segments for turnover throughout the period and 26 companies (23.9%) the same segments for profit. Other companies have either introduced such disclosures subsequent to 1973 or have changed the number or definition of segments disclosed over the eleven year period. There are other sources of inconsistencies also. In particular, treatment of intra-company transfers that changes over time, changing treatments of common costs and definitions of profit, especially the inclusion or exclusion of associated companies results. Whilst these changes are likely to be welcomed by users if they reflect changes in the operations of the company they greatly reduce the sample of companies that provide information suitable for disaggregated time series modelling.

These problems mean that the available sample of companies is no longer large enough to provide conclusions that can be considered to be statistically valid. However, even if this was not the case there are additional reasons to consider this approach inappropriate. By the very nature of time series modelling the assumption is initially made that the series being forecast is an autoregressive integrated moving average (ARIMA) process. If this assumption is valid then Hopwood, Newbold and Silhan (1982) argue that there are two conditions which are sufficient for disaggregated or segmental models to outperform aggregate or consolidated models. These are that the parameters of the models are not identical and that a disaggregated series lags the aggregate series. An argument can be made that the sales or profits generated in some geographical areas may lead that of others. This would be the case where, for example, any major upturn or downturn in the economics of the developed markets of North America or Western Europe filter through to the less developed countries of Africa or Asia. However, there appears to be no reason to believe that the time series properties of sales or earnings streams from different countries should differ, so that, for example, profit from the EEC can best be described as a random walk and profit from North America as a moving average process. The only empirical work in this area is by Ahadiat (1983). He applied Box Jenkins models to both consolidated and geographical data for 38 companies and found that the disaggregated models did not generally outperform the consolidated ones. Although this study suffers from several severe methodological problems, in particular, the number of data points used was insufficient for the Box-Jenkins methodology, the findings do support the contention that such an approach is likely to offer few advantages.

Given both the lack of data and the likelihood that, even if such data was available, such an approach would not lead to better forecasts than those generated from consolidated information, a more sensible approach seems to be to employ a different forecasting methodology for forecasts based upon geographical information. This can be done by taking advantage of the unique information provided by such disclosures.

6.2.2. FORECASTS BASED UPON ECONOMIC DATA.

One important advantage of disaggregation of either sales or profit information is that it allows the user of the accounts to consider external factors when assessing the past or likely future performance of a company. In the case of line-of-business disclosures, a company's performance can be placed in the context of the average performance or future prospects of specific industries. In the case of geographical disclosures it allows use to be made of information regarding the past or future expected performance of the economies of specific countries or geographical regions.

The approach of using external data for forecasting has been employed for line-of-business data. For example, Kinney (1971), Collins (1976) and Emmanuel and Pick (1980) all used segmental sales multiplied by the expected percentage increase in industry sales as a basis for forecasting future consolidated sales and profits. It is also possible to employ this type of technique for forecasts based upon geographically disaggregated information.

6.2.3. ASSUMPTIONS BEHIND THE ECONOMIC DATA APPROACH.

The major assumption behind this approach is that a company's sales or profits will closely follow the general performance of the economy in which it is situated. In particular, an X% increase or decrease in the Gross National Product (G.N.P.) will also mean an X% change in the company's sales and profits. In practice, the relationship between an economy's performance and that of a specific company is unlikely to be as straightforward as this. This simple one-to-one relationship should only hold if three conditions are met. Namely that the income elasticity of demand is unitary, that the company neither exports nor imports and that the profit/sales relationship is linear.

Unitary income elasticity of demand is necessary for an X% increase in income to lead to an X% increase in demand for a product. In practice, the income elasticity of demand for luxury goods will be greater than one so that companies in the consumer goods industry, for example, will increase sales by more than X% for every X% increase in G.N.P. and the income elasticity of demand for staple goods will be less than one. Secondly, if a company either exports much of its output or imports much of its input then the performance of the company is not only dependent upon the economy of the country it is physically situated in but also upon the economies of its trading partners. In practice many foreign subsidiaries are set up specifically to exploit regional markets covering a number of countries or to take advantage of one factor of production, such as cheap labour for final assembly work with much of the final product exported or raw materials imported. The third requirement is necessary for the assumption that an X% increase or decrease in sales will also lead to an X% increase or decrease in profit. This will not be the case if the company is faced by either economies or diseconomies of scale or factor costs and revenues that are not a strict linear function of the quantity produced.

The extent to which these assumptions are valid is an empirical question. In practice it is very unlikely that any of them are met at all perfectly. The extent to which any foreign subsidiary meets these requirements will be dependent upon the industry it operates in, the extent it engages in foreign trade, the type of production technology it employs and the particular country that the subsidiary operates in.

This implies that to forecast future sales or profit accurately, fairly detailed line-of-business, as well as geographic information, plus additional information such as details of international trade, intra-group tranfers and production technology would be required. Use of this quantity of company specific information would necessitate forecasting on a company-by-company basis, rather than for a cross-sectional group of companies. If individual company forecasting was employed, this would raise the further question of whether a more suitable approach would not be to rely upon the financial press or investment analysts for company specific information. This implies a very different methodological approach. If cross-sectional forecasts based upon the information contained in annual reports are used, the relevant question then becomes to what extent is this ideal of using a large amount of company specific information achievable.

As explained in chapter 3, UK company legislation does not require companies to disclose the amount of exports, imports, intra-group transfers or details of production technology. This means that the only additional information most companies provide is details of sales and profits on a line-of-business basis. However, even this is seldom provided in a form which is very useful in this context. What is required is for such information to be provided in a matrix form with geographical information. This is done by very few companies and instead, most report them separately. Therefore, using both types of information would entail making the assumption that each geographical segment has the same production mix. This is unlikely to be the case, especially for horizontally integrated companies or those that operate in countries with very different factor endowments, or at different stages of development. An additional problem occurs when the quality of the data provided by companies and the quality of external information are considered. Many companies report line-of-business information on a fairly aggregated basis, this means that application of sector specific information can be very difficult. Also industry information, whilst available for the developed economies, cannot easily be obtained for very many countries. All of these factors mean that the only practible approach, at least at this stage of knowledge, is to only consider geographic data and to ignore industry or company specific information.

Whilst these limitations may appear to be sufficiently serious to invalidate the approach employed here, this is not the case. Although they remain as serious limitations, their importance is somewhat reduced because of the relatively large sample employed. So that whilst, for example, for an individual company, knowledge of industry specific factors is important, when the sample increases there should be sufficient diversity in such factors to greatly reduce their significance.

6.3. FORECASTS BASED UPON GEOGRAPHICAL INFORMATION.

6.3.1. THE BASIC FORECAST FOR EACH SEGMENT.

Given all the problems or limitations inherent in using the information that is available, the only practicable technique usable on a cross-sectional sample of companies is to consider only the geographical information provided. As can be seen from Appendices 4-1 to 4-4, the majority of companies disclose segmental information on a continent-by-continent basis. Few companies disclose on a more disaggregated basis of individual or smaller groups of countries and some report on a wider basis. It can be assumed that most companies report primarily on a continent-by-continent basis and only use larger segments if the former approach would yield immaterial information. Therefore, these larger segments can be allocated to one or more of the more common groupings with little risk of any major problems occurring. This means that, at least initially, all disclosures can be allocated to one of the major country groupings employed. The country groups used here are the UK, EEC, Europe, Europe excluding EEC, North America, South America, the Americas, Middle East, Far East, Asia, Africa and two catch-all groups of the rest and other. Whilst there is some duplication in these categories, for example, North, South and all America, so that no company will use all the categories, reducing the number of categories would lead to the loss of information that may be of value. Whilst some companies provide more detailed information than this classification picks up, it is of sufficient disaggregation to meet the disclosure practices of most companies.

The first step in building a forecast is to classify all disclosures into the above groupings. The second stage is then to find country forecasts and to use these to build up forecasts for the country groupings or segments employed.

Sources of World Financial and Banking Information (Dicks, 1981) was used as a source book for locating economic forecasts. The major requirement was for the forecasts to cover a large number of countries. There are several sources of forecasts that pertain to the major developed countries, in particular the OECD countries, for example the OECD Economic Outlook (issued twice a year), Amex Bank Review (monthly) International Economic Indicators (US Department of Commerce, annually) and by the Bank of Montreal (issued annually). When forecasts covering more countries are considered there are several sources also, in particular, by Phillips and Drew, McGraw Hill, Predicasts and the Economist Intelligence Unit. Ideally all four sources should be used. This is because different sources may not be equally accurate so that they may lead to different conclusions regarding the usefulness of segment based forecasts. However, due to the cost and limited availability of the forecasts this proved impossible. The only forecast obtainable was that from the E.I.U.. The EIU issues two publications, namely the quarterly Economic Review for a large number of individual countries and the Annual World Outlook covering approximately 160 countries, which is a summary of the Reviews. The latter was used solely due to considerations of time and simplicity. In a limited attempt to assess the extent to which any results may be dependent upon the sources of the forecasts used, an alternative forecast source was also consulted. The OECD Economic Outlook was used to build up forecasts for the areas that it covers and these were then used to forecast the results of a smaller sample of companies which only reported results for these segments. Whilst this is a second best alternative necessitated by the problems of data availability, it should provide some guidance on the extent that the results found are forecast source specific.

Appendix 5 gives details of the country forecasts from the World Outlook 1978-1984. These forecasts are issued in February or March which means that they were available at approximately the same time time as the sample companies issued their annual reports. This is important as it means that any forecasts of annual results based on geographical data can be made at the same time as time series forecasts become available, namely approximately 8 months before the year end. The forecasts are either for real GNP or real GDP. GNP and GDP are not perfect substitutes, but for most countries it is unlikely that the two series will behave in very different ways so that, whilst not ideal, the use of both series should not cause any major problems. GNP forecasts can be of either real or nominal changes. The differences between these two series and the implications will be discussed below. Where a range of estimates was provided, the midpoint was considered as a point estimate, and where either a maximum or minimum figure was provided this was again treated as a point estimate. This treatment was necessary as no idea of the likely range was provided. However, as there appears to be no consistent pattern in the provision of either minimum or maximum estimates this should not lead to any consistent biases.

Having obtained country forecasts, a method of aggregation of these into segment forecasts is necessary. Any aggregation system involves making assumptions regarding the appropriate weighting system, which is in turn dependent upon assumptions regarding the most likely pattern of investment by the sample companies.

The simplest approach would be a simple average forecast. This method is based upon the assumption that companies' investment decisions are not influenced by the size of the host country's economy, but that they invest equally in all countries. This is obviously an unrealistic assumption as whilst the size of a host country's economy is not the sole determinant of investment decisions it would be expected to generally have a major impact. An alternative assumption is that the amount invested in a country is linearly related to the size of the country's

GNP. This must be considered as a simplifying assumption. However, it seems more reasonable than other simple assumptions regarding the relationship. This means that the country forecasts should be weighted by the relative size of each country's GNP to form a segment forecast, and this is the approach that is taken here. Appendix 6 gives details of the GNP of all countries that GNP information is available for. The currency that GNP is denominated in is unimportant. It is the relative sizes which are important and these are not currency specific. Also, exchange rate changes can be ignored for weighting purposes, as each year's data is given in U.S.A. dollars of that year. Appendix 7 provides details of the area forecasts generated from the data given in Appendix 5 and 6, where the following formula was used:

$$\text{Area forecast} = \frac{[\Sigma(1 + F_{t+1,i}) \cdot GNP_{ti}]}{\Sigma\, GNP_{ti}} \qquad (1)$$

where $F_{t+1,i}$ is the forecast of change in real GNP for country i for year t+1

GNP_{ti} is GNP of country i for year t.

6.3.2. COMPANY FORECASTS.

Having generated a forecast of the expected change in the real level of GNP for most of the areas or segments used by companies these can then be used to generate forecasts of the future results of the sample companies. Before doing this it is necessary to decide which definition of profit should be employed. Profit can be defined in terms of total profit (or absolute amount), in terms of earnings per share or by a rate of return figure. All three of these approaches have both problems and advantages centering around the ease of use and the likely behaviour of the series. Total profit is obviously the easiest to use requiring no adjustments to the series disclosed in the annual reports. Rate of return requires the calculation of an appropriate investment base. E.P.S. requires the calculation of the relevant number of shares outstanding. This is the most difficult to calculate because e.p.s. as reported by companies requires adjustment for stock splits, options etc.. This data is not readily available for U.K. companies so that this definition of profit was excluded on the basis of the difficulties involved in calculation. This left the choice of rate of return and absolute amount, both of which have been employed in prior empirical studies. The advantage of rate of return is that it takes into account any changes in the size of the investment base of companies so that any increase in absolute profits due to increases in the size of companies are excluded. This means that one likely source of a trend in profits is removed. However, this advantage is perhaps not as great as would at first appear. The information produced by companies is on a historical cost basis which means that the investment base comprises many assets that are valued at a figure much lower than their current value. Because of this the investment base is often greatly undervalued, especially for companies that have a relatively old asset structure so that any detrending of profits by adjustment for the investment base must be at best incomplete. An alternative measure for detrending might be the market capitalisation of the company. However, this measure was also rejected. The problem with using market capitalisation is that it can fluctuate greatly over fairly short periods. This means that very different rate of return figures may result depending upon the date taken for calculating the market capitalisation. This in turn means that the results found may vary crucially depending upon the fairly arbitrary choice of date used for calculating the market capitalisation figure.

Profit can be measured in several ways from operating profit before associates to attributable profit after extraordinary items and the choice of one of these measures is largely arbitrary. It seems logical to use a measure that the users of the accounts and, by implication, those most interested in forecasts of profits, are most interested in. This suggests the use of attributable profit (after tax and debenture interest). This figure normally includes extraordinary items but these by their very nature should occur both infrequently and, to a large extent, unexpectedly, being outside the normal operations of the company. Inclusion of such items would therefore lead to a profit series which contains a number of items that cannot be forecast and that mask any underlying patterns, so attributable profit before extraordinary items was chosen as the relevant series to be forecast. This is a historical cost based series and so ignores the effects of inflation. Therefore, it might be expected to show an increasing trend over time because of this. However, this is largely an empirical question that has yet to be adequately tested. In addition, the data is not available to deflate for any price changes in an adequate manner. However, the inflation rate in the UK was 12% in 1981, 5.4% in 1982 and 5.3% in 1983 (C.S.O. 1986). Therefore, inflation was built into some of the forecasts by adjusting the GNP forecasts used.

There are two ways to use the area forecasts to generate profit forecasts. Firstly, they can be applied to the segment sales and aggregate profit margins and, secondly, applied directly to segment profits. There are major problems involved in directly using segmental profits as can be seen when the lack of cross-sectional consistency is considered. This means that there are few companies that use the same definition of profits and use of more than one definition of such profits would imply that they are all equally useful in the forecasting of attributable profit. Use of segmental profits would further reduce the population size to 78 companies. Also the calculation of segmental profits involves several fairly arbitrary decisions regarding the allocation of common costs and the pricing of intra-group transfers that can mean that such figures are often not comparable across companies. This implies that the use of such data for forecasting purposes may be placing more faith in its objectivity and accuracy than can be justified. This was a major reason behind the decision not to concentrate solely upon segment profit based forecasts but to instead first examine segment turnover based forecasts and then to examine the question of whether segment profit based forecasts lead to better forecasts. There is support for this approach as it has been found that for forecasts based upon line of business information the use of segmental profit information offers little or no benefit over segmental sales information (Kinney 1971, Collins 1976, Emmanual and Pick 1980). The area forecasts are therefore applied to the segmental sales figures to calculate expected future sales and then the profit margin on last years sales is applied to the total forecast sales, i.e.

$$E(P_{t+1}) = (\Sigma FGNP_{i,t+1} \cdot T_{i,t}) * (P_t/T_t) \qquad (2)$$

where;

P_t is total attributable profit in period t

T_t is total turnover in period t

$E(P_{t+1})$ is the expected attributable profit in period t+1

$FGNP_{i,t+1}$ is the forecast change in real GNP for area i in period t+1

$T_{i,t}$ is the turnover of area i in period t

This approach assumes that companies will earn the same profit rate on sales next period as last and that profit and sales are both equally affected by inflation as well as several other important assumptions e.g. any increases in sales will not result in fixed costs being spread over a larger number of units and so increasing profit more than proportionately. Given the diversity of cost functions that companies face and the impossibility of making any other more reasonable assumptions this must be the most accurate approach that can be taken.

The major practical problem encountered in using the profit segment data disclosed is that different companies use different definitions of profit. If such data is used to forecast attributable profit the profit disclosed must be converted into a common measure. This was done by combining the segment profits disclosed with forecasts of GNP changes and then adjusting the resultant forecasted profit measures by multiplying the ratio of segmental profit to attributable profit, i.e.

$$E(P_{t+1}) = (\Sigma\, FGNP_{i,t+1} \cdot SP_{i,t}) * (P_t/SP_t) \qquad (3)$$

where;

$E(P_{t+1})$ is the expected attributable profit in period t+1

$FGNP_{i,t+1}$ is the forecast change in real GNP for area i in period t+1

$SP_{i,t}$ is the reported profit for segment i in period t

P_t is total attributable profit in period t

SP_t is total reported segment profit in period t

6.3.3. THE USE OF REAL VERSUS NOMINAL GNP FORECASTS.

GNP forecasts are of two types, real or nominal. The difference between the two being that forecasts of nominal changes include an inflation forecast whilst for real GNP the effects of inflation are netted out. Which of these two forecasts should be employed is not immediately obvious as the decision depends upon whether or not purchasing power parity (ppp) holds.

PPP is not a new concept, indeed it appears to have been first suggested in 1601 by de Malynes, a Spanish mercantilist (Kalamotousakis, 1978), its modern form can be traced mainly to the works of Cassel in the 1920's during a period of flexible exchange rates (Kalamotousakis op.cit, Frenkel, 1978). There are two forms of the ppp theorum;

The absolute version: The equilibrium exchange rate between domestic and foreign currencies is equal to the ratio between domestic and foreign prices.

The relative version: The exchange rate reflects changes in the ratio of domestic and foreign prices since a base year when exchange rates were in equilibrium (Officer, 1976). For empirical studies the equilibrium base year has been assumed to be the first year of such a study.

It is important to realise that ppp specifies no linkage mechanism but only specifies the relationship that should hold between the variables of exchange rate and relative prices. This lack of specification of any causal mechanism has led to much controversy regarding the usefulness of ppp and differing interpretations of how the concept should be operationalised and tested. At one extreme it is assumed that the mechanism is through commodity arbitrage and so the relevant price index is of internationally traded goods only (Angell, 1922). At the other extreme, which is now generally accepted, the mechanism is taken to be through equilibrium in the asset markets. This in turn implies the use of an index of all commodity prices (Cassel, 1928).

Turning to a brief examination of the empirical work on ppp the results found generally seem to suggest that ppp fails to hold and that deviations from parity can be persistent over several years. The 1920's provided the first period of flexible exchange rates when the theory could be tested. Frenkel (1978) used a regression equation to test for ppp in the period 1921 to 1925 for U.S.A., U.K. and France. He used monthly data of the wholesale price index, material price index and a food index and concluded that exchange rate changes fully reflected price levels in both the short and long term. These results can be contrasted to those found by Krugman (1978) who employed a similar methodology for seven floating exchange rates in the 1920's and 1970's and found no support for ppp. However, when he used a more sophisticated instrumental variable technique the results were rather more ambiguous. Isard (1977) used a rather different methodology by regressing quarterly exchange rates on the ratio of U.S.A. import value to export value for 7-digit SIC industry groups for Canada, Japan and Germany. Therefore, this is rather more a test of commodity purchasing parity. However, he found that, at least for Japan and Germany, purchasing power parity deviations were both substantial and lasted for several years. This result was also supported by Adler and Lehman (1983). This study is important as it used both annual and monthly exchange rates, wholesale price index and consumer price index over a period that covered both fixed and flexible exchange rates and many countries. They found that they could not reject the hypothesis that deviations from ppp followed a martingale pattern.

These empirical studies are representative of a large body of empirical work which generally supports the conclusion that ppp deviations occur, that they can be sustantial and last over several years. (See e.g. Adler and Dumas (1983)).

These findings have important implications for the choice of GNP forecast. If ppp holds then exchange rate changes should reflect relative price movements in the two countries. This in turn implies that if a company translates its results using a current exchange rate then this should effectively net out most of the effects of inflation. This means that forecasts of growth should be based upon real changes. However, if ppp deviations occur this is not necessarily the case, Instead, exchange rate changes fail to fully reflect relative inflation rates and translation at current exchange rates will not fully exclude the effects of inflation. This means that forecasts of growth need to take into account price changes.

6.3.4. THE FORECASTING MODELS EMPLOYED.

The evidence concerning ppp is not conclusive. Exchange rates appear not to fully reflect relative price level changes, although the extent to which inflation is partially reflected in relative exchange rate movements is not known. The best approach, therefore, appears to be to employ several alternative forecasts rather than relying upon one. Thus four forms of the basic model were employed. These are:

Model 1; Based upon forecasts of real GNP change, i.e. equation (2).

Model 2; Model 1 with only the U.K. segment forecast adjusted for expected U.K. inflation.

Model 3; Model 1 * Expected U.K. inflation.

Model 4; Model 1 with all areas being adjusted for expected inflation in that area.

Models 1 and 2 are based upon the assumption that ppp holds. Model 2 adjusts the U.K. for expected inflation on the premise that as these results are not translated the effects of inflation must be explicitly considered. Models 3 and 4 are based upon the assumption that ppp deviations occur. However, whilst it is generally accepted that such deviations occur their magnitude is not known. These models are based upon the assumption that none of the effects of inflation are reflected in exchange rate movements so that forecasts of nominal GNP growth should be used. However, forecasts of nominal GNP are not available. Instead, they have to be generated from forecasts of real GNP and inflation forecasts. Therefore, model 3 makes the simplifying assumption that expected U.K. inflation is the correct rate to use for all areas, whilst model 4 attempts a more realistic representation of expected price changes. The inflation forecasts used for this are given in appendix 7-2. Only inflation forecasts for the O.E.C.D. countries were available. This means that whilst such forecasts were available for Western Europe and North America the other forecasts had to be approximated. It was assumed that the rate for Australia applied also to Australasia, the rate for North America applied to all of the Americas and the rate for Western Europe applied to all Europe based segments. For all the other segments the average rate for all O.E.C.D. countries excluding the U.K. was used.

These forecasts are therefore not ideal and involve assumptions regarding the correct inflation adjustments. This coupled with the assumption that exchange rate changes fail to reflect any of the differentials in inflation rates between countries means that the forecasts can be considered only as fairly crude approximations to what might be expected to occur. Because of this an ex-post forecast was also employed. That is, actual changes in GNP were used to construct a forecast based upon the assumption of perfect knowledge of future changes. This was done in an attempt to assess the extent to which limitations in ex-ante forecasts of GNP change and inflation, rather than the method of construction of the forecasts, leads to inaccurate predictions of future results. This leads to the addition of a further two models,

Model 5; Forecasts based upon the actual change in GNP for each area as measured in U.S.A. $.

Model 6; Forecasts based upon the actual change in GNP for each area as measured in U.K. £.

Appendices 7-3 and 7-4 give details of the actual area forecasts used for each model. Model 5 was employed as the relevant data was originally in $. Model 6 was employed as it seems more realistic to convert such an analysis into sterling given that this is the reporting currency of the sample companies. The exchange rate used for this being the average for the year. Average exchange rates were used as most companies will employ such a rate for the translation of foreign currency profit and loss account items.

6.3.5. ADDITIONAL PROBLEMS.

As shown in chapter 7, 63% of the sample companies used a definition of turnover based upon manufacturing origin and 36% based upon customer location. However, it is intended to ignore this difference and to treat all the companies in the same manner. The difference in the two methods is the different treatment of exports. It would be expected that the amount of exports would be mainly a function of the economies of the countries to which they are sold rather than the economy of the country in which they are manufactured, so that the more useful approach for forecasting purposes would be turnover based upon customer location. This means that it might be expected that forecasts for those companies that disclose information on this basis would be more accurate. However, all companies will be treated alike. The validity of this is based upon the assumption that either exports are immaterial or that they are mainly within each segment, which given transport costs, is a reasonable assumption for many companies. The problem with exports and, similarly, imports, is that there is insufficient information to enable an attempt to be made to convert manufacturing based disclosures to customer based ones. This means that the disclosures made cannot be converted into disclosures based upon a different criteria.

6.4. TIME SERIES MODELS BASED UPON CONSOLIDATED DATA.

Segmental information is generally only dislosed in the U.K. on an annual basis, this coupled with difficulties of obtaining information over a long time period, restricts the amount of data available to a maximum period of eleven years or eleven data points for each company. This means that only cross-sectional forecasts are applicable. As shown in chapter 5 there has been considerable research into the time series properties of income streams, but there has been no general agreement as to whether an optimal model exists and if it does, what form such a model takes. Because of this several models must be used to forecast consolidated results or otherwise any evidence found that segmental models outperform consolidated models may simply be due to consolidated model misspecification. Several criteria are important in choosing the models. Firstly there must be some evidence in the literature that such a model has been found to be useful. Whilst this is no guarantee that for this particular sample of companies this will still hold it does significantly reduce the number of models that need to be employed. It seems unlikely that either a new untested model or a model that has, in the past, proved unsuccessful would be the most appropriate one. Secondly, parsimony is a desirable characteristic of any model. If two models are equally applicable the statistically simpler model is the better one. Thirdly, as there is no general agreement upon the time series properties of income streams all the main classes or types of models should be covered.

All discrete linear stochastic processes are of the general form;

$$Z_t = a_t + u_t + b_1 u_{t-1} + b_2 u_{t-2} + \dots \qquad (4)$$

where a and b_i are fixed parameters and $(u_t, u_{t-1}, \dots)$ is a series of indentical and independently distributed random disturbances with mean zero and variance σ_u^2 (Nelson, 1973).

One important subclass of such models are the moving average models. These models use only data from a limited number of past periods, that is $b_i = 0$ for $i>q$. The principle behind this group of models is that any random shock exists for only q periods, so that, for example, for a moving average of order one (MA(1)) then;

$$Z_t = a + u_t + {}_1u_{t-1} \quad (5)$$

$$E(Z_t) = a + E(u_t) + {}_1E(u_{t-1}) \quad (6)$$

and any observation Z_t is related to observations Z_{t-1} and Z_{t+1} only (McCleary and Hay 1980).

Instead of expressing the series Z_t in terms of past error terms or disturbances it can be expressed in terms of past observations, i.e.

$$Z_t = bZ_{t-1} + bZ_{t-2} + \ldots + q + u_t \quad (7)$$

This then becomes the general class of autoregressive models, i.e. those that are basically a regression upon the same series for an infinite number of observations. If the first order autoregressive model, AR(1) is considered then

$$Z_t = bZ_{t-1} + q + u_t \quad (8)$$

By successive substitutions it can be seen that this is simply an infinite order moving average process. This property holds for all orders of autoregressive models.

One very important AR model is the first order model with b set to 1 and q set to 0. That is;

$$Z_t = Z_{t-1} + u_t \quad \text{or} \quad u_t = Z_t - Z_{t-1} \text{ so that}$$

$$E(Z_t) = Z_{t-1} \quad (9)$$

where u_t is a random variable with mean zero and variance σ_u^2 (O'Donovan, 1983). This is the random walk model which states that next period's value of a series will be the same as this period's value. This is a very important model for two reasons. Firstly, it is the simplest model that can be employed and so acts as a useful benchmark against which to assess the predictive ability of other more complex models. Secondly, it has been found to be the best model of the earnings series by many researchers (e.g. Gonedes 1973, Watts and Leftwich 1977, Ruland 1980). Because of this the random walk model will be used here.

Empirical research has also suggested that the earnings process can be modelled by a submartingale process (e.g. Ball and Watts 1972, Carey 1978). This class of model are random walk models with the addition of a trend component. This seems intuitively plausible as a model for attributable profit as attributable profit seems likely to contain a trend due either to increases in the size of companies or due to the effects of inflation. Therefore, two trend models were employed, namely a percentage change and an absolute change model. Both of these were modelled as the average change over each of one, two, three, four and five years, making a total of ten simple trend models in all. For a one year trend these models are;

Percentage change;

$$E(Z_t) = Z_{t-1} \times (1 + (Z_{t-1} - Z_{t-2})/Z_{t-1}) \qquad (10)$$

Absolute change;

$$E(Z_t) = Z_{t-1} + (Z_{t-1} - Z_{t-2}) \qquad (11)$$

The important class of moving average models should also be covered. The series is normally smoothed by using a weighted average of past terms of the series such that the weights add up to one. The simplest type of weighting system is where each past observation has the same weight, i.e.

$$E(Z_t) = bZ_{t-1} + bZ_{t-2} + \ldots$$
$$= \sum Z_{t-i}/i \qquad (13)$$

As the appropriate order of such a model is not known it was decided to test the model for each of two to six years, (six years being the maximum period that the data allows for) so that a total of five forms of the general model were employed. However, intuitively it seems unlikely that such a simple model, assuming as it does equal weights, is the optimal one. A more reasonable assumption appears to be that the more recent observations should be given a greater weight so that the series should be instead weighted in an exponential manner. Therefore, an exponentially weighted moving average model was also tested. This model is of the form

$$E(Z_t) = bZ_{t-1} + (1-b)E(Z_{t-1}) \qquad (13)$$

or, from successive substitutions;

$$E(Z_t) = bZ_{t-1} + \sum b(1-b)^i Z_{t-i} \qquad (14)$$

(Abraham and Ledolter, 1983).

It can be seen that this series is an indefinite one in that it depends upon the complete history of the series. It is obviously impossible to do this. Therefore, it is assumed that $E(Z_{1974}) = Z_{1973}$ that is 1973 is used as the base year and forecasts generated from this point onwards. The choice of a smoothing constant b is dependent upon the properties of the time series. If it is believed that a large number of past observations should be used then a low value of b should be used whilst if the series is thought to depend upon a limited number of observations then a high value should be used. Due to the lack of sufficient evidence regarding the appropriate weighting scheme, weights from 0.05 to 0.95 were employed in steps of 0.05.

The final model used is the linear regression model;

$$Z_{t-1} = a + b_1 Z_{t-1} + b_2 Z_{t-2} + \dots \qquad (15)$$

where the weights are not constrained to fall within preset boundaries. All this model says is that current earnings are a function of past earnings but the form of that relationship is not known. The major advantage of this model is therefore that it assumes less about the time series characteristics of earnings than other models do. The actual weights were found by using a step regression with a preset tolerance level of 0.05 and F-level of 1.5 (Nie et.al. 1975). This means that the past observations of the series were only employed if they met these significance levels.

Thus six basic models were employed, namely

1. Random walk
2. Random walk plus a percentage change (for 1 to 5 years)
3. Random walk plus an absolute change (for 1 to 5 years)

4. Simple moving average (for 2 to 6 years)

5. Exponentially weighted moving average (weights from 0.05 to 0.95)

6. Regression model

As explained above the major criteria used in choosing these models is that they have all been used in prior research into the time series properties of earnings and that they cover the major classes of simple time series models.

6.5. ERROR METRICS.

The question of which way to measure the accuracy of forecasts is more important than may at first appear. This is because each measure of error is based upon an implicit assumption regarding the relative importance of the errors. These different assumptions can in turn lead to different conclusions regarding the relative accuracy of different forecasts. The assumptions behind the various error metrics are concerned with the importance of any losses that are generated by using the forecast series which was later found to be incorrect. Relative or absolute error metrics are based upon the assumption that the loss function of any investor is a linear one. Squared error metrics give a much greater weight to large errors and so are based upon the assumption of a quadratic loss function. Because of this difference in the relative weightings given to any very large errors it can be seen that under some circumstances the two types of error metrics may give different answers to the question of the relative accuracy of different forecasting techniques. In particular, this will occur if one forecasting method gives forecasts that are normally more accurate but also provides some forecasts that are very inaccurate. The third type of error metric (although in practice these have seldom been used) are normalised errors. This class of errors relates the accuracy of a forecast to the variability of the series that is being forecast. Imhoff and Pare (1982) used several denominators, namely A′, A′, the coefficient of variation, beta and the standard error of regression. They found significant differences in the rankings when percentage error measures were employed, but when these other error measures were used instead no such significant differences were found.

Looking at the actual error metrics that have been employed in this area it is found that no clear consensus exists about which types to employ. Indeed, many more error metrics have been employed than those already mentionned, for example Elton and Gruber (1972) used the standard error, $(A-F)^2/A^2$, Watts and Leftwich (1977) used weighted sum of squared error, $(A-F)^2/A$ and weighted sum of absolute errors $|A-F|/|A|$. Thus the choice of which error metric to employ is not an obvious one and has been decided upon on mainly pragmatic grounds. Normalised error metrics are not employed as it is not apparent that the extra work required to calculate these is worth the effort. Absolute error measures are not used as they ignore any differences in the relative sizes of the series being forecast. Given that the sample employed includes companies of very different sizes, these error metrics would be biased towards the results of the largest companies, which is clearly inappropriate. There seems no good reason to assume that the loss function associated with any forecast should be either a linear or a quadratic function and to resolve this question would need research into the actual uses made of such forecasts. Therefore the desirable course seems to be to employ both types of error measures, namely the mean square error $\sum((A-F)/A)^2$, and the absolute percentage error $\sum|A-F|/|A|$. Whilst many authors have only employed one error metric there is also plenty of support for the use of more than one metric, for example Elton and Gruber (1972), Gonedes (1973), Watts and Leftwich (1977), Brandon and Jarrett (1977), and Khumawela, Polhemus and Liao (1980).

Given the need for weighted error measures the choice of denominator must also be made. In practice both forecast and actual have been employed, and again the choice is dependent upon which assumptions are made. The use of forecast can be supported by the argument that if it assumed that the forecast made is an unbiased predictor of the series then the actual results will be the forecast plus an error term with an expected value of zero. Thus the weights employed should not contain such an error term but should instead simply be the unbiased forecast. Alternatively it can be argued that in practice the actual value should be used as this will more accurately reflect how the error would be measured by a user of the forecast, who is more likely to measure error in terms of the deviation from the actual. Given that there seems to be no clear answer to which weighting should be employed and that the use of the alternatives may give different answers to the question of the relative accuracy of different forecasts the approach adopted here will be to use both methods. This has the additional advantage that it will also allow an assessment to be made of the extent to which the different measures do, in practice, lead to differing conclusions.

One additional difference in the treatment of error metrics in prior research, has been in the treatment of outliers. These have either not been truncated or truncated at 100%, 200% or 300%. The reason for truncation is that otherwise a few large outliers may bias the error measure. This is especially likely to be the case when squared error terms are employed. Again this is an argument that has no ready solution. The best method depends upon assumptions regarding the importance of the size of the errors for users of such forecasts. Because this is the case, and given that different choices of both error metric and truncation rules may give different conclusions regarding the relative accuracy of the different forecasts, the procedure employed here will be to use both error metrics with no truncation and with truncation at 100%. 100% was taken as the truncation rule as it was felt that this was sufficiently large not to truncate errors that are not true outliers whilst capturing enough of the outliers to potentially yield results different from those found for the non-truncated errors.

6.6. CONCLUSIONS.

This chapter has described the twelve models that will be used in this study. The six time series models were chosen to represent the major simple time series models available. The segment based forecasts whilst originating from the same basic model were built upon differing assumptions, especially regarding the importance of including inflation forecasts. The main problems in these models centre around the simplifing assumptions inherent in the segmental models. Probably the most important of these is the assumption that a x% increase in GNP will lead to an x% increase in turnover or profits. Also important are the assumptions that if a company discloses a segment then it operates in each country covered by that segment and that the scale of its operations in each bears a direct relationship to the relative size of the countries' economies. Finally, this chapter showed that there is no general agreement upon the best way to measure the relative accuracy of the forecasts made. How to measure the errors depends instead upon the assumptions made about the importance of the errors to the users of such forecasts. It was therefore shown, that at least at this stage of our understanding, it is better to use more than one error measure.

Chapter 7.

DESCRIPTION OF THE SAMPLE COMPANIES.

7.1. INTRODUCTION.

Having described the forecasting models that will be used in this study the next step is to examine the sample of companies that these models will be applied to. This chapter firstly explains the sample selection criteria that were employed. It then examines some of the key financial variables of these companies and the extent to which they disclose segmental information. The sample companies are then compared with the rest of the population that they are drawn from to assess whether or not they may be considered as a representative sub-group of these companies. Finally the consistency of the geographical segments disclosed is considered. The consistency of the methods of disclosure are considered in two ways. Firstly, the temporal consistency, or the extent to which the information disclosed by any company is constant over time. Secondly, cross-sectional consistency, or the extent to which different companies disclose similar information in any single year.

7.2. SAMPLE SELECTION CRITERIA.

Generally there is a positive relationship between the extent of overseas investment and the size of companies and also between the size of companies and the amount of information disclosed (Buzby 1975, Firth 1979). This implies that generally only large companies are likely to disclose geographically segmented information. Therefore, the initial sample selected was all U.K. quoted companies, except financial institutions, in The Times 1000 1981-1982. The choice of a year is essentially an arbitrary decision as data is required for the period 1973 to 1983, however 1981 was chosen as this is the first year for which predictions are to be made. In addition, the choice of an intermediate year tends to avoid the inclusion of some companies that were very small in the earlier years whilst also reducing the problem of including a large number of companies that no longer exist as independent companies. This yielded a population of 330 of the largest U.K. companies, with turnover varying from £30.9 million to £25,347.0 million (for 1980). The next step was to discover which of these companies were purely domestic companies. This initial screening was done by excluding all companies that failed to disclose geographical segments in any one year from 1980 to 1983, (plus one company which it proved impossible to obtain any reports for and one which reported such information in a form that could not be used). This reduced the population to 263 companies.

A major problem with carrying out empirical work upon U.K. companies is that the financial year end can occur at any time throughout the calendar year. This can create major problems especially when employing annual economic forecasts as the forecasting period for such forecasts will not coincide with the financial year of many companies. To reduce this problem only companies with a financial year end between the end of October and the end of March were chosen. All these companies were then treated as if they had a financial year coinciding with the calendar year. This is not as major an assumption as may at first appear as, for this sample of companies, this is the most common year end, with 59% of the sample companies having a December year end with a further 29% having a March year end, as shown in table 1. This criterion further reduced the sample size to 220, i.e. only 43 companies were excluded because of this requirement. Company reports were then gathered for these 220 companies for the years 1973 to 1983, i.e. an eleven year period. It was found that 7 companies had changed their year end during this period, these were then also excluded. It was not possible to collect the annual accounts for the entire eleven year period for 104 companies, which left a total sample of 109 companies. A full list of these companies and those excluded is given in appendix 1.

Table 1.

YEAR END OF THE COMPANIES IN THE POPULATION AND THE SAMPLE.

Year End	Number of cos.			Percentage of cos.		
	Popn.	Unav.	Sample	Popn.	Unav.	Sample
October	11	6	5	5	6	5
November	2	1	1	1	1	1
December	128	63	65	60	61	59
January	9	4	5	4	4	5
Febuary	1	0	1	1	0	1
March	62	30	32	29	28	29
Total	213	104	109	100	100	100

7.3. SAMPLE CHARACTERISTICS.

Appendix 2 provides a statistical description of both the sample and unavailable companies for the financial year 1981. Data was available for all the companies for 1981, but not for the entire eleven year period investigated. Table 2 below provides a summary of the most important findings. As explained above although the choice of 1981 is essentially arbitrary there appears to be no reason to believe that it is not a representative year, so that a similar picture should have been obtained if a different year had been used. The sample companies are generally very large companies, whether measured in terms of turnover (on average £1,070 million) shareholder funds (£333 million) or total net assets (£532 million). They are, on average, approximately three times larger than the unavailable companies which have an average turnover of £351 million (or 33% of the size of the sample companies), shareholders funds of £116 million (35%) and total net

Table 2.

MAIN DESCRIPTIVE STATISTICS FOR ALL THE SAMPLE COMPANIES FOR 1981.

	AVAILABLE COS.		UNAVAILABLE COS.	
	MEAN	STD. DEV.	MEAN	STD. DEV.
Turnover	1070.455	2782.455	351.227	351.227
Shareholders Funds	333.209	837.527	116.209	289.527
Total Net Assets	531.591	1799.436	171.267	502.816
No. Geog. Turnover Segments	4.661	1.911	4.114	2.118
No. Geog. Profit Segments	3.587	2.334	2.276	2.069
No. LoB Turnover Segments	3.532	2.820	2.962	2.872
No. LoB Profit Segments	3.294	2.806	2.657	2.776
No. Countries with Subsidiaries	10.193	7.725	2.695	4.429
No. Additional Countries with Associates	2.165	2.271	0.374	1.076
% U.K. Turnover	61.495	20.815	63.646	22.983
% U.K. Profit	50.188	49.683	62.405	112.845

assets of £171million (32%). It is impossible to accurately measure the degree of diversification of these companies without more detailed line of business information than generally provided. However, an idea can be gained by considering the numbers of lines of business that they disclose. The majority of companies disclosed more than one line of business (73% for turnover and 70% for profit), whilst on average they reported rather more than 3 such classes. This implies a fairly high degree of product diversification especially when it is realised that this average includes those companies that reported no line-of-business information. Looking at geographical diversification it can be seen that, on average, 39% of turnover was generated overseas, with the maximum being 86%, and that such sales appeared to be more profitable than domestic sales, namely yielding approximately 50% of profits. The mean number of geographical turnover segments was nearly 5 and rather more than 3 for profits, although this figure is somewhat reduced by the inclusion of 19 companies that failed to provide a profit breakdown. Overall the sample may be described as consisting of large companies that are fairly well diversified in terms of product and highly geographically diversified. Finally, the main industry that they operate in is also reported, these are based upon the F.T. 500 Actuaries Index. As can be seen the sample covers the broad spectrum of all industries. Also when they are compared with the rest of the companies there appears to be little difference in the overall industrial composition of the two groups. The spread of industries represented is fairly even, except for the relatively large number of companies in electricals, namely 13% of the sample.

7.4. COMPARISON WITH THE UNAVAILABLE COMPANIES.

Further examination of appendix 2 provides an indication of the extent to which the sample companies' characteristics may be considered as similar to those of the other companies. It appears that the sample is composed of companies that are not only significantly larger but also more internationally diversified, whether this is measured in terms of the number of segments reported or the number of countries that they operate in. These initial observations are confirmed by analysis of the differences between the two groups by t-tests, as reported in appendix 3. This technique tests for the differences in means between two groups i.e. it is a test of whether they are drawn from the same population.

Looking firstly at size variables, i.e. turnover, ordinary shareholders capital, shareholders funds and total net assets, for each of these measures the sample companies are significantly larger at the 5% confidence level. Similar results are found for profit measures, with U.K. profit and attributable profit being significantly different at the 5% level and the other measures significantly different at the 10% level. However, there is no evidence that the relative profitability, as measured by return on shareholders funds or return on turnover, differs. This result is reinforced by the finding of no difference in turnover per net assets. Looking next at the number of lines of business reported, limited support is given for the sample companies being more diversified, with significantly more profit segments at the 10% level and the number of turnover segments narrowly failing to meet this level of significance. The sample group is clearly more internationally diversified with the number of both turnover and profit segments reported being greater at the 5% significance level, (for turnover 4.7 versus 4.1 and for profit 3.6 versus 2.3). This is further supported by the differences in both the number of countries that subsidiaries operate in (on average 10.2 versus 2.7) and the number of additional countries with associates (2.2 versus 0.4), again both are significant at the 5% level. However, an interesting, and apparently contradictory finding, is that that there is no significant difference in the overall importance of foreign operations for the two groups. The percentage of both turnover and profit generated in the U.K. is not significantly different for the two groups (for turnover 61.5% versus 63.6% and for profit 50.2% versus 62.4%). Thus the sample appears to have a wider spread of overseas operations, but in total, these are just as important for both groups.

It appears that the sample companies are larger and earn more profit in absolute, but not in relative, terms than the other companies. They are also more internationally diversified. There is limited support for the assertion that they are also more diversified in terms of product, and finally the relative importance of U.K. operations for the two groups are approximately equal. The findings that the sample companies are generally larger is one that would be expected given the data collection process. Companies were included if it was possible to obtain their annual reports for the years 1973-1983, and it would be expected that this would be easier for the larger companies.

These results are very important when the generalisability of any findings is considered. If the conclusions of this research are to be generalised from the sample companies to a wider population then the sample companies must be representative of this wider population. However, from these tests it appears unlikely that such external validity holds very well. Given that the companies included in this research are generally both larger and more internationally diversified than other U.K. multinationals any conclusions reached may be sample specific, and can only give an approximate indication of the results that might be found if the same analysis was applied to the rest of the population of large U.K. multinational companies.

7.5. INFORMATION DISCLOSED.

Appendices 4.1-4.4 provide details of the segmental disclosures made by the 109 sample companies. Appendices 4.5 and 4.6 provide the same information in the form of frequency counts for the more common segment descriptions. Tables 3 to 5 below provide a summary of the most important results.

To assess the adequacy of such disclosures it is necessary to compare them with the actual activities of companies to see whether or not they faithfully reflect both the sources of turnover and profits and the organisational structure of the firm. Alternatively, they may instead be designed purely for financial reporting purposes, or even designed to mislead the user and so prevent them making an accurate assessment of the company's performance. The only available source of such information are the qualitative disclosures made in other parts of the annual report. The amount, quality and usefulness of such disclosures varies greatly for the sample companies. Because of these inadequecies in the information provided and the unavailability of external information all that is possible here is an assessment of the amount of information that is disclosed and its consistency both over time and on a cross-sectional basis. The information disclosed can be analysed on several bases. For the purposes of this research two types of analysis are important. Firstly, the amount of information disclosed and its consistency over time on a company by company basis and secondly, its consistency on a cross-sectional basis. Both of these questions are of importance. To use segmental data for forecasting purposes, especially for time series forecasting, then inter-temporal consistency is a requirement, whilst if aggregate rather than company specific forecasting techniques are employed then a certain level of cross-sectional consistency is also required.

7.5.1. TEMPORAL CONSISTENCY.

When either a ten or eleven year period is considered then very few companies have employed consistent segment definitions, namely 41 companies (37.6%) for turnover and 26 companies (33.8% of 78 companies) for profit. However, these findings are probably not very surprising or indicative of reporting that is needlessly inconsistent.

It would be expected that over a relatively long time period such as this the operations and geographical diversity of many companies have changed quite dramatically. In particular, they will have become both more complex and more internationally diversified. This means that what was seen as relevant and informative disclosures in 1973 or 1974 can no longer be so considered in 1983 or 1984. If this is the case then the desire for more useful information should outweigh the desire for information that is temporally consistent. Given the likely changes in company operations, the general increase in the amount of information disclosed over this time period and the fact that this research employs geographical disclosures over a shorter time horizon than eleven years the disclosures made have been analysed in more detail only from 1977/1978 onwards. If this shorter time period is considered then the number of companies that have consistently employed the same segment definitions increases to 50 (45.9%) for turnover and 38 (48.7%) for profit. If only disclosures from 1980 onwards are considered then the respective figures become 66 (60.6%) and 50 (64.1%). These findings are somewhat surprising as they suggest that only rather more than one half of the sample companies have consistently reported segmental results for a period as short as four years and that of these companies a high proportion have not changed their segmental disclosures for more than ten years. This relatively low level of temporal consistency may be partially explained by the 1981 Companies Act which, due to the fact that it required segmental information to be disclosed in the notes to the accounts rather than the Directors' Report, appears to have led many companies to rethink what geographical information should be disclosed. This is supported by the evidence in appendices 4.1-4.4 which show that many companies changed their segmental definitions and even the definition of what constituted overseas turnover in 1983.

Table 3 below describes some of the segments employed by the sample companies, (see Appendices 4.1 to 4.4 for fuller details).

Table 3.

SOME OF THE SEGMENT DESCRIPTIONS USED BY THE SAMPLE COMPANIES.

U.K./Overseas
U.K./Europe/Other
U.K./Europ/ Americas/Other
U.K./Europe excl. Germany/North America/Germany/Other
U.K./Ireland/Asia/Africa/Middle East
U.K./Netherlands/Australia/Other
U.K./Europe Americas/Australasia/Asia/Africa
U.K./E.E.C./Rest of Europe/North America/South America/ Australasia/Asia/Africa
U.K./Europe/Americas/Australia + Asia/Africa + Middle East/Europe/Americas/Australasia/South Africa/Other
U.K./E.E.C./North America/Other
U.K./Germany + Ireland/North America
U.K./Europe/North America/Australasia/Africa/Middle East/ Other

It was found that the majority of companies disclose results on a continent by continent basis with certain minor exceptions. In particular, several companies used a much finer classification in certain cases, especially by disclosing results on a country by country basis. However, it was also fairly common to find wider geographical groupings being employed. These have either been allocated to one of the continent groupings concerned, (for example middle east plus far east being allocated to middle east) or if this was considered as too arbitrary, to the "other" group (for example the cases of overseas or, often, the rest). Table 4 provides a summary of the number of companies that use the more common segment definitions. It is found that although less than 50% of the sample companies maintained consistent segmental disclosures over this period this is not reflected in the aggregate picture. Instead, the segments employed were remarkably consistent in aggregate with only minor changes in the numbers of companies disclosing each type of segment. When the actual segment definitions are considered they are much as might be expected, with the most commonly used segments being Europe, North America or U.S.A., Africa and Australasia. It can be seen that nearly 50% of the companies used some sort of catch-all segment, and that of these, 17 companies disclosed information only on the basis of U.K. and overseas. For some of the later analysis it was found that such disclosures were of too general a nature to allow the use of economic forecasts and so these companies were excluded. Many of the remaining companies used a finer classification of individual countries or small groups (e.g. Benelux, Caribbean) or used it for a small percentage of their overseas operations.

Table 4.

THE MAIN SEGMENTAL GROUPS EMPLOYED.

	1977	1978	1979	1980	1981	1982	1983
TURNOVER (107 Companies)							
U.K.	103	104	105	104	104	104	104
Europe	71	74	75	76	77	75	77
E.E.C.	8	9	8	8	8	8	7
Eur. excl EEC	8	8	8	8	8	8	6
Nth. America	47	48	51	54	59	59	57
Sth. America	7	7	7	7	9	9	9
Americas	28	29	31	31	30	31	31
Asia	30	30	31	33	34	32	34
Africa	51	50	53	51	51	50	50
Mid. East	7	7	7	8	9	10	11
Far East	5	7	7	6	7	6	5
Australasia	52	53	52	50	50	49	46
Rest	47	47	44	46	45	46	48
Other	3	4	6	6	6	5	5
PROFIT (78 companies).							
U.K.	70	72	74	72	73	72	60
Europe	47	51	52	53	52	50	45
E.E.C.	4	3	4	3	4	5	6
Eur. excl EEC	2	1	2	1	1	1	1
Nth. America	35	36	40	41	42	41	37
Sth. America	4	3	3	3	4	4	4
Americas	17	18	18	18	18	18	18
Asia	19	18	22	22	23	23	23
Africa	32	31	34	31	31	31	28
Mid. East	3	4	4	5	5	5	5
Far East	3	4	5	3	4	3	2
Australasia	32	34	34	32	31	30	28
Rest	30	31	28	29	30	31	24
Other	3	4	5	5	5	4	3

7.5.2. CROSS-SECTIONAL CONSISTENCY.

It can be argued that for segmental disclosures the users of accounts are more interested in temporal rather than cross-sectional consistency. This is because such information by its very nature must be largely company specific, depending as it does for its structure and validity upon the characteristics of the specific company. Whilst this type of disclosure is probably of more use for comparison of a single company over time than for comparing several companies over a single time period, cross-sectional consistency is still a desirable characteristic. This is because users do undoubtedly require information for a comparison of companies. Such information can be more easily understood and analysed by users if each company does not provide such information on a different basis, both in terms of the segments employed and in terms of definitions of the variables disclosed. This research also requires a minimum level of cross-sectional consistency. The more consistent such disclosures are then the easier it is to apply forecasts based upon such information.

All that is required here is a general idea of the degree of consistency, and so initially, only one year of data was used, namely 1981. This should provide a picture similar to that found for other years. Table 5 below shows the number of segments used for both profits and turnover.

As can be seen the number of segments employed varies quite considerably. The number of turnover segments disclosed varies between 2 (U.K. and overseas) and 13 with an average of 4.7, whilst the number of profit segments varies between 0 and 13 with an average of 3.6. This implies that there is little consistency across companies. However, before any conclusions can be drawn regarding the consistency of the amount of information disclosed the

Table 5.

NUMBER OF SEGMENTS DISCLOSED BY THE SAMPLE COMPANIES.

TURNOVER SEGMENTS.

NO. SEGS.	FREQ. COS.	%	CUM. %	NO. SEGS.	FREQ. COS.	%	CUM. %	NO. SEGS.	FREQ. COS.	%	CUM. %
2	17	16	16	5	25	23	68	8	5	5	98
3	15	14	30	6	23	21	88	10	1	1	99
4	17	16	45	7	5	5	93	13	1	1	100

PROFIT SEGMENTS.

0	19	17	17	4	13	12	58	7	4	4	98
2	17	16	33	5	23	21	79	8	1	1	99
3	15	14	47	6	16	15	94	13	1	1	100

	MEAN	STD.DEV.	MINIMUM	MAXIMUM
TURNOVER SEGMENTS	4.661	1.911	1	13
PROFIT SEGMENTS	3.587	2.334	0	13

degree of multinationality or international diversification should be considered. If the extent of overseas operations of the sample companies varies greatly then this finding of little consistency in disclosures is probably due to this fact and not because companies have decided to disclose very differing amounts of information. What is important here is not the percentage of foreign operations but rather the geographical spread of such operations. An idea of this can be gained from an examination of the number of countries that have significant subsidiaries operating in them. Table 6 provides information on the number of countries that the companies operate in.

Table 6.

EXTENT OF OVERSEAS OPERATIONS.

NUMBER OF COUNTRIES WITH SUBSIDIARIES

NO. COUN.	NO. COS.	%	CUM. %	NO. COUN.	NO. COS.	%	CUM. %	NO. COUN.	NO. COS.	%	CUM. %
0	1	1	1	9	6	6	55	18	5	5	87
1	2	2	3	10	4	4	59	19	2	2	89
2	10	9	12	11	7	6	65	20	1	1	90
3	7	6	18	12	3	3	68	21	3	3	93
4	5	5	22	13	2	2	70	23	1	1	94
5	10	9	31	14	1	1	71	24	3	3	97
6	7	6	37	15	5	5	75	25	1	1	98
7	4	4	41	16	6	6	81	29	1	1	99
8	10	9	49	17	1	1	82	53	1	1	100

NUMBER OF ADDITIONAL COUNTRIES WITH ASSOCIATES

0	32	29	29	4	7	6	86	8	2	2	99
1	16	15	44	5	8	7	93	14	1	1	100
2	21	19	63	6	2	2	95				
3	18	17	80	7	2	2	97				

	MEAN	STD DEV.	MINIMUM	MAXIMUM
NO. SUBSIDS	10.193	7.725	0.000	53.000
NO. ASSOCS	2.165	2.271	0.000	14.000
% U.K. TURNOVER	61.495	20.815	13.530	99.587
% U.K. PROFIT	50.188	49.683	-272.727	230.125

Companies are required by law to provide details of their major subsidiaries and associated companies. From Table 6 it can be seen that the number of overseas countries which subsidiaries operate in varies from none to 53 (mean 10.2) and the number of additional countries with associates varies up to a maximum of 14 countries. This provides evidence that the geographical spread of companies in the sample varies by a large amount. However, differing definitions of what constitutes an important subsidiary may be at least partially responsible for this finding. Therefore, evidence concerning the extent of U.K.

operations was also considered. This evidence is less subjective as its does not depend upon assumptions concerning what is material. It also seems reasonable to assume that the less of a company's operations that are in the U.K. then the more geographically diversified that company is. From Table 6 it can also be seen that the percentage of turnover generated in the U.K. varies between 13.53% and 99.59% (mean 61.5%) and profit between -272.7% and 230.1% (mean 50.2%). Whilst none of this is conclusive it does show that the degree of international diversification of the sample companies is by no means uniform. This implies that this may be the reason for the very different number of segments that the sample companies disclose, rather than differing assumptions regarding the level of disclosure that is material. This conclusion is also supported when the relatively large number of companies that disclose segments that only cover a limited part of the world are also considered.

Another important aspect of cross-sectional consistency is the consistency in the definitions of the variables employed. Turnover can have two meanings, either the amount of turnover that is actually manufactured in a country or the amount sold in that country. That is, exports can be excluded or included in foreign turnover. The Stock Market Listing Requirements call only for a "geographical analysis of turnover" and fail to stipulate how exports should be treated. This flexibility in definition has undoubtedly led to the situation that companies have treated exports in different ways. Of the sample companies in 1981, 69 (63%) used a definition based upon the location of production and 39 (36%) used location of customer whilst for one company it proved impossible to estimate which definition was employed. For some companies it makes little difference which method is used. However, many companies export a considerable quantity of goods so that the treatment of exports can have important implications for the disclosure of information. The 1981 Companies Act was rather more explicit about what constitutes overseas operations, namely "the amount of turnover attributable to each market". This implies a definition based upon the customer location rather than production location. However, only two companies appeared to have changed their treatment of exports because of this requirement and the other companies have instead continued with production based disclosures. Another aspect of turnover definition concerns the treatment of intragroup transfers. The U.S.A. under FASB 14 requires the separate disclosure of intragroup sales but in the U.K. there is no requirement in this area. The majority practice is to exclude such transfers so that segmental sales equal total external sales but a minority of 15 companies (13.8%) include intra-group transfers in the segmental turnover figures. A few companies also show a separate segment of discontinued businesses, foreign currency gains or losses or other categories such as shipping or entrepot activities.

When profit rather than turnover is considered the extent of cross-sectional consistency is further reduced. In this case the problem of differing treatments of exports is still encountered as well as additional problems of profit definition. The most common definitions of profit are, as would be expected, trading or operating profit and pre-tax profit. However, the picture is not as clear-cut as this as associate companies are both included and excluded under both of these definitions in roughly equal proportions. In addition, a minority of companies also exclude other costs from the segmental profit figures, in particular all common costs, central common costs or expenses and central interest expenses. In addition, many companies have changed their definition of what constitutes segmental profit over the time period examined.

7.6. CONCLUSIONS.

This chapter looked at the sample selection criteria employed and how the final sample of 109 companies was chosen. When these companies were examined it was found that these companies vary greatly from the companies that had to be excluded due to incomplete information. In particular, the sample companies are significantly larger, being approximately three times as large. Approximately 39% of their turnover was generated from overseas, which is not significantly different from that for the whole population. However, they disclose more geographical segments and also appear to be rather more diversified across lines of business. Finally, they operate in a large number of countries, disclosing, on average, subsidiaries in over 10 countries. These differences suggest that any conclusions drawn from this sample may not be equally applicable to the unavailable companies and so the external validity of any conclusions drawn may be limited.

When the number of segments disclosed and the definition of the variables employed are considered then the level of consistency of the disclosures made on a company by company basis seems to be relatively low. However, when the companies are aggregated and the disclosures made are considered at the cross-sectional level then the level of consistency appears to be much greater. This means that although many of the companies have changed the amount of information that they disclose these changes have largely cancelled each other out. In aggregate there is relatively little difference in the information disclosed over the entire eleven years.

Chapter 8.

FORECASTS OF TURNOVER.

8.1 INTRODUCTION.

Prior to examining the forecasts of profits a similar approach was employed to examine turnover forecasts. This was done for several reasons. The profit forecasts used were initialy based upon forecasts of turnover and a multiplier of historical profit to turnover then applied to generate profit forecasts. This two step process has two major sources of potential error, the forecast of turnover and the multiplier applied to that forecast. Therefore, an examination of turnover forecasts should help in the separation of these two errors and so provide more information about any potential problems and limitations involved in forecasting profits. Secondly, it might be expected that the time series of turnover is of a different nature to the earnings stream. If so this would have important implications for the relative predictability of the two series and the models that are most likely to be the optimal predictors. Demand for a product, and so a companies' turnover, can be influenced by a company, primarily both by changes in price which cause a movement along any given demand curve and by advertising or promotion activities which have the potential to cause shifts to a different demand curve. However, the demand for many goods, especially those that are neither fashion nor high technology goods, will tend to be fairly stable, at least in the short term and will often be largely a function of external macro-economic factors such as GNP and population size or growth. Profits will tend to be a function of many more factors, which are economic, organisational or accounting based. This in turn implies that profits will be more volatile or less stable than turnover. This tendency for greater volatility will also be greatly increased due simply to the relative sizes of the two series. A small change in turnover will be reflected in a proportionally very much larger change in profits especially if a company is, at least in the short term, locked into a particular cost structure or organisational form. This implies that turnover should be easier to predict, both by consolidated models that are based upon past turnover and by segment models based upon GNP forecasts. This may in turn mean that one model is more likely to be the optimal model across all years and error metrics. Secondly, it implies that the optimal consolidated model is perhaps more likely to be a function of only the last year's turnover than will be the case for profit forecasts.

In analysing the forecasts the first step is to determine the optimal form of each of the multiple form models. As explained in chapter 6 the consolidated models are of six types. The random walk and regression models are of one form only. The percentage and absolute change models, each for 1 to 5 years, and the moving average model, from 2 to 6 years (this being the maximum length that the data allows for) all have five forms. The exponential smoothing model, with a weighting of 0.95 to 0.05, has 19 different forms. The best form of each of these multiple form models was found for all four forms of error metric, namely absolute percentage error and squared error with denominators of both actual and forecasted turnover. The optimal form of each model was then chosen by ranking each form of each model and calculating the average rank for all four errors and all four years (1980 to 1983). The ranks were based solely upon the mean or average error except when this resulted in a tie. In this case the size of the maximum error was also considered. Whilst no single number captures the entire distribution of the error, the mean seems to be not only the simplest but the most economical way of discriminating between the errors. The major problem with this method is in the treatment of outliers. Depending upon the uses that a forecast are put to and the risk preferences of the user a forecasting method with a larger average error may be preferred to one with a smaller average error if it results in a smaller maximum error. However, to a large extent this problem is avoided by the use of error metrics that treat such outliers in differing ways. The use of an average rank across all four errors should avoid the problem that, otherwise, any conclusions may be specific to the actual error measure employed. However, where different error measures give very different results this will be highlighted.

MULTIPLE FORM MODELS:

8.2 THE ABSOLUTE CHANGE MODEL.

Appendix 8 provides details of all the errors generated for the five forms of this model for the years 1980 to 1983. From these it appears fairly clear that the best form of the model is the 5 year model, i.e.

$$\text{Turnover}_{t+1} = \text{Turnover}_t + (\text{Turnover}_t - \text{Turnover}_{t-5})/5 + E$$

Table 1 below provides a summary of the rankings of all the forms of this model derived from the results reported in appendix 8.

For 1982 and 1983 the five year model was ranked first for all errors. In 1980 it was the first for both absolute percentage errors whilst for both squared errors it was ranked second behind the three year model, so that on average these two were ranked first equal. In 1981 it was again ranked first for all errors except the mean squared error (mse) with a denominator of forecast where it was ranked fifth. Overall, the rankings indicate that the five year model is the optimal form of this model. This conclusion is reinforced when the consistency of all the ranks are considered. The four year model is the second best whilst the three year model is the third best etc. The spearman rank correlations also generally provide a similar and consistent picture, as reported in appendix 9. Whilst the actual correlation coeffecients differ for errors with forecasted and actual turnover as denominators

Table 1.

RANKS OF ABSOLUTE CHANGE MODELS.

	1980 mape /act	1980 mse /for	1980 mape /act	1980 mse /for	1981 mape /act	1981 mse /for	1981 mape /act	1981 mse /for
1 yr.	5	5	5	5	5	3	5	5
2 yr.	3	4	3	4	4	2	4	4
3 yr.	2	1	2	1	2	1	3	3
4 yr.	4	3	4	3	3	4	2	2
5 yr.	1	2	1	2	1	5	1	1

	1982				1983			
1 yr.	5	5	4	5	4	5	4	3
2 yr	4	4	3	4	3	3	3	4
3 yr.	3	3	5	3	5	4	5	5
4 yr.	2	2	2	2	2	2	2	2
5 yr.	1	1	1	1	1	1	1	1

	Overall ranks 1980	1981	1982	1983	Average	Overall
1 yr.	5	4.25	4.75	4	4.5	5
2 yr.	3.5	3.75	3.75	3.25	3.5625	4
3 yr.	1.5	2.25	3.5	4.75	3	3
4 yr.	3.5	2.75	2	2	2.5625	2
5 yr.	1.5	2	1	1	1.375	1

mape; mean absolute percentage error
mse; mean squared error
act; actual turnover
for; forecasted turnover

the results are such that the same conclusions can be drawn from the two sets of correlations. All the correlation coeffecients were significant at the 1% level and, with the exception of the 1983 two year model and 1980 one year model correlated with both four and five years models, all correlation coeffecients exceeded 0.5. Generally they were found to be much higher than this. Of greater interest is the finding that, with a few minor exceptions, the coefficients decrease as the difference in the models increases. That is, the correlation of the one and two year models exceeds that of the one and three year models which in turn exceed that of the one and four year models etc. Given that the optimal form of the absolute change model appears to be the five year model then the correlations of this model are of particular interest. These are reported in table 2 below for errors with a denominator of forecasted turnover.

Table. 2

SPEARMAN CORRELATION COEFFICIENTS FOR THE FIVE YEAR ABSOLUTE CHANGE MODEL:

	1 yr.	2 yr.	3 yr.	4 yr.
1980	0.5920	0.7823	0.8517	0.9614
1981	0.3546	0.6155	0.8221	0.9261
1982	0.5850	0.6704	0.8021	0.8934
1983	0.5361	0.2459	0.8515	0.9373

It is interesting to note that if all the models that are only one year apart are considered (i.e. 1 and 2 year models, 2 and 3 year models etc.) then the highest correlation coefficient is for the 4 and 5 year model. Similarly, the highest correlation for models two years apart is for the 3 and 5 year model, whilst, except for 1983, the same holds for models three years apart. However, the reasons for this finding are not immediately apparent.

Whilst examination of both the ranks of errors and correlations appears to provide evidence of a very consistent picture which supports the contention that the 5 year model is the optimal form for the absolute change model it says nothing regarding the significance of the findings. What is of importance is knowledge not only of the optimal model but also information on whether or not the choice of another form of this model would lead to forecasts that are significantly inferior. There are several ways to assess whether or not the differences in the errors generated by the differing forms of the basic model are significantly different and the choice of which method to use is dependent upon two factors. Firstly, the distribution of the errors which determines which tests are valid or invalid and secondly, the pragmatic factor of ease of computation. Based upon these criteria it was decided to employ the t-test which is a parametric test that tests for whether two variables or two samples come from a single population with the same mean (Blalock 1972). As the method of comparing the predictive ability of the various models was by ranking the mean errors a test of differences in means was also used. This test assumes that the errors are normally distributed, whilst this was not tested for, this test should provide at least an indication of the significance of choosing differing forms of the model. Given that this study should be viewed as an initial study and the results indicative only of the results likely if a different sample or time period or different sources of external data were employed, the test results found should be sufficiently robust for the purpose. Appendix 9 also provides details of the results of all the t-tests for all forms of the model whilst table 3 below provide a summary of the significance of the test for the 5 year model compared to the other forms of this model only.

Table 3.

T-TESTS FOR THE 5 YEAR ABSOLUTE CHANGE MODEL COMPARED TO THE ALTERNATIVE MODELS.

	mape/actual T-value	Sign.	mse/actual T-val.	Sign.	mape/forcast T-val.	Sign.	mse/forcast T-val.	Sign.
1980								
1/5 yr.	2.46	.015	2.65	.009	2.19	.031	2.65	.009
2/5 yr.	0.99	.326	1.39	.167	0.88	.383	1.39	.166
3/5 yr.	0.28	.783	0.41	.686	0.50	.616	0.38	.701
4/5 yr.	4.53	.000	4.18	.000	3.67	.000	1.88	.062
1981								
1/5 yr.	1.73	.087	-0.13	.895	3.16	.002	1.93	.056
2/5 yr.	1.13	.261	-0.17	.865	2.13	.036	2.16	.033
3/5 yr.	0.25	.803	-0.61	.543	1.47	.144	1.64	.104
4/5 yr.	0.63	.532	-0.48	.632	1.96	.058	2.06	.042
1982								
1/5 yr.	2.83	.005	1.42	.159	1.36	.177	1.02	.310
2/5 yr.	1.62	.108	1.22	.224	1.22	.225	1.03	.307
3/5 yr.	0.76	.451	0.92	.358	1.11	.269	1.07	.285
4/5 yr.	0.79	.433	1.25	.216	0.99	.326	1.06	.294
1983								
1/5 yr.	0.21	.835	0.84	.402	0.49	0.626	1.14	.258
2/5 yr.	-0.04	.966	0.29	.774	0.50	0.618	0.80	.424
3/5 yr.	1.12	.264	0.83	.411	1.34	0.183	1.02	.308
4/5 yr.	-0.23	.816	-0.28	.779	0.09	0.926	0.79	.429

mape mean absolute percentage error
mse mean squared error

Taken overall it can be seen that generally the level of significance is very low which implies that the choice of form of this model is relatively unimportant. However, there are a few important exceptions to this general conclusion. For 1983 there are no significant differences for any combination of model and error metric if the significance level is taken as 10%. A similar result holds for 1982 when the error is taken to be mse/forecast and for 1981 for mse/actual turnover. This shows that the significance is dependent upon both the year considered and the error method used. This is reinforced when the rest of the results are also considered. For 1982 the only significant difference occurs for the 1 and 5 year models using mape/actual. When all the results in appendix 9 are considered it can be seen that this is due to the one year model being significantly less accurate than all other models rather than the 5 year model being better than all other models. This appears to be rather a strange result due to the particular year and error metric employed. Overall for 1982 there is very little difference between the accuracy of all the forms of the model. The results for 1981 are rather more ambiguous. As mentioned above for mse/actual there are no significant differences. However, for both mape/forecast and mse/forecast all differences are significant at at least the 10% level except for 3 and 4 years and 3 and 5 year models whilst for mape/actual there appears to be no consistent picture. 1980 provides the most consistent picture. If only combinations of the 5 year model are considered it can be seen that for all errors there are significant differences between the accuracy of the 1 and 5 year models and the 4 and 5 year models only.

Overall then a very consistent picture emerges. The 5 year form of this model is clearly the optimal one and this holds for virtually all years and error metrics. This picture of consistency is reinforced when the correlations are considered. They show, as expected, that models that are more similar to each other are also more highly correlated. When the t-tests are considered though the picture becomes far less clear. It appears that the significance of any differences are heavily dependent upon the year that is being forecast and, to a lesser extent, the way in which the errors are calculated. Indeed it is only for 1980 that the results appear to to be both consistent and to show significant differences between the relative accuracy of the various forms of the absolute change model.

8.3. THE PERCENTAGE CHANGE MODEL.

Appendix 8 provides details of the errors generated by the percentage change model when the change is calculated over periods of one to five years. Table 4 below provides a summary of the rankings of the five alternative forms of this model.

It can be seen from this that, unlike the case of the absolute change models, there is no one form of the model that is clearly superior to the others. This is generally the case even when either each year or each error metric is considered in isolation. This lack of consistency in rankings suggests that this model is misspecified and so will not be a good predictor. However, whether or not this

Table 4.

RANKS OF THE PERCENTAGE CHANGE MODELS.

	mape /act	mse /act	mape /for	mse /for		mape /act	mse /act	mape /for	mse /for
1980					1981				
1 yr.	2	3	2	5		3	1	5	5
2 yr.	1	2	1	3		2	2	3	4
3 yr.	3	1	3	1		1	3	1	1
4 yr.	4	5	4	4		4	4	2	2
5 yr.	5	4	5	2		5	5	4	3
1982					1983				
1 yr.	5	4	5	5		2	5	5	5
2 yr.	1	1	3	4		1	1	1	2
3 yr.	2	2	4	3		3	2	4	3
4 yr.	3	3	2	2		4	4	2	4
5 yr.	4	5	1	1		5	3	3	1

Overall	1980	1981	1982	1983	Average	Overall
1 yr.	3	3.5	4.75	3.75	3.75	5
2 yr.	1.75	2.75	2.25	1.25	2	1
3 yr.	2	1.5	2.75	3	2.3125	2
4 yr.	4.25	3	2.5	4	3.4375	3
5 yr.	4	4.25	2.75	3	3.5	4

is the case this will be examined later. Overall the best form appears to be the 2 year model, i.e.

$$Turnover_t = Turnover_{t-1} * (1 + PCH_2) + E$$

where $PCH_2 = ((Turnover_{t-1} - Turnover_{t-3})/Turnover_{t-3})/2$

There appears to be no theoretical reason why turnover should be a function of the percentage change over a two year period rather than either the shortest or longest period considered and so no a priori reason why this model should be the optimal one. It would appear that this result is at least partially due to the averaging of several different optimal models when different years or error metrics are considered. This conclusion is supported when table 4 is examined in greater depth. It can be seen that in no single year or across all four years for any one error metric was any single form the optimal one. In addition with the exception of the four year model all the models were found to be optimal in at least one case. If the error metrics are combined and the average for each year considered then only in 1981 was the two year model not the best one. However, in 1980 it was fairly closely tied with the three year model and this form was found to be the best in 1981. Overall, the two year model came first in more cases than any other model, however, the three year model was also ranked first in 5 cases. These results are rather confusing and they suggest that no single form of the model is clearly superior over the four year period.

Appendix 10 provides details of the spearman correlation coefficients and t-test results for all five forms of this model. The results for the two year percentage change model only are given in tables 5 and 6 below. When the correlations are considered the general conclusions are very similar to those found for the absolute change model. The coefficients however, are smaller in virtually all cases with several coefficients, especially in 1983, being less than 0.5. This might suggest that it is more important which form of this model is chosen. Again, with a very few exceptions, the coefficients are higher for forms of the model that are nearer each other. In this context it is interesting to see that the correlations for the 2 and 3 year models are all higher than those of the 1 and 2 year models. This supports the finding that the 3 year model is the second best model and the 1 year model the lowest ranked.

Table 5.

SPEARMEN CORRELATION COEFFICIENTS FOR THE TWO YEAR PERCENTAGE CHANGE MODEL.

	mape and mse/actual				mape and mse/forecast			
	1980	1981	1982	1983	1980	1981	1982	1983
1/2 yr.	.7136	.6569	.5797	.3799	.6828	.6549	.5892	.3825
2/3 yr.	.8723	.7778	.7712	.3967	.8635	.7732	.7780	.3836
2/4 yr.	.7538	.6953	.6119	.3727	.7414	.6871	.6104	.3490
2/5 yr.	.6524	.4797	.4916	.3183	.6372	.4660	.4944	.2996

Again, there are relatively few forms of the model that generate significant t-values. However, what might at first appear to be a rather confusing picture can be largely explained if these results are compared to the rankings as reported in table 4. For example, for 1980 all the differences are significant for the 4 and 5 year models. If the ranks of these are examined it can be seen that these two models are ranked last and fourth respectively across all error measures for that year. If the ranks of each model and each error measure are considered for 1981 then the t-tests show that all four last ranked and one fourth ranked model generate differences that are significantly larger than those found for the optimal model. Similarly, for 1982, both the differences that are significant are for models that are

Table 6.

T-TESTS FOR THE TWO YEAR PERCENTAGE CHANGE MODEL.

	mape/act.		mse/act.		mape/for.		mse/for.	
	T-value	Sig	T-value	Sig	T-value	Sig	T-value	Sig
1980								
1/2 yr.	0.31	.759	0.29	.771	0.46	.643	0.94	.352
2/3 yr.	-0.95	.344	0.49	.622	-0.95	.342	0.52	.604
2/4 yr.	-6.55	.000	-4.36	.000	-4.68	.000	-1.67	.097
2/5 yr.	-6.96	.000	-4.80	.000	-4.82	.000	-1.79	.076
1981								
1/2 yr.	0.19	.847	-0.20	.842	1.83	.070	1.84	.069
2/3 yr.	0.40	.686	0.31	.759	1.37	.174	2.09	.039
2/4 yr.	-1.27	.206	-1.61	.111	0.14	.892	0.95	.344
2/5 yr.	-3.51	.001	-2.43	.017	-1.38	.171	0.14	.887
1982								
1/2 yr.	1.88	.063	1.25	.212	1.86	.066	1.18	.239
2/3 yr.	-0.68	.497	-0.41	.684	1.01	.314	1.95	.053
2/4 yr.	-1.01	.314	-1.14	.257	0.84	.405	1.63	.106
2/5 yr.	-1.29	.200	-1.50	.136	0.74	.464	1.47	.145
1983								
1/2 yr.	0.72	.476	1.25	.214	1.09	.280	1.78	.078
2/3 yr.	-1.44	.154	-1.02	.311	-1.58	.118	-0.85	.398
2/4 yr.	-1.51	.133	-1.43	.156	-0.90	.370	-0.87	.384
2/5 yr.	-1.93	.057	-1.67	.098	-0.76	.447	0.49	.623

ranked fifth, whilst two of the three significant differences in 1983 are for the last ranked models for those particular errors. If the complete results of appendix 10 are considered along with the optimal model for each error and each year then it can be seen that most of the significant differences can be easily explained.

Therefore, for the percentage change model, if only one model is required for all years and all error measures, the optimal model is the two year model. However, for this particular model this is rather too broad an approach. For several combinations of years and error measures this is not the optimal model and overall the three year model is a fairly close contender for the position of being the single best model. Again, the correlations are generally significant and fairly high although they are lower than those for the absolute change model which may imply that the choice of optimal model is rather more important for percentage change. The t-tests tend initially to give a rather confusing picture. They suggest that overall the choice of which form of the model to use may have little significant effect upon the size of the errors generated. However, this is rather too superficial an analysis. If the optimal model for each year and each error measure is considered than generally there are significant differences between the optimal form and the worst one or two forms of the model.

8.4 THE MOVING AVERAGE MODEL.

The errors for the five forms of the moving average model, as reported in appendix 8, provide a remarkably consistent picture. For all four years and all four error metrics in all cases the optimal model is the two year model, the second best model is the three year model, the third best is the four year model etc. This picture is even more consistent than that found for the absolute change model. In addition this result is neither year nor error measure specific. Therefore, it might be expected that the same result would hold either for a different sample or different time period. Thus the optimal model is clearly;

$$\text{Turnover}_t = (\text{Turnover}_{t-1} + \text{Turnover}_{t-2})/2 + E$$

Appendix 11 provides details of both the correlation coeffecients and t-test results for the five forms of the model used (i.e. unweighted moving averages for 2 to 6 years). A summary of these results for the 2 year model are provided below in tables 7 and 8.

Table 7.

SPEARMAN CORRELATION COEFFICIENTS FOR THE TWO YEAR MOVING AVERAGE MODEL.

	mape/act. and mse/actual				mape/for. and mse/for.			
	1980	1981	1982	1983	1980	1981	1982	1983
2/3 yr.	.9344	.9225	.9489	.9375	.9340	.9017	.9570	.9484
2/4 yr.	.8188	.8716	.8731	.8583	.8143	.8450	.8948	.8687
2/5 yr.	.7213	.8250	.8114	.7393	.6781	.8028	.8040	.7246
2/6 yr.	.6557	.7957	.7577	.7059	.6029	.7775	.7384	.6962

Two things are striking about the correlation coeffecients. Firstly, they are generally all very high with the smallest being 0.6029 whilst for all the models the majority are over 0.9. Secondly, whilst for the two models previously considered most of the correlations are consistent in the sense used here, for the moving average model all the correlations are, without exception, consistent. Given such high correlation coeffecients the findings of the t-tests are perhaps surprising. For the absolute and percentage change models only relatively few of the differences were significant for the moving average models. For the moving average model not only are the

Table 8.

T-TESTS OF THE TWO YEAR MOVING AVERAGE MODEL.

	mape/act. T-value	Sig	mse/act. T-val.	Sig	mape/for. T-val.	Sig	mse/for. T-val.	Sig
1980								
2/3 yr.	-12.96	.000	-11.05	.000	-12.96	.000	-5.78	.000
2/4 yr.	-13.54	.000	-12.02	.000	-13.54	.000	-5.10	.000
2/5 yr.	-15.16	.000	-13.74	.000	-15.16	.000	-5.23	.000
2/6 yr.	-16.74	.000	-15.83	.000	-16.74	.000	-5.37	.000
1981								
2/3 yr.	-9.02	.000	-7.26	.000	-9.02	.000	-5.18	.000
2/4 yr.	-12.24	.000	-7.92	.000	-12.24	.000	-5.92	.000
2/5 yr.	-14.26	.000	-11.38	.000	-14.26	.000	-6.17	.000
2/6 yr.	-16.20	.000	-14.43	.000	-16.20	.000	-6.49	.000
1982								
2/3 yr.	-8.47	.000	-2.36	.020	-8.47	.000	-5.54	.000
2/4 yr.	-11.29	.000	-3.27	.001	-11.29	.000	-6.85	.000
2/5 yr.	-12.93	.000	-3.92	.000	-12.93	.000	-7.45	.000
2/6 yr.	-14.15	.000	-4.94	.000	-14.15	.000	-7.66	.000
1983								
2/3 yr.	-8.36	.000	-3.71	.000	-8.36	.000	-3.34	.001
2/4 yr.	-9.68	.000	-2.97	.004	-9.68	.000	-3.35	.001
2/5 yr.	-11.90	.000	-3.83	.000	-11.90	.000	-3.55	.001
2/6 yr.	-11.61	.000	-3.37	.001	-11.61	.000	-3.60	.000

tests shown in table 8 all significant but appendix 11 shows that all the tests are significant at the least at the 5% level. Indeed, virtually all are significant at the 1% level.

Thus, for at least the moving average forecasts of turnover, the results are totally unambiguous. The two year model is clearly the optimal model in all cases. The rank correlations are all significant at the 1% level and are all fairly high. This shows that if all the user is interested in is a ranking of companies in terms of their likely future turnover then the choice of form of moving average model may not be very important. However, the t-tests show that the choice of form of this model is an important decision if the size of error is an important variable. The use of any form of the model except the two year form will yield significantly larger errors whichever way such errors are measured.

8.5. THE EXPONENTIAL SMOOTHING MODEL.

Appendix 8 again gives details of the distribution of errors for all four years and error metrics for all 19 forms of this model, whilst table 9 below reports the errors for 1980 for mape/actual only. The errors reported below are generally larger than those for mse/actual and smaller than those for mape/forecast and mse/forecast. However, the absolute size of the errors is not relevant when deciding the optimal form of the model. Instead, what is relevant is the relative sizes of the errors for the 19 forms of the model tested. On this criteria the errors reported in table 9 are representative of all years and all error measures.

From this it can be seen that, as for the moving average models, the most striking feature is the consistency of the results. Appendix 8 shows that the example above is representative of all years and all errors, so that the optimal weighting constant is 0.95, the second best is 0.90, the third best is 0.85 etc. The only exception to

Table 9.

ERRORS FOR THE EXPONENTIAL SMOOTHING MODELS FOR 1980.
(MAPE/ACTUAL)

Smoothing Constant	Mean	Std. Error	Std. Dev.	Range	Minimum
0.95	0.090	0.007	0.076	0.506	0.005
0.90	0.093	0.007	0.077	0.515	0.000
0.85	0.097	0.008	0.078	0.519	0.001
0.80	0.101	0.008	0.080	0.526	0.000
0.75	0.107	0.008	0.081	0.533	0.000
0.70	0.115	0.008	0.082	0.533	0.007
0.65	0.123	0.008	0.084	0.546	0.003
0.60	0.133	0.008	0.086	0.558	0.001
0.55	0.144	0.008	0.088	0.571	0.001
0.50	0.159	0.009	0.090	0.580	0.006
0.45	0.176	0.009	0.093	0.597	0.005
0.40	0.196	0.009	0.097	0.617	0.004
0.35	0.221	0.010	0.100	0.639	0.004
0.30	0.251	0.010	0.102	0.650	0.019
0.25	0.289	0.010	0.105	0.656	0.043
0.20	0.333	0.011	0.111	0.716	0.018
0.15	0.386	0.011	0.115	0.744	0.030
0.10	0.451	0.011	0.116	0.808	0.012
0.05	0.528	0.011	0.116	0.811	0.063

this is for 1983 mse/forecast where the weighting of 0.60 is more highly ranked than it is in all other cases. The optimal form of the exponentially weighted moving average model is therefore;

$$\text{Turnover}_t = (0.95 * \text{Turnover}_{t-1}) + (0.05 * \text{FTurnover}_{t-1}) + E$$

where FTurnover_{t-1} is the forecast of turnover for period t-1

Given the results for the unweighted moving average this result is what would be expected. Taken together they appear to imply that the optimal predictor of turnover will be last years turnover, that is, a random walk model. These findings of maximum weight being placed upon last years results may also explain the rather inconsistent findings for the percentage change model. They suggest that models based upon changes may be incorrectly specified. If this is so then it not surprising that the results for these models are not as consistent.

Appendix 12 provides details of the spearman correlation coefficients and t-tests for all forms of the model. Looking at the correlations they support the picture found when the rankings were considered. Again they provide a totally consistent picture. That is, the closer together are the smoothing constants then the higher are the correlations. Also of interest are the size of the correlations which are all significant at 1% and are generally high. For example, if all combinations of smoothing constants that are only 0.05 apart (i.e 0.95 and 0.90, 0.90 and 0.85 etc.) are considered then the smallest correlation is 0.9823 whilst if those only 0.10 apart are considered then the smallest correlation is 0.9350. However, the correlations do decrease quite considerably when models further apart are considered, so that the smallest correlation, that between a constant of 0.95 and 0.05 is as low as 0.3507 in one case. This not only supports the conclusions drawn from the rankings of errors but suggests that if all one is interested in is ranking companies then it will make little difference if the model is slightly misspecified but that it can make a very great difference if completely the wrong form of the model is chosen.

Table 10 below provides a summary of the most important results found for the t-tests whilst appendix 12 provides details of all the results for the four years for mape/actual. The other three error metrics were not used for these tests, but given the results for the rankings and correlations there is no reason to suggest that the results for these would be significantly different.

Table 10.

T-TEST RESULTS FOR A WEIGHTING OF 0.95 FOR ERRORS DEFINED AS MAPE/ACTUAL.

	1980		1981		1982		1983	
	T-value	Sig	T-value	Sig	T-value	Sig	T-value	Sig
0.90	-4.51	.000	-4.77	.000	-5.16	.000	-5.79	.000
0.85	-5.05	.000	-5.23	.000	-5.31	.000	-6.72	.000
0.80	-5.83	.000	-5.59	.000	-5.48	.000	-6.98	.000
0.75	-6.97	.000	-6.04	.000	-5.69	.000	-7.03	.000
0.70	-8.04	.000	-6.60	.000	-6.07	.000	-7.19	.000
0.65	-8.86	.000	-7.18	.000	-6.53	.000	-7.45	.000
0.60	-9.81	.000	-7.82	.000	-7.00	.000	-7.59	.000
0.55	-10.82	.000	-8.60	.000	-7.52	.000	-8.12	.000
0.50	-12.12	.000	-9.52	.000	-8.11	.000	-8.74	.000
0.45	-13.40	.000	-10.86	.000	-8.75	.000	-9.52	.000
0.40	-14.70	.000	-12.99	.000	-9.53	.000	-10.34	.000
0.35	-16.45	.000	-15.48	.000	-10.73	.000	-11.11	.000
0.30	-18.79	.000	-18.48	.000	-12.08	.000	-11.87	.000
0.25	-20.96	.000	-22.10	.000	-13.55	.000	-12.69	.000
0.20	-22.83	.000	-25.88	.000	-15.02	.000	-13.96	.000
0.15	-26.28	.000	-29.65	.000	-18.28	.000	-16.69	.000
0.10	-31.35	.000	-32.80	.000	-23.86	.000	-20.20	.000
0.05	-37.78	.000	-34.59	.000	-31.23	.000	-25.03	.000

Whilst the t-value and, therefore, the significance increases as weights further apart are considered all the differences reported here are signifcant at the 1% level and the same occurs for all possible combinations of smoothing constants. It would appear to be important to select the correct form of this model if the size of error is important. If the size of the actual errors are considered then this result is what would be expected if two weighting constants that are fairly far apart are considered. For example, in table 8 it can be seen that the minimum average error is 0.090 but the maximum 0.528, a difference that is obviously significant. However, it is somewhat surpising that the same result holds for all combinations of smoothing constant that are only 0.05 apart. For example in table 8 it can be seen that the difference in mean error for weight of 0.95 and 0.90 is only 0.003 (0.090 vs 0.093) yet even this very small difference is highly significant, a result especially surprising when it is also seen that the range of errors is relatively large, being for these two model in excess of five times the mean errors.

8.6. COMPARISON OF ALL MODELS

Having found the optimal form of each of the four multiple form models these can now be used to predict turnover and compared with the forecasts generated by the other models. This process of comparison should ideally be done using a three step process each step dependent upon different assumptions concerning the extent of knowledge the user is assumed to have. The first way that the models can be compared is to take the form of the model that is, on average, the best model in all four years and to compare this with the other models. Major problems occur with this approach though. The optimal models are defined as those that provide the best predictions over the period 1980 to 1983. To use these then to predict turnover in 1981 to

1983 assumes perfect future knowledge over a maximum of three years. Therefore, this method is at best an ex-post comparison of forecasting ability and, if the models are not constant over time, provides little or no guide for prediction purposes when the ex-post optimal model is unknown. The second way of comparing these forecasts is to use the optimal model for each year, so that, for example, the best form of percentage change for 1981 is compared with the best form of all the other models for the same year. This again assumes perfect knowledge of the future so that the best form of model for that year is known before the results for that year are available. The advantage of this approach is that it assumes future knowledge for only one year rather than a maximum of three years. In addition, if the optimal form of any model is not stable over time it will compare the optimal forms for that single year and not the form that is best, on average, over a longer period of time. If any model is very volatile over time this approach would be expected to show this model in a much better light than would the previous approach. The major limitation of these two methods is that they both assume future knowledge. The third alternative is to compare the models based upon the optimal form of each model for the previous year so that no future knowledge is assumed. This is the only approach of the three that could be used in practice and therefore may be considered the most important method of comparison. However, all three methods provide somewhat different information and in combination provide a fuller picture of which is the best model to use, especially if the optimal form of any of the multiple form models is volatile over time. For these turnover forecasts the optimal form of each model is very similar whichever of these three approaches is taken. Therefore, only two of the approaches are used. Firstly, the best form of each model over the entire period will be considered. Secondly, the models are compared on the basis of the optimal ex-ante form of each model.

In addition to the four consolidated models examined so far two others are used: the random walk and a regression model. The regression model is found by employing a multiple step regression with the independent variables being the past turnover figures. The optimal form of this is then defined as the regression model that provides the highest possible regression coefficient subject to each variable in the equation being significant at the 10% level. Whilst this might be considered as a fairly low level of significance it was chosen to maximise the overall regression coefficient. Use of a higher significance level would have resulted in lower overall explanatory ability. This process was carried out on the turnover for the four years 1980 to 1983 to provide models for the three ex-post predictions and the three ex-ante predictions required. The regression models then employed were as follows;

$$Turn_{1980} = 13.12421 + (T_{1979} \times 1.28725) - (T_{1973} \times 0.63511)$$

$$Turn_{1981} = -24.76210 + (T_{1980} \times 1.11074) - (T_{1973} \times 1.04145) + (T_{1976} \times 0.18776) + (T_{1974} \times 0.26693) + (T_{1978} \times 0.21409)$$

$$Turn_{1982} = -11.16367 + (T_{1981} \times 1.17117) - (T_{1973} \times 0.18500)$$

$$Turn_{1983} = 29.56579 + (T_{1982} \times 1.27270) - (T_{1975} \times 0.50271)$$

There are some interesting similarities between these four models. Whilst the constant term varies greatly from -#24.76 million to #29.57 million, the first term in all equations is turnover of the preceding year with a weighting in excess of one. Three of the models only have two terms with the second term being 1973 turnover in two cases and 1975 turnover in the third case and all have a negative weight. There seems to be no rationale for this second term or the extra terms in the case of 1981. Overall, they all seem to support the use of a submartingale with drift.

These six consolidated models were then compared with the six segment based models. The actual models used to compute the segment based forecasts are given in appendix 7-5. Appendix 13 provides details of all the errors for the years 1981 to 1983 for the 12 models where the four multiple form models are defined as the optimal model over the entire four year period 1980 to 1983. Table 11 below provides a summary of the ranks of the models for each year. Looking firstly at the overall picture for the three years combined the best model is the five year absolute change model with an average rank of 1.417. This is

Table 11.

RANKS OF THE OVERALL OPTIMAL FORM OF ALL MODELS.

	1981 mape /act	1981 mse /act	1981 mape /for	1981 mse /for	1982 mape /act	1982 mse /act	1982 mape /for	1982 mse /f	1983 mape /act	1983 mse /act	1983 mape /for	1983 mse /f
Rand.W.	9	3	4	3	10	3	4	4	8	2	4	4
Abs.Ch.	1	1	1	1	1	1	1	1	4	1	2	2
Per.Ch.	8	4	2	2	7	5	3	3	5	4	1	1
Mov.Av.	11	11	6	6	12	9	6	6	11	7	6	6
Exp.Sm.	10	5	5	4	11	4	5	5	9	3	5	5
Reg.	6	2	3	5	2	2	2	2	10	9	3	3
Seg.1	7	6	11	12	6	6	11	11	3	5	11	11
Seg.2	2	7	9	9	3	7	9	10	2	8	7	9
Seg.3	5	10	7=	7=	4	10	8	8=	7	12	8	8
Seg.4	4	9	7=	7=	5	11	7	7	6	11	9	7
Seg.5	12	12	12	11	8	12	10	8=	1	6	10	10
Seg.6	3	8	10	10	9	8	12	12	12	10	12	12

Overall

	1981	1982	1983	Average	Overall Rank
Rand.W.	4.75	5.25	4.5	4.833	4
Abs.Ch.	1	1	2.25	1.413	1
Per.Ch.	4	4.5	2.75	3.75	2
Mov.Av.	8.5	8.25	7.5	8.083	9
Exp.Sm.	6	6.25	5.5	5.917	5
Reg.	4	2	6.25	4.083	3
Seg.1	9	8.5	7.5	8.333	10
Seg.2	6.75	7.25	6.5	6.833	6
Seg.3	7.5	7.625	8.75	7.9583	8
Seg.4	7	7.5	8.25	7.583	7
Seg.5	11.75	9.625	6.75	9.375	11
Seg.6	7.75	10.25	11.5	9.633	12

somewhat surprising given that it was argued above that there appears to be no theoretical reasons to support this model, and unlike the moving average and exponential models, was not the optimal form of the model for all errors and years. Not only is it the optimal model but it has a very high ranking having been the optimal model for all four errors for 1981 and 1982 and in 1983 its average rank was 2.25. The second best model is the percentage change model with again a fairly high average rank of

3.25. The relatively good performance of this model is even more surprising given that the two year model was not the best form of this model in all three years and there appears to be even less reason to expect this to be a good predictor.

In spite of these findings regarding the inconsistency in the optimal forms of these models there are some possible explanations of these results. The success of the absolute and percentage change models is probably mainly due to the effects of inflation. Given fairly high levels of inflation in the period being examined then it would be expected that turnover as measured in historical cost terms would rise even if the amount measured in real terms failed to increase. Therefore, it would be expected that turnover might be best measured by a random walk plus an increase to reflect the effects of price increases. This is supported when the relative predictive abilities of the random walk, exponential smoothing and moving average models are considered. If turnover is increasing annually due to inflation then all of these three models would produce conservative measures of turnover, whilst absolute change and percentage change models may give errors that are on average either positive or negative. In addition, the least conservative of the other models would be the random walk model followed by the exponential smoothing model which weights last years results by 0.95 and then the moving average model which weights them by 0.5 only. This is supported by the findings that this is the relative ranking of the three models, random walk then exponential smoothing then moving average.

Overall, the segment models all appear to perform rather poorly. The best segment model is model 2, that is, with only the U.K. segment adjusted for expected inflation. However, even then it is only ranked fifth and provides more accurate forecasts than the moving average and regression models only. Models 3 and 4, ie. all times U.K. inflation and each area times its own expected inflation rate are ranked seventh equal. The regression model is the only consolidated model that performs worse. The worst model is the U.K. ex-post model followed by the U.S.A. ex-post model, results that suggest that these models in particular are seriously misspecfied. If each year is considered seperately then the first five models all have approximately the same overall ranks in each of the three years and most of the other models have ranks that are only slightly less consistent over all years. However, segment model 5 is ranked sixth in 1983 and elevth and twelfth in the other two years whilst segment model 6 is ranked eighth in 1981 and last for the other two years. If all the years and models are considered then the number of models that perform consistently greatly falls and it becomes very difficult to see many clear patterns. Whilst the rankings of some models seems to be fairly consistent the ranks of others seems to depend crucially upon whether or not the denominator of the errors is taken to be the actual or forecasted turnover. This appears to be particularly the case for the percentage change model and segment model 1 in all years and to a lesser extent segment model 5 and the moving average, although why these models in particular should be so affected is unclear. Also of interest are the findings concerning the random walk and exponential smoothing models. These give fairly consistent ranks across all years and error metrics with the exception of mape/actual which give consistently lower ranks. This conclusion is reinforced if the average ranks are aggregated over the three years for each error measure as reported in table 12 below. Whilst the average ranks differ slightly the ordering of the models are identical for mape/forecast and mse/forecast, and for these two measures all the consolidated models outperform all six segment based models. However, for the other two error measures the ranks show considerably less consistency. If mape/actual is considered then the absolute change model is the only consolidated model that outperforms segment models 1 to 4. If mse/actual is considered then the only consolidated model that is outperformed by any of the segment models is the moving average model. In addition, the rankings of the models often differ greatly for these two error measures. For example, the random walk model is ranked second for mse/actual but only tenth for mape/actual whilst the exponential smoothing model is ranked third and eleventh.

The result that different error measures may result in different rankings and, therefore, different conclusions regarding the relative performances of the different models is one that has been generally underexplored. Most studies have used only one error measure, however, several studies have used more than one although the results have not been conclusive. For example, Watts and Leftwich (1977) used three different errors and found that the results differed across the errors. Elton and Gruber (1972) found that whilst the two error measures they used resulted in the same model being ranked first they resulted in different rankings for the other models. Khumawala, Polhemus and Liao (1981) used three error measures, they found that the rankings of the models were unaffected, however, the number of significant differences varied across the different errors. However, these results have not been found in all cases, for example, Ball and Watts (1972) and Gonedes (1972) found no important differences when different errors were used. However, moast of these studies used absolute and squared errors, the results found here suggest that a more important factor is the choice of denominator or weighting factor.

For a complete assessment of the relative predictive ability of all the models it is insufficient to merely rank the errors and claim that the best model is that which has the highest rank. It also necessary to know whether or not the differences in the errors are significant. Appendix 14 provides details of the spearman correlations for all 12 models used. Whilst the correlations differ from year to year

Table 12.

RANKS AGGREGATED OVER YEARS FOR EACH ERROR METRIC.

	mape/act.		mse/act.		mape/for.		mse/for.	
	average	absolute	aver.	abs.	aver.	abs.	aver.	abs.
Random walk	9	10	2.67	2	4	4	3.67	4
Absolute ch.	2	1	1	1	1.33	1	1.33	1
Percentage ch.	6.67	7	4.33	4=	2	2	2	2
Moving av.	11.33	12	9	9	6	6	6	6
Exponential s.	10	11	4	3	5	5	4.67	5
Regression	6	6	4.33	4=	2.67	3	3.33	3
Segment 1	5.33	4=	5.67	6	11	11	11.33	11
Segment 2	2.33	2	7.33	7	8.33	9	9.33	9
Segment 3	5.33	4=	10.67	12	7.67	8	7.67	8
Segment 4	5	3	10.33	11	7.33	7	7	7
Segment 5	7	8	10	10	10.67	10	9.67	10
Segment 6	8	9	8.67	8	11.33	12	11.33	12

the overall pattern seems to be fairly consistent and some interesting conclusions can be drawn from these. Overall, very many of the correlations are surprisingly low and a significant minority are not significant at any reasonable level. In addition, quite a few of the correlations of segment models 3 to 6 with the consolidated models are negative. This is an important result in that it implies that the choice of model may often be more important than might initially appear. For example, for 1981 if mape/actual is employed the moving average model is ranked eleventh and segment model 5 twelfth. This would suggest that there is little to choose between these two models. However, the correlation whilst significant at 1% is also negative. This suggests that whilst, on average, the two models give similar results if only a sample of the companies were chosen the results might be very different. In particular, it shows that the companies which for one model have the smallest errors have, for the other model, the highest errors. The highest correlations are those that would be expected if the nature of the models are considered. For example, one of the highest correlations is between exponential smoothing and the random walk, two models that are very similar given the smoothing constant used in the exponential smoothing model was 0.95. Similarly, the percentage change and absolute change models are fairly highly correlated as are several of the segment models. Not only are the correlations of the segment and consolidated models generally very low but so are the correlations of the regression model with all the other models. Again this is probably due to the fact that the models are of very different types. Overall the results show that even if, on average, the errors generated by the models are fairly similar the errors for any particular company are often very different. This suggests that for different companies the optimal models may be very different. Whether this is due to random factors or whether different models are best for certain consistent groupings of companies is an important question which still remains to be examined.

In addition to the correlations t-tests were also carried out and the results are provided in appendix 14. Table 13 below provides a summary of all the t-tests that were significant at the 5% level. What is most surprising about these results are the number of models that appear to give significantly different errors. Whilst it would be expected that the errors for models that have very different ranks would be significant the same might not be

Table 13

SIGNIFICANT T-TESTS FOR ALL MODELS USED TO FORECAST TURNOVER.

	1981				1982				1983			
	ape/a	se/a	ape/f	se/f	ape/a	se/a	ape/f	se/f	ape/a	se/a	ape/f	se/f
RW/Abs.	.000	.035	.000	.000	.000		.000	.000	-.000	-.006		
RW/Per.			.035		.026		.000				-.002	-.044
RW/Mov.	-.000	-.080	-.000	-.011	-.000	-.002	-.000	-.000		.049		
RW/Exp.	-.000		-.000	-.099	-.000	-.000	-.000	-.000	.029	.032		
RW/Reg.					-.000		-.000	-.004	-.000	-.001		
RW/S.1			-.000	-.000			-.000	-.000	.000	.006	.001	.084
RW/S.2	-.037		-.002	-.000	.056		-.003	-.000	.000	.006	.001	.083
RW/S.3			-.003	-.000			-.004	-.000	.000	.006	.001	.083
RW/S.4	.098		-.003	-.000			-.004	-.000	.000	.006	.001	.083
RW/S.5	-.008	-.043	-.000	-.000			-.003	-.000	.000	.006	.001	.084
RW/S.6	.054		-.001	-.000			-.000	-.000	.000	.006	.004	.086
Ab/Per	-.003		-.001	-.007	-.017	-.029	-.003	-.007				
Ab/Mov	-.000	-.017	-.000	-.000	-.000	-.001	-.000	-.000	.005	.012		
Ab/Exp	-.000	-.007	-.000	-.000	-.000	-.088	-.000	-.000	.000	.006	.011	
Ab/Reg			.014	.008		.065		.028	.001	-.001	-.043	
Ab/S.1	-.095		-.000	-.000			-.000	-.000	.000	.005	.043	
Ab/S.2			-.000	-.000			-.000	-.000	.000	.005	.042	
Ab/S.3			-.000	-.000			-.000	-.000	.000	.005	.042	
Ab/S.4			-.000	-.000			-.000	-.000	.000	.005	.042	
Ab/S.5	-.000	-.020	-.000	-.000			-.000	-.000	.000	.005	.042	
Ab/S.6			-.000	-.000	-.024		-.000	-.000	.000	.005	.061	
Pe/Mov	-.028		-.000	-.028	-.000	-.027	-.000	-.000				
Pe/Exp					-.008		-.000		-.000		-.000	.047
Pe/Reg			-.006					-.047	-.000	-.002	-.056	-.010
Pe/S.1			-.000	-.000			-.000	-.000	.001		.001	.050
Pe/S.2			-.000	-.000			-.000	-.000	.001		.001	.050
Pe/S.3			-.000	-.000			-.000	-.000	.001		.001	.050
Pe/S.4			-.000	-.000			-.000	-.000	.001		.001	.050
Pe/S.5	-.004	-.086	-.000	-.000			-.000	-.000	.001		.001	.050
Pe/S.6			-.000	-.000			-.000	-.000	.002		.001	.051

Mo/Exp	.000	.077	.000		.000	.003	.000	.000		-.051		
Mo/Reg	-.008		-.017		-.000	-.003	-.000	-.000	-.000		-.000	-.035
Mo/S.1	.005		-.002	-.000	.000		-.039	-.001	.000	.001		
Mo/S.2	.000		-.025	-.000	.000			-.002	.000	.001		
Mo/S.3	.003		-.037	-.001	.001			-.002	.000	.001		
Mo/S.4	.002		-.038	-.001	.001			-.002	.000	.001		
Mo/S.5		-.081	-.001	-.000	.003			-.002	.000	.001		
Mo/S.6	.000		-.021	-.000	.004		-.003	-.000	.000	.001		
Ex/Reg					-.000		-.000	-.002	.076	.020		
Ex/S.1			-.000	-.000	.055		-.000	-.000	.000	.005	.005	
Ex/S.2	.024		-.002	-.000	.030		-.004	-.000	.000	.005	.004	
Ex/S.3	.081		-.004	-.000			-.006	-.000	.000	.005	.004	
Ex/S.4	.070		-.004	-.000	.092		-.007	-.000	.000	.005	.004	
Ex/S.5	-.012	-.043	-.000	-.000			-.004	-.000	.000	.005	.005	
Ex/S.6	.035		-.002	-.000			-.000	-.000	.000	.005	.012	
Re/S.1			-.002	-.000	.000			-.008	.000	.000	.004	
Re/S.2	.000		-.019	-.001	.000			-.016	.000	.000	.004	
Re/S.3	.002		-.027	-.001	.000			-.019	.000	.000	.004	
Re/S.4	.002		-.028	-.001	.000			-.019	.000	.000	.004	
Re/S.5			-.001	-.000	.001			-.018	.000	.000	.004	
Re/S.6	.001		-.016	-.001	.002		-.038	-.003	.000	.000	.005	
S.1/2	.005		.000	.000			.001	.004			.028	
S.1/3			.000	.000			.015	.026				
S.1/4	.093		.000	.000			.008	.020				
S.1/5	-.000	-.038					.059	.037			.040	.019
S.1/6	.015		.000	.000	-.000		-.000	-.000	-.000		-.000	-.002
S.2/3				.072					-.015	-.051		
S.2/4				.062					-.016	-.057		
S.2/5	-.000	-.006	-.000	-.071	-.016	-.050					-.052	
S.2/6	-.070	-.096	-.035	-.050	-.001		-.000	-.000	-.000		-.000	-.005
S.3/4	.004	.011	.068		.010	.031			.092	.044		
S.3/5	-.000	-.004	-.000	-.000	-.007	-.025	-.025			.086		
S.3/6				-.052	-.066		-.000	-.004	-.000		-.000	-.009
S.4/5	-.000	-.004	-.000	-.000	-.001	-.008	-.011			.092		
S.4/6				-.047	-.038		-.000	-.003	-.000		-.000	-.009
S.5/6	.000	.007	.000				-.000	-.004	-.000		-.000	-.002

expected for models with similar ranks. However, this is not what is found. For example, there are more significant differences in 1981 and 1982 between the absolute change model and models with similar ranks than for some of the models with very low ranks. To an extent this result can be explained by the nature of the test.

The t-test looks only for differences in the means of two groups, and assumes that the distributions are normal. So if one of the groups has a few outliers that causes its variance to be much larger than that of the other group then even if the mean is also larger this might not be picked up by this test. The main conclusion from this test though is that generally the choice of prediction method does appear to be important. This appears to be especially the case in 1981 and 1982 if the errors are measured by mape/forecast and mse/forecast and in 1983 if mape/actual and mse/actual are used.

8.7 THE PREDICTION MODELS.

When there is a choice of which form of a model to use the form that is, on average, the optimal over all four years has so far been used. However, this procedure assumes ex-post knowledge. For example, if predictions are to be made of turnover in 1981 all that is known is the optimal model for 1980 and not the optimal model for the entire period 1980-1983. Therefore, a better comparison of the predictive ability of consolidated and segment based models is to compare both only using information that is known when the forecast is made. Therefore, the segment models were additionally compared with such models. The form of each multiple form model used was that form which provided the most accurate forecast in the previous year. So that the model that gave the smallest error in 1980 was used to predict turnover in 1981, and the optimal ex-post model in 1981 was used to predict 1982 etc. The optimal form of each model was again defined as that form which had the lowest rank when averaged over all four error metrics for each year. However, for turnover, this procedure provides results that are generally very similar to those reported above. The models for absolute change, moving average and exponential smoothing remain exactly the same. The only difference for the percentage change model is that for predictions of 1982 turnover a three year average is used. The major difference is for the regression model where the 1980 model is applied to forecasts of 1981, the 1981 model used for 1982 and the 1982 model used to forecast 1983. The results using this procedure are reported in table 14 below (derived from the full results reported in appendix 16). If this is compared with table 11 it can be seen that the major difference is in the rank of the regression model. This model is now ranked tenth rather than third. Overall, the optimal model is still the absolute change model followed by percentage change model whilst the random walk model now becomes the third best. In addition, segment model 2 outperforms the moving average model and all four ex-ante segment models out perform the regression model. As generally, with the exception of the regression model, the results are as those reported above they will not be considered in detail here.

Table 14.

RANKS OF ALL THE MODELS, OPTIMAL PREDICTION FORMS.

	1981 mape /act	1981 mse /act	1981 mape /for	1981 mse /for	1982 mape /act	1982 mse /act	1982 mape /for	1982 mse /f	1983 mape /act	1983 mse /act	1983 mape /for	1983 mse /f
Rand.W.	8	2	3	3	9	3	3	3	8	2	3	3
Abs.Ch.	1	1	1	1	1	2	1	1	4	1	2	2
Per.Ch.	7	3	2	2	7	1	2	2	7	4	1	1
Mov.Av.	10	10	6	5	11	8	5	5	10	7	5	5
Exp.Sm.	9	4	4	4	10	4	4	4	9	3	4	4
Reg.	11	11	5	6	12	12	6	6	12	12	6	6
Seg.1	6	5	11	12	5	5	11	11	3	5	11	11
Seg.2	2	6	9	9	2	6	9	10	2	8	7	9
Seg.3	5	9	8=	7=	3	9	8	8=	6	11	8	8
Seg.4	4	8	8=	7=	4	10	7	7	5	10	9	7
Seg.5	12	12	12	11	6	11	10	8=	1	6	10	10
Seg.6	3	7	10	10	8	7	12	12	11	9	12	12

	1981	1982	1983	Average	Overall Rank
Rand W.	4	4.5	4	4.167	3
Abs.Ch.	1	1.25	2.25	1.5	1
Per.Ch.	3.5	3	2.75	3.083	2
Mov.Av.	7.75	7.25	6.75	7.25	6
Exp.Sm.	5.25	5.5	5	5.25	4
Regres.	8.25	9	9	8.75	10
Seg.1	8.5	8	7.5	8	9
Seg.2	6.5	6.75	6.5	6.583	5
Seg.3	7	7	8.25	7.417	7=
Seg.4	7	7	8.25	7.417	7=
Seg.5	11.75	9	6.75	9.167	11
Seg.6	7.5	9.75	11	9.417	12

The results reported here have all been for the non-truncated errors. If the truncated results, as reported in appendix 8, are considered it can be seen that for most of the models no truncation was necessary. In addition, when errors were truncated the same results in terms of ranking were generally found. Overall, the differences between truncated and non-truncated results were insufficiently important to lead to any major differences in conclusions, so that, at least for turnover forecasts, the truncated results were not analysed in depth.

8.8. CONCLUSIONS.

Whilst there are some important differences between the conclusions that can be drawn when the different error measures or years are considered what is perhaps most striking about these results is the generally high level of consistency of the conclusions that can be drawn.

Considering, firstly, the consolidated models, the major conclusions appears to be that the best models are those that build in a positive drift term. This is probably largely because of the effects of inflation which means that turnover will increase over time even if the number of units sold remains constant. The best consolidation based models are the absolute change model followed by the percentage change and then the regression models. The other three fail to build in a drift term and their relative performances were ranked in increasing order of conservatism, namely, randon walk, exponential smoothing (weight 0.95) and then moving average (two year). If each error measure and each year is considered seperately then the optimal form of the moving average and exponential smoothing models remain virtually identical whilst the same is not the case for the other two models. This again suggests that a positive drift model is required, however the amount of change is not stable over either time or error metric. If prediction models are used the same conclusions hold with the exception of the regression model which now performs relatively badly.

The most surprising, and disappointing, results concern the relatively poor performance of the segment based models. Looking firstly at overall models, if the errors, as reported in appendix 13, are considered it can be seen that for mape/actual and mse/actual the average segment errors are not very different from those of the other models. However, if mape/forecast and mse/forecast are instead used then the segment models generally result in much larger errors. The t-test results show that most of these differences are significant (see table 11 above). This means that, for example, if mape/actual is used then only the absolute change model outperforms segment models 1 to 4. Taken overall though the results are very different. In this case, segment models 2 to 4 outperform the moving average model. Otherwise, all segment models are outperformed by all the consolidated models. When the prediction models are considered the major difference is in the poor performance of the regression models which is now outperformed by all the models except the two ex-post segment models.

Chapter 9.

FORECASTS OF EARNINGS: THE ENTIRE SAMPLE OF COMPANIES.

9.1. INTRODUCTION.

Having examined the predictions of turnover a similar approach will be used to examine the earnings predictions. Initially the profit forecasts generated will be based upon segmental turnover data. This means that the segment based forecasts will be generated by a two step process. This involves the use of segment turnover data to forecast turnover and this forecast is then multiplied by the ratio of total profit to turnover earned in the previous year. This can be represented by an equation of the general form;

$$P_t = \sum (T_{i,t-1} \times (1 + FGNP_i)) \times P_{t-1}/T_{t-1}$$

where $FGNP_i$ is the forecast of growth in GNP for area i for the period t-1.

$T_{i,t-1}$ is the turnover for area i for the period t-1.

P_{t-1} is total attributable profit in period t-1

T_{t-1} is total turnover in period t-1

This two step process with earnings forecasts being based upon turnover segment data is carried out before considering forecasts based upon segment earnings data for several reasons. The current legislation in this area appears to be based, at least partially, upon the assumption that, in most cases, geographical earnings data has little extra information content over that provided by geographical turnover segment data. For example, it was shown that the Stock Exchange requires the disclosure of earnings information only if the ratio of earnings to turnover for the segments vary greatly. This implicit assumption that earnings data is, in most cases, of little extra value needs to be investigated. The logical way of doing this appears to be to examine turnover based forecasts and then to assess the extra information value of earnings data. In addition, this approach means that the results found can be more easily compared with the empirical studies using line of business data. The third reason for this approach is due to the sample of companies used in this study. It was shown in chapter 7 that not all the companies disclosed earnings data. Therefore, the best approach is to start with a method that means that all the companies can be used. Then, after this, use earnings segment data with the smaller sample of companies that disclose such information.

The consolidated models used were of the same type as those used for turnover forecasts but, unlike the segment based forecasts, profit was forecasted directly using past profits rather than by a two step process. The definition of profit employed was attributable profit before extraordinary items. This was chosen because, as explained in chapter 6, attributable profit is the profit figure that is probably of most interest to shareholders whilst extraordinary items have been excluded because, by their very nature, they should not be forecastable.

The first step in this process is again to find the optimal form of each of the four multiple form models. When profit rather than turnover is forecast the errors are generally much larger and there are also often a few exceptionally large errors or outliers. Such outliers can create problems. They may lead to the choice of a forecasting method with the smallest average error over another model that is more accurate for the vast majority of companies but also generates one or two very large outliers. This means that the truncated errors must also be examined and a similar analysis will be carried out on both the non-truncated and truncated errors. In addition, the optimal form of each model is often far less consistent over time than was the case for turnover forecasts (so that the optimal model for the entire period is often different from the model that is best in any one year). This means that, in addition to the analysis as carried out for turnover, the optimal ex-post model for each year is examined and the performance of the optimal prediction models is examined in rather more depth.

MULTIPLE FORM MODELS.

9.2. THE ABSOLUTE CHANGE MODEL.

Full details of the errors from the five absolute change models, both non-truncated and truncated at 1.00 or 100%, are provided in appendix 16. Table 1 below provides a summary of the ranks for the non-truncated errors derived from this data.

Table 1.

RANKS OF THE NON-TRUNCATED ERRORS FOR THE ABSOLUTE CHANGE MODELS.

p/a s/a p/f s/f

	1980				1981				1982				1983			
1 yr.	5	5	5	5	5	5	3	3	4	4	2	2	4	4	5	5
2 yr.	4	4	4	4	4	4	5	5	5	5	3	3	2	3	1	1
3 yr.	3	3	3	3	3	3	4	4	3	3	1	1	5	5	4	4
4 yr.	2	2	1	1	2	2	2	2	1	1	4	4	3	2	3	3
5 yr.	1	1	2	2	1	1	1	1	2	2	5	5	1	1	2	2

Average ranks

	1980	1981	1982	1983	p/a.	s/a.	p/f.	s/f.	Aver.	Overall
1 yr.	5	4	3	4.5	4.5	4.5	3.75	3.75	4.125	5
2 yr.	4	4.5	4	1.75	3.75	4	3.25	3.25	3.5625	4
3 yr.	3	3.5	2	4.5	3.5	3.5	3	3	3.25	3
4 yr.	1.5	2	2.5	2.75	2	1.75	2.5	2.5	2.1875	2
5 yr.	1.5	1	3.5	1.5	1.25	1.25	2.5	2.5	1.875	1

p/a mean absolute percentage error, denominator of actual
s/a mean squared error, denominator of actual
p/f mape, denominator of forecast
s/f mse, denominator of forecast

From this it is evident that the optimal single model is the same as that for turnover, namely the five year model. The consistency of this result is somewhat less than for turnover though. In particular, in 1980 it ranks equal first with the four year model, whilst in 1982 it ranks only fourth and is outperformed by all the models except the two year model. The relative lack of consistency of the ranks for profit forecasts compared to the turnover forecasts can be seen when the average ranks are considered. The maximum possible range is from 1 to 5. For turnover, the average ranks varied between 1.375 and 4.5 whilst for profits the range is smaller being from 1.875 to 4.125, although this is a considerably wider range than was found for some of the alternative models considered below. The ranks vary quite considerably if each year is considered separately but the same is not the case if, instead, the ranks are considered for each error measure over the four year period. In this case all four errors provide the same overall ordering of the models. There also appears to be some redundancy in using four error measures. For each year mape/forecast and mse/forecast provide identical results. The same holds for mape/actual and mse/actual in all years except 1983. It therefore appears that the important factor is whether the denominator is actual or forecast profits rather than whether a squared error or an average percentage error is used.

If the size of the errors are considered, it is seen that they are, as expected, generally much larger than those for turnover. In a few instances they are also exceptionally large. In particular, for mse/actual in 1980 the mean error for all five forms exceeds 100 and for mse/forecast exceptionally large errors occur in 1981 for the two and three year models, in 1982 for the two, four and five year models and in 1983 for the one, three and four year models. This implies that in these cases there are a few companies for which these models provide forecasts that are very inaccurate. That these large average errors are caused by a few outliers rather than by the forecasts for most of the companies can be seen when the truncated results are examined. If the models were seriously misspecified and most errors were therefore large then the truncated errors whould be near 1.0. Instead of this being the case the errors are no larger than those for the other models. Indeed they are often smaller than those for the other forms which have considerably smaller non-truncated errors. The existence of a few outliers illustrates the importance of also considering the truncated errors as such outliers may bias the conclusions drawn. Table 2, below, provides a summary of the ranks for the truncated errors and is also derived from the full results as reported in appendix 16.

Table 2.

AVERAGE RANKS OF THE TRUNCATED ERRORS FOR THE ABSOLUTE CHANGE MODELS.

	1980	1981	1982	1983	Average	Overall
1 yr.	5	5	4.5	2.75	4.3125	5
2 yr.	4	4	4.5	3	3.875	4
3 yr.	3	2.5	2.75	5	3.3125	3
4 yr.	2	2.5	2.25	3.25	2.5	2
5 yr.	1	1	1	1	1	1

This provides some evidence that the outliers have had the effect of masking a more consistent underlying pattern in most of the years. In 1980 all four error measures give the same results whilst a very similar pattern appears in 1981 and 1982, However, for 1983 apart from the clear supremacy of the five year model no pattern is apparent. Overall, the results for the truncated models are the same as those for the non-truncated errors, the only exception to this being that the five year model is also the best form of the model for 1982 rather than the three year model as found for the non-truncated errors. Indeed, the five year model is the best model for all combinations of error metric and year.

Appendix 17 provides details of both the spearman rank correlation coefficients and t-test results for the five forms of this model with non-truncated errors. If the correlations are considered, then it is apparent that the results are generally very similar to those found for the turnover forecasts. All the coefficients are significant at the 1% level and, in addition, with the exception of the two year model in 1983, are all in excess of 0.5 with most considerably higher than this. The results are also generally consistent in the sense that the nearer are the two forms of the model being compared then the higher is the correlation coefficient (again with the exception of the 1983 two year model). The correlations are generally higher than those reported for the turnover forecasts and the highest correlations are for the four and five year models.

The ranks of the models show that the best model is nearly always the five year model, but an examination of the t-test results suggests that the differences between this model and most of the other models are not significant. Table 3 below provides a summary of the errors that are significantly different at the 10% level for two-tailed probability tests.

Table 3.

SIGNIFICANT T-TESTS FOR NON-TRUNCATED ERRORS FOR THE ABSOLUTE CHANGE MODELS.

	mape/act.		mse/act.		mape/for.	
	T-value	Sign.	T-value	Sign.	T-value	Sign.
1981						
1/3 yr.	1.70	0.093				
1/4 yr.	1.77	0.080			2.03	0.045
1/5 yr.	1.81	0.073				
1982						
1/3 yr.	1.79	0.076				
1/4 yr.	1.93	0.056				
1/5 yr.	2.08	0.040				
1983						
1/5 yr.	1.71	0.090	1.83	0.071		
4/5 yr.	3.87	0.000	2.55	0.012		

If these results are compared to those for the turnover forecasts it can be seen that far fewer of the differences are now significant. Specifically, it appears that for forecasts of 1980 profit there are no significant differences between the average accuracy of the five models. The same is true for the other three years if mse/forecast is used to measure the errors. The other difference between these results and those for turnover are that most of the significant differences involve the least accurate model. So that, especially if mape/actual is used, it appears that in many cases the one year model produces forecasts that are significantly worse than those generated by the alternative models. Therefore, it appears that the choice of which form of the absolute change model to use is probably not very important. As long as the one year model is not used the other four models do not provide forecasts that are, on average, significantly different from each other. However, if only a subset of the sample companies are considered then the correlations reported in appendix 17 suggest that the choice of model may be rather more important.

If the truncated errors are considered a different pattern emerges. This can be seen if either all the results (see appendix 18) or the summary of the significant results (see table 4) are examined. If the truncated errors are compared to the non-truncated then there is evidence, again, that the outliers had the effect of hiding a clearer picture that holds for most of the companies. Considerably more of the differences are now significant and any conclusions derivable from these results are less dependent upon how the errors are measured. Most of the models that were significant for the non-truncated errors remain significant for the truncated errors. In addition to this, for 1980, the five year model appears to significantly outperform both the three and four year models. However, this is not the case for the two year model, due to the larger standard deviations of these forecasts. In 1981, in particular, the one year model is outperformed by all the other models whilst, again, there is some evidence that the five year model outperforms the other models. In the other two years the pattern of the

Table 4.

SIGNIFICANT T-TESTS FOR TRUNCATED ERRORS FOR THE ABSOLUTE CHANGE MODELS.

	mape/act.		mse/act.		mape/for.		mse/for.	
	T-value	Sign.	T-value	Sign.	T-value	Sign.	T-value	Sign.
1980								
3/4 yr.					1.97	0.051		
3/5 yr.	1.82	0.071			2.03	0.045	1.68	0.096
4/5 yr.			1.83	0.070			1.84	0.069
1981								
1/2 yr.					2.18	0.032	2.26	0.026
1/3 yr.	2.42	0.017	1.79	0.076	2.91	0.004	2.51	0.014
1/4 yr.	2.35	0.020	1.90	0.060	2.70	0.008	2.36	0.020
1/5 yr.	2.86	0.005	2.35	0.021	3.14	0.002	2.79	0.006
2/3 yr.					1.82	0.072		
2/5 yr.	1.69	0.093			1.96	0.052		
4/5 yr.	2.46	0.015	1.95	0.054	1.96	0.052	1.84	0.069
1982								
1/4 yr.	2.01	0.047	2.06	0.042				
1/5 yr.	2.12	0.036	2.05	0.043				
2/3 yr.					1.87	0.065	1.95	0.054
2/4 yr.	1.73	0.086	1.95	0.054				
2/5 yr.	1.78	0.077	1.80	0.075	1.84	0.069	1.66	0.099
1983								
1/3 yr.	-1.71	0.091	-2.07	0.041			-1.83	0.070
2/3 yr.	-1.96	0.053	-2.34	0.021	-2.10	0.038	-2.40	0.018
3/4 yr.	2.93	0.004	2.75	0.007	2.86	0.005	3.15	0.002
3/5 yr.	3.67	0.000	3.54	0.001	3.08	0.003	3.21	0.002
4/5 yr.	2.03	0.045	2.08	0.040				

mape mean absolute percentage error
mse mean squared error

results is far less clear cut. For both these years there are several significant differences for all the error measures and generally the pattern is similar for all four error measures. Overall then it appears that if truncated errors are considered then the choice of which form of this model to use is important. Generally the one year model is outperformed by the other models, whilst the five year model is very often significantly better at forecasting profits than are the other models. Thus these results are quite different from those for the non-truncated errors. Then the major conclusion appeared to be that in most cases the difference in the accuracy of the five models is not significant. Also whether or not any of the results are significant appears to depend upon which year is considered and, even more crucially, upon which error measure is used. These differences would appear to be due to the non-truncated outliers which often cause a large dispersion in the forecasts.

9.3. THE PERCENTAGE CHANGE MODEL.

Table 5 below provides a summary of the ranks of the five forms of the percentage change model for the non-truncated errors. These results are generated from the errors reported in appendix 16. In this case the results differ from those for forecasts of turnover. The optimal model over all four years and error measures is the four year model rather than the two year model (which in this case is ranked fourth). This is followed by the five year then the three year model whilst the worst model is the one year model. Only the result for the one year model is the same as that found for forecasts of turnover. Looking in more detail at the results it can be seen that the four year model is the best model for all four error measures in 1983 and is, on average, also the best model in 1980

Table 5.

RANKS OF THE NON-TRUNCATED ERRORS FOR THE PERCENTAGE CHANGE MODELS.

p/a s/a p/f s/f

	1980				1981				1982				1983			
1 yr.	5	5	5	5	5	5	5	5	5	4	5	5	5	5	5	5
2 yr.	4	4	4	4	3	4	4	3	4	5	4	4	4	4	2	2
3 yr.	3	3	3	3	2	2	2	2	1	1	3	3	3	3	3	3
4 yr.	1	1	1	2	1	1	3	4	2	2	1	1	1	1	1	1
5 yr.	2	2	2	1	4	3	1	1	3	3	2	2	2	2	4	4

Average

	1980	1981	1982	1983	p/a.	s/a.	p/f.	s/f.	Aver.	Overall
1 yr.	5	5	4.75	5	5	4.75	5	5	4.9375	5
2 yr.	4	3.5	4.25	3	3.75	4.25	3.5	3.25	3.6875	4
3 yr.	3	2	2	3	2.25	2.25	2.75	2.75	2.5	3
4 yr.	1.25	2.25	1.5	1	1.25	1.25	1.5	2	1.5	1
5 yr.	1.75	2.25	2.5	3	2.75	2.5	2.25	2	2.375	2

p/a mean absolute percentage error, denominator actual
s/a mean squared error, denominator actual
p/f mean absolute percentage error, denominator forecast
s/f mean squared error, denominator forecast

and 1982. For 1981 it is ranked equal with the five year model and both perform less well than the three year model. 1981 is also the year when the ranks generated by the four different error measures differ the most. Overall the 4 year model is ranked first in eleven of the sixteen combinations of year and error measures. If each error measure is aggregated across all four years then, for all four errors, the four year model is the optimal model. Overall the rankings both across error metrics and across years are more consistent then those for turnover. This can be seen when the average ranks are considered. For turnover, the average ranks varied between 2 and 3.75, a very narrow range, whilst for profit they vary between 1.5

and 4.9375 whch is not very much smaller than the maximum possible range. Again, it appears that there is much greater similarity between the ranks for errors with denominators of actual or forecasted profits than for errors defined in terms of either squared errors or absolute errors.

If the cases that give very large errors are examined, then it is evident that in most cases the model giving very large errors is the one year model. Specifically if the error is measured using mse/forecast the mean errors for this model are in excess of 100 in 1981, 1982 and 1983. If the error is measured using mse/actual then the same is true for the one year model in 1981 and 1983. In addition, for this error measure all the errors for 1980 are in excess of 100. If these results are compared with those for the absolute change models then the only cases where each model gives such large errors is for mse/actual in 1980. This appears to imply that, for at least some companies, the results for 1980 in particular diverged from any underlying pattern that may exist. If instead the errors are truncated at 1.00 it is evident, again, that these large errors are mainly caused by a few companies which have extremely large errors. This can be seen when the size of the truncated errors is considered. Whilst the one year model is on average the poorest predictor this is not so in all cases. For example, in 1983 it is ranked third overall and its average rank over the four years is only 3.5625 which is considerably less than the maximum possible of 5.0. This can be seen when the average ranks of the five models are considered as reported in table 6.

Table 6.

AVERAGE RANKS OF THE TRUNCATED ERRORS FOR THE PERCENTAGE CHANGE MODELS.

	1980	1981	1982	1983	Average	Overall rank
1 yr.	3.5	4.25	4	2.5	3.5625	5
2 yr.	3.25	2	3	4.5	3.1875	4
3 yr.	1	2	1.75	4.5	2.3125	1
4 yr.	4.5	2.75	3	1.75	3	3
5 yr.	2.75	4	3.25	1.75	2.9375	2

These results are rather surprising for two reasons. Firstly, there is very little agreement regarding the relative ranks of the models. The average ranks vary between 2.3125 and 3.5625, a range that is very narrow and also much smaller than that found for the non-truncated errors. If instead the ranks for each year are considered then again the degree of consistency across the four error measures is less in each year than was the case for the non-truncated errors. This is the reverse of the situation found for the absolute change models. It therefore appears that whilst the outliers for the absolute change models may have masked a considerably more consistent picture the reverse is true for the percentage change models. Why this is so is unclear and the result appears surprising. This suggests that the characteristics of the companies providing the outliers should, ideally, be examined in greater depth, however, this is beyond the scope of this work. Secondly, the optimal model differs from that for the non-truncated errors both over the entire period and in two of the years. Over all four years and four error measures the optimal model is the three year rather than the four year model. The relative ranks of these two models is now the reverse of that found for the non-truncated errors whilst the ranks of the other three models remain the same. If the four years are considered separately then the three year model is the best in 1980 for all four error measures. In 1981 it is ranked equal first with the two year model and they both have an average rank of 2.0 which shows that the results for the four errors differed quite considerably. In 1982 it was again ranked first, although again the ranks differed quite substantially depending upon how the errors were calculated. In 1983 it was ranked equal fourth behind all models except the two year model. The optimal models for this year were the four and five year models which each had an average rank of 1.75.

Appendix 19 gives details of the spearman rank correlation coefficients and t-tests for the five forms of the model for the non-truncated errors. Examining firstly the correlation coefficients, what is most striking is the similarity of these to those found for the forecasts of turnover and the absolute change forecasts. Again, all the correlations are significant at the 1% level and all are in excess of 0.5 with the exception of the two year model for 1983. This is the only model that does not provide coefficients that are consistent, so that these coefficients are lower than those found when the one year model is instead compared to the other three models. There appears to be no particular reason for this finding especially as this particular model did not appear to provide errors that were very different from those generated by the other models (however, this also occured for the turnover forecasts and for the absolute change models). Table 7 provides a summary of the significant t-tests for the five forms of this model.

Table 7.

SIGNIFICANT T-TESTS FOR NON-TRUNCATED ERRORS FOR THE PERCENTAGE CHANGE MODELS.

	mape/act.		mse/act.		mape/for.		mse/for.	
	T-value	Sig.	T-value	Sig.	T-value	Sig.	T-value	Sig
1981								
2/3 yr					2.08	0.040	1.87	0.064
2/5 yr					2.58	0.011	2.07	0.041
3/5 yr	-1.91	0.059					2.80	0.006
4/5 yr	-1.85	0.067						
1982								
1/2 yr					1.85	0.068		
1/3 yr					2.11	0.037		
1/4 yr					2.14	0.035		
1/5 yr					2.10	0.038		
2/3 yr					2.71	0.008		
2/4 yr					2.56	0.012		
2/5 yr					1.97	0.051		
3/4 yr	-2.38	0.019	-1.89	0.061	1.67	0.098		
3/5 yr	-2.25	0.027			2.22	0.029		
1983								
2/4 yr	1.72	0.088			2.53	0.013	2.05	0.042

Some of the conclusions that can be drawn from these results are similar to those for the absolute change model. Specifically, whether or not the means of the error distributions are significantly different is, in particular, dependent upon the year that is being considered. Again none of the differences are significant for 1980. However, this result is at least partly due to the differences in variances. In particular, the very large errors generated by the one year model in 1980 means that the variances of this form of the model are significantly larger than those of the other forms. In 1981 there are some significant differences, but no pattern appears to emerge. For 1983 only one case is significant, namely the two year model is significantly outperformed by the four year model. Most of the models give significant results for 1982 for errors measured by mape/forecast, but not for the other error measures. Unlike the situation for turnover forecasts there appears to be no explanation for the occurrence of these significant differences.

In the case of the absolute change models it was apparent that in most of the cases if the t-tests were significant for non-truncated errors they were also significant for truncated errors. If the results for the percentage change models with truncated errors are instead considered the case is rather different (see table 8 below and appendix 20).

Whilst again, there are rather more cases where the results are significant, there are relatively few cases where the results are significant for both the truncated and non-truncated errors. The results for 1980 appear to reinforce the conclusions regarding the effects of outliers. Across all four errors the forecasts from the four and five year models are significantly worse than those of the two and three year models. For errors with a

Table 8.

SIGNIFICANT T-TESTS FOR TRUNCATED ERRORS FOR THE PERCENTAGE CHANGE MODELS.

	mape/act. T-value	mape/act. Sign.	mse/act. T-value	mse/act. Sign.	mape/for. T-value	mape/for. Sign.	mse/for. T-value	mse/for. Sign.
1980								
1/4 y	-2.77	0.007	-2.89	0.005				
1/5 y	-3.00	0.003	-2.89	0.005				
2/4 y	-3.15	0.002	-3.13	0.002	-2.38	0.019	-2.01	0.047
2/5 y	-3.57	0.001	-3.35	0.001	-2.81	0.006	-2.23	0.028
3/4 y	-3.67	0.000	-3.43	0.001	-3.32	0.001	-3.02	0.003
3/5 y	-4.02	0.000	-3.54	0.001	-3.38	0.001	-2.51	0.013
1981								
1/2 y					2.29	0.024	2.48	0.015
1/3 y					2.48	0.015	2.37	0.020
1/4 y					1.99	0.049	2.26	0.026
1/5 y							2.14	0.034
2/5 y	-1.96	0.053						
3/4 y	-1.76	0.081						
3/5 y	-2.13	0.035						
1982								
1/2 y			1.90	0.061				
3/4 y	-1.91	0.059						
3/5 y	-2.53	0.013						
4/5 y	-1.73	0.087						
1983								
3/4 y	1.74	0.084			2.16	0.033		
3/5 y					2.30	0.023		

denominator of actual profits they are also worse than those for the one year model. Thus for 1980 it appears to be important not to choose either of these two forms of the model, but the choice between the other three forms is relatively unimportant. In the other three years whether or not any of the results are significant appears to depend upon how the errors are measured. Generally no consistent patterns emerge and very few of the differences are significant. There is limited evidence that in 1981 the one year model, which was the worst model, is significantly outperformed by all the other models.

9.4. THE MOVING AVERAGE MODEL.

Table 9 below provides a summary of the rankings of the five alternative forms of the moving average model for the non-truncated errors (derived from the errors as reported in appendix 16).

Table 9.

RANKS OF THE NON-TRUNCATED ERRORS FOR THE MOVING AVERAGE MODELS.

	1980				1981				1982				1983			
	p/a	s/a	p/f	s/f												
2 yr.	5	5	1	2	5	5	3	3	1	1	4	3	4	2	5	5
3 yr.	4	4	2	1	4	4	5	5	3	5	5	5	3	1	2	2
4 yr.	3	3	3	3	3	3	1	1	2	4	2	2	5	5	1	1
5 yr.	2	2	4	4	2	2	4	4	5	3	1	1	2	4	4	3
6 yr.	1	1	5	5	1	1	2	2	4	2	3	4	1	3	3	4

Average

	1980	1981	1982	1983	p/a	s/a	p/f	s/f	Aver	Overall
2 yr.	3.25	4	2.25	4	3.75	3.25	3.25	3.25	3.375	4
3 yr.	2.75	4.5	4.5	2	3.5	3.5	3.5	3.25	3.4375	5
4 yr.	3	2	2.5	3	3.25	3.75	1.75	1.75	2.625	1=
5 yr.	3	3	2.5	3.25	2.75	2.75	3.25	3	2.9375	3
6 yr.	3	1.5	3.25	2.75	1.75	1.75	3.25	3.75	2.625	1=

These results differ greatly from those found for turnover forecasts. For those the optimal model was the two year model which provided the smallest errors across all years and errors. For forecasts of profit the two year model is the optimal model only in 1982 for mape/actual errors and mse/actual errors. Not only are the results much less consistent than those found for the turnover forecasts but they are also less consistent than those for profit forecasts derived from either of the two models considered above. Overall, the four and six year models are ranked equal first. If the error is measured with actual profits as the denominator then the optimal model is the six year model whilst if the denominator is taken to be forecasted profit then this model performs relatively badly and instead the optimal model is the four year model. This lack of overall supremacy by any one model is also seen when the average ranks are examined. These vary between 2.625 and 3.375, so that the overall performance of all the models are fairly similar. This range is, in addition, considerably smaller than that found for either of the two models considered previously. This disagreement as to which is the best model also occurs if the ranks are aggregated either across years for each error measure or across error measures for each year. Again, in each year the errors with a denominator of forecasted profits perform in virtually the same way. In 1980 and 1981 the other two errors have equal ranks, which are often very different from the forecast based errors. If each year is considered separately then the three year model performs the best in 1980 and 1983, the six year model performs the best in 1981 and the four and five year models are the best in 1982. Thus overall no one form of this model consistently outperforms the rest and there is little to choose between the five forms. Only if the errors are considered on a year by year basis and only averaged across either forecast or actual profit based errors can any very definite conclusions be drawn. This lack of consistency suggests that the moving average model of earnings is seriously misspecified. This would seem to imply that it will generally produce forecasts that are less accurate than those generated by the alternative models. Whether or not this is the case will be examined later. However, if the actual errors generated, as reported in appendix 16, are considered it appears that these models generate far fewer very large errors than do either the absolute or percentage change models. For example, the only cases where the mean error exceeds 100 are for the mse/forecast errors, in 1981 and 1982 for the three year model and in 1983 for the two year model. Generally the errors are considerably smaller than this and very few average errors exceed 10. Although there are relatively few cases where the errors are very large it does appear that the inclusion of these cases masks a much more consistent pattern that is apparent if the truncated errors are instead considered. The ranks for these errors are shown in table 10.

Table 10.

AVERAGE RANKS OF THE TRUNCATED ERRORS FOR THE MOVING AVERAGE MODELS.

	1980	1981	1982	1983	Average	Overall rank
2 yr.	1.25	1.75	1	4.25	2.0625	1
3 yr.	1.75	2.75	2	4.75	2.8125	2
4 yr.	3	2.5	3	3	2.875	3
5 yr.	4	3.5	4	1.5	3.25	4
6 yr.	5	4.5	5	1.5	4	5

Not only are these results much more consistent across at least three years and all errors but they are much more like those found for turnover forecasts. The ranks for 1982 are exactly the same as those found for all years for turnover forecasts whilst those for 1980 and 1981 are very similar. Only 1983 provides a conflicting picture so that, on average, the optimal model is the two year model, although it is ranked fourth in 1983. The overall results also provide a consistent picture, if the two year model is the optimal model then it would be expected that the model that is most similar to this would be the second best and so on. For these truncated errors this is the case. This suggests that for most companies this model is reasonably well formulated and it was the behaviour of a minority of companies that caused the somewhat contradictory findings for the non-truncated errors.

Appendix 21 gives details of the spearman correlation coefficients and t-test results for the five forms of this model for non-truncated errors whilst table 11 below provides a summary of the significant t-tests. Examining the correlations it is apparent that they again provide a consistent picture. Without exception the correlations are higher for two and three year models than for the two and four year models etc. Also, generally, the correlations are fairly high. However, they are nearly always less than those for the turnover forecasts. This is what would be expected given that the profit forecasts are less accurate. These correlations can be compared with the pearson correlation coeffecients reported in the t-test results. There are some interesting differences between

Table 11.

SIGNIFICANT T-TESTS FOR NON-TRUNCATED ERRORS FOR THE MOVING AVERAGE MODELS.

	mape/act.		mse/act.		mape/for.		mse/for.	
	T-value	Sig.	T-value	Sig.	T-value	Sig.	T-value	Sig.
1980								
2/4 y					-2.65	0.009		
2/5 y					-2.68	0.008		
2/6 y					-1.86	0.066		
3/4 y					-4.59	0.000	-2.15	0.034
3/5 y					-2.80	0.006		
3/6 y					-1.83	0.069		
4/5 y					-2.26	0.026		
1981								
5/6 y	2.17	0.032	1.93	0.056				
1982								
2/4 y	-1.70	0.093					1.79	0.076
2/5 y	-2.30	0.024					2.24	0.027
2/6 y	-2.59	0.011						
4/5 y							2.66	0.009
1983								
4/6 y	1.68	0.096						
5/6 y	2.31	0.023						

the parametric and non-parametric correlations. The pearson correlations are generally much higher, although this is not always the case. In particular, for errors measured by mape/forecast and mse/forecast, several of these correlations are not significant. There are even some cases where the correlation coeffients are negative. In these cases the paired t-test as carried out here is probably not a valid test. However, these cases are fairly infrequent, and in no case is the correlation negative and the t-test result significant.

The most striking feature of the t-test results for turnover forecasts was the fact that they were all significant at the 5% level or less. This meant that the choice of which form of the model to choose was always important. This is not the case for the profit forecasts. If any general conclusions can be drawn from the t-tests for the non-truncated errors it is that the choice of forecasting method is generally not important if one is interested in the average forecast. Very few of the differences are significant at the 10% level and there appears to be no pattern in the results over either years or error measures. The position is very different for the truncated errors. These results (a summary of which is given in table 12 and the full results in appendix 22) again support the conclusion that the outliers should be truncated as they often mask significant differences. The results are much more similar to those found for turnover than they are to the non-truncated profit forecast errors. This is especially the case for errors with a denominator of forecasted profit. In particular, in 1980 for these two error measures all the differences are significant. For mape/forecast in 1981 and 1982 nine of the ten differences are significant whilst for mse/forecast the respective figures are eight and five. Similarly, in 1980 and 1982, the majority of the results for mape/actual are significant. It is only in 1983 that a minority of the differences are significant, although even here it appears that in most cases the two and three year models perform significantly better than do the other models. Overall, providing the error is not measured by mse/actual then the choice of which form of the moving average model to use is an important decision.

Table 12.

SIGNIFICANT T-TESTS FOR TRUNCATED ERRORS FOR THE MOVING AVERAGE MODELS.

	mape/act.		mse/act.		mape/for.		mse/for.	
	T-vale	Sig.	T-value	Sig.	T-value	Sig.	T-value	Sig.
1980								
2/3 y.					-2.52	0.013	-2.14	0.035
2/4 y.					-4.36	0.000	-3.97	0.000
2/5 y.	-1.95	0.053			-5.31	0.000	-5.09	0.000
2/6 y.	-2.51	0.013			-6.09	0.000	-5.93	0.000
3/4 y.	-2.07	0.041			-5.21	0.000	-5.00	0.000
3/5 y.	-2.25	0.026			-5.76	0.000	-5.48	0.000
3/6 y.	-2.85	0.005			-6.43	0.000	-6.14	0.000
4/5 y.	-2.03	0.044			-5.61	0.000	-5.03	0.000
4/6 y.	-2.84	0.005			-6.28	0.000	-5.79	0.000
5/6 y.	-3.40	0.001	-2.55	0.012	-5.95	0.000	-5.54	0.000
1981								
2/4 y.					-2.27	0.025	-2.12	0.036
2/5 y.					-3.18	0.002	-2.79	0.006
2/6 y.					-4.24	0.000	-3.87	0.000
3/4 y.					-2.04	0.044		
3/5 y.					-3.19	0.002	-2.55	0.012
3/6 y.					-4.42	0.000	-3.82	0.000
4/5 y.	-1.84	0.068			-3.38	0.001	-2.86	0.005
4/6 y.	-2.17	0.032			-4.83	0.000	-4.44	0.000
5/6 y.	-2.01	0.047			-5.56	0.000	-5.34	0.000
1982								
2/3 y.	-2.89	0.005	-2.37	0.019	-2.08	0.040		
2/4 y.	-2.58	0.011	-1.96	0.053	-2.37	0.020		
2/5 y.	-3.25	0.002	-2.52	0.013	-3.11	0.002	-2.04	0.044
2/6 y.	-3.54	0.001	-2.78	0.006	-3.80	0.000	-2.73	0.007
3/5 y.					-2.24	0.027		
3/6 y.	-2.01	0.047			-3.03	0.003	-2.31	0.023
4/5 y.	-1.78	0.078			-2.12	0.037		
4/6 y.	-2.35	0.020	-2.15	0.034	-3.13	0.002	-2.59	0.011
5/6 y.	-2.41	0.017	-2.58	0.011	-3.75	0.000	-4.10	0.000
1983								
2/4 y.			1.76	0.081				
2/5 y.	1.83	0.070	2.07	0.041				
2/6 y.	2.00	0.048	2.38	0.019				
3/4 y.	2.45	0.016	2.25	0.027	2.51	0.014	2.40	0.018
3/5 y.	2.37	0.019	2.26	0.026	2.19	0.031	2.25	0.027
3/6 y.	2.37	0.019	2.45	0.016				

9.5. THE EXPONENTIAL SMOOTHING MODEL.

As explained in chapter 6, 19 forms of the exponential smoothing model were employed, that is with a smoothing constant from 0.95 to 0.05 in steps of 0.05. Each form of the model weights the past earnings in a different manner. At one extreme if the weight is 0.95 then future profits are predominantly a function of only the last years profits, whilst at the other extreme higher weights are given to profits in earlier years. Ideally this model should include all past profits but due to data limitations the series has been arbitrarily limited to the period from 1973. Given the relatively long time period being considered this should have little practical effect. Looking firstly at the non-truncated errors (see table 13 below and appendix 16) it is apparent that no clear pattern emerges. If the ranks are considered on a year by year basis then, for 1980, the optimal model is either a weighting of 0.45 or 0.40, although only for one error measure was either of these the optimal model. In 1981 the best model is a weighting of 0.10, which is optimal for no single error measure. In 1982 it was 0.95 and 0.90, again optimal in one instance only and for 1983 0.15 which in this case was the best model in three cases. Especially for 1981 and 1983 these results appear rather surprising as weights of 0.10 and 0.15 give very little importance to the more recent history of the earnings stream. This is even more the case in 1980 for mape/actual and mse/actual where the results are the complete reverse of what might

Table 13.

AVERAGE RANKINGS OF THE NON-TRUNCATED ERRORS FOR THE EXPONENTIAL SMOOTHING MODELS.

	ap /a	se /a.	ap /f.	se /f.	ap /a.	se /a.	ap /f.	se /f.	ap /a.	se /a.	ap /f.	se /f.	ap /a.	se /a.	ap /f.	se /f.
	1980				1981				1982				1983			
0.95	19	19	15	17	14	19	1	1	2	4	2	6	18	19	2	5
0.90	18	18	11	15	13	18	8	12	1	3	3	7	17	18	5	7
0.85	17	17	7	12	11	17	2	2	3	2	15	15	16	17	7	9
0.80	16	16	4	9	12	16	5	8	4	1	7	9	15	16	12	13
0.75	15	15	6	10	16	15	16	16	5	5	11	12	14	15	15	15
0.70	14	14	17	18	17	14	19	19	6	6	16	16	12	14	14	12
0.65	13	13	19	19	19	13	6	6	7	7	19	19	11	13	16	14
0.60	12	12	9	13	18	12	3	3	8	8	12	13	10	12	10	16
0.55	11	11	3	7	15	11	4	4	9	9	14	14	9	10	11	10
0.50	10	10	1	4	10	10	7	10	10	10	5	8	8	9	19	18
0.45	9	9	2	2	9	9	14	15	11	11	10	11	6	6	9	8
0.40	8	8	5	1	8	8	12	13	12	12	18	18	5	4	6	6
0.35	7	7	8	3	7	7	18	18	13	13	1	1	1	5	18	19
0.30	6	6	10	5	4	6	15	14	14	14	8	10	2	8	13	11
0.25	5	5	12	6	1	5	17	17	15	17	4	4	3	7	17	17
0.20	4	4	13	8	5	4	9	9	16	16	6	5	4	3	3	4
0.15	3	3	14	11	6	3	10	5	17	15	17	17	7	1	1	1
0.10	2	2	16	14	3	2	11	7	18	18	9	3	13	2	4	2
0.05	1	1	18	16	2	1	13	11	19	19	13	2	19	11	8	3

Average ranks

	1980	1981	1982	1983	p/a.	s/a.	p/f.	s/f.
0.95	17.5	8.75	3.5	11.00	13.25	15.25	5.00	7.25
0.90	15.5	12.75	3.5	11.75	12.25	14.25	6.75	10.25
0.85	13.25	8	8.75	12.25	11.75	13.25	7.75	9.5
0.80	11.25	10.25	5.25	14	11.75	12.25	7	9.75
0.75	11.5	15.75	8.25	14.75	12.5	12.5	12	13.25
0.70	15.75	17.25	11	13	12.25	12	16.5	16.25
0.65	16	11	13	13.5	12.5	11.5	15	14.5
0.60	11.5	9	10.25	12	12	11	8.5	11.25
0.55	8	8.5	11.5	10	11	10.25	8	8.75
0.50	6.25	9.25	8.25	13.5	9.5	9.75	8	10
0.45	5.5	11.75	10.75	7.25	8.75	8.75	8.75	9
0.40	5.5	10.25	15	5.25	8.25	8	10.25	9.5
0.35	6.25	12.5	7	10.75	7	8	11.25	10.25
0.30	6.75	9.75	11.5	8.5	6.5	8.5	11.5	10
0.25	7	10	10	11	6	8.5	12.5	11
0.20	7.25	6.75	10.75	3.5	7.25	6.75	7.75	6.5
0.15	7.75	6	16.5	2.5	8.25	5.5	10.5	8.5
0.10	8.5	5.75	12	5.25	9	6	10	6.5
0.05	9	6.75	13.25	10.25	10.25	8	13	8

	Average	Overall rank
0.95	10.1875	12=
0.90	10.875	16
0.85	10.5625	14
0.80	10.1875	12=
0.75	12.5625	17
0.70	14.25	19
0.65	13.375	18
0.60	10.6875	15
0.55	9.5	9=
0.50	9.3125	8

	Average	Overall
0.45	8.8125	4
0.40	9	5
0.35	9.125	6=
0.30	9.125	6=
0.25	9.5	9=
0.20	7.0625	1
0.15	8.1875	3
0.10	7.875	2
0.05	9.8125	11

be expected. If the results are examined in more detail it can be seen that these results appear to be at least partially caused by the different results found for errors with a denominator of actual profits and those with a denominator of forecasted profits. Thus the optimal weight for mape/forecast is 0.95 whilst this is the lowest ranked form for mape/actual and mse/actual. Although there is this difference between the results depending upon how the error is measured there is more diversity in the results when all four years are aggregated across each error than when each error measure is aggregated across all the years. This can be seen when the range of the average ranks is considered. Overall the optimal weight is 0.20 even though in no single case is this the best form, whilst the worst is 0.70. The average ranks vary from 7.0625 to 14.25, a range which is considerably smaller than the maximum possible range of 1 to 19. There is no clear pattern overall, although in very many cases the optimal weight appears to be very small. Especially for 1980 and for errors with a denominator of actual in 1981 and 1983, the general pattern of the results appears to be counter-intuitive and the opposite of the results for turnover forecasts. For turnover forecasts it was found that for all years and errors the optimal model had a weighting of 0.95. Again, one reason for these results appears to be the incidence of outliers especially in the cases of the larger smoothing constants. For example, if the results for 1980 for a constant of 0.95 are considered the removal of the company with the largest error provides results that are very different. For mape/actual the average error falls from 1.64 to 0.879, which is smaller than any of the errors reported in table 13, for mse/actual the difference is even greater, from 67.208 to 2.758 whilst for mse/forecast the mean error falls to approximately one half, from 13.255 to 6.524. The effect of truncating all errors to 1.00 can be seen in appendix 16, summarised in table 14 below.

Table 14.

AVERAGE RANKS OF THE TRUNCATED ERRORS FOR THE EXPONENTIAL SMOOTHING MODELS.

	1980	1981	1982	1983	Average	Overall
0.95	5	6.75	2.5	4.25	4.625	2
0.90	7.5	3.25	5.5	4	5.0625	3
0.85	7.25	1	5.5	4.5	4.5625	1
0.80	7.25	3.75	4.5	5.25	5.1875	4
0.75	7	3.5	5.75	7.5	5.9375	5
0.70	8.25	4	5	9.5	6.6875	7
0.65	6.5	5.75	5	11	7.0625	8
0.60	6.25	8	2.25	9.25	6.4375	6
0.55	7	9.5	9	11.25	9.1875	9
0.50	7.25	9.5	10	11.25	9.5	10
0.45	8.75	11	11	9.25	10	11
0.40	9.5	12.25	12	8.75	10.625	12
0.35	10.75	13.25	13	8.5	11.375	13
0.30	12	13.5	14	9.5	12.25	14
0.25	13.5	15	15	12.25	13.9375	15
0.20	12.25	16	16	12.25	14.125	16
0.15	17	17	17	14.25	16.4375	17
0.10	18	18	18	18	18	18
0.05	19	19	19	19	19	19

The results are not as clear cut as those for turnover but they are much more consistent than those reported above and are very similar to what would be expected.

If the results for all four years combined are considered then the average ranks vary between 4.5625 and 19 rather than the 7.0625 to 14.25 for the non-truncated errors, a much wider range. The optimal model is a constant of 0.85 followed by 0.95 and then 0.90. Generally the results give a consistent picture with the models performing less well as the constant decreases or as less weight is placed upon the most recent history. If instead, the results are considered on a year by year basis, then the best model in both 1980 and 1982 is a weighting of 0.95. This is also the second best in 1983, being outperformed by a weight of 0.90. Only for 1981 is the smoothing constant of 0.85 the optimal weight.

Appendix 23 provides details of the spearman rank correlation coefficients for the non-truncated errors. Generally these results are similar to those that would be expected, that is, the nearer are the two weights then the higher the correlation coefficient. Surprisingly, the correlations are often higher than those found for turnover forecasts (see appendix 12) for weights that are similar to each other. However, for the turnover forecasts all the correlations were significant at the 1% level and the smallest coefficient was 0.3587. For the profit forecasts several of the coefficients are much smaller than this, indeed even negative, and are not significant. This is especially the case when errors are measured with a denominator of forecasted profits and for all errors in 1983. In particular, this occurs very often when weights of either 0.10 or 0.05 are correlated with the alternative weights. For the truncated errors (see appendix 23) the pattern is similar. Again, the correlations involving weights of either 0.10 or 0.05 are often not significant. The correlations are often lower than those for non-truncated errors, a result which appears to be counterintuitive. If the t-tests for the non-truncated errors are considered (see table 15 and the full results in appendix 24) then it can be seen that they are very different from those for turnover forecasts. Specifically, for turnover forecasts it was found that all the differences were significant when the error was defined as mape/actual. For profit forecasts none of the differences are significant in either 1980 or 1981. Whilst the results would be different if the error was measured in an alternative manner there appears to be no evidence to suggest that they would be very different. In 1982, it appears to be important not to choose a very small weight. There are no significant differences between any pairs of weights between 0.95 and 0.60 but the majority of the alternative combinations yield significant differences. These results are interesting as 1982 is the only year when the ranks of the models are as one would expect and this is supported by the results for the t-tests. In 1983 there are very few differences that are significant and, again, these involve the lowest ranked weights rather than

Table 15.

SIGNIFICANT T-TESTS FOR NON-TRUNCATED ERRORS OF THE EXPONENTIAL SMOOTHING MODELS.

MAPE/ACTUAL

	0.95	0.90	0.85	0.80	0.75	0.70	0.65	0.60	0.55	0.50	0.45	0.40	0.35	0.30	0.25	0.20	0.15	0.10
1982																		
0.55							.059	.020										
0.50					.083	.049	.023	.010	.006									
0.45			.091	.065	.042	.023	.011	.006	.003	.002								
0.40	.097	.072	.053	.036	.022	.012	.006	.004	.002	.002	.002							
0.35	.055	.039	.027	.017	.010	.005	.003	.002	.001	.001	.001	.001						
0.30	.024	.016	.010	.006	.003	.002	.001	.001	.001	.000	.001	.001	.001					
0.25	.007	.004	.003	.001	.001	.000	.000	.000	.000	.000	.001	.002	.005	.015				
0.20	.001	.001	.000	.000	.000	.000	.000	.000	.000	.001	.002	.006	.015	.035	.070			
0.15	.000	.000	.000	.000	.000	.000	.000	.000	.001	.003	.008	.019	.038	.074				
0.10	.000	.000	.000	.000	.000	.000	.001	.002	.004	.011	.025	.047	.079					
0.05	.000	.000	.000	.000	.000	.001	.003	.007	.016	.032	.057	.091						
1983																		
0.90	.021	.023																
0.85	.020	.049																
0.80	.031																	
0.75	.063																	
0.10															.067	.043	.023	
0.05											.077	.054	.042	.030	.019	.014	.009	.006

Table 16.

SIGNIFICANT T-TESTS FOR TRUNCATED ERRORS OF THE EXPONENTIAL SMOOTHING MODELS.

MAPE/ACTUAL

	0.95	0.90	0.85	0.80	0.75	0.70	0.65	0.60	0.55	0.50	0.45	0.40	0.35	0.30	0.25	0.20	0.15	0.10
1980																		
0.40											.093							
0.35											.083	.080						
0.30									.096	.069	.056	.048	.033					
0.25						.097	.064	.046	.033	.023	.017	.012	.006	.002				
0.20	.081	.073	.062	.052	.044	.036	.024	.017	.012	.008	.007	.005	.003	.002	.002			
0.15	.034	.030	.026	.022	.018	.015	.010	.007	.005	.004	.003	.002	.002	.001	.001	.002		
0.10	.017	.015	.014	.012	.010	.009	.006	.005	.004	.003	.003	.002	.002	.002	.003	.006	.022	
0.05	.003	.003	.002	.002	.002	.002	.001	.001	.001	.000	.000	.000	.000	.000	.000	.001	.002	.000
1981																		
0.55			.078	.056			.083											
0.50			.082	.078														
0.45			.051	.053						.064								
0.40		.089	.042	.044	.081	.095	.089	.095										
0.35	.090	.052	.025	.027	.050	.059	.055	.059	.077	.068	.097	.064						
0.30	.059	.035	.017	.020	.036	.043	.042	.048	.065	.062	.092							
0.25	.028	.017	.009	.010	.019	.023	.024	.029	.040	.040	.058	.069	.089	.052				
0.20	.011	.007	.003	.004	.008	.010	.010	.013	.019	.019	.028	.036	.045	.031	.034			
0.15	.004	.002	.001	.001	.003	.004	.004	.005	.007	.007	.011	.013	.015	.012	.014	.025		
0.10	.000	.000	.000	.000	.000	.001	.001	.001	.001	.001	.002	.002	.003	.002	.004	.006	.003	
0.05	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

1982

0.55							.057	.042										
0.50	.030	.036	.030	.030	.038	.027	.005	.007	.006									
0.45	.004	.005	.004	.005	.008	.007	.002	.003	.007	.009								
0.40	.002	.002	.002	.003	.006	.006	.003	.003	.008	.012	.021							
0.35	.001	.001	.001	.002	.004	.005	.003	.003	.003	.006	.009	.015						
0.30	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000					
0.25	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000				
0.20	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000			
0.15	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000		
0.10	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	
0.05	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

1983

0.75	.073	.046	.047	.081														
0.70	.055	.055	.069															
0.65	.067	.070	.081															
0.15												.072	.048	.056	.097	.069		
0.10	.008	.008	.008	.009	.011	.017	.020	.019	.015	.013	.008	.003	.002	.002	.003	.001	.000	
0.05	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

the more successful models.

Table 16 provides a summary of the results for the truncated errors (see appendix 24 for full details). These also provide evidence that the outliers had hidden a clearer underlying picture. Generally the results for all four years are similar to those found in 1982 for the non-truncated errors. In the three years 1980 to 1982 the models that have the lowest ranks perform significantly less well than the alternative models. In 1980 there are no significant differences between any combinations of models with weights of 0.95 to 0.45, and in 1981 and 1982 no significant differences between combinations of weights of 0.95 to 0.50. Outside these ranges the majority of the differences appear to be significant. For 1983 there are significant differences between weights of 0.95 to 0.85 and 0.75 to 0.65 and it also appears important not to use weights of 0.15,0.10 or 0.05.

9.6. COMPARISON OF ALL MODELS

Having examined the behaviour of the errors generated from the multiple form models the optimal form of each of these four models can now be compared with the alternative models. This will be carried out firstly for the non-truncated errors and then a similar analysis made of the truncated errors. This will be done using the three step process described in chapter 8. Firstly, the form of each model that is, on average, optimal over the entire four year period will be compared. Then, because of the instability of the optimal models over this period, a similar analysis will be carried out using the optimal form of each model for each of the years 1981 to 1983. Finally the optimal form of each model will be used to predict the profits of the next year, that is ex-ante rather than ex-post optimal models will be employed.

9.7 THE OPTIMAL SINGLE MODEL.

When non-truncated errors are considered then, over the period 1980 to 1983, the most accurate form of the absolute change model is the 5 year model. Similarly, the optimal form of the other three multiple form models are the 4 year percentage change model, the 4 or 6 year moving average model and an exponentially weighted moving average model with a weight of 0.20. The desire for a parsimonious model means that for the moving average model the 4 year model will be used. The other two consolidated based models are the random walk and the regression model. The procedure used to choose the regression model was the same as that used for forecasting turnover. This produced three models as follows:

$$
\begin{aligned}
P_{1981} = 0.43987 &+ (P_{1980} \times 0.89850) + (P_{1976} \times 1.20030) \\
&- (P_{1974} \times 0.52991) - (P_{1975} \times 0.60982) \\
&- (P_{1979} \times 0.05123)
\end{aligned}
$$

$$P_{1982} = 1.35425 + (P_{1981} \times 1.02532) - (P_{1979} \times 0.12069) + (P_{1975} \times 0.70929) - (P_{1974} \times 0.57702)$$

$$P_{1983} = 3.47681 + (P_{1982} \times 0.93150) + (P_{1974} \times 0.86249) - (P_{1981} \times 0.27769) + (P_{1978} \times 0.51910) - (P_{1977} \times 0.40624)$$

When these are compared with the models used to forecast turnover then there are some interesting differences. In this case all the constant terms are positive. Again, the first term in all cases is the profit of the preceding year and is also positive, but only in one case is the weighting greater than 1.0. In both 1981 and 1983 considerably more terms enter into the equations than was the case for turnover forecasts.

Table 17 below provides details of the ranks of the 12 models (for full details see appendix 25). Comparing firstly the performance of the 6 segment models with the 6 consolidated models it can be seen that generally the consolidated models are clearly superior. Overall, all the segment models are outperformed by the other 6 models. This also holds true for each of the three years. If the ranks for each year and each error metric are examined then there are 7 cases where consolidated models are outperformed by at least one segment model (from a maximum of 72 cases). This occurs once in 1981 when the absolute change model is outperformed by segment model 1 if the error is measured by mse/actual profit. In 1982 this occurs five times, and when the error is measured by

Table 17.

AVERAGE RANKS OF THE NON-TRUNCATED ERRORS FOR THE OPTIMAL SINGLE MODELS

	1981				1982				1983			
	p/a	s/a	p/f	s/f	p/a	s/a	p/f	s/f	p/a	s/a	p/f	s/f
RW	3	5	1	1	1	2	2	3	4	4	3	3
AC	6	7	2	2	2	3	12	12	6	5	6	12
PC	1	1	6	6	4	1	4	4	2	1	5	5
MA	5	3	3	3	6	12	1	1	3	6	2	1
ES	2	2	5	4	5	5	3	2	1	2	4	4
Re	4	4	4	5	3	4	11	11	5	3	1	2
S1	7	6	12	12	8	7	9	9	8	8	11	10
S2	8	8	10	10	9	8	8	8	10	10	9	8
S3	11	11	8	8	11	10	5	5	12	12	7	6
S4	10	10	9	9	10	9	7	6	11	11	8	7
S5	12	12	7	7	12	11	6	7	9	9	10	9
S6	9	9	11	11	7	6	10	10	7	7	12	11

Average rank

	1981	1982	1983	mape/a	mse/a	mape/f	mse/f	Aver.	Overall
RW	2.5	2	3.5	2.67	3.67	2	2.33	2.667	1
AC	4.25	7.25	7.25	4.67	5	6.67	8.67	6.25	6
PC	3.5	3.25	3.25	2.33	1	5	5	3.33	3
MA	3.5	5	3	4.67	7	2	1.67	3.833	4
ES	3.25	3.75	2.75	2.67	3	4	3.33	3.25	2
Re	4.25	7.25	2.75	4	3.67	5.33	6	4.75	5
S1	9.25	8.25	9.25	7.67	7	10.67	10.33	8.916	9=
S2	9	8.25	9.25	9	8.67	9	8.67	8.833	7=
S3	9.5	7.75	9.25	11.33	11	6.67	6.67	8.833	7=
S4	9.5	8	9.25	10.33	10	8	7.33	8.916	9=
S5	9.5	9	9.25	11	10.67	7.67	7.67	9.25	12
S6	10	8.25	9.25	7.67	7.33	11	10.67	9.166	11

mse/actual then the moving average model is ranked last. When the error is measured with a denominator of forecasted profits then the regression model is ranked eleventh and the absolute change model twelfth.

This conclusion, that the segment models are outperformed by the consolidated models, reinforces similar findings for the turnover forecasts. For the profit forecasts this conclusion is far more definite as there are considerably less cases where it fails to hold. Also, again, the worst two models are the ex-post models which provides further evidence that they are seriously misspecified. There is also more evidence that the choice of error measure is important. The important decision is the choice of denominator rather than choice of numerator, and in certain cases, these errors may give results that are quite different.

Looking just at the segmental models then the best two models are model 2 and 3 (i.e. U.K. x expected inflation and all areas x expected U.K. inflation). For turnover forecasts the best segment model was model 2. However, overall there is little to choose between the various segment models, indeed in 1983 all 6 models are ranked equal. Overall, there is much less difference in the relative performance of the segment models than was the case for turnover forecasts. For turnover the average ranks varied between 6.83 and 9.63 rather than the 8.83 to 9.25 for the profit forecasts. The most accurate model overall is the random walk model. This is not surprising given the results of much of the prior empirical work in this area (eg. Gonedes 1972, Whittred 1978, Ruland 1979, Firth 1982 all found that this was the best model). On a year by year basis this is the optimal model in both 1981 and 1982 whilst it is ranked fifth in 1983 and the best models are the regression and exponential smoothing models. In spite of this overall supremacy the random walk model is ranked first for only three of the twelve year and error combinations examined. The moving average model is also ranked first three times in spite of its relatively low overall rank (fourth) and the percentage change model is ranked first in four cases (overall rank third). With the exception of the relatively poor performance of the absolute change model there appears to be little difference in the performance of the consolidated models. The rank of the absolute change model is somewhat surprising given that it was found to be the optimal model when turnover forecasts were examined.

Table 18 below gives details of the actual mean average percentage errors with a denominator of actual earnings. That is, the actual rather than absolute errors are used. This gives information upon whether the models, on average, under or overestimate profits. There appear to be some interesting differences both across years and across the models. The only model which gives consistent results is the exponential smoothing models which all underestimate earnings in all three years. These models all assume that future earnings are a function of past earnings with a total weight of 1.0, so that future earnings are a combination of past earnings with no growth element built in. As might be expected the error generally appears to increase as the more recent history of earnings is weighted less highly. The random walk model overestimates earnings in 1981 and underestimates in the other two years. Similar results also apply to the other consolidated models. More forms of the absolute change, percentage change and moving average models provide

Table 18.

MEAN ACTUAL PERCENTAGE ERRORS. (Forecast - Actual)/Actual.

	1981		1982		1983	
	Mean	Std.Dev.	Mean	Std.Dev.	Mean	Std.Dev.
Random W.	0.568	4.604	-0.134	1.225	-0.395	1.058
Absolute Change						
1 yr.	0.299	14.092	-0.363	3.703	-0.458	1.746
2 yr.	1.017	7.643	-0.692	5.351	-0.350	1.605
3 yr.	0.928	6.753	0.023	1.407	-0.710	2.619
4 yr.	0.847	6.074	0.016	1.247	-0.459	1.552
5 yr.	0.812	5.585	-0.021	1.291	-0.427	1.429
Percentage Change						
1 yr.	-1.477	11.149	-1.477	11.149	-1.151	10.554
2 yr.	-0.280	4.818	-0.324	1.757	-0.516	2.325
3 yr.	0.127	1.760	-0.070	1.057	-0.489	1.525
4 yr.	0.337	1.626	-0.049	1.119	-0.308	0.734
5 yr.	0.340	4.269	0.004	1.176	-0.314	0.891
Moving Average						
2 yr.	0.703	5.162	-0.020	1.403	-0.363	0.801
3 yr.	0.359	4.052	0.314	3.661	-0.403	0.768
4 yr.	0.141	3.736	0.084	2.994	-0.165	1.662
5 yr.	0.004	3.508	-0.080	2.731	-0.160	1.328
6 yr.	-0.105	3.205	-0.183	2.522	-0.171	1.133
Exponential Smoothing						
0.95	-0.164	0.991	-0.208	0.901	-0.433	0.916
0.90	-0.165	1.003	-0.193	0.831	-0.428	0.888
0.85	-0.171	1.019	-0.185	0.770	-0.422	0.860
0.80	-0.179	1.042	-0.179	0.726	-0.416	0.832
0.75	-0.189	1.073	-0.174	0.701	-0.407	0.804
0.70	-0.199	1.112	-0.172	0.691	-0.396	0.777
0.65	-0.212	1.159	-0.176	0.691	-0.388	0.745
0.60	-0.226	1.212	-0.186	0.702	-0.380	0.708
0.55	-0.242	1.271	-0.200	0.730	-0.370	0.669
0.50	-0.265	1.329	-0.220	0.771	-0.359	0.627
0.45	-0.298	1.390	-0.245	0.826	-0.348	0.583
0.40	-0.333	1.458	-0.279	0.891	-0.341	0.531
0.35	-0.370	1.528	-0.321	0.967	-0.337	0.478
0.30	-0.408	1.596	-0.371	1.057	-0.340	0.427
0.25	-0.467	1.653	-0.430	1.166	-0.348	0.398
0.20	-0.536	1.727	-0.499	1.300	-0.366	0.401
0.15	-0.611	1.813	-0.582	1.468	-0.396	0.445
0.10	-0.690	1.910	-0.680	1.688	-0.445	0.526
0.05	-0.778	2.010	-0.801	1.988	-0.516	0.640

Segment Turnover Based Models

Model 1	-0.149	5.459	-0.120	2.348	0.557	8.788
Model 2	-0.116	5.792	-0.058	2.548	0.625	9.167
Model 3	-0.058	6.043	-0.026	2.599	0.675	9.456
Model 4	-1.091	3.502	-0.426	1.502	-0.455	1.876
Model 5	-1.163	3.938	-0.424	1.531	-0.465	1.800
Model 6	-1.090	3.458	-0.471	1.354	-0.497	1.595

underestimations in 1982 compared to 1981 and even more provide underestimations in 1983. The segment models provide an opposite picture. All the models underestimate earnings in 1981 and 1982 whilst three of the models overestimate earnings in 1983. Whilst the actual errors were not analysed it is also clear that in very many cases the segment based forecasts generate much larger errors than do the consolidated based models.

Analysis of the behaviour of the multiple form models demonstrated that the existence of a few very large outliers had the effect of masking the underlying pattern. It is important to assess if this is also the case when all 12 models are compared. Table 19 below (derived from the full results reported in appendix 25) provides a summary of rankings of the truncated errors. For these truncated errors in all cases all the consolidated models outperform all the segment models, so that this is even more conclusive than that found for the non-truncated errors. Again, the ranks often vary quite considerably depending upon how the error denominator is measured. This difference largely explains why the average ranks of all the segment models are so close, namely 9.33 to 9.583. If, instead, only mape/actual and mse/actual errors are considered the ranks vary from 7.417 (for model 6) to 11.25 (for model 3). Similarly the ranks vary from 7.83 (model 3) to 11.5 (model 6) if mape/forecast and mse/forecast are considered.

Table 19.

RANKS OF THE TRUNCATED ERRORS FOR THE OPTIMAL SINGLE MODELS.

	1981				1982				1983			
	p/a	s/a	p/f	s/f	p/a	s/a	p/f	s/f	p/a	s/a	a/f	s/f
RW	4	3	4	3	1	1	2	2	2	2	2	2
AC	1	4	2	4	4	4	4	4	3	4	3	4
PC	6	6	6	6	6	6	6	6	5	5	5	6
MA	5	5	5	5	5	5	5	5	4	3	6	5
ES	3	1	3	2	2	2	3	1	1	1	4	3
Re	2	2	1	1	3	3	1	3	6	6	1	1
S1	9	7	12	12	7	8	11	11	8	8	11	11
S2	7=	9	10=	10=	9	9	10	10	9	10	8=	9
S3	11	10=	8=	8	11	10=	8	8	12	12	7	7=
S4	10	10=	8=	9	10	10=	9	9	11	11	8=	7=
S5	12	12	7	7	12	10=	7	7	10	9	10	10
S6	7=	8	10=	10=	8	7	12	12	7	7	12	12

	1981	1982	1983	p/a	s/a	p/f	s/f	Aver.	Overall
RW	3.5	1.5	2	2.33	2	2.67	2.33	2.33	2
AC	2.75	4	3.5	2.67	4	3	4	3.417	4
PC	6	6	5.25	5.67	5.67	5.67	6	5.75	6
MA	5	5	4.5	4.67	4.33	5.33	5	4.83	5
ES	2.25	2	2.25	2	1.33	3.33	2	2.167	1
Re	1.5	2.5	3.5	3.67	3.67	1	1.67	2.5	3
S1	10	9.25	9.5	8	7.67	11.33	11.33	9.583	11=
S2	9.375	9.5	9.125	8.5	9.33	9.67	9.83	9.33	7
S3	9.5	9.5	9.625	11.33	11.17	7.83	7.83	9.547	10
S4	9.5	9.75	9.5	10.33	10.83	8.67	8.5	9.583	11=
S5	9.5	9.25	9.75	11.33	10.67	8	8	9.5	9
S6	9.25	9.75	9.5	7.5	7.33	11.5	11.5	9.4583	8

The optimal model is now no longer the random walk model but instead the exponential smoothing model whilst the random walk model is ranked second, a reversal of their previous positions.

For non-truncated errors, the optimal smoothing constant for the exponential weighted moving average model was 0.20. It was argued that, from a theoretical viewpoint this weight would not be expected to an optimal one. For the truncated errors the optimal weight is 0.85 which is approximately the weight that one would expect, and this is reinforced by the improved relative performance of this model. Whilst the exponential smoothing model is the optimal overall model it is not ranked first in any of the three individual years (although it is first for four of the twelve combinations of year and error measure). In 1981 the optimal model is the regression model whilst in both 1982 and 1983 the best model is the random walk model. Overall, this model ranks first in two cases and the regression model first in five cases. Generally there seems very little difference in the performance of the random walk, exponential smoothing and regression models, although again their relative performance depends on which denominator is used when measuring the errors. The absolute change model in particular appears to have been seriously affected by outliers and its relative performance has now greatly improved. The worst consolidated model now appears to be percentage change model with a relatively low average rank of 5.75 (previously this was ranked third with an average value of 3.33).

To gain a fuller insight into the relative predictive ability of these models an examination of the differences in the forecasts generated is also necessary. This is again done with the aid of t-tests. Table 20 below, derived from the full results in appendix 26, provides a summary of the significant results for the non-truncated errors.

Any conclusions drawn from these results must be dependent upon both the year and error measure being considered. If the error is measured in terms of mse/forecast then in 1981 most of the differences between the segment models are significant. In 1982 several are still significant and the moving average model (ranked first) significantly outperforms all the segment models. In 1983, there are virtually no significant results. If mape/forecast is used, in 1981 the percentage change model (ranked first) outperforms all the alternative models, the exponential smoothing model (ranked second) outperforms the segment models and if a segment model is used then the choice of which one to use is generally important. Again in 1982 the best model is the percentage change model and again it outperforms all the segment models whilst the choice of segment model is again important. In 1983, there is some evidence that the absolute change model (ranked fifth) is significantly outperformed by the alternative consolidated models. If mape/actual is used then the choice of model is of much greater importance. In 1981, virtually all combinations of models provide significant differences with the exception of the percentage change model (ranked sixth). The same is true for 1982 with the exception of the percentage change and absolute change models. In 1983,

Table 20.

SIGNIFICANT T-TESTS FOR NON-TRUNCATED ERRORS FOR THE OPTIMAL SINGLE MODELS.

	1981				1982				1983			
	ape/a	mse/a	ape/a	mse/a	ape/a	mse/a	ape/a	mse/a	ape/a	mse/a	ape/f	mse/f
RW/AC	0.030								0.000	0.006		
RW/PC					0.014		0.000	0.081		0.046	0.001	0.069
RW/MA					0.059							
RW/ES			0.006	0.092	0.002	0.081						
RW/Re					0.096							
RW/S1	0.026		0.011		0.008		0.032		0.092			
RW/S2	0.015		0.013		0.007		0.040		0.089			
RW/S3	0.012		0.013		0.005		0.043		0.087			
RW/S4	0.012		0.013		0.005		0.042		0.087			
RW/S5	0.005		0.016		0.006		0.046		0.091			
RW/S6	0.015		0.013		0.009		0.030		0.099		0.070	
AC/PC									0.007	0.015		
AC/MA					0.087							
AC/ES			0.052		0.009				0.054	0.062		
AC/Re										0.068		
AC/S1			0.016		0.014							
AC/S2	0.065		0.019		0.011							
AC/S3	0.053		0.020		0.009							
AC/S4	0.053		0.020		0.009							
AC/S5	0.022		0.024		0.009							
AC/S6	0.065		0.018		0.016							
PC/MA	0.044	0.047					0.081					
PC/ES	0.087	0.039			0.028	0.065						
PC/Re	0.018	0.064					0.001	0.070			0.037	
PC/S1	0.002	0.036	0.087		0.021	0.098			0.073			
PC/S2	0.002	0.034			0.017	0.090			0.071			
PC/S3	0.001	0.034			0.014	0.082			0.070			

PC/S4	0.001	0.034			0.014	0.083			0.070		
PC/S5	0.001	0.031			0.014	0.082			0.073		
PC/S6	0.002	0.034			0.024		0.093		0.076		
MA/ES	0.025	0.075	0.000								
MA/S1			0.024				0.021	0.084	0.093	0.032	
MA/S2	0.081		0.029				0.026	0.086	0.089	0.038	
MA/S3	0.067		0.031				0.027	0.086	0.088	0.042	
MA/S4	0.068		0.031				0.027	0.087	0.088	0.041	
MA/S5	0.037		0.039				0.030	0.097	0.091	0.033	
MA/S6	0.081		0.029				0.020	0.094		0.019	
ES/Re										0.041	
ES/S1	0.032		0.055				0.042	0.096	0.070		
ES/S2	0.022	0.090	0.068				0.053		0.068		
ES/S3	0.018	0.083	0.075				0.058		0.067		
ES/S4	0.019	0.083	0.075				0.057		0.067		
ES/S5	0.010	0.065	0.097				0.061		0.069		
ES/S6	0.022	0.089	0.067				0.040		0.072	0.098	
Re/S1			0.046				0.028		0.095	0.012	
Re/S2	0.081		0.057				0.035		0.092	0.014	
Re/S3	0.066		0.063				0.037		0.090	0.015	
Re/S4	0.066		0.063				0.037		0.090	0.015	
Re/S5	0.031		0.082				0.040		0.094	0.013	
Re/S6	0.080		0.056				0.027			0.008	
S1/S2	0.000	0.040	0.001	0.084	0.005	0.064	0.001	0.083	0.039	0.000	0.086
S1/S3	0.000	0.024	0.002	0.094	0.000	0.038	0.001	0.073	0.042	0.001	
S1/S4	0.000	0.024	0.002	0.092	0.001	0.040	0.001	0.069	0.041	0.001	
S1/S5	0.000	0.023	0.002	0.094	0.001	0.047	0.000	0.038	0.043	0.011	
S1/S6	0.000	0.033	0.002	0.093	0.001	0.012	0.029		0.057	0.000	
S2/S3	0.005	0.091	0.009		0.000	0.012	0.033		0.051	0.008	
S2/S4	0.004	0.090	0.008		0.000	0.010	0.037		0.049	0.008	
S2/S5	0.000	0.024	0.004	0.099	0.000	0.029	0.002	0.090	0.037	0.000	0.058
S2/S6					0.002	0.049	0.002	0.082	0.051	0.000	
S3/S4	0.012		0.042		0.000	0.034	0.013		0.065	0.044	
S3/S5	0.000	0.026	0.003	0.094	0.090	0.098			0.043	0.001	
S3/S6	0.003	0.091	0.009		0.000	0.032	0.005		0.050	0.000	
S4/S5	0.000	0.025	0.004	0.097	0.030	0.078			0.042	0.001	
S4/S6	0.003	0.090	0.009	0.096	0.000	0.033	0.005		0.050	0.000	
S5/S6	0.000	0.023	0.004	0.095	0.001	0.040	0.002	0.084	0.054	0.000	

both the regression model (ranked first) and moving average model (ranked second) outperform the segment models and again, if a segment model is used, the choice of which one to employ is important. If mape/actual is used then, for 1981, nearly all combinations yield significant results. In 1982, both the random walk model (ranked first) and absolute change model (ranked second) outperform all the alternative models. In addition the percentage change model outperforms the segment models and if a segment model is used care must be exercised in its choice. Finally in 1983, with the exception of the absolute change model, all the consolidated models significantly outperform all the segment models and there are significant differences in the average performance of the various segment models. Whilst it is difficult to draw any general conclusions from these results it does appear that generally the segment models produce forecasts that are significantly different from each other so that the choice of segment model is important. This is an interesting result as it was shown that the average ranks of these six models were very similar. This apparent inconsistency can be explained by the very great differences in the relative ranks of these models when different error measures are employed. The best one or two consolidated models generally appear to significantly outperform the alternative models. Therefore, in most cases it does seem important to know which is the optimal model and to use this model. Unfortunately which model is the optimal one appears to be dependent upon how the errors are measured and, to a lesser extent, the year being considered.

This conclusion, that the t-test results are largely a function of how the errors are measured, does not hold true if the errors are instead truncated. In this case the results are very similar whichever error measure is employed. This is especially so in both 1981 and 1982. Table 21 below provides a summary of the significant t-tests for the truncated errors (appendix 27 provides the full results). In addition, many more of the results are now significant, which again supports the conclusion that the use of non-truncated errors can mask patterns or conclusions that apply to most of the companies. In this case this is because outliers cause the variances of the errors to be very large in certain cases. In 1981, virtually all the combinations which include at least one consolidated model yield significant results. In 1982, nearly all the combinations of one consolidated and one segment based model yield significant differences. In addition, if mse/forecast is used then the choice of segment model is important. In 1983, if either mape/actual or mse/actual is used then nearly all combinations of consolidated and segment based models yield significant results. In addition, for mse/actual several of the combinations of two segment models are also significant. For mape/forcecast several of the combinations of two consolidated models are significant as are combinations of two segment models. In addition, the regression model outperforms the segment based models. If mse/forecast is

Table 21.

T-TESTS OF TRUNCATED ERRORS FOR THE OPTIMAL SINGLE MODELS

	1981				1982				1983			
	ape/a	mse/a	ape/f	mse/f	ape/a	mse/a	ape/f	mse/f	ape/a	mse/a	ape/f	mse/f
RW/AC		0.069								0.004		
RW/PC	0.015	0.013	0.077	0.016	0.000	0.000	0.000	0.000	0.003	0.004	0.018	0.006
RW/MA	0.092								0.005	0.041	0.001	0.002
RW/Re			0.041	0.071	0.077				0.089	0.020	0.001	0.000
RW/S1	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.097	0.057
RW/S2	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.070
RW/S3	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.073
RW/S4	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.073
RW/S5	0.000	0.000	0.002	0.000	0.000	0.000	0.001	0.000	0.000	0.000		0.063
RW/S6	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.031	0.020
AC/PC	0.020	0.047	0.009	0.014	0.002	0.008	0.001	0.005	0.063		0.021	0.082
AC/MA											0.013	
AC/ES										0.010		
AC/Re				0.084							0.003	0.000
AC/S1	0.000	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.000		
AC/S2	0.000	0.000	0.001	0.000	0.000	0.000	0.001	0.001	0.000	0.000		
AC/S3	0.000	0.000	0.001	0.001	0.000	0.000	0.001	0.002	0.000	0.000		
AC/S4	0.000	0.000	0.001	0.001	0.000	0.000	0.001	0.002	0.000	0.000		
AC/S5	0.000	0.000	0.001	0.001	0.000	0.000	0.001	0.002	0.000	0.000		
AC/S6	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.039	0.061
PC/MA					0.006	0.036	0.022	0.054				
PC/ES	0.008	0.003	0.061	0.015	0.000	0.000	0.000	0.000	0.004	0.003	0.083	0.034
PC/Re	0.018	0.035	0.009	0.009	0.041		0.002	0.002			0.000	0.000
PC/S1	0.000	0.000	0.010	0.003	0.000	0.000	0.040	0.014	0.000	0.000		
PC/S2	0.000	0.000	0.015	0.005	0.000	0.000	0.057	0.028	0.000	0.000		
PC/S3	0.000	0.000	0.017	0.006	0.000	0.000	0.063	0.038	0.000	0.000		
PC/S4	0.000	0.000	0.017	0.006	0.000	0.000	0.062	0.036	0.000	0.000		
PC/S5	0.000	0.000	0.017	0.007	0.000	0.000	0.064	0.041	0.000	0.000		
PC/S6	0.000	0.000	0.015	0.005	0.000	0.000	0.028	0.009	0.000	0.000		

MA/ES	0.015	0.028	0.099						0.005	0.025	0.001	0.004
MA/Re	0.016	0.081	0.002	0.016							0.000	0.000
MA/S1	0.000	0.000	0.003	0.000	0.000	0.000	0.001	0.000	0.000	0.000		
MA/S2	0.000	0.000	0.005	0.000	0.000	0.000	0.002	0.001	0.000	0.000		
MA/S3	0.000	0.000	0.006	0.000	0.000	0.000	0.002	0.001	0.000	0.000		
MA/S4	0.000	0.000	0.006	0.000	0.000	0.000	0.002	0.001	0.000	0.000		
MA/S5	0.000	0.000	0.005	0.000	0.000	0.000	0.002	0.001	0.000	0.000		
MA/S6	0.000	0.000	0.005	0.000	0.000	0.000	0.001	0.000	0.000	0.000		
ES/Re			0.076			0.055			0.075	0.015	0.001	0.000
ES/S1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.092
ES/S2	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000		
ES/S3	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000		
ES/S4	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000		
ES/S5	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000		
ES/S6	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.044	0.034
Re/S1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Re/S2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Re/S3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Re/S4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Re/S5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Re/S6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
S1/S2			0.077				0.074	0.007		0.010	0.050	0.066
S1/S3							0.096	0.007				
S1/S4								0.007				
S1/S5								0.007			0.077	0.062
S1/S6			0.082				0.013	0.011			0.005	0.009
S2/S3								0.038		0.091		
S2/S4		0.099						0.039		0.094		
S2/S5		0.069						0.018			0.056	0.086
S2/S6							0.024	0.005		0.048	0.007	0.013
S3/S4								0.046				
S3/S6							0.044	0.006		0.041	0.014	0.023
S4/S5		0.099					0.042	0.032				
S5/S6								0.006		0.042	0.014	0.022
S5/S6		0.067					0.050	0.006		0.039	0.005	0.010

used the same conclusions hold and, in addition, the random walk model also outperforms the segment based models.

9.8 THE OPTIMAL ANNUAL MODELS.

A comparison of the alternative models using forms that are optimal over the entire four year period offers only a partial insight into their relative forecasting ability. As explained previously a serious limitation of this approach is that it assumes knowledge of up to four years into the future. To partially rectify this a similar analysis will be carried out using the form of each model that performs the best in any one year. Most of the models are unaffected by this change. Specifically the random walk, regression and segment models all remain unaffected.

The non-truncated errors are considered firstly. For the absolute change model this means that for 1982 a 3 year model is used. For the percentage change models, 1981 now becomes a 3 year model. For the moving average models, 1981 becomes a 6 year model and for 1982 a 2 year model is used. Only for the exponential smoothing models are all years affected, 1981 has a smoothing constant of 0.10, 1982 0.95 and 1983 becomes 0.15. Table 22 summarises the effects of these changes (for fuller details see appendix 28).

Table 22.

RANKS OF NON-TRUNCATED ERRORS FOR THE OPTIMAL ANNUAL MODELS

	1981				1982				1983			
	p/a	s/a	p/f	s/f	p/a	s/a	p/f	s/f	p/a	s/a	p/f	s/f
RW	3	5	1	1	2	3	3	3	4	5	3	4
AC	6	7	2	2	4	5	1	1	6	6	6	12
PC	1	1	6	6	6	1	5	4	2	1	5	5
MA	5	3	4	4	5	4	4	5	3	3	4	2
ES	2	2	5	3	1	2	2	2	1	2	2	1
Re	4	4	3	5	3	6	12	12	5	4	1	3
S1	7	6	12	12	8	8	10	10	8	8	11	10
S2	8	8	10	10	9	9	9	9	10	10	9	8
S3	11	11	8	8	11	11	6	6	12	12	7	6
S4	10	10	9	9	10	10	8	7	11	11	8	7
S5	12	12	7	7	12	12	7	8	9	9	10	9
S6	9	9	11	11	7	7	11	11	7	7	12	11

Average

	1981	1982	1983	p/a	s/a	p/f	s/f	Aver.	Overall
RW	2.5	2.75	4	3.33	4.33	2.33	2.67	3.083	2
AC	4.25	2.75	7.5	5.33	6	3	5	4.833	5
PC	3.5	4	3.25	3	1	5.33	5	3.583	3
MA	4	4.5	3	4.33	3.33	4	3.67	3.833	4
ES	3	1.75	1.5	1.33	2	3	2	2.083	1
Re	4	8.25	3.25	4	4.67	5.33	6.67	5.167	6
S1	9.25	9	9.25	7.67	7.33	11	10.67	9.167	9=
S2	9	9	9.25	9	9	9.33	9	9.083	7=
S3	9.5	8.5	9.25	11.33	11.33	7	6.67	9.083	7=
S4	9.5	8.75	9.25	10.33	10.33	8.33	7.67	9.167	9=
S5	9.5	9.75	9.25	11	11	8	8	9.5	11
S6	10	9	9.25	7.67	7.67	11.33	11	9.417	10

The overall effect of these changes is very small. The best model overall is now the exponential smoothing model followed by the random walk, a reversal of their former positions. The only other change is that the absolute change and regression models have also reversed their relative positions. If the ranks are considered in greater detail then, again, it is apparent that in most cases the effects have been relatively trivial. In 1981, none of the relative ranks have changed by more than one position. In

1982 the major effects have been on the relative positions of the absolute change and moving average models. For the absolute change model the ranks for the four errors were 2,3,12,12 they have now become 4,5,1,1. For the moving average model they were 6,12,1,1 and are now 5,4,4,5. In 1983 the effects again were fairly marginal. The effects upon the truncated errors are generally of a similar magnitude to those for the non-truncated errors. The new rankings are given in table 23 below (derived from the errors reported in appendix 28).

Table 23.

RANKS OF THE TRUNCATED ERRORS FOR THE OPTIMAL ANNUAL MODELS.

	1981				1982				1983			
	ap/a	se/a	ap/f	se/f	p/a	s/a	p/f	s/f	p/a	s/a	p/f	s/f
RW	4	3	4	3	1	1	3	2	3	3	2	3
AC	1	4	2	4	4	4	4	4	4	5	3	6
PC	6	6	6	6	6	6	6	6	5	4	4	5
MA	5	5	5	5	5	5	5	5	1	1	6	2
ES	3	1	3	2	2	2	2	1	2	2	5	4
Re	2	2	1	1	3	3	1	3	6	6	1	1
S1	9	7	12	12	7	8	11	11	8	8	11	11
S2	7=	9	10=	10=	9	9	10	10	9	10	8=	9
S3	11	10=	8=	8	11	10=	8	8	12	12	7	7=
S4	10	10=	8=	9	10	10=	9	9	11	11	8=	7=
S5	12	12	7	7	12	10=	7	7	10	9	10	10
S6	7=	8	10=	10=	8	7	12	12	7	7	12	12

Average

	1981	1982	1983	ap/a	se/a	ap/f	se/f	Aver.	Overall
RW	3.5	1.75	2.75	2.67	2.33	3	2.67	2.667	3
AC	2.75	4	4.5	3	4.33	3	4.67	3.75	4
PC	6	6	4.5	5.67	5.33	5.33	5.67	5.5	6
MA	5	5	2.5	3.67	3.67	5.33	4	4.167	5
ES	2.25	1.75	3.25	2.33	1.67	3.33	2.33	2.417	1
Re	1.5	2.5	3.5	3.67	3.67	1	1.67	2.5	2
S1	10	9.25	9.5	8	7.67	11.33	11.33	9.583	11=
S2	9.375	9.5	9.125	8.5	9.33	9.67	9.83	9.33	7
S3	9.5	9.5	9.625	11.33	11.17	7.83	7.83	9.547	10
S4	9.5	9.75	9.5	10.33	10.83	8.67	8.5	9.583	11=
S5	9.5	9.25	9.75	11.33	10.67	8	8	9.5	9
S6	9.125	9.75	9.5	7.5	7.33	11.5	11.5	9.4583	8

The absolute change model is unaffected by this change. The percentage change model now becomes a 2 year model for 1981 and 4 year for 1983 whilst only the 1983 form of the moving average model changes becoming a 5 year model. For the exponentially weighted moving average model a smoothing constant of 0.60 is used in 1982 and 0.90 in 1983. Overall, the effects of these changes are fairly negligible. The random walk model is now ranked third and the regression model second, a reversal of their previous positions. If the ranks for each error and year are considerd then it can be seen that the change in the form of the percentage change model in 1981 had no effect upon ther relative ranks. Similarly, the only change in 1982 is the reversal of the relative performance of the random walk and exponential smoothing models when the errors are measured by mape/forecast. For 1983, there are several changes in the relative performance of the models. With the exception of the moving average model nearly all involve a change of only one position. The ranks of the moving average model for the four errors was 4,3,6,5 and this has now become 1,1,6,2.

Because of the relatively small difference made by employing annual models rather than a single form for each model no further analysis of these results was undertaken.

9.9 THE OPTIMAL PREDICTION MODELS.

The best way to compare the models is treat each model alike. That is, to assume no future knowledge when choosing any of the models. The segment models and random walk models are unaffected by this, as they are all ex-ante models and the form of such models is not dependent upon how they have performed in the past. The choice of form for the other models is dependent upon past performance. In these cases whichever form performed the best in ex-post predictions of the previous year's profit will be used to predict the next year's profits. For the regression models the models are now;

$$P_{1981} = 2.72449 + (P_{1980} \times 0.57899) - (P_{1976} \times 0.30183) + (P_{1975} \times 1.17605) - (P_{1977} \times 0.48761)$$

$$P_{1982} = 0.43987 + (P_{1981} \times 0.89850) + (P_{1977} \times 1.20030) - (P_{1975} \times 0.52991) - (P_{1976} \times 0.60982) - (P_{1980} \times 0.05123)$$

$$P_{1983} = 1.35425 + (P_{1982} \times 1.02532) - (P_{1980} \times 0.12069) + (P_{1976} \times 0.70929) - (P_{1975} \times 0.57702)$$

If the non-truncated errors are considered then several of the multiple form models differ from those used in the earlier analysis of the optimal overall models. For the absolute change models the 4 year model is used for 1981 and the 3 year model for 1983 (overall the best model was the 5 year model). For the percentage change model the 3 year model is employed in 1982 rather than the 4 year model. For the moving average model the 4 year is now not used. Instead in 1981 the 3 year model is employed. For 1982 it becomes the 6 year model and for 1983 the 2 year model. The smoothing constant for the exponentially weighted moving average model is now no longer 0.20. Instead for 1981 it is 0.45, for 1982 0.10 and 1983 0.95. Table 24 below (summarised from appendix 28) provides a summary of the ranks of all 12 models. Again, the overall changes in the ranks are fairly small. The random walk model is now ranked first equal with the percentage change model (which was ranked third) and again all the consolidated models outperform the segment models. The moving average model (previously fourth) is now the least efficient consolidated model whilst the relative rank of the exponential smoothing model declines from second to third and the regression model is ranked fourth rather than fifth. However, there is a decrease in the difference in the average ranks of the worst consolidated model and the best segment model (7.167 and 8.167 versus 6.25 and 8.833). In addition, there appears to be a greater difference in the relative performances of the consolidated models (the range now being 2.67 to 7 versus 2.667 to 6.25). This demonstrates that the overall ranks are now less dependent upon either the year or way in which the error is measured. In addition, there is a much greater difference between the performance of the best three models (for which there is little difference in their overall performance) and the other consolidation based models.

Table 24.

RANKS OF THE NON-TRUNCATED ERRORS FOR THE PREDICTION MODELS.

	1981				1982				1983			
	ap/a	se/a	ap/f	se/f	p/a	s/a	p/f	s/f	p/a	s/a	p/f	s/f
RW	4	5	1	1	1	2	2	3	5	4	2	2
AC	6	11	2	2	2	3	12	12	6	6	11	11
PC	1	1	3	3	3	1	5	4	2	1	4	4
MA	5	4	12	12	5	7	4	5	3	5	12	12
ES	3	3	4	10	4	4	3	2	4	3	3	3
Re	2	2	11	11	12	12	1	1	1	2	1	1
S1	7	5	10	9	7	6	10	10	8	8	9	9
S2	8	7	8	7	8	8	9	9	10	10	7	7
S3	11	10	6	5	10	10	6	6	12	12	5	5
S4	10	9	7	6	9	9	8	7	11	11	6	6
S5	12	12	5	4	11	11	7	8	9	9	8	8
S6	9	8	9	8	6	5	11	11	7	7	10	10

Average

	1981	1982	1983	p/a	s/a	p/f	s/f	Aver.	Overall
RW	2.75	2	3.25	3.33	3.67	1.67	2	2.67	1=
AC	5.25	7.25	8.5	4.67	6.67	8.33	8.33	7	5
PC	2	3.25	2.75	2	1	4	3.67	2.67	1=
MA	8.25	5.25	8	4.33	5.33	9.33	9.67	7.167	6
ES	5	3.25	3.25	3.67	3.33	3.33	5	3.83	3
Re	6.5	6.5	1.25	5	5.33	4.33	4.33	4.75	4
S1	8	8.25	8.5	7.33	6.67	9.67	9.33	8.25	9=
S2	7.5	8.5	8.5	8.67	8.33	8	7.67	8.167	7=
S3	8	8	8.5	11	10.67	5.67	5.33	8.167	7=
S4	8	8.25	8.5	10	9.67	7	6.33	8.25	9=
S5	8.25	9.25	8.5	10.67	10.67	6.67	6.67	8.67	12
S6	8.5	8.25	8.5	7.33	6.67	10	9.67	8.417	11

The average ranks of segment models have also all improved but this is insufficient to affect their relative positions. If the ranks of each model for each year and each error are considered there are some interesting changes. Most of the changes in ranks are relatively small but there are some notable exceptions to this. The regression model had ranks of 4,4,4,5 in 1981, these have now become 2,2,11,11, whilst for 1982 they have changed from 3,4,11,11 to 12,12,1,1. These changes, whilst large, tend to cancel each other out when the average rank across all four error metrics is considered. The effects on the relative performance of this model are especially great in 1981 when its relative position changes from third equal to tenth equal. On a year by year basis the ranks of the other models change by relatively small and insignificant amounts. Similarly, if the ranks of the moving average model are compared with those which occurred when a single form was used then the ranks in 1981 have changed from 5,3,3,3 to 5,4,12,12. In 1983 the change is from 3,6,2,1 to 3,5,12,12, whilst in 1982 the ranks considerably worsened, so that the average rank changed from 3.83 to 7.167, easily the largest change in absolute terms.

Table 25 below provides a summary of the significant t-tests for the models that differ from the optimal overall models (derived from the full results reported in appendix 30). The most striking result is that now less of the differences are significant. In particular, in 1981 for errors measured by mape/forecast the moving average, exponential smoothing and regression models are not now significantly better than the segment models. The moving average model no longer outperforms the segment models in 1982 for mape/forecast and mse/forecast and again in 1983 for errors measured by mape/forecast. There are only two cases where the results are significant now when they were not before. These are for the regression model in 1981 for mse/actual and 1982 for mse/forecast. Thus, overall the conclusions that can be drawn from these tests are are very similar to those derived from the optimal single

Table 25.

T-TESTS OF THE NON-TRUNCATED ERRORS FOR THE PREDICTION MODELS.
(For the models that vary from the annual models only).

	1981				1982				1983			
	map/a	mse/a	map/f	mse/f	map/a	mse/a	map/f	mse/f	map/a	mse/a	map/f	mse/f
RW/AC	0.048								0.031			
RW/PC							0.000					
RW/MA					0.002					0.049		
RW/ES					0.000	0.026			0.029	0.032		
RW/Re					0.005				0.006		0.046	
AC/PC									0.018			
AC/MA					0.006	0.092			0.022			
AC/ES					0.000	0.060			0.029			
AC/Re					0.009				0.008		0.074	
AC/S1			0.078									
AC/S2			0.095									
AC/S3	0.088											
AC/S4	0.090											
AC/S5	0.039											
AC/S6			0.094									
PC/MA	0.078				0.012	0.066						
PC/ES	0.097				0.001	0.036				0.049	0.032	
PC/Re					0.011		0.043				0.013	
PC/S1					0.012	0.087						
PC/S2					0.011	0.081						
PC/S3					0.008	0.074						
PC/S4					0.009	0.075						
PC/S5					0.009	0.075						
PC/S6					0.014	0.093						

MA/ES	0.092						0.051	
MA/Re						0.031		
MA/S1				0.094		0.081		
MA/S2	0.090					0.078		
MA/S3	0.075					0.077		
MA/S4	0.076					0.077		
MA/S5	0.042					0.080		
MA/S6	0.090			0.083		0.085		
ES/Re			0.067	0.031		0.007	0.013	0.077
ES/S1	0.039			0.055	0.088	0.090		
ES/S2	0.026			0.069		0.087		
ES/S3	0.022			0.076	0.092	0.085		
ES/S4	0.022			0.075	0.093	0.085		
ES/S5	0.011	0.093		0.080		0.089		
ES/S6	0.026			0.051	0.098	0.096		0.098
Re/S1	0.010	0.069		0.012	0.082	0.063		0.011
Re/S2	0.006	0.055		0.016	0.094	0.061		0.013
Re/S3	0.005	0.054		0.015	0.084	0.061		0.013
Re/S4	0.005	0.054		0.015	0.085	0.061		0.013
Re/S5	0.003	0.042		0.017	0.095	0.062		0.011
Re/S6	0.006	0.055		0.012	0.092	0.064		0.007

models.

Table 26 provides a summary of the results for the truncated errors (for the full results see appendix 31).

Table 26

RANKS OF THE TRUNCATED ERRORS FOR THE PREDICTION MODELS.

	1981				1982				1983			
	p/a	s/a	p/f	s/f	p/a	s/a	p/f	s/f	p/a	s/a	p/f	s/f
RW	2	1	2	2	1	1	1	1	2	3	2	3
AC	1	3	1	3	3	3	3	2	3	5	3	4
PC	5	5	5	5	5	5	5	5	6	6	5	6
MA	4	4	4	4	4	4	4	3	5	2	6	5
ES	3	2	3	1	2	2	2	12	4	4	4	2
Re	6	6	12	12	6	6	6	4	1	1	1	1
S1	9	7	11	11	7	8	11	10	8	8	11	11
S2	7=	9	9=	9=	9	9	10	9	9	10	8=	9
S3	11	10=	7=	7	11	12	8	7	12	12	7	7=
S4	10	10=	7=	8	10	10=	9	8	11	11	8=	7=
S5	12	12	6	6	12	10=	7	6	10	9	10	10
S6	7=	8	9=	9=	8	7	12	11	7	7	12	12

Average

	1981	1982	1983	a/p	s/e	a/f	s/f	Aver.	Overall
RW	1.75	1	2.5	1.67	1.67	1.67	2	1.75	1
AC	2	2.75	3.75	2.33	3.67	2.33	3	2.83	2
PC	5	5	5.75	5.33	5.33	5	5.33	5.25	6
MA	4	3.75	4.5	4.33	3.33	4.67	4	4.083	4
ES	2.25	4.5	3.5	3	2.67	3	5	3.4167	3
Re	9	5.5	1	4.33	4.33	6.33	5.67	5.167	5
S1	9.5	9	9.5	8	7.67	11	10.67	9.33	11
S2	9.125	9.25	9.125	8.5	9.33	9.33	9.167	9.167	7
S3	8.75	9.5	9.625	11.33	11.5	7.5	7.167	9.2917	10=
S4	9	9.375	9.5	10.33	10.67	8.33	7.83	9.2917	10=
S5	9	8.875	9.75	11.33	10.5	7.67	7.33	9.2083	8=
S6	8.625	9.5	9.5	7.5	7.33	11.17	10.83	9.2083	8=

For both the optimal single and annual ex-post models it was seen that the truncation of the errors did not lead to any very great changes in the overall rankings of the models. The difference in the rankings between the non-truncated and truncated errors for the prediction models, whilst not large, are greater. The consolidated models still outperform all the segment models and the best model overall is still the random walk model. However, the percentage change model is now ranked sixth rather than first equal and the absolute change model is fifth rather than second. It was shown above that the existence of outliers tended to mask a more consistent underlying picture in the case of the multiple form models (with the exception of the percentage change model). Now this is generally not the case. The consistency of the performance of the random walk model has increased (the average rank having changed from 2.67 to 1.75). This model is ranked first for all errors in 1982 and its lowest rank is now third rather than fifth. However, the range of the average ranks of the consolidated models for the non-truncated errors was from 2.67 to 7.167, but it is now from 1.75 to 5.25. This shows that whilst there is a greater consistency in the performance of the best model there is less agreement about the relative performance of the poorer performing consolidated models. The other major difference due to the truncation of the errors is in the relatively poorer performance of the segment models. The average ranks of these models had varied between 8.167 and 8.67, but they are now from 9.167 to 9.33. Again, the narrowness of this range is largely due to differences in the ranks when the errors are measured by a denominator of either actual or forecast profits. When the non-truncated results were considered there were 16 cases when a consolidated model was outperformed by at least one segment model. Now there are only 3 such cases (the regression model being ranked twelfth twice and the exponential smoothing model ranked twelfth once).

The only models that have differed from the optimal single model are the three regression models, the exponential smoothing model in both 1981 and 1983 and the percentage change model in 1982. Therefore, the significance of the t-test results for these models only are summarised in table 27 below (for the full results see appendix 31). The general conclusions that can be drawn from these results are very similar to those for the non-truncated errors. Namely, that less of the differences are now significant. Specifically, in 1981 the regression model now no longer outperforms the segment models when the errors are

Table 27.

T-TESTS OF TRUNCATED ERRORS FOR THE PREDICTION MODELS.
(For models that differ from the annual models.)

	mape/act.		mse/act.		mape/for.		mse/for.	
	T-value	Sig.	T-value	Sig.	T-value	Sig.	T-value	Sig.
1981								
ES/PC	-2.16	0.033	-2.40	0.018			-2.25	0.027
ES/MA	-1.66	0.099						
ES/Re	-3.90	0.000	-2.50	0.014	-6.09	0.000	-5.70	0.000
ES/S1	-6.56	0.000	-6.35	0.000	-3.36	0.001	-3.93	0.000
ES/S2	-6.48	0.000	-6.39	0.000	-3.22	0.002	-3.82	0.000
ES/S3	-6.56	0.000	-6.50	0.000	-3.19	0.002	-3.76	0.000
ES/S4	-6.56	0.000	-6.49	0.000	-3.19	0.002	-3.77	0.000
ES/S5	-6.80	0.000	-6.68	0.000	-3.20	0.002	-3.71	0.000
ES/S6	-6.47	0.000	-6.38	0.000	-3.21	0.002	-3.82	0.000
Re/RW	4.02	0.000	2.52	0.013	6.24	0.000	5.80	0.000
Re/AC	3.52	0.001	1.90	0.061	5.91	0.000	5.40	0.000
Re/PC	1.85	0.067			4.81	0.000	4.45	0.000
Re/MA	2.54	0.013			5.28	0.000	5.12	0.000
Re/S1	-4.31	0.000	-4.99	0.000				
Re/S2	-4.24	0.000	-5.05	0.000				
Re/S3	-4.35	0.000	-5.17	0.000				
Re/S4	-4.34	0.000	-5.17	0.000				
Re/S5	-4.57	0.000	-5.38	0.000				
Re/S6	-4.22	0.000	-5.03	0.000				

1982								
PC/RW	4.54	0.000	3.66	0.000	4.58	0.000	4.23	0.000
PC/AC	3.05	0.003	2.53	0.013	3.92	0.000	3.57	0.001
PC/MA	2.87	0.005	2.18	0.031	2.88	0.005	2.69	0.008
PC/ES	3.47	0.001	2.94	0.004	3.44	0.001	3.50	0.001
PC/Re	-4.74	0.000	4.23	0.000				
PC/S1	-4.45	0.000	-4.31	0.000			-1.85	0.068
PC/S2	-4.48	0.000	-4.32	0.000				
PC/S3	-4.57	0.000	-4.37	0.000				
PC/S4	-4.56	0.000	-4.36	0.000				
PC/S5	-4.58	0.000	-4.35	0.000				
PC/S6	-4.51	0.000	-4.29	0.000	-1.75	0.083	-1.99	0.049
Re/RW	9.59	0.000	6.16	0.000	4.28	0.000	2.43	0.017
Re/AC	8.47	0.000	7.50	0.000	3.76	0.000	1.80	0.075
Re/MA	7.49	0.000	6.58	0.000	3.11	0.002		
Re/ES	8.78	0.000	7.57	0.000	4.10	0.000	2.39	0.018
Re/S1							-2.79	0.006
Re/S2							-2.50	0.014
Re/S3							-2.35	0.020
Re/S4							-2.37	0.019
Re/S5							-2.31	0.023
Re/S6							-2.95	0.004
1983								
ES/RW					2.73	0.007	2.35	0.020
ES/PC	-2.43	0.017						
ES/MA					1.81	0.074	-1.70	0.093
ES/Re	2.25	0.027	-2.61	0.010	3.39	0.001	3.32	0.001
ES/S1	-7.53	0.000	-7.75	0.000				
ES/S2	-7.53	0.000	-7.88	0.000				
ES/S3	-7.65	0.000	-8.05	0.000				
ES/S4	-7.64	0.000	-8.03	0.000				
ES/S5	-7.54	0.000	-7.83	0.000				
ES/S6	-7.48	0.000	-7.17	0.000				
Re/RW	-2.30	0.023	-2.67	0.009	-3.25	0.002	-3.04	0.003
Re/AC	-2.65	0.000	-3.51	0.001	-2.67	0.009	-3.26	0.001
Re/MA	-3.82	0.000	-3.81	0.000	-4.66	0.000	-4.32	0.000
Re/S1	-9.67	0.000	-9.86	0.000	-3.33	0.001	-3.51	0.001
Re/S2	-9.64	0.000	-9.94	0.000	-3.20	0.002	-3.42	0.001
Re/S3	-9.79	0.000	-10.09	0.000	-3.20	0.002	-3.41	0.001
Re/S4	-9.78	0.000	-10.07	0.000	-3.21	0.002	-3.41	0.001
Re/S5	-9.68	0.000	-9.93	0.000	-3.27	0.001	-3.47	0.001
Re/S6	-9.85	0.000	-9.43	0.000	-3.80	0.000	-3.90	0.000

measured by either mape/forecast or mse/forecast. This is what would be expected given that this model is now ranked last rather than first for these two errors. Again, it fails to outperform the segment models in 1982 for all errors except mse/forecast. The other difference is the percentage change model in 1982 for mape/forecast and mse/forecast. In these two cases this model is now ranked fifth rather than fourth, a change that would not appear to be very significant.

9.10 CONCLUSIONS.

The major conclusion that can be drawn from these results is, as for the turnover forecasts, that overall the consolidated models outperform the segment models. There are a few cases where one or more segment models outperform some of the consolidated models but there is no consistent pattern in this and they appear to be largely due to the existence of a few cases where the consolidated model is seriously misspecified.

Looking firstly at the non-truncated results, for the optimal overall models the best model is the random walk followed by the exponential smoothing model. These two change places for the single year models. In the case of the prediction models the random walk and percentage change models are ranked first followed by the exponential smoothing models. Generally the relative orderings of the models is not very different whichever of the three comparisons is considered. The relative rankings of the models differ greatly from those for turnover forecasts and the conclusions appear not to be so intuitive. When the segment models are considered then the best model is model 2 (only U.K. times expected inflation). This was also the best segment model for forecasting turnover and, again, the worst models are the two ex-post ones. If the truncated results are considered then for turnover forecasts the only differences were in the relative rankings of the moving average and segment models. For the profit forecasts the differences between the results are much greater. The random walk model is now the best of the prediction models and the exponential smoothing model the best for the two ex-post comparisons. Again, the segment models are the poorest performers and, of these, the best model is model 2 which is now followed by the two ex-post models.

Apart from conclusions about the relative performance of the twelve models two other conclusions appear to hold for both the forecasts of turnover and profits. These are, firstly, that the results are dependent in many cases upon whether the denominator of the error measures is forecast or actual, but not whether absolute or squared errors are employed. Secondly, that a few large outliers occur especially when the alternative forms of the multiple form models are considered. These outliers often mask a much more consistent underlying pattern that is only apparent when the truncated errors are considered.

One reason for the apparently very poor performance of the segment models may be that the sample of companies used includes segments of varying fineness. The number of segments disclosed varies across the sample as does the geographical area covered by the segments. The next chapter attempts to assess whether or not the relative performance of the segment models is improved if the sample of companies employed is changed.

Chapter 10.

FORECASTS OF EARNINGS: THE EFFECTS OF CHANGING THE SAMPLE.

10.1. INTRODUCTION

It was shown in the previous chapter that, for forecasting earnings, with a very few exceptions, the consolidated models outperformed the turnover based segment models and that very often the difference in accuracy was significant. It was also shown that, for both turnover and profit forecasts, the ex-post segment models failed to outperform the ex-ante models. There are several possible reasons for these findings. One possible explanation is the aggregation of country forecasts into segment forecasts applicable to the sample companies' disclosures. If aggregation of country forecasts creates problems then it would be expected that such problems are more serious for some companies than others. Specifically, the more homogeneous are the country groupings then the less serious will the problem be and so the more accurate the segment based forecasts. Therefore, this is the first question that will be investigated. Appendix 4-1 and 4-2 showed that the sample covered companies that disclosed anything from two to thirteen segments. Also, that the segments disclosed varied in fineness from single countries to continents to just "overseas". It would be expected that as the segments increased in size or in the number of countries they covered the assumptions made when calculating the segment forecasts become less and less valid and so more error prone. At the extreme, it is very unlikely that the assumptions made when calculating the non-U.K. segment forecast hold for those companies that disclose just U.K and overseas. Therefore, this chapter initially examines only the 92 companies that disclose more segments than the two; U.K. and overseas. An alternative approach would have been to compare the errors of the seventeen companies that disclose only an overseas segment with the remaining companies. This was not done for two reasons. Firstly, the small sample size makes it difficult to assess the statistical validity of the results. Secondly, whilst the relative performance of the segment based forecasts for these two samples are of interest, their relative performance in comparison with the consolidated forecasts are more important. The approach taken allows such a comparison with the consolidated models.

It was argued in chapter 6 that problems may occur due to the use of only one forecasting service. It may be that this particular source has produced forecasts that are consistently less accurate than other alternatives, although there appears to be no reason to believe that this is so. Some evidence regarding this question can be found if forecasts from more than one source are used. Forecasts by the O.E.C.D. were also available. These only cover the O.E.C.D. countries and so are inappropriate for many of the sample companies. Therefore, a subsample of companies was taken, namely those that disclose segments covering only O.E.C.D. countries. This resulted in a sample of 24 companies. These were then used to see whether there appeared to be any consistent or significant differences in the accuracy of the segment forecasts derived from the two economic forecasts.

The third problem that this chapter investigates is not a problem specifically with the segment models but rather is likely to apply to all of the models to a varying extent. This is the problem of very small or negative profits in any year. If, for any reason, a company suffers an unusually bad financial year and makes little or negative profits then it is unlikely that the same model is equally applicable to that company and to other companies not in that position. For example, Brooks and Buckmaster (1976, 1980) provide evidence of a mean reversion process in these cases. It was decided to briefly examine the relative performance of the forecasting models for samples that excluded companies that had made either a loss or only a small profit. Due to the impossibility of objectively defining what is meant by a "small" profit level it was decided to use several filter rules. Companies were excluded from the sample if they did not make at least £1m., then £2m., £3m. and £4m. attributable profit in each year since 1974. Whilst it is possible to argue about the suitability of the specific filter rules used they do have the effect of excluding all but the largest and most successful sample companies. It would undoubtedly be useful to have evidence concerning whether or not different forecasting models apply to these companies.

10.2 FORECASTS FOR COMPANIES THAT DISCLOSE MORE THAN U.K. AND OVERSEAS SEGMENTS.

The exclusion of companies with such limited segmental disclosures led to the sample being reduced to 92 companies rather than the initial 109. The analysis carried out upon this sample was the same as that used for the initial sample. However, as the purpose was only to investigate one possible source of error in the segment models, the significance of the results was not tested for, with the exception of the comparison of the prediction models. Again, the first step was to investigate which form of the four multiple form models appeared to be most appropriate.

10.2.1 THE ABSOLUTE CHANGE MODEL.

Table 1 below provides a summary of the ranks of the five absolute change models for the non-truncated errors (for the full results see appendix 32). It can be seen that overall the best model is the 5 year model, as it was for both turnover and the profit forecasts for all companies. However, the degree of consistency has slightly increased. This is because this model is now ranked first for all errors in 1983 when, for the full sample the two year model was ranked first for errors with a denominator of forecasted earnings. The overall ranks of the five models is unchanged with the four year being second best etc. and, again, the only year when the five year model is not ranked first or first equal is in 1982 when it is outperformed by the four year model.

Table 1.

RANKS OF THE NON-TRUNCATED ERRORS FOR THE ABSOLUTE CHANGE MODELS.

	1980				1981				1982				1983			
	p/a	s/a	p/f	s/f												
1 yr.	5	5	5	5	5	5	3	3	5	4	3	3	4	4	5	5
2 yr.	4	4	4	4	4	4	5	5	4	5	4	4	2	3	3	2
3 yr.	3	3	3	3	3	3	3	3	3	3	1	1	5	5	4	4
4 yr.	2	2	1	1	2	2	2	2	1	1	2	2	3	2	2	3
5 yr.	1	1	2	2	1	1	1	1	2	2	5	5	1	1	1	1

Average ranks

	1980	1981	1982	1983	p/a	s/a	p/f	s/f	Average	Overall
1 yr.	5	4	3.75	4.5	4.75	4.5	4	4	4.3125	5
2 yr.	4	4.5	4.25	2.5	3.5	4	4	3.75	3.8125	4
3 yr.	3	3.5	2	4.5	3.5	3.5	3	3	3.25	3
4 yr.	1.5	2	1.5	2.5	2	1.75	1.75	2	1.875	2
5 yr.	1.5	1	3.5	1	1.25	1.25	2.25	2.25	1.75	1

If the truncated results are compared (see appendix 32 and table 2 below) with those for the entire sample then again, the five year model is the best. Before its average rank was also 1, now it has an average rank of 1.5, which shows that the level of consistency has fallen. However, this does not appear to be a major change and it is still better than the average rank of 1.75 for the non-truncated errors.

Table 2.

AVERAGE RANKS OF THE TRUNCATED ERRORS FOR THE ABSOLUTE CHANGE MODELS.

	1980	1981	1982	1983	Average	Overall
1 yr.	4.5	5	4.5	2.5	4.125	5
2 yr.	3.25	3.5	4.5	2.5	3.4375	4
3 yr.	2.75	2	2.5	5	3.0625	3
4 yr.	2.75	3	2.25	3.5	2.875	2
5 yr.	1.75	1.5	1.25	1.5	1.5	1

10.2.2 THE PERCENTAGE CHANGE MODEL.

It was found for the full sample that the best form of this model for forcasting turnover was the two year model whilst for profit forecasts it was the four year model. For both forecasts there appeared to be no particular reason why these should be the optimal forms. Table 3 below (derived from the full results in appendix 32) provides a summary of the ranks for the non-truncated errors. The results are somewhat surprising. If they are compared with those for the entire sample then it is seen that there are no differences in any of the ranks. The removal of 17 companies has had no effect at all.

Table 3.

RANKS OF THE NON-TRUNCATED ERRORS FOR THE PERCENTAGE CHANGE MODELS.

	1980				1981				1982				1983			
	p/a	s/a	p/f	s/f												
1 yr.	5	5	5	5	5	5	5	5	5	4	5	5	5	5	5	5
2 yr.	4	4	4	4	3	4	4	3	4	5	4	4	4	4	2	2
3 yr.	3	3	3	3	2	2	2	2	1	1	3	3	3	3	3	3
4 yr.	1	1	1	2	1	1	3	4	2	2	1	1	1	1	1	1
5 yr.	2	2	2	1	4	3	1	1	3	3	2	2	2	2	4	4

	1980	1981	1982	1983	p/a	s/a	p/f	s/f	Average	Overall
1 yr.	5	5	4.75	5	5	4.75	5	5	4.9375	5
2 yr.	4	3.5	4.25	3	3.75	4.25	3.5	3.25	3.6875	4
3 yr.	3	2	2	3	2.25	2.25	2.75	2.75	2.5	3
4 yr.	1.25	2.25	1.5	1	1.25	1.25	1.5	2	1.5	1
5 yr.	1.75	2.25	2.5	3	2.75	2.5	2.25	2	2.375	2

Table 4 provides a summary of the ranks for the truncated errors. Now, the removal of these companies has had some effects. The optimal model is still the three year model, but now this is followed by the four year rather than the five year model. There is also slightly more agreement about the optimality of the three year model as its average rank has decreased from 2.315 to 2.25. Again, this does not appear to a significant change.

Table 4.

AVERAGE RANKS OF THE TRUNCATED ERRORS FOR THE PERCENTAGE CHANGE MODELS.

	1980	1981	1982	1983	Average	Overall
1 yr.	3.25	4.5	4.5	1.5	3.4375	5
2 yr.	3	3	3	4	3.25	3=
3 yr.	1.25	1.75	2	4	2.25	1
4 yr.	3.75	2	2.75	2.75	2.8125	2
5 yr.	3.75	3.75	2.75	2.75	3.25	3=

10.2.3. THE MOVING AVERAGE MODEL.

For the non-truncated errors for the moving average models the results are, again, very similar to those found for the full sample. Table 5, below, provides a summary of the ranks (for the full results see appendix 32). For 1980 none of the ranks have changed. For 1981 and 1983 only some of the ranks for mse/forecast differ whilst for 1982 the change in sample has only affected errors measured by mape/actual. The overall effect of this is that instead of the four and six year models being ranked equal first now the six year model is ranked first and the four year model second.

Table 5.

RANKS OF THE NON-TRUNCATED ERRORS FOR THE MOVING AVERAGE MODELS.

	1980				1981				1982				1983			
	p/a	s/a	p/f	s/f												
2 yr.	5	5	1	2	5	5	3	3	1	1	4	3	4	2	5	5
3 yr.	4	4	2	1	4	4	5	4	5	5	5	5	3	1	2	2
4 yr.	3	3	3	3	3	3	1	1	2	4	2	2	5	5	1	1
5 yr.	2	2	4	4	2	2	4	5	4	3	1	1	2	4	4	4
6 yr.	1	1	5	5	1	1	2	2	3	2	3	4	1	3	3	3

	1980	1981	1982	1983	p/a	s/a	p/f	s/f	Aver.	Overall
2 yr.	3.25	4	2.25	4	3.75	3.25	3.25	3.25	3.375	4
3 yr.	2.75	4.25	5	2	4	3.5	3.5	3	3.5	5
4 yr.	3	2	2.5	3	3.25	3.75	1.75	1.75	2.625	2
5 yr.	3	3.25	2.25	3.5	2.5	2.75	3.25	3.5	3	3
6 yr.	3	1.5	3	2.5	1.5	1.75	3.25	3.5	2.5	1

If the average ranks for the truncated errors, as reported in table 6, are considered, then all years, with the exception of 1982, are affected by the change in sample. The overall effect is very small with the relative performances of the five models being unaffected, but the consistency of the relative ranks appears to have decreased. The average ranks now vary between 2.125 and 3.875 rather than the slightly wider range of 2.065 to 4.0.

Table 6.

AVERAGE RANKS OF THE TRUNCATED ERRORS FOR THE MOVING AVERAGE MODELS.

	1980	1981	1982	1983	Average	Overall
2 yr.	1.25	1.75	1	4.5	2.125	1
3 yr.	1.75	3	2	4.5	2.8125	2
4 yr.	3.25	2.5	3	3	2.9375	3
5 yr.	3.75	3.75	4	1.5	3.25	4
6 yr.	5	4	5	1.5	3.875	5

10.2.4. THE EXPONENTIAL SMOOTHING MODEL.

Table 7 below summarises the ranks for the nineteen possible versions of this model (for the full results see appendix 32). Most of the error and year combinations have several ranks that differ from those for the full sample. This is reflected in the fact that the relative ranks of nearly all the models are also different. Virtually the only models that retain the same ranks are the models that are ranked first (0.20) second (0.10) and third (0.15). Similarly, the optimal model for each year and each error metric has not changed. Whilst the range of the average ranks has increased marginally the change cannot be considered significant.

The comparison of the the truncated errors (see table 8 and appendix 33) yields fewer differences when compared with those found for the entire sample. A smoothing constant of 0.85 is still the best model overall though now this is followed by 0.90 then 0.95, a reversal of their previous positions. The optimal model in 1980 is still a weighting of 0.95 and a weight of 0.85 is still

Table 7.

RANKS OF THE NON-TRUNCATED ERRORS FOR THE EXPONENTIAL SMOOTHING MODELS.

	1980				1981				1982				1983			
	p/a	s/a	p/f	s/f												
0.95	19	19	15	17	18	19	1	1	2	4	2	6	19	19	2	5
0.90	18	18	12	15	10	18	8	12	1	2	3	7	17	18	5	7
0.85	17	17	9	12	13	17	2	2	3	1	15	15	16	17	8	10
0.80	16	16	5	7	14	16	6	9	4	3	7	9	15	16	12	14
0.75	15	15	6	8	16	15	16	16	5	5	11	14	14	15	15	16
0.70	14	14	17	18	17	14	19	19	6	6	16	16	13	14	13	13
0.65	13	13	19	19	19	13	5	6	7	7	19	19	12	13	16	15
0.60	12	12	13	13	15	12	3	3	8	8	13	13	11	12	10	9
0.55	11	11	3	10	12	11	4	4	9	9	14	14	9	11	11	11
0.50	10	10	1	5	11	10	7	10	10	10	6	8	8	9	19	18
0.45	9	9	2	2	9	9	15	15	11	11	10	12	7	6	9	8
0.40	8	8	4	1	8	8	13	14	12	12	18	18	5	4	6	6
0.35	7	7	7	3	7	7	18	18	13	13	1	1	3	5	18	19
0.30	6	6	8	4	5	6	11	13	14	14	8	11	2	8	14	14
0.25	5	5	11	6	1	5	17	17	15	17	4	4	1	7	17	17
0.20	4	4	13	9	4	4	9	8	16	16	5	5	4	3	4	4
0.15	3	3	14	11	6	3	10	5	17	15	17	17	6	2	1	1
0.10	2	2	16	14	3	2	12	7	18	18	9	3	10	1	3	2
0.05	1	1	18	16	2	1	14	11	19	19	12	2	18	10	7	3

Average ranks

	1980	1981	1982	1983
0.95	17.5	9.75	3.5	11.25
0.90	15.75	12	3.25	11.75
0.85	13.75	8.5	8.5	12.75
0.80	11	11.25	5.75	14.25
0.75	11	15.75	8.75	15
0.70	15.75	17.25	11	13.25
0.65	16	10.75	13	14
0.60	12.5	8.25	10.5	10.5
0.55	8.75	7.75	11.5	10.5
0.50	6.5	9.5	8.5	13.5
0.45	5.5	12	11	7.5
0.40	5.25	10.75	15	5.25
0.35	6	12.5	7	11.25
0.30	6	8.75	11.75	9
0.25	6.75	10	10	10.5
0.20	7.5	6.25	10.5	3.75
0.15	7.75	6	16.5	2.5
0.10	8.5	6	12	4
0.05	9	7	13	9.5

	mape/a	mse/a	mape/f	mse/f	Average	Overall
0.95	14.5	15.25	5	7.25	10.5	13
0.90	11.5	14	7	10.25	10.6875	15
0.85	12.25	13	8.5	9.75	10.875	16
0.80	12.25	12.75	7.5	9.75	10.5625	14
0.75	12.5	12.5	12	13.5	12.625	19
0.70	12.5	12	16.25	16.5	14.3125	18
0.65	12.75	11.5	14.75	14.75	13.4375	17
0.60	11.5	11	9.75	9.5	10.4375	12
0.55	10.25	10.5	8	9.75	9.625	10=
0.50	9.75	9.75	8.25	10.25	9.5	9
0.45	9	8.25	9	9.25	9	4=
0.40	8.25	8	10.25	9.75	9.0625	6
0.35	7.5	8	11	10.25	9.1875	7
0.30	6.75	8.5	10.25	10.5	9	4=
0.25	5.5	8.5	12.25	11	9.3125	8
0.20	7	6.75	7.75	6.5	7	1
0.15	8	5.75	10.5	8.5	8.1875	3
0.10	8.25	5.75	10	6.5	7.625	2
0.05	10	7.75	12.75	8	9.625	10=

the best in 1981. In 1982 the optimal weight is 0.95 when previously it was ranked second behind 0.60. Finally, in 1983, the optimal weight is still 0.90 although 0.85 now performs as well.

Table 8.

AVERAGE RANKS OF THE TRUNCATED ERRORS FOR THE EXPONENTIAL SMOOTHING MODELS.

	1980	1981	1981	1982	Average	Overall
0.95	4.5	9	1	4.5	4.75	3
0.90	6.25	4	3.75	4	4.5	2
0.85	7	1	3.5	4	3.875	1
0.80	7.25	4	3.25	5.25	4.9375	4
0.75	7.5	3	3.75	7	5.3125	5
0.70	9.5	4.5	6.25	9.5	7.4375	6=
0.65	7	5	6.75	11	7.4375	6=
0.60	6.75	7.5	7.75	11.25	8.3125	8
0.55	6.75	9	9	10.75	8.875	9
0.50	6.25	8.5	10	12.75	9.375	11
0.45	6.5	11	11	8.25	9.1875	10
0.40	9.25	12.25	12	7.75	10.3125	12
0.35	10.5	13	13	11.75	12.0625	14
0.30	11.75	13.25	14	9	12	13
0.25	13.25	15	15	11.25	13.625	15
0.20	16	16	16	12	15	16
0.15	17	17	17	13.5	16.125	17
0.10	18	18	18	17.5	17.875	18
0.05	19	19	19	19	19	19

10.2.5. THE OPTIMAL SINGLE MODEL.

It has been shown that the exclusion of the nineteen companies has generally led to either very little or no difference in the relative performance of the alternative forms of the multiple form models. This is what would be expected, as if the conclusions drawn earlier are fairly robust then the optimal form of each model should not change to any major extent when the sample of companies is changed slightly. The justification for excluding these companies was that the segment models would probably perform relatively less well for such companies. To see if the segment models do perform more efficiently than before, the optimal single models will be compared. Given the relatively minor changes in the performance of the multiple form models it was decided not to re-examine the annual ex-post models although the prediction models will also be compared.

Table 9 below (derived from the full results reported in appendix 34) summarises the ranks for the non-truncated errors for the optimal overall models. Appendix 33 provides details of the forms of the regression models employed.

The overall conclusions that can be drawn from these ranks are the same as those found for the original sample, namely that the consolidated models all outperform the segment models. If the average ranks are compared to those

Table 9.

AVERAGE RANKS OF THE NON-TRUNCATED ERRORS OF THE OPTIMAL SINGLE MODELS.

	1981				1982				1983			
	p/a	s/a	p/f	s/f	p/a	s/a	p/f	s/f	p/a	s/a	p/f	s/f
RW	1	1	6	7	11	12	1	1	6	12	1	1
AC	6	7	2	3	1	2	12	12	5	5	3	3
PC	2	2	5	2	2	1	12	12	3	1	5	5
MA	4	4	4	5	12	11	4	5	1	3	6	9
ES	3	3	3	4	10	9	2	2	2	2	4	4
Re	5	5	1	1	3	10	3	3	4	4	2	2
S1	7	6	12	12	5	4	10	10	8	7	11	11
S2	8	8	10	10	6	5	9	9	10	9	9	8
S3	11	11	8	8	8	7	6	6	12	11	7	6
S4	10	10	9	9	7	6	7	7	11	10	8	7
S5	12	12	7	6	9	8	8	8	9	8	10	10
S6	9	9	11	11	4	3	11	11	7	6	12	12

	Average rank					109 Companies	
	1981	1982	1983	Average	Overall	Average	Overall
RW	3.75	6.25	5	5	4	2.67	1
AC	4.5	6.75	4	5.0833	6	6.25	6
PC	3.75	3	3.5	3.4166	1	3.33	3
MA	4.25	8	4.75	5.66	5	3.83	4
ES	3.25	5.75	3	4	3	3.25	2
Re	3	4.75	3	3.583	2	4.75	5
S1	9.25	7.25	9.25	8.583	10	8.916	9=
S2	9	7.25	9	8.416	8=	8.83	7=
S3	9.5	6.75	9	8.416	8=	8.83	7=
S4	9.5	6.75	9	8.416	8=	8.917	9=
S5	9.25	8.25	9.25	8.916	12	9.25	12
S6	10	7.25	9.25	8.83	11	9.167	11

for the larger sample then it can be seen that the average ranks of all the segment models have improved. This implies that the relative predictive ability of the segment models is now slightly greater. In 1981 there are two cases where a consolidated model is outperformed by a segment model, previously there was only one such case, the absolute change model for mse/actual errors. In 1983 there is one case of the random walk model being ranked twelfth (previously fourth) and one case where the exponential smoothing model is ninth (previously first). There is also one instance of an improvement in the rank of the absolute change model from twelfth to third. It is in 1982 where the relative performance of the segment models appears to have increased significantly, especially for errors with a denominator of actual profit. For mape/actual the exponential smoothing, random walk and moving average models are now ranked 10, 11 and 12, when previously they were ranked 5,1,6 respectively. For mse/actual only the percentage change, absolute change and regression models outperform the segment models, previously only the moving average model performed less well than the segment models.

It was shown above that the optimal form of each multiple form model generally changed only marginally. It was also argued that given the relatively small change in the sample, this is what should be expected. It is therefore surprising to see the difference in the relative performance of each of the consolidated models due to the change in the sample. The largest change is that now the percentage change model is ranked first rather than third, this is especially surprising given that the ranks of none of the forms of this model changed for any year or error measure when the sample size was reduced. This model is now followed by the regression model, previously fifth then the exponential smoothing model, previously ranked second. For the larger sample the best model was the random walk model which is now ranked fourth. These changes in the ranks of the models imply that the results found may be very susceptible to changes in the sample composition. Whether or not the ranks will change by as much for other changes in the sample needs to be further investigated.

Table 10 below provides a summary of the ranks of the truncated errors (for the full results see appendix 34). The change in the sample has now had a far smaller effect. This is what might be expected. If the rationale for excluding the companies that disclose only U.K. and overseas segments is correct then it would be expected that these are the companies with the largest errors. As such the exclusion of these will have a much greater effect upon the non-truncated errors than the truncated errors as the truncation has already removed much of the effects of outliers. The average ranks of the models have not changed by very much or, for the segment models, in any consistent manner. The absolute change model is now ranked third and the regression model fourth, a reversal of their previous positions. The major change in the ranks of the segment models is in the rank of segment model 6 which is now eighth rather than twelfth, whilst model 4 is ranked ninth rather than last equal. Previously there were no cases of any segment model outperforming any consolidated model. Now there is only one such case, the moving average model is ranked tenth rather than sixth in 1983 for mape/forecast.

Table 10.

RANKS OF THE TRUNCATED ERRORS OF THE OPTIMAL SINGLE MODELS

	1981				1982				1983			
	p/a	s/a	p/f	s/f	p/a	s/a	p/f	s/f	p/a	s/a	p/f	s/f
RW	3	1	5	4	3	3	1	1	5	4	2	2
AC	4	2	3	6	2	4	2	2	2	5	3	3
PC	6	6	6	5	6	6	6	6	4	3	5	6
MA	5	5	4	3	4	2	5	5	3	2	10	5
ES	2	3	2	2	1	1	3	3	1	1	4	4
Re	1	4	1	1	5	5	4	4	6	6	1	1
S1	8	7	12	12	7	8	11	11	8	8	11	11
S2	7	8.5	10	10	9	9	10	10	10	10	8	9
S3	10.5	10.5	8.5	8.5	11	12	8	8	12	12	6	7.5
S4	10.5	10.5	8.5	8.5	10	10.5	9	9	11	11	7	7.5
S5	12	12	7	7	12	10.5	7	7	9	9	9	10
S6	9	8.5	11	11	8	7	11	12	7	7	12	12

						109 Companies	
	1981	1982	1983	Average	Overall	Average	Overall
RW	3.25	2	3.25	2.833	2	2.33	2
AC	3.75	2.5	3.25	3.166	3	3.417	4
PC	5.75	6	4.5	5.416	6	5.75	6
MA	4.25	4	5	4.416	5	4.83	5
ES	2.25	2	2.5	2.25	1	2.167	1
Re	1.75	4.5	3.5	3.25	4	2.5	3
S1	9.75	9.25	9.5	9.5	10	9.583	11=
S2	8.875	9.5	9.25	9.2083	7	9.33	7
S3	9.5	9.75	9.375	9.5416	11	9.547	10
S4	9.5	9.625	9.125	9.416	9	9.583	11=
S5	9.5	9.125	9.25	9.2916	8	9.5	9
S6	9.875	9.5	9.5	9.625	12	9.4583	8

10.2.6. THE OPTIMAL PREDICTION MODELS.

Table 11 below (derived from the full results reported in appendix 35) provides a summary of the ranks of the non-truncated errors for the prediction or ex-ante models.

Table 11.

RANKS OF THE NON-TRUNCATED ERRORS OF THE OPTIMAL PREDICTION MODELS.

	1981				1982				1983			
	ap/a	se/a	ap/f	se/f								
RW	1	1	4	4	10	12	1	1	6	12	1	1
AC	5	11	1	1	1	2	12	12	5	5	3	3
PC	2	2	2	2	2	1	4	3	1	1	4	2
MA	4	4	11	12	12	11	3	4	3	2	12	12
ES	3	3	3	9	9	9	11	11	4	4	2	4
Re	6	10	8	11	11	10	2	2	2	3	7	8
S1	7	5	12	10	4	4	9	9	8	7	10	10
S2	8	6	9	7	5	5	8	8	10	9	8	7
S3	11	9	6	5	7	7	5	5	12	11	5	5
S4	10	8	7	6	6	6	6	6	11	10	6	5
S5	12	12	5	3	8	8	7	7	9	8	9	9
S6	9	7	10	8	3	3	10	10	7	6	11	11

						109 Companies	
	1981	1982	1983	Average	Overall	Average	Overall
RW	2.5	6	5	4.5	2	2.67	1=
AC	4.5	6.75	4	5.083	3	7	5
PC	2	2.5	2	2.16	1	2.67	1=
MA	7.75	7.5	7.25	7.5	8=	7.167	6
ES	4.5	10	3.5	6	4	3.83	3
Re	8.75	6.25	5	6.66	5	4.75	4
S1	8.5	6.5	8.75	7.916	10=	8.25	9=
S2	7.5	6.5	8.5	7.5	8=	8.167	7=
S3	7.75	6	8.25	7.33	6=	8.167	7=
S4	7.75	6	8.5	7.33	6=	8.25	9=
S5	8	7.5	8.75	8.083	12	8.67	12
S6	8.5	6.5	8.75	7.916	10=	8.4167	11

The general conclusions that can be drawn from these results are very similar to those for the full sample reported in the previous chapter. Previously the consolidated models all outperformed the segment models. This is still the case with only one exception. The moving average model is outperformed by segment models 3 and 4. On a year by year basis previously the moving average model was outperformed by segment models 1 to 4 in 1981. Now it only outperforms model 2. The major differences again occur in 1982, as was the case for the overall models. The absolute change model is outperformed by all the segment model with the exception of model 5. The moving average model is also outranked by all segment models except model 5, which has the same rank as the moving average model. The exponential smoothing model is also outperformed by all the segment models. On a case by case basis there are also some major changes in the relative performance of the models, again especially in 1982. Specifically, the random walk model was ranked 1,2,2,3 for the four errors. It is now ranked 10,12,1,1. Whilst the exponential smoothing model was ranked 4,4,3,2 and is now ranked 9,9,11,11. Most other changes are neither very large nor apply across all the error measures. Overall, although the relative performance of the segment models has not increased greatly the results do suggest that the applicability of such models does depend upon the fineness of the segment disclosures.

Table 12 provides a summary of the significant t-test results for these models (for the full results see appendix 36). If these results are compared with those found for the larger sample then it can be seen that the results are generally similar. There are now rather more significant differences and many cases now where the results are significant at 1% rather than 10%. It is also interesting to note that there are far more significant results for errors measured by mape/actual than for the other error measures. This supports the conclusion drawn earlier that the choice of error measure is important and the conclusions drawn are often error specific. If, firstly, the consolidated models are compared with the segment models then there are significant differences in each year for each model, with the exception of the regression model in 1981. If errors measured by mape/actual are considered first then, in 1981, all consolidated models except the regression model outperform the segment models. In 1982 only the moving average and regression models are not significantly different from the segment models whilst in 1983 all the consolidated models provide significant differences. For mse/actual there are less significant differences. In 1981 only the percentage change and exponential smoothing models significantly outperform the segment models. In 1982 there are no significant differences. In 1983 all the differences except those for the random walk and absolute change models are significant. Mape/forecast again provides few significant differences, namely, for 1981 random walk and absolute change, for 1982 random walk, exponential smoothing and regression models and in 1983 there are no significant differences. Similarly for mse/forecast there are no significant differences in 1983 nor indeed for either 1981 or 1982. Several of these results did not apply for the larger sample. In particular, previously none of the models yielded significant results for mse/actual in 1983. Only the regression model yields less significant results for this smaller sample.

If the consolidated models are compared with each other

Table 12.

SIGNIFICANT T-TESTS FOR NON-TRUNCATED ERRORS OF THE OPTIMAL PREDICTION MODELS.

	1981				1982				1983			
	map/act	mse/act	map/for	mse/for	map/act	mse/act	map/for	mse/for	map/act	mse/act	map/for	mse/for
RW/AC	0.032								0.000	0.006		
RW/PC				0.000	0.046		0.000	0.083	0.094	0.045	0.002	0.079
RW/MA												
RW/ES			0.005									
RW/Re					0.001	0.069						
RW/S1	0.042		0.052		0.050		0.046		0.007			
RW/S2	0.026		0.058		0.042		0.056		0.005			
RW/S3	0.022		0.061		0.032		0.061		0.004			
RW/S4	0.022		0.061		0.033		0.060		0.004			
RW/S5	0.010		0.069		0.033		0.064		0.007			
RW/S6	0.026		0.058		0.058		0.044		0.015			
AC/PC									0.008	0.015		
AC/MA									0.025	0.031		
AC/ES			0.093						0.066	0.083		
AC/Re					0.009				0.081			
AC/S1			0.071		0.044		0.083		0.072			
AC/S2	0.099		0.080		0.036		0.099		0.054			
AC/S3	0.081		0.085		0.028				0.043			
AC/S4	0.082		0.085		0.029				0.044			
AC/S5	0.039		0.099		0.029				0.065			
AC/S6	0.098		0.080		0.051		0.075					
PC/MA	0.054	0.026	0.099									
PC/ES		0.036			0.028		0.009					
PC/Re	0.039				0.009	0.060						
PC/S1	0.004	0.038							0.001	0.059		
PC/S2	0.003	0.036			0.093				0.001	0.057		
PC/S3	0.003	0.036			0.072				0.000	0.053		
PC/S4	0.003	0.036			0.074				0.000	0.053		

PC/S5	0.002	0.033		0.073				0.001	0.059		
PC/S6	0.003	0.036						0.001	0.074		
MA/ES	0.022	0.044									0.048
MA/Re	0.077			0.000	0.024						
MA/S1	0.079							0.000	0.055		
MA/S2	0.058							0.000	0.052		
MA/S3	0.048							0.000	0.049		
MA/S5	0.028	0.084						0.000	0.049		
MA/S6	0.057							0.000	0.055		
ES/Re	0.054			0.001	0.047			0.001	0.068	0.092	
ES/S3	0.036	0.095		0.035		0.047		0.001	0.065		
ES/S2	0.026	0.081		0.029		0.057		0.001	0.061		
ES/S3	0.022	0.075		0.022		0.061		0.001	0.057		
ES/S4	0.022	0.076		0.023		0.060		0.001	0.057		
ES/S5	0.013	0.061		0.023		0.064		0.001	0.064		
ES/S6	0.026	0.080		0.041		0.044		0.002	0.083	0.064	
Re/S1						0.040		0.001	0.079		
Re/S2						0.049		0.001	0.073		
Re/S3						0.052		0.001	0.068		
Re/S4						0.051		0.001	0.068		
Re/S5						0.055		0.001	0.078		
Re/S6						0.037		0.002			
S1/2	0.000	0.045	0.006	0.005		0.004	0.088	0.000	0.052	0.001	
S1/3	0.000	0.027	0.011	0.001	0.074	0.003	0.075	0.000	0.023	0.003	
S1/4	0.000	0.027	0.011	0.001	0.074	0.003	0.071	0.000	0.024	0.003	
S1/5	0.000	0.026	0.013	0.001		0.001	0.040	0.005	0.097	0.060	
S1/6	0.001	0.037	0.007	0.005	0.020	0.035		0.000	0.023	0.002	
S2/3	0.006	0.093	0.027	0.000	0.029	0.040		0.000	0.040	0.012	
S2/4	0.006	0.092	0.026	0.000	0.023	0.044		0.000	0.033	0.011	
S2/5	0.000	0.026	0.018	0.000	0.086	0.003	0.092	0.000	0.031	0.001	0.089
S2/6			0.038	0.002	0.080	0.003	0.084	0.000	0.027	0.001	
S3/4	0.011		0.048	0.001	0.080	0.020		0.004		0.067	
S3/5	0.000	0.029	0.016					0.000	0.017	0.003	
S3/6	0.004	0.092	0.023	0.001	0.059	0.008		0.000	0.023	0.002	
S4/5	0.000	0.028	0.016					0.000	0.016	0.003	
S4/6	0.004	0.092	0.022	0.001	0.058	0.008		0.000	0.023	0.002	
S5/6	0.000	0.026	0.017	0.001	0.082	0.003	0.086	0.000	0.027	0.002	

then there are relatively few significant differences and there appears to be no pattern in the results found. The percentage change model was found to be the best model when the single models were considered. Now not only is it the best model over the three years but it is the best in each year as well. However, it fails to significantly outperform the other consolidated models in many cases. It outperforms the random walk model for more than half of the year error combinations whilst there are only two instances of it significantly outperforming the average change and moving average models and three instances of it significantly outperforming the exponential smoothing and regression models. Thus whilst this is the best model its supremacy is not great especially if the error is measured with a denominator of forecasted profit. If the segment models are considered then most of the differences are significant with the exception of errors measured by mse/forecast. These results are very similar to those found for the larger sample except, again, there are more significant differences. Specifically, for mse/actual in 1982 and 1983 plus a much higher level of significance for mape/actual in 1983.

A summary of the ranks for the truncated errors is provided in table 13 below (for the full results see appendix 34).

Table 13.

RANKS OF THE TRUNCATED ERRORS OF THE OPTIMAL PREDICTION MODELS.

	1981				1982				1983			
	ap/a	se/a	ap/f	se/f								
RW	1	1	4	2	3	2	1	1	6	5	1	1
AC	3	2	1	4	2	4	2	2	2	6	2	2
PC	5	5	5	3	5	5	6	6	5	4	5	6
MA	4	4	3	1	4	3	4	4	4	3	10	5
ES	2	3	2	5	1	1	3	3	1	1	3	4
Re	6	6	12	12	6	6	5	5	3	2	4	3
S1	9	7	11	1	7	8	1	11	8	8	11	11
S2	8	8	9	9	9	9	10	10	10	10	8	9
S3	10.5	10.5	7.5	8	11	12	8	8	12	12	6	7.5
S4	10.5	10.5	7.5	7	10	10.5	9	9	11	11	7	7.5
S5	12	12	6	6	12	10.5	7	7	9	9	9	10
S6	7	9	10	10	8	7	12	12	7	7	12	12

	1981	1982	1983	Average	Overall	Average	Overall
RW	2	1.75	3.25	2.33	1	1.75	1
AC	2.5	2.5	3	2.66	3	2.83	2
PC	4.5	5.5	5	5	5	5.25	6
MA	3	3.75	5.5	4.083	4	4.083	4
ES	3	2	2.25	2.416	2	3.4167	3
Re	9	5.5	3	5.83	6	5.167	5
S1	9.5	9.25	9.5	9.416	10=	9.33	11
S2	8.5	9.5	9.25	9.083	7	9.167	7
S3	9.125	9.75	9.375	9.416	10=	9.2917	10=
S4	8.875	9.625	9.125	9.2083	9	9.2917	10=
S5	9	9.125	9.25	9.125	8	9.2083	8=
S6	9	9.75	9.5	9.416	10=	9.2083	8=

Again, the general conclusions derivable from a comparison of these ranks with those for the full sample are virtually identical to those for the overall models. Whilst the average ranks of all the models differ the changes are generally very small. There is no pattern in the changes in the ranks of the segment models, some having decreased and some increased with the relative performance of none of the models changing by very much. The random walk model is still the best overall followed by the exponential smoothing and then the absolute change models, a reversal of their previous positions. Only the overall rank of segment model 6 has changed by more than one position, namely from eighth equal to tenth equal. On a case by case basis there is only one new instance of a consolidated model being outperformed by a segment model, namely the moving average model in 1983 for mape/forecast. Overall, these results also support the conclusion that the change in sample does not effect the relative performance of the segment models if the errors are truncated, even if such a change does have an effect on the ranks of the non-truncated errors.

10.3. COMPARISON OF DIFFERENT ECONOMIC FORECASTS.

As explained earlier the segment models used so far have all been based upon the E.I.U. country forecasts. An alternative source of forecasts is the O.E.C.D. forecasts. These cover only the O.E.C.D. member countries. They are therefore not applicable to many of the segments that companies disclose, for example Africa or the Middle East. However, 24 companies disclose segments that do not include such areas and so can be used in conjunction with the O.E.C.D. forecasts. These companies were used to compare the errors of forecasts derived from these two sources. Table 14 below provides a summary of the results (for full details see appendix 37). The table presents the t-test results where the difference is taken to be the E.I.U. forecast error less the O.E.C.D. forecast error. These are all for segment model 1 only (no inflation adjustments). The conclusions derived for this model should apply equally to the other segment models, so it should not be necessary to repeat the analysis upon all six segment models.

Table 14.

COMPARISON OF ERROR MEASURES FOR PROFIT FORECASTS BASED UPON O.E.C.D. AND E.I.U. FORECASTS.

	NON-TRUNCATED				TRUNCATED			
	(DIFFERENCE) MEAN	STANDARD DEVIATION	T VALUE	2-TAIL PROB.	MEAN	STANDARD DEVIATION	T VALUE	2-TAIL PROB
MAPE/ACTUAL								
1981	0.0340	0.019	1.82	0.081	0.0052	0.031	0.82	0.419
1982	0.0024	0.007	0.37	0.714	-0.0056	0.018	-1.54	0.137
1983	0.0261	0.025	1.04	0.310	-0.0072	0.031	-1.14	0.265
MAPE/FORECAST								
1981	-0.0428	0.034	-1.27	0.217	0.0029	0.014	1.03	0.314
1982	-0.0546	0.023	-2.39	0.025	-0.0040	0.017	-1.14	0.265
1983	-0.0458	0.027	-1.71	0.102	-0.0190	0.082	-1.14	0.267
MSE/ACTUAL								
1981	0.3997	1.486	1.32	0.201	0.0102	0.056	0.89	0.383
1982	0.0253	0.104	1.19	0.245	-0.0065	0.019	-1.67	0.109
1983	0.1603	0.585	1.34	0.192	-0.0041	0.025	-0.79	0.437
MSE/FORECAST								
1981	-1.0877	5.111	-1.04	0.308	0.0029	0.014	1.03	0.315
1982	-0.6769	1.883	-1.76	0.092	-0.0072	0.029	-1.20	0.243
1983	-0.4001	1.747	-1.12	0.273	-0.0241	0.111	-1.06	0.301

There appears to be no consistent pattern in the occurrence of positive and negative differences for the non-truncated errors. For the truncated errors it appears that all the differences are positive in 1981 and negative in the other two years. Of much more importance than the sign of the differences are their significance. At the 5% level of significance only one case is significant, the non-truncated mape/forecast error in 1982 when the better forecast is provided by the E.I.U. At the 10% level two differences are significant. These are for 1981 mape/actual when the O.E.C.D. forecast is the better and in 1982 the E.I.U. forecast is better for mse/forecast. These three instances are not enough to conclude that there is any important and consistent difference in the accuracy of forecasts based upon the two economic forecasting services, and, given the number of cases compared, these differences may well be due to chance only.

Whilst this does not demonstrate that there are not other economic forecasts available which would have led to a significantly improved performance by the segment models there appears to be no reason to believe that the results found are forecasting service specific.

10.4. SAMPLES BASED UPON THE SIZE OF ATTRIBUTABLE PROFITS.

It has been found in the past that different companies exhibit different time series patterns of earnings. One factor that may explain these different patterns is the size of earnings (Brooks and Buckmaster 1976, 1980). If earnings are either very small or negative in any year then it might be expected that a different model will apply from normal or that the errors generated from some of the models will be very large. There are several ways to assess if this is the case. One way would be to compare two samples of companies, those with very small or negative profits and those with larger profits. A second way is to assess the extent that different models are applicable to different samples. The second approach was taken. This method was chosen for two reasons. The main objective of this study is to examine the relative predictive ability of segment models compared to consolidated models. Therefore, it is more appropriate to test this for various samples than to compare the relative predictive ability of each model for two samples. The second reason is that this approach is consistent with the approach used elsewhere in this study. Only the non-truncated errors were considered. If some models do not apply to companies with small profits they will give very large errors so if the errors are truncated then these effects will be largely removed. This means that the effect of changing the sample should be much less for the truncated errors than for the non-truncated errors. It was found previously that there was relatively little difference in the relative performance of the models for the optimal single and annual models. Therefore, only the single and prediction models will be considered.

10.4.1. THE ABSOLUTE CHANGE MODEL.

It was found earlier that the absolute change model appeared to be the most robust when the sample size was changed and that the same results were found for turnover and profit forecasts. If the overall ranks as reported in table 16 (derived from the full results in appendix 38) below are examined then it can be seen that again the change in samples has little effect. The only difference is the reversal in the relative ranks of the 1 and 2 year models for the 53 company sample. The consensus in the ranks over years remains relatively high and changes little across the samples. This can be seen if the difference in the average ranks of the best and worst forms of the model are considered. The maximum difference is 4, for the five samples the differences are 2.50, 2.875, 3.1875, 3.0625 and 2.6875. However, this suggests that whilst there is relatively high agreement across years and errors, the level of consistency does not change in any consistent manner as the sample changes. If the ranks are compared on a year by year basis, again there seem to be no consistent patterns appearing as the sample size gets smaller.

Table 16.

RANKS OF THE NON-TRUNCATED ERRORS FOR THE ABSOLUTE CHANGE MODELS. COMPANIES THAT DISCLOSE MORE THAN U.K. AND OVERSEAS

(92 Companies).

	1980	1981	1982	1983	Average	Overall
1 yr.	5	4	3.5	4.5	4.25	5
2 yr.	4	4.5	4.5	2.5	3.875	4
3 yr.	3	3.5	2	4.5	3.25	3
4 yr.	1.5	2	1.5	2.5	1.875	2
5 yr.	1.5	1	3.5	1	1.75	1

ATTRIBUTABLE PROFIT GREATER THAN £1m. (60 Companies).

1 yr.	4.5	4.5	3.75	4.25	4.25	5
2 yr.	4.5	4.25	5	3	4.1875	4
3 yr.	3	1.75	3.25	4.5	3.125	3
4 yr.	2	2.25	1.75	2.25	2.0625	2
5 yr.	1	2.25	1.25	1	1.375	1

ATTRIBUTABLE PROFIT GREATER THAN £2m. (53 Companies).

1 yr.	4.5	4.5	3.5	4	4.125	4
2 yr.	4.5	4.5	5	3.5	4.375	5
3 yr.	2.75	2.5	3.5	4.5	3.3125	3
4 yr.	2	2.5	1.75	1.75	2	2
5 yr.	1.25	1	1.25	1.25	1.1875	1

ATTRIBUTABLE PROFIT GREATER THAN £3m. (46 Companies).

1 yr.	4.75	5	4	3.75	4.375	5
2 yr.	3.25	3.5	5	3.5	3.8125	4
3 yr.	2.75	2	3	4.5	3.0625	3
4 yr.	2.75	3.5	1.5	2	2.4375	2
5 yr.	1.5	1	1.5	1.25	1.3125	1

ATTRIBUTABLE PROFIT GREATER THAN £4m. (40 Companies).

1 yr.	4.25	5	3	4.5	4.1875	5
2 yr.	3.25	3.5	5	2.5	3.5625	4
3 yr.	2.75	2.25	3.75	4.5	3.3125	3
4 yr.	3	3.25	1.5	2	2.4375	2
5 yr.	1.75	1	1.75	1.5	1.5	1

10.4.2. THE PERCENTAGE CHANGE MODEL.

The percentage change models provide a very different picture from that for the absolute change models. It was found that when the sample was reduced from 109 to 92 companies there was absolutely no effect upon any of the ranks for any year or error measure. Table 17 below gives a summary of the ranks if the sample size is further reduced. It can be seen that now the relative ranks change quite dramatically. For the 92 companies the best model was the 4 year model followed by 5, 3, 2 and 1 year models. For the 60 companies the worst model is still the

1 year. However, the best model is the 3 year followed by the 4 year. The ranks do not change when the sample is further reduced to 53 companies. However, when the sample is further reduced the relative ranks change again. For 46 companies the best model is still the 3 year model but this is now followed by the 2, 3, 5 and 4 year models. For 40 companies the relative ranks provide a picture that appears to be more as would be expected. Namely, the 1 year model followed by 2 year, 3, 5 and then 4 year models. The relative ranks are now nearly the reverse of those found for the full sample or for the absolute change models. When the results are considered in rather more depth it can be seen that there is very little agreement across years, and very often, across errors for any one year. The difference between the average ranks for 92 companies is 3.3125, but when the sample size decreases the difference drops to a very small 0.6875 and fails to increase greatly for the other three samples (being 0.75, 0.875 and 1.125). These very small differences are largely due to the difference in performance across different errors rather than different years. For example, for the 60 company sample the average ranks for each year only vary by 2.25, 1.25, 1 and 1.25 whilst the maximum possible range is 4. This, again supports the conclusion that often the results are error specific. It also appears to suggest that this model is misspecified especially for the smaller samples.

Table 17.

AVERAGE RANKS OF THE NON-TRUNCATED ERRORS FOR THE PERCENTAGE CHANGE MODELS.

	1980	1981	1982	1983	Average	Overall Rank
COMPANIES THAT DISCLOSE MORE THAN U.K. AND OVERSEAS (92 Companies)						
1 yr.	5	5	4.75	5	4.9375	5
2 yr.	4	3.5	4.25	3	3.6875	4
3 yr.	2.75	2	2	3	2.4375	3
4 yr.	1.75	2.25	1.5	1	1.625	1
5 yr.	1.5	2.25	2.5	3	2.3125	2
ATTRIBUTABLE PROFIT GREATER THAN £1m. (60 Companies).						
1 yr.	4.5	3	3.5	2.75	3.4375	5
2 yr.	2.75	3.25	2.5	3.5	3	3=
3 yr.	2.25	2.25	3	3.5	2.75	1
4 yr.	2.25	3	3	3	2.8125	2
5 yr.	3.25	3.5	3	2.25	3	3=
ATTRIBUTABLE PROFIT GREATER THAN £2m. (53 Companies).						
1 yr.	4.5	3	3.5	2.75	3.4375	5
2 yr.	2.75	3.5	2.5	3.5	2.9375	3=
3 yr.	1.75	2.25	3	3.75	2.6875	1
4 yr.	2.5	3.25	3	2.75	2.875	2
5 yr.	3.5	3	3	2.25	2.9375	3=
ATTRIBUTABLE PROFIT GREATER THAN £3m. (46 Companies).						
1 yr.	2.75	3	3.5	2.75	3	3
2 yr.	2.75	3.5	2.5	2.5	2.8125	2
3 yr.	1.5	2	2.5	4	2.5	1
4 yr.	4	3.25	3	3.25	3.375	5
5 yr.	4	3.25	3.5	2.5	3.3125	4
ATTRIBUTABLE PROFIT GREATER THAN £4m. (40 Companies).						
1 yr.	2.75	3	1.5	3	2.5625	1
2 yr.	1.5	4	3	2	2.625	2
3 yr.	1.75	2	3.25	4	2.75	3
4 yr.	5	3	3.25	3.5	3.6875	5
5 yr.	4	3	4	2.5	3.375	4

10.4.3. THE MOVING AVERAGE MODEL.

It has been seen that for the entire sample the best forms of this model were the 4 and 6 year models, whilst for 92 companies the best model was the 6 year followed by the 4 year model. In addition, the relative ranks depended crucially upon how the errors were measured. Table 18 below gives a summary of the ranks for the various samples. It can be seen that as the sample size decreases the relative ranks change dramatically. Specifically, for all samples smaller than 92 companies the best model is the 1 year model followed by the 2 year model. As the sample size gets smaller the consistency of the overall ranks increases. For the smallest sample the overall ranks provide a totally consistent picture, namely the best model is the 2 year followed by 3 year, 4, 5 and then 6 year models. If the results are considered on a year by year basis the results are somewhat different, especially in 1980. For the 92 companies the average ranks for 1980 varied between 2.75 and 3.25, for both 60 and 53 companies all the models perform equally well, as they do in 1981 for the 60 companies. This difference in the relative performances of the error measures is reflected in the average ranks. For 92 companies they only vary by 0.875, for 60 companies this falls even further to 0.375 which shows that across the four errors there is really nothing to choose between the forms of this model. This increases slightly to 0.9375 for 53 companies and increases quite significantly to 2.375 and 2.75 for the other two samples which shows that only for these two samples is there much to choose between the various forms.

Table 18.

AVERAGE RANKS OF THE NON-TRUNCATED ERRORS FOR THE MOVING AVERAGE MODELS.

	1980	1981	1982	1983	Average	Overall
COMPANIES THAT DISCLOSE MORE THAN U.K. AND OVERSEAS (92 Companies)						
2 yr.	3.25	4	2.25	4	3.375	4
3 yr.	2.75	4.25	4.75	2	3.4375	5
4 yr.	3	2	2.5	3	2.625	2
5 yr.	3	3.25	2.5	3.25	3	3
6 yr.	3	1.5	3	2.75	2.5625	1
ATTRIBUTABLE PROFIT GREATER THAN £1m. (60 Companies).						
2 yr.	3	3	1.5	3.5	2.75	1
3 yr.	3	3	3.5	2.5	3	2=
4 yr.	3	3	3	3.5	3.125	4=
5 yr.	3	3	3.5	2.5	3	2=
6 yr.	3	3	3.5	3	3.125	4=
ATTRIBUTABLE PROFIT GREATER THAN £2m. (53 Companies).						
2 yr.	3	3.25	1.5	1.75	2.375	1
3 yr.	3	3.25	3.5	2.5	3.0625	2=
4 yr.	3	3.25	3	4	3.3125	5
5 yr.	3	2.25	3.5	3.5	3.0625	2=
6 yr.	3	3	3.5	3.25	3.1875	4
ATTRIBUTABLE PROFIT GREATER THAN £3m. (46 Companies).						
2 yr.	2.25	1.25	1.25	2.5	1.8125	1
3 yr.	2.25	2.5	1.75	4.5	2.75	2=
4 yr.	3	3.5	3.25	1.25	2.75	2=
5 yr.	3.5	3.75	4.25	2.5	3.5	4
6 yr.	4	4	4.5	4.25	4.1875	5
ATTRIBUTABLE PROFIT GREATER THAN £4m. (40 Companies).						
2 yr.	2.75	1	1.25	1.75	1.6875	1
3 yr.	2.25	2.25	1.75	4	2.5625	2
4 yr.	2.75	3.5	3	1.5	2.6875	3
5 yr.	3.25	4	4.25	3	3.625	4
6 yr.	4	4.25	4.75	4.75	4.4375	5

10.4.4. THE EXPONENTIAL SMOOTHING MODELS

It was found that the overall ranks for the full sample and for the 92 companies were fairly similar. For both, the optimal model was a weighting of 0.20 followed by

0.10. In addition, generally the smaller the weighting then the better the relative overall performance. Table 19 below gives details of the ranks for the five samples considered. It can be seen that the results for samples based upon the size of attributable profits provide results that are generally very different. The most obvious difference is the finding that now the better models are those with the highest weights. As the sample size reduces this becomes even more apparent, so that for the two smallest samples the overall ranks provide a totally consistent picture with the exception of the ranks of the weights 0.95 to 0.85. These findings are generally as would be expected. The earlier findings of the best forecasts being generated by models with low weights were counter-intuitive as they meant that the earnings of a large number of years ago were more important than the most recent history of the earnings stream. It was found for the moving average models that the results for 1980 in particular were dependent upon the way the errors were measured. This again appears to be the case. For attributable profit greater than £2million and £3million all the models perform equally well, whilst for the smallest sample the average ranks vary only by 6.25 compared to the maximum range of 18. This result does not apply to the other three years and the difference in the average ranks for all of these remain relatively high, ranging from 9.75 to 17. Although the overall ranks for the two smallest samples are entirely consistent the picture on a year by year basis is less consistent. It is

Table 19.

AVERAGE RANKS OF THE NON-TRUNCATED ERRORS FOR THE EXPONENTIAL SMOOTHING MODELS.

	1980	1981	1982	1983	Average	Overall Rank
COMPANIES THAT DISCLOSE MORE THAN U.K. AND OVERSEAS (92 Companies)						
0.95	17.5	9.75	3.5	11.25	10.5	13
0.90	15.5	12	3.25	11.75	10.625	14
0.85	13.5	8.75	8.5	12.75	10.875	16
0.80	11.5	11.5	5.75	14.25	10.75	15
0.75	11.5	15.75	8.25	15	12.625	17
0.70	15.75	17.25	11	13.25	14.3125	19
0.65	16	10.75	13	14	13.4375	18
0.60	11.5	7.75	10.5	10.5	10.0625	12
0.55	8	7.75	11.5	10.5	9.4375	9
0.50	6.5	9.5	8.5	13.5	9.5	10
0.45	5.5	12	10.75	7.5	8.9375	4=
0.40	5.25	10.75	15	5.25	9.0625	6
0.35	6	12.5	7	11.25	9.1875	7
0.30	6.5	8.75	11.5	9	8.9375	4=
0.25	7	10	10	10.5	9.375	8
0.20	7.25	6.25	10.5	3.75	6.9375	1
0.15	7.75	6	16.5	2.5	8.1875	3
0.10	8	6	12	4	7.625	2
0.05	9	7	13	9.5	9.625	11
ATTRIBUTABLE PROFIT GREATER THAN £1m. (60 Companies).						
0.95	10	5.5	5.5	8.75	7.4375	6
0.90	10	5	4.75	8	6.9375	5
0.85	10	4.75	4	6.5	6.3125	3
0.80	10	4.25	3.75	6	6	1
0.75	10	4.5	3.25	7	6.1875	2
0.70	10	6.25	4	7	6.8125	4
0.65	10	7.75	5.5	6.75	7.5	7
0.60	10	9.75	7.75	6.75	8.5625	8
0.55	10	11.75	9.25	6.5	9.375	9
0.50	10	14	10.25	6.25	10.125	10
0.45	10	14.5	11.75	7	10.8125	11
0.40	10	14.25	13	8.5	11.4375	12
0.35	10	14	14.5	11	12.375	13
0.30	10	13.5	15	12.5	12.75	14
0.25	10	13	15.25	14.5	13.1875	15
0.20	10	12.5	15.5	16.5	13.625	19
0.15	10	12	15.5	16.75	13.5625	18
0.10	10	11.5	15.75	16.75	13.5	17=
0.05	10	11.25	15.75	17	13.5	17=

ATTRIBUTABLE PROFIT GREATER THAN £2m. (53 Companies).

0.95	10	5.5	1	6	5.625	1=
0.90	10	5.5	2	5.5	5.75	3=
0.85	10	5.25	3	4.25	5.625	1=
0.80	10	4.5	4	4.5	5.75	3=
0.75	10	5	5	5.25	6.3125	5
0.70	10	6.5	6.5	6	7.25	6
0.65	10	8	7	6.5	7.875	7
0.60	10	10	8.5	7	8.875	8
0.55	10	11.75	9.75	7.5	9.75	9
0.50	10	13.75	10.75	7.75	10.5625	10
0.45	10	14.25	12	9	10.6875	11
0.40	10	14	13.25	10.75	12	12
0.35	10	13.75	14.5	12.5	12.6875	13
0.30	10	13.25	15	14.5	13.1875	14
0.25	10	12.75	15.75	16	13.625	18
0.20	10	12	16.25	16.5	14.3125	19
0.15	10	11.75	15.75	16.75	13.5625	17
0.10	10	11.25	15.25	16.75	13.3125	16
0.05	10	11.25	14.75	17	13.25	15

ATTRIBUTABLE PROFIT GREATER THAN £3m. (46 Companies).

0.95	9	2.75	2.25	7.5	5.375	1
0.90	9	2.5	2.75	7.5	5.4375	2=
0.85	9	2	3.25	7.5	5.4375	2=
0.80	8.75	3	3.75	7.5	5.75	4
0.75	8.75	4.75	4.25	7	6.1875	5
0.70	8.75	6	4.75	6	6.375	6
0.65	8.5	7	7	4.75	6.8125	7
0.60	8.5	8	8	4.25	7.1875	8
0.55	8.5	9	9	3.5	7.5	9
0.50	8.25	10	10	6.75	8.75	10
0.45	8	11	11	8	9.5	11
0.40	8.5	12	12	10	10.625	12
0.35	9.25	13	13	11.5	11.6875	13
0.30	10.5	14	14	13.25	12.9375	14
0.25	11.75	15	15	15	14.1875	15
0.20	13	16	16	16	15.25	16
0.15	13.5	17	17	17	16.125	17
0.10	14	18	18	18	17	18
0.05	14.5	19	19	19	17.875	19

ATTRIBUTABLE PROFIT GREATER THAN £4m. (40 Companies).

0.95	9.5	3	1.75	6.25	5.125	1=
0.90	9.25	2.25	3	6.25	5.1875	3
0.85	9.25	2	3.5	5.75	5.125	1=
0.80	9.25	3.25	3.75	6	5.5625	4
0.75	9.25	4.5	4.25	5.25	5.8125	5
0.70	9	6	4.75	5.75	6.375	6
0.65	9	7	7	5.5	7.125	7
0.60	9	8	8	5.75	7.6875	8
0.55	8.75	9	9	7	8.4375	9
0.50	8.75	10	10	7.75	9.125	10
0.45	8.75	11	11	8.75	9.875	11
0.40	8.5	12	12	10	10.625	12
0.35	8.5	13	13	11.5	11.5	13
0.30	9.25	14	14	13.5	12.6875	14
0.25	10.5	15	15	15	13.875	15
0.20	11.75	16	16	16	14.9375	16
0.15	13.25	17	17	17	16.0625	17
0.10	14	18	18	18	17	18
0.05	14.5	19	19	19	17.875	19

still true that generally the ranks are lower as the weights get smaller but this does not hold as consistently. For example, for the smallest sample, whilst the best overall model is a weighting of 0.95 this is the best model only in 1982. In the other three years the best models are a weighting of 0.50, 0.85 and 0.55. This can also be seen if the range of the average ranks are considered. For the 92 companies the range is 7.375, for the other four samples the ranges are 7.625, 8.6875 and 12.5, ranges that are all much smaller than those for any single year with the exception of 1980.

10.4.5. THE OPTIMAL SINGLE MODELS.

Table 20 below (derived from the full results reported in appendices 39-1 to 39-4) reports the summaries of the ranks for the 12 models for the four samples. If the relative performance of the segment models is considered, then it is seen that generally they are all outperformed by the consolidated models. With the exception of the 46 company sample there are a few cases where, in 1981, a consolidated model does not outperform all the segment models, but these cases are far fewer than found for the two larger samples considered earlier. It therefore appears that the reduction in the sample size has led to the relative performance of the consolidated models improving. This is what would be expected if the inclusion of companies with very small or negative profits caused some of these models to be seriously misspecified. If the segment models are considered then there are very few consistent or large differences in their relative performance. It appears that, as was found for the other samples, the relative ranks of these models depends upon how the errors are measured. Now, in most cases the average ranks of all six segment models are indentical. This is because the averaging of the ranks over errors with a denominator of actual and forecast error has effectively cancelled out the differences in the performance of these models. Where this is not the case, then the poorest model is still one of the two ex-post segment models. When the relative performance of the consolidated models was examined for the 92 companies rather than the full sample there were a number of differences. The random walk model was fourth rather than first, the regression model second rather than fifth and the best model was the percentage change model. When the sample is further reduced the results are more like those

Table 20.

AVERAGE RANKINGS OF THE NON-TRUNCATED ERRORS OF THE OPTIMAL SINGLE MODELS

ATTRIBUTABLE PROFIT GREATER THAN £1m. (60 COMPANIES).

						92 Cos.		109 Cos.	
	1981	1982	1983	Average	Overall	Av.	Over.	Av.	Over.
Rand.W	2	1.75	2.25	2	1	5	4	2.67	1
Abs.Ch	3.25	4	4.5	3.916	3	5.083	6	6.25	6
Per.Ch.	3.75	5	4.75	4.5	6	3.416	1	3.33	3
Mov.Av.	5.5	3	3.5	4	4	5.66	5	3.83	4
Exp.Sm.	3	3.25	2.75	3	2	4	3	3.25	2
Regres.	5	4	3.25	4.083	5	3.583	2	4.75	5
Seg.1	9.25	9.5	9.5	9.417	7=	8.583	10	8.916	9=
Seg.2	9.25	9.5	9.5	9.417	7=	8.416	8=	8.83	7=
Seg.3	9.25	9.5	9.5	9.417	7=	8.416	8=	8.83	7=
Seg.4	9.25	9.5	9.5	9.417	7=	8.416	8=	8.917	9=
Seg.5	9.25	9.5	9.5	9.417	7=	8.916	12	9.25	12
Seg.6	9.25	9.5	9.5	9.417	7=	8.83	11	9.167	11

ATTRIBUTABLE PROFIT GREATER THAN £2m. (53 Companies)

	1981	1982	1983	Average	Overall
Random Walk	2	1.25	2.75	2	1
Absolute Change	3	4.5	4.25	3.9166	4
Percentage Change	4.25	5.75	5	5	6
Moving Average	5.5	4.75	3.25	4.5	5
Exponential Sm.	2.75	2.5	2.25	2.5	2
Regression	5.25	2.25	3.5	3.66	3
Segment 1	9.25	9.5	9.5	9.417	8=
Segment 2	9	9.5	9.5	9.33	7
Segment 3	9.25	9.5	9.5	9.417	8=
Segment 4	9.25	9.5	9.5	9.417	8=
Segment 5	9.25	9.5	9.5	9.417	8=
Segment 6	9.5	9.5	9.5	9.5	12

ATTRIBUTABLE PROFIT GREATER THAN £3m. (46 Companies)

Randon Walk	2.75	1.75	3	2.5	2
Absolute Change	4	3.75	4.25	4	4
Percentage Change	6	5.75	5.25	5.66	6
Moving Average	4.75	4.5	3.25	4.166	5
Exponential Sm.	2	2	2	2	1
Regression	1.5	3.25	3.25	2.66	3
Segment 1	9.5	9.5	9.5	9.5	8=
Segment 2	9.5	9.5	9.5	9.5	8=
Segment 3	9.5	9	9.5	9.33	7
Segment 4	9.5	9.5	9.5	9.5	8=
Segment 5	9.5	10	9.5	9.66	12
Segment 6	9.5	9.5	9.5	9.5	8=

ATTRIBUTABLE PROFIT GREATER THAN £4m. (40 Companies)

Random W.	2.5	1.5	3.25	2.417	2
Absolute Change	4	4.5	4.75	4.417	4
Percentage Change	8.5	4.75	3.5	5.583	6
Moving Average	5.25	5.25	3.75	4.75	5
Exponential Sm.	2.25	2.5	2.25	2.33	1
Regression	1.5	2.5	3.5	2.5	3
Segment 1	9	9.5	9.5	9.33	7=
Segment 2	9	9.5	9.5	9.33	7=
Segment 3	9	9.5	9.5	9.33	7=
Segment 4	9	9.5	9.5	9.33	7=
Segment 5	9	9.5	9.5	9.33	7=
Segment 6	9	9.5	9.5	9.33	7=

for the full sample rather than the 92 companies. For attributable profit greater than £1m. the relative ranks are the same as those for the full sample with the exception of the absolute and percentage change models, with the percentage change model now being ranked sixth rather then third. For the other three samples there are very few changes in the relative ranks. For attributable profit greater than £2 million only the rank of the regression model has changed by more than one place, whilst the best model is still the random walk model and the worst the percentage change model. When the sample is further reduced to 46 companies the only change is in the reversal of the relative positions of the random walk model, which is now second, and the exponential smoothing model, now first. The further reduction in the size of the sample to 40 companies has no additional effect upon the relative ranks of the consolidated models.

An idea of the extent that these results also hold up for each year and error can be found by examining the average ranks. Generally the consistency appears to increase as the sample size is reduced, although for none of the samples is the overall consistentcy high. Given that the consolidated models outperform the segment models then the maximum range for the average ranks is 5, that is from 1 to 6. For the full sample the range was 2.08, whilst for the 92 companies it was 2.25. For the other samples the range increases. For these four samples the ranges are 2.5, 3.0, 3.66 and 3.25. If the results are considered on a year by year basis then there are several cases when the optimal annual model is not the same as the optimal overall model. For the 53 companies the best model in 1983 is the exponential smoothing model rather than the random walk. For both the 46 and 40 companies, in 1981 the best model is the regression model and in 1982, the best model is the random walk rather than the exponential smoothing model.

Table 21 below provides a summary of the significant t-test results for a comparison of the consolidated and segment model 1 (for the full results see appendix 40). As can be seen most of the differences are significant. However, as found for the other samples, the results often tend to be both year and error specific. In 1981 for the 60 and 53 companies rather less than half of the differences are significant, with no significant differences occurring with errors with a denominator of forecast profits. For the other two samples all the differences are significant with the exception of percentage change for the 40 companies. In 1982 the

Table 21.

SIGNIFICANT T-TESTS FOR NON-TRUNCATED ERRORS OF THE OPTIMAL SINGLE MODELS COMPARED TO SEGMENT MODEL 1.

ATTRIBUTABLE PROFIT GREATER THAN 1 million. (60 Companies)

	1981		1982		1983			
	map/act	mse/act	map/for	mse/for				
RW	0.000	0.014	0.003	0.065	0.000	0.063	0.022	0.093
AC	0.000	0.016	0.005	0.090	0.000	0.064	0.076	
PC	0.000	0.016	0.013	0.086	0.000	0.065	0.055	
MA			0.006	0.065	0.000	0.064	0.032	
ES	0.006		0.007	0.061	0.000	0.062	0.020	0.091
Re	0.000	0.025	0.008	0.067	0.000	0.099	0.006	0.080

ATTRIBUTABLE PROFIT GREATER THAN 2 million. (53 Companies)

RW	0.000	0.040	0.004	0.080	0.000	0.088	0.023	0.092
AC	0.000	0.041	0.005	0.091	0.000	0.090	0.053	
PC	0.001	0.044	0.015	0.098	0.000	0.092	0.044	
MA			0.008	0.089	0.000	0.090	0.027	0.091
ES	0.001	0.051	0.004	0.080	0.000	0.088	0.023	0.091
Re	0.001		0.004	0.086	0.004		0.010	0.085

ATTRIBUTABLE PROFIT GREATER THAN 3 million. (46 Companies)

RW	0.000	0.008	0.000	0.002	0.012	0.054	0.002		0.039	
AC	0.000	0.008	0.001	0.005	0.015	0.059	0.001		0.080	
PC	0.000	0.011	0.004	0.010	0.038	0.073	0.002		0.065	
MA	0.000	0.010	0.001	0.002	0.026	0.070	0.002		0.042	
ES	0.000	0.008	0.000	0.001	0.013	0.054	0.002		0.039	
Re	0.000	0.007	0.000	0.001	0.013	0.068	0.003	0.001	0.014	0.095

ATTRIBUTABLE PROFIT GREATER THAN 4 million. (40 Companies)

RW	0.000	0.014	0.001	0.004	0.027	0.017	0.000	0.002	0.050	
AC	0.000	0.015	0.002	0.012	0.031	0.011	0.000	0.002	0.095	
PC	0.000	0.015			0.047	0.044	0.000	0.002	0.080	
MA	0.001	0.019	0.003	0.004	0.045	0.045	0.000	0.002	0.052	
ES	0.000	0.015	0.001	0.003	0.028	0.018	0.000	0.002	0.049	
Re	0.000	0.015	0.000	0.001	0.024	0.040	0.000	0.009	0.019	0.098

results are also error specific. For all the samples all the differences are significant for errors measured in absolute terms, whilst there are no significant differences for either of the two squared errors. Again, in 1983 all the absolute differences are significant. For mse/actual most of the differences are significant with the exception of the 46 companies, although it is unclear why this should be so. For mse/forecast profits then very few of the differences are significant.

10.4.6. THE PREDICTION MODELS.

If the prediction models are instead considered, then there are rather less differences in the relative ranks of the models as the sample size is reduced. There are a few cases where at least one consolidated model is outperformed by segment models, specifically in 1981 for the 60, 53 and 46 company samples and 1982 for the 60 company sample (see table 22 below and appendix 39-1 to 39-4 for fuller details). However, these few cases do not affect the conclusion that, overall, the consolidated models all outperform the segment based models. Indeed the only changes in any of the overall ranks of the segment models occurs for the 60 companies, instead of all the models being ranked equally model 6 is ranked twelfth and model 2 seventh. However, the difference in the average ranks is very small, from 9.083 to 9.417, and is due only to their performance in 1981. For the single models the best model varied across the samples. Now the random walk

Table 22.

AVERAGE RANKINGS OF THE NON-TRUNCATED ERRORS OF THE PREDICTION MODELS.

ATTRIBUTABLE PROFIT GREATER THAN £1m. (60 Companies)

						92 cos.		109 Cos.	
	1981	1982	1983	Aver.	Over.	Aver.	Over.	Aver.	Over.
Ran.W	2	1.75	1.75	1.833	1	2.33	1	1.75	1
Abs.Ch.	3.25	4.75	4.5	4.166	4	2.66	3	2.83	2
Per.Ch.	4	4.25	4.5	4.25	5	5	5	5.25	6
Mov.Av.	5	2.25	3.25	3.5	3	4.083	4	4.083	4
Exp.Sm.	2.5	2.5	1.5	2.166	2	2.416	2	3.416	3
Reg.	8.75	5.5	5.5	6.583	6	5.83	6	5.167	5
Seg.1	8.75	9.5	9.5	9.25	8=	9.416	10=	9.33	11
Seg.2	8.25	9.5	9.5	9.083	7	9.083	7	9.167	7
Seg.3	8.75	9.5	9.5	9.25	8=	9.416	10=	9.2917	10=
Seg.4	8.75	9.5	9.5	9.25	8=	9.2083	9	9.2917	10=
Seg.5	8.75	9.5	9.5	9.25	8=	9.125	8	9.2083	8=
Seg.6	9.25	9.5	9.5	9.417	12	9.416	10=	9.2083	8=

ATTRIBUTABLE PROFIT GREATER THAN £2m. (53 Companies)

	1981	1982	1983	Average	Overall
Random Walk	2	1	2.25	1.417	1
Absolute Change	3	3	3.75	3.25	3
Percentage Change	4.25	3.75	4.75	4.25	4
Moving Average	5.25	6.5	2.75	4.833	5
Exponential Sm.	2.5	2.75	1.75	2.33	2
Regression	8.5	8.5	5.75	7.583	6
Segment 1	8.75	8.75	9.5	9	8=
Segment 2	8.5	8.75	9.5	8.917	7
Segment 3	8.75	8.75	9.5	9	8=
Segment 4	8.75	8.75	9.5	9	8=
Segment 5	8.75	8.75	9.5	9	8=
Segment 6	9	8.75	9.5	9.083	12

ATTRIBUTABLE PROFIT GREATER THAN £3m. (46 Companies)

Random Walk	1.25	1.25	2.25	1.583	1
Absolute Change	2.5	3.5	5	3.666	4
Percentage Change	4.75	5.25	3.5	4.5	5
Moving Average	3.25	4	3.25	3.5	3
Exponential Sm.	3.25	1.75	1.25	2.083	2
Regression	9	5.25	5.75	6.66	6
Segment 1	9	9.5	9.5	9.33	8=
Segment 2	9	9.5	9.5	9.33	8=
Segment 3	9	9	9.5	9.166	7
Segment 4	9	9.5	9.5	9.33	8=
Segment 5	9	10	9.5	9.5	12
Segment 6	9	9.5	9.5	9.33	8=

ATTRIBUTABLE PROFIT GREATER THAN £4m. (40 Companies)

Random Walk	2.25	1.5	3	2.25	1
Absolute Change	3.5	4.5	4.5	4.167	4
Percentage Ch.	5.5	4.5	3.25	4.417	5
Moving Average	4.5	5.25	4.5	4.75	6
Exponential Sm.	4	2.75	2.5	3.083	3
Regression	1.25	2.5	3.25	2.33	2
Segment 1	9.5	9.5	9.5	9.5	7=
Segment 2	9.5	9.5	9.5	9.5	7=
Segment 3	9.5	9.5	9.5	9.5	7=
Segment 4	9.5	9.5	9.5	9.5	7=
Segment 5	9.5	9.5	9.5	9.5	7=
Segment 6	9.5	9.5	9.5	9.5	7=

model is the best model for all the samples. The overall ranks of all the other models varies as the sample size changes. The exponential smoothing model is ranked either second or third whilst the ranks of all the models vary by more than this as the sample size changes. Whilst this makes it impossible to generalise about the relative performance of the consolidated models it is interesting to note that the consistency of the findings for any one sample is now greater than was the case for the single models. The range of the average ranks of the consolidated models is now greater than was found previously for all the samples except the 40 company sample. Not only is the range greater but in most cases the change appears to be quite large, being for the 60 companies 4.75 instead of 2.083, for 53 companies 6.166 instead of 3.0 and for 46 companies 5.083 instead of 3.66.

10.5. CONCLUSIONS.

This chapter has explored three questions. Namely, the effects of removing those companies that disclose only the two segments of U.K. and overseas, the effects of employing a different source for the economic forecasts and the effect of excluding companies with either negative or very small profits.

When the seventeen companies which disclosed very little segmental information were excluded the effects upon the relative performances of the models were generally very small. For the non-truncated errors the optimal form of each of the multiple form models was unchanged. However, the best overall model was found to be the percentage change model rather than the random walk model. The segmental models were still outperformed by the consolidated models, although the average ranks of the segment models did improve slightly. This suggests that the types of segmental disclosures made have at least a small effect upon the forecasting accuracy of the segment based models. For the truncated errors, as would be expected, the effects of excluding these companies was even less. Overall there were some changes in the relative performances of the six segmental models, whilst for the consolidated models the only change was in the reversal of the positions of the regression and absolute change models (ranked third and fourth overall). For the prediction models the effects were generally similar. Overall there was little effect when these companies were excluded, and this was especially so for the truncated errors. However, it was found that there were more significant differences in the relative performances of the models when this was measured by the t-test.

Forecasts provided by the E.I.U. and the O.E.C.D. were compared for a sample of 24 companies, these being the only companies that disclosed segments suitable for use with the O.E.C.D. forecasts. Of twelve comparisons made between the forecasts only one difference was significant at the 5% level. Whilst this is not conclusive it does suggest that the results found are not specific to the E.I.U. forecasts. This supports the generalisability of the conclusions generated by this study.

Finally, samples were employed based upon the size of attributable profits. Companies were excluded if any of the profits since 1973 had been less than £1 million giving a sample of 60 companies, then if profits had been less than £2 million (53 companies), less than £3 million (46 companies) and finally less than £4 million (40 companies). For the absolute change models there were no important differences in the relative performances of the various forms of the model. For the percentage change models there was a major change in the relative performance for the 46 company sample and by the time of the smallest sample the relative rankings were the opposite of those found for the largest samples. A similar result was found for the other two models. A complete reversal of the relative performances of the moving average models had occurred by the 60 company sample. The exponential smoothing models also slowly reversed their relative ranks as the sample size was reduced, so that by the time the smallest sample was reached the relative positions of the various forms was as would be expected.

When the best single models were compared there was less difference in the relative ranks of the models than would have been expected given the changes in the relative performances of the various forms of the multiple form models. The relative ranks of the segmental models generally decreased and when the ranks were averaged over all the errors there was very little to choose between the six segmental models. When there were any differences then the poorest models were the two ex-post models. There was less difference in the relative ranks of the consolidated models than were found for the 109 company sample. The major difference was in the reversal of the ranks of the exponential smoothing and random walk models (now ranked first and second) for the 60 and 53 company samples. For the prediction models the random walk model remained the best model for all samples. However, the relative performances of the other consolidated models changed quite considerably. For both the prediction and single models the consistency of the ranks of the various models generally increased as the sample size was reduced.

Chapter 11.

SEGMENT EARNINGS BASED FORECASTS.

11.1 INTRODUCTION.

The analysis carried out so far has been based upon segmental turnover disclosures rather than earnings information. This initial concentration upon turnover based forecasts was for two reasons. Firstly, only information on segmental turnover is required to be disclosed by the Companies Act 1981. This means that more companies disclose turnover than profits. Thus the use of turnover information has allowed the use of a larger sample of companies. Secondly, and of greater importance, similar research into the predictive ability of line of business information has suggested that the addition of profit segments lead to only a marginal improvement in the forecasts (Kinney 1971, Collins 1976) or, in the U.K. context, no improvement over those based upon segmented turnover data (Emmanuel and Pick, 1980). This finding was at least partially attributed to the problems involved in obtaining accurate segmental profit figures. For example Collins argues that;

> "One possible explanation for this result is that substantial common cost allocations reduced the reliability of the reported segment profit margins for a number of the sample firms." (1976, page 174).

This problem of common cost allocations and the similar problem of transfer pricing mean that segmental profits may contain a significant element of arbitrary allocations. The importance of these items will depend, amongst other factors, upon the organistational structure of the specific company. There does not appear to be any reason to believe that such items will be less important for geographical segments than they are for line of business segments. This means that similar results might be expected for geographical disclosures. However, evidence about whether or not geographical profits data helps in predicting earnings would undoubtedly be valuable. Accordingly this chapter attempts to answer this question.

Seventy eight of the sample companies reported segmental profits for all three years 1980 to 1982 on a similar basis to their turnover disclosures and these companies form the sample used here. The analysis of the relative predictive ability of the consolidated models and segment turnover models led to the conclusion that generally the best model was the random walk model. This was especially the case when the best form of each model in any one year was applied to predict the results for the next year. The relative predictive ability of the models is of more interest and value to users of accounts than knowledge of the model that best describes the earnings on an ex-post basis. Therefore, the only consolidated model that will be used for this analysis is the random walk model. If it is found that the profit based forecasts outperform the random walk model for this sample then, given the robustness of the supremacy of the random walk model over the other consolidated models, it would appear that such a conclusion would also hold for the other consolidated models used previously.

The six turnover based segment models used previously will be used again. Each model will also be applied to the segmental profit disclosures, which, together with the random walk model gives a total of thirteen models. The general form of the turnover based segment models is;

$$E(P_{t+1}) = (\Sigma FGNP_{i,t+1} \cdot T_{it}) \times P_t/T_t$$

where

$E(P_{t+1})$ is forecasted attributable profit in period t+1

$FGNP_{i,t+1}$ is forecast GNP in percentage terms for segment i in period t+1

$T_{i,t}$ is turnover for segment i in period t

P_t is total attributable profit in period t

T_t is total turnover in period t

For the profit based segment models the general form of the models is now;

$$E(P_{t+1}) = (\Sigma FGNP_{i,t+1} \cdot SP_{i,t}) \times P_t/\Sigma SP_{i,t}$$

where

$SP_{i,t}$ is profit, however defined, of segment i in period t

The definition of profit used in the segment disclosures varies considerably across the sample. It is therefore necessary to convert the profit measures disclosed by the companies into attributable profit. This accounts for the last term in the equation.

The same general approach will be used as was employed in earlier chapters. Namely the use of one year ahead forecasts to predict earnings for the three years 1981 to 1983, with the errors measured in four ways. Initially this will be done for the non-truncated errors and then for errors truncated at 1.0 or 100%.

11.2. NON-TRUNCATED ERRORS.

Table 1 below provides details of the ranks for all years and errors (for the full results see appendix 41). It can be seen that the results are rather different from those found in earlier studies concerned with line of business data. If the turnover based models are considered then there is only one case where any of these outperform the random walk model, namely for mse/actual in 1982. This result is very similar to those found for the samples considered earlier. However, all the profit based models outperform the turnover based models. This result holds for all years and all errors. In addition, on average, all these models also outperform the random walk model. On a case by case basis the random walk model is the best model in only two cases, it is also second once and fourth once. For the other cases it is ranked sixth, seventh or even lower. The best model overall is model 2 (U.K. adjusted for U.K. inflation only) followed by model 3 (all segments times U.K. inflation), whilst the poorest profit based

Table 1

RANKS OF THE NON-TRUNCATED ERRORS

	1981				1982				1983			
	p/a	s/a	p/f	s/f								
Rand.W.	1	2	6	6	4	12	7	6	1	7	6	6
Turnover Based												
Seg.1	8	8	13	13	9	8	12	12	9	9	12	12
Seg.2	9	9	11	11	10	9	11	11	11	11	10	10
Seg.3	12	12	9	9	11	11	9	9	13	13	8	8
Seg.4	11	11	10	10	12	10	8	8	12	12	9	9
Seg.5	13	13	8	8	13	13	10	10	10	10	11	11
Seg.6	10	10	12	12	8	7	13	13	8	8	13	13
Profit Based												
Seg.1	2	1	7	5	2	2	5	5	4	2	5	5
Seg.2	3	3	4	4	3	3	4	4	2	4	3	3
Seg.3	6	5	2	2	6	6	1	1	6	6	1	1
Seg.4	5	6	3	3	5	5	2	2	5	5	2	2
Seg.5	7	7	1	1	7	4	3	3	3	3	4	4
Seg.6	4	4	5	7	1	1	6	7	7	1	7	7

	1981	1982	1983	Average	Overall
Random Walk	3.75	7.25	5	5.333	7
Turnover Based					
Model 1	10.5	10.25	10.5	10.417	11
Model 2	10	10.25	10.5	10.25	9
Model 3	10.5	10	10.5	10.33	10
Model 4	10.5	9.5	10.5	10.167	8
Model 5	10.5	11.5	10.5	10.83	13
Model 6	11	10.25	10.5	10.583	12
Profit Based					
Model 1	3.75	3.5	4	3.75	3=
Model 2	3.5	3.5	3	3.33	1
Model 3	3.75	3.5	3.5	3.583	2
Model 4	4.25	3.5	3.5	3.75	3=
Model 5	4	4.25	3.5	3.917	5
Model 6	5	3.75	5.5	4.75	6

models are the two ex-post models, as they are for the turnover based models. If the average ranks are considered then the differences between the relative performance of the profit based models are very similar to those found previously for the segment turnover based forecasts. The range of the average ranks are very small, being only 1.417 (from 3.33 to 4.75) compared with a maximum of 5. Again, this is largely due to the differences in the relative performances when the errors are measured by a denominator of actual and forecast earnings. For mape/actual and mse/actual the best model is model 1, being ranked first or second in five of the six cases. For mape/forecast and mse/forecast the best model is model 3 being ranked first or second in all cases. Thus, although model 2 is the best model in each year when averaged over all four errors, it is not the best model for any of the twelve year and error combinations, and it is ranked second in only one case. A similar picture emerges for the turnover based models. The average ranks vary between 10.167 and 10.83 suggesting that there is even less to choose between the models. If instead, only errors with a denominator of actual are considered then both models 1 and 6 are best with an average rank of 8.5 and models 3 and 5 worst, both with a rank of 12. If mape/forecast and mse/forecast are instead considered then the reverse holds. The best model is now model 3 with an average rank of 8.67 and the worst is model 6 with an average rank of 12.67.

To obtain a fuller picture of the relative performance of the models it is also necassry to consider the significance of these findings. Table 2, below, summarises the significant t-test results when the random walk model is compared to the segment models and each turnover based segment model is compared with the equivalent profit based model. Combinations of the segment models are not tested, as the important question is whether profit based models outperform the alternatives, rather than which form of the basic segment model is the best. The full results are given in appendix 42. Although it had been found that the random walk model outperformed all the turnover based segment models with only one exception, it is now seen that many of the differences are not significant. For 1981 the results are significant only if the mean absolute percentage errors are used. In 1982 all the differences are significant with the exception of mse/forecast errors, whilst in 1983 only if mape/forecast is used does the random walk model significantly outperform the turnover based segment models. Identical results are found when the profit based and turnover based forecasts are compared. All the profit based forecasts outperformed the turnover based forecasts. However, the cases that are significant are the same as those for the random walk models. When the random walk model is compared with the profit based forecasts the results provide no consistent picture. In 1981 for mape/actual the random walk model was the best model and it significantly outperforms all the segment models except model 1 which was ranked second. For mse/actual it was ranked second and significantly outperforms segment models 3 and 4, ranked fifth and sixth. For the other two errors it was ranked sixth and is

Table 2

SIGNIFICANT T-TESTS FOR THE NON-TRUNCATED ERRORS.

	1981				1982				1983			
	map/act	mse/act	map/for	mse/for	map/act	mse/act	map/for	mse/for	map/act	mse/act	map/for	mse/for
Random Walk/Turnover Based												
Mod.1	0.083		0.019		0.002	0.064	0.058				0.056	
Mod.2	0.059		0.021		0.002	0.065	0.069				0.063	
Mod.3	0.056		0.021		0.002	0.061	0.072				0.066	
Mod.4	0.056		0.021		0.002	0.060	0.070				0.066	
Mod.5	0.032		0.023		0.002	0.063	0.076				0.057	
Mod.6	0.060		0.021		0.002	0.067	0.056				0.039	
Random Walk/Profit Based												
Mod.1										0.028	0.000	
Mod.2	0.032		0.081				0.064				0.000	
Mod.3	0.003	0.050	0.005	0.014			0.021			0.024	0.000	
Mod.4	0.003	0.052	0.005	0.015			0.019			0.022	0.000	
Mod.5	0.002		0.046	0.034			0.021				0.000	
Mod.6	0.024									0.056	0.000	
Turnover/Profit Based												
Mod.1	0.084		0.019		0.002	0.064	0.051				0.051	
Mod.2	0.083		0.020		0.002	0.066	0.059				0.050	
Mod.3	0.090		0.018		0.003	0.067	0.052				0.045	
Mod.4	0.089		0.018		0.002	0.065	0.052				0.046	
Mod.5	0.097		0.019		0.003	0.066	0.061				0.049	
Mod.6	0.084		0.020		0.001	0.062	0.060				0.062	

significantly outperformed by models 2 to 5, ranked first to fourth for mape/forecast and models 3 to 5 ranked first to third for mse/forecast. In 1982 very few of the differences are significant, the only cases being for errors measured by mse/forecast. In this case the random walk model is ranked seventh and is significantly outperformed by the best four segment models. In 1983 the only significant results are for mse/actual and mape/forecast. For mse/actual the random walk model is ranked seventh and is outperformed by models 1, 3, 4 and 6, ranked 2, 6, 5, and 1, a result that is difficult to explain. For mape/forecast the random walk model is outperformed by models 1 to 5 and outperforms model 6.

11.3. TRUNCATED ERRORS.

When the errors are truncated at 1.00 the relative rankings of the turnover based models remain unaltered. Table 3 below (derived from the full results in appendix 41) provides a summary of all the rankings. Whilst the average ranks of each of the turnover based models has changed they are still ranked from eighth to thirteenth. There are now no cases where any of these models outperform the other models. The average ranks vary by even less than for the non-truncated errors, from 10.167 to 10.67. This means that little importance can be attached to the changes in the relative ranks of these six models. This very small difference in the ranks is again attributable to averageing of very different relative performances for errors with a denominator of actual earnings and forecast earnings rather than to differences in their relative performances across the three years.

Previously, on average all the profit based models outperformed the random walk. Now the random walk model outperforms models 5 and 6, the two ex-post models. The average rank of the random walk model has increased from 5.33 to 4.75, mainly as it is now ranked fourth rather than twelfth in 1982 for mse/actual errors. Without this one change the average error would be virtually the same as before. The average ranks of models 5 and 6 (the two ex-post models) are now also slightly worse, for model 5 from 3.917 to 4.917 and model 6 from 4.75 to 5.25. The most important single change occurs for model 6 in 1983. Previously this was ranked seventh for three errors and first for mse/actual, a somewhat surprising result, it is now ranked seventh across all four errors. This highlights another difference between the non-truncated and truncated errors. There is now slightly less difference in the ranks for errors with a denominator of actual earnings and errors with a denominator of forecast earnings. This can be seen if the differences in the actual ranks are considered. For the non-truncated errors the maximum difference for the six profit based segment models and the random walk model was 2.00 (from 3.33 to 5.33). It is now 2.58 (from 2.67 to 5.25), although this is still a lot less than the maximum range of 6. Previously the best model was model 2 followed by model 3. Now the best model is model 4 (all areas adjusted for that area's expected inflation rate) with models 2 (U.K. times expected inflation only) and 3 (all areas times U.K. expected

Table 3.

RANKS OF THE TRUNCATED ERRORS.

	1981				1982				1983			
	ap/a	se/a	pa/f	se/f								
Ran.W	4	1	6	6	4	4	7	7	5	1	6	6
Turnover Based												
Mod.1	8	8	13	13	8	9	12	12	9	9	12	12
Mod.2	9	9	11.5	11.5	10	10	11	11	11	11	8	9
Mod.3	11.5	12	9.5	9.5	11	12	8.5	9.5	12.5	12.5	9.5	9
Mod.4	11.5	11	9.5	9.5	12	13	8.5	9.5	12.5	12.5	9.5	9
Mod.5	13	13	8	8	13	11	10	8	10	10	11	11
Mod.6	10	10	11.5	11.5	9	8	13	13	8	8	13	13
Profit Based												
Mod.1	5	2	7	7	1	2	4	5	6	6	5	5
Mod.2	1	3	4	4	3	3	2	4	3	2	3	3
Mod.3	2.5	6	1.5	1.5	6	6	3	1.5	1	4	1	1
Mod.4	2.5	5	1.5	1.5	5	5	1	1.5	2	3	2	2
Mod.5	7	7	3	3	7	7	5	3	4	5	4	4
Mod.6	6	4	5	5	2	1	6	6	7	7	7	7

	1981	1982	1983	Average	Overall
Random Walk	4.25	5.5	4.5	4.75	5
Turnover Based					
Model 1	10.5	10.25	10.5	10.417	9
Model 2	10.25	10.5	9.75	10.167	8
Model 3	10.625	10.25	10.875	10.583	11
Model 4	10.375	10.75	10.875	10.67	12=
Model 5	10.5	10.5	10.5	10.5	10
Model 6	10.75	10.75	10.5	10.67	12=
Profit Based					
Model 1	5.25	3	5.5	4.583	4
Model 2	3	3	2.75	2.917	2=
Model 3	2.875	4.125	1.75	2.917	2=
Model 4	2.625	3.125	2.25	2.67	1
Model 5	5	5.5	4.25	4.917	6
Model 6	5	3.75	7	5.25	7

inflation) ranked equal second. The average rank of model

2 previously was 3.33 whilst the average rank of model 4 is now 2.67. This suggests that there is more agreement now over which model is best, however, this is not the case if the results are considered on a year by year basis. For the non-truncated errors model 2 was the best model in two years and equal first in 1982, although across all year and error combinations it was first for none of the twelve combinations. Model 4 is now the best model for one combination and equal first for three, although on a year by year basis it performs the best only in 1981, whilst models 1 and 2 are best in 1982 and model 3 the best in 1982.

To obtain a fuller picture of the relative predictive ability of these models an examination of the significance of the differences in their predictive ability is also necessary. Table 4 below summarises the t-test results (see appendix 42 for full details). The most striking results concern the turnover based forecasts. Now the random walk model significantly outperforms all the turnover based forecasts. With the exception of 1983 errors with a denominator of forecast profits all the results are significant at 1% or higher. These results support those found for the previous samples and for the non-truncated errors. However, this sample appears to be the only one which produces results that are all significant. Of greater interest are the findings for the comparison of the turnover and profit based forecasts. These results appear to be the complete opposite of those found in earlier studies for line of business segments.

Table 4.

SIGNIFICANT T-TESTS FOR THE TRUNCATED ERRORS.

	1981				1982				1983			
	map/act	mse/act	map/for	mse/for								
Random Walk/Turnover Based												
Mod.1	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.078	0.034
Mod.2	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.096	0.039
Mod.3	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.092	0.039
Mod.4	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.092	0.039
Mod.5	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.086	0.037
Mod.6	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.026	0.016
Random Walk/Profit Based												
Mod.1											0.000	0.000
Mod.2			0.034								0.000	0.000
Mod.3			0.042					0.071			0.000	0.000
Mod.4			0.039					0.067			0.000	0.000
Mod.5		0.021									0.000	0.000
Mod.6									0.000	0.030	0.000	0.000
Turnover/Profit Based												
Mod.1	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.039	0.022
Mod.2	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011	0.010
Mod.3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.006
Mod.4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.007
Mod.5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.023	0.015
Mod.6	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000		

Not only do the profit based forecasts outperform the turnover based forecasts but they result in significantly better forecasts. With the exception, again, of 1983 errors with a denominator of forecasted profits all the differences are significant at the 1% level and the majority of the remaining differences are significant at the 5% level. These results are much more conclusive than those for the non-truncated errors which further supports earlier findings that some large errors or outliers may have the effect of masking a more consistent pattern that applies to the majority of the sample companies. A comparison of the profit based forecasts and the random walk model yields far more inconclusive results and less significant differences than were found for the non-truncated errors. Very few of the differences are significant. The majority of the significant differences are for mse/forecast, and, in 1983 also for mape/forecast.

11.4. CONCLUSIONS.

This chapter has examined the relative predictive ability of segment models based upon turnover and upon profits. Prior research upon line of business information found that segmented profit data was either of marginal or no additional benefit over turnover data. It was argued that given problems, in particular with transfer pricing and common cost allocations, similar conclusions would be expected for geographical information. However, it was found that this is far from the case. Table 5 gives details of the differences in the errors between the

Table 5.
DIFFERENCES BETWEEN RANDOM WALK, TURNOVER BASED AND PROFIT BASED SEGMENTAL FORECASTS.

	Mape/act.	Mse/act.	Mape/for.	Mse/for.
1981				
Random Walk/Turnover				
Seg.1	-0.7403	-8.5559	-1.7620	-45.1522
Seg.2	-0.8155	-9.1930	-1.6437	-40.4718
Seg.3	-0.8873	-11.6175	-1.5644	-36.7841
Seg.4	-0.8829	-11.4461	-1.5682	-36.9957
Seg.5	-1.0498	-14.0747	-1.4122	-30.7347
Seg.6	-0.8199	-9.4214	-1.6509	-40.6610
Random Walk/Profit				
Seg.1	-0.0057	0.0549	-0.0019	0.0042
Seg.2	-0.0500	-0.8040	0.0167	0.0186
Seg.3	-0.0865	-1.0423	0.0427	0.1001
Seg.4	-0.0849	-1.0429	0.0420	0.0980
Seg.5	-0.2010	-2.6763	0.0444	0.1083
Seg.6	-0.0554	-0.8085	0.0088	0.0045
1982				
Random Walk/Turnover				
Seg.1	-0.8865	-6.4982	-2.1279	-90.6230
Seg.2	-0.9547	-7.7687	-2.0064	-86.9525
Seg.3	-0.9893	-8.1039	-1.8316	-72.1233
Seg.4	-0.9912	-8.0791	-1.8168	-69.8987
Seg.5	-1.0039	-8.4882	-1.8715	-78.2508
Seg.6	-0.8599	-6.1743	-2.3187	-108.3586
Random Walk/Profit				
Seg.1	0.0169	0.0098	0.0494	0.6656
Seg.2	0.0054	-0.0010	0.0657	0.8901
Seg.3	-0.0294	-0.1457	0.1219	2.2431
Seg.4	-0.0219	-0.1162	0.1151	2.0331
Seg.5	-0.0303	-0.0814	0.0953	1.4772
Seg.6	0.0270	0.1098	-0.0244	-1.1874
1983				
Random Walk/Turnover				
Seg.1	-1.5520	-102.7576	-1.3231	-33.0241
Seg.2	-1.6311	-111.8989	-1.2478	-30.7002
Seg.3	-1.6971	-119.3528	-1.1861	-28.0773
Seg.4	-1.6901	-118.5505	-1.1901	-28.2768
Seg.5	-1.5824	-106.2727	-1.2992	-32.1879
Seg.6	-1.3423	-79.3676	-1.6123	-43.8994

Random Walk/Profit

Seg.1	-0.0094	-0.0504	0.0248	0.1511
Seg.2	-0.0003	-0.0971	0.0644	0.2059
Seg.3	-0.0120	-0.2377	0.1007	0.6354
Seg.4	-0.0114	-0.2260	0.0976	0.5990
Seg.5	-0.0015	-0.0547	0.0425	0.1918
Seg.6	-0.0184	0.2259	-0.1423	-1.0001

random walk model and the segment models for the non-truncated errors. From this it can be seen that the differences between the turnover based and random walk models are very much larger than those between the profit based and random walk models. This, in turn, implies that the differences between the turnover and profit based forecasts are relatively large. This is supported by the findings reported above. If the ranks of the models are considered then it was found that for both non-truncated and truncated errors the profit based models outperformed the turnover models. For the non-truncated errors most of the differences were significant whilst for the truncated error only in one case were the differences not significant. The most important results concern the relative performance of the random walk and earnings based models. For the non-truncated errors, on average, all the segment models outperformed the random walk model. This was also the case in 1982 and 1983. In 1981, the opposite holds, only one segment model outperformed the random walk model. In addition, the majority of these differences were significant, especially in 1982. For the truncated errors, on average, the random walk model outperformed the two ex-post models. On a year by year basis the random walk model outperformed three segment models in 1981, none in 1982 and two in 1983. However, with the exception of 1983, relatively few of the differences are significant.

These results conflict with those for line of business data. The findings of these works can be summarised as being that turnover based segment models outperform consolidated models. The addition of earnings based segment data has little or no additional predictive power. The findings here regarding geographical data can also be briefly summarised. The consolidated models significantly outperform the segment turnover models. Segment earnings based models significantly outperform the turnover based models. They also significantly outperform the random walk model, and by extension, the other consolidated models if the errors are not truncated. If the errors are truncated then most of the earnings based models still outperform the consolidated models, although, generally, the differences are not significant. The reasons for the differences in the results for geographical and l-o-b data were not empirically explored however, various possible reasons can be suggested.

Only the turnover based segment models employ an aggregate profit to turnover margin and the use of such an average figure may provide a possible explanation for these findings. The use of a total profit margin implicitly assumes that profits are highly correlated to turnover. If this is not the case then such an approach is likely to lead to incorrect forecasts. At least for this sample of companies the spearman rank correlations of profit and turnover are relatively low. For all three years the correlations were significant at the 1% level. However, they were only 0.5225 in 1981, 0.5461 in 1982 and 0.5870 in 1983. These relatively low correlations are likely to be at least partially responsible also for the very low correlation of the turnover based and profit based segment models. Table 6 below provides details of the correlations between these models.

Table 6.

SPEARMAN CORRELATION COEFFICIENTS FOR THE SEGMENT TURNOVER AND PROFIT BASED FORECASTS.

Model	1	2	3	4	5	6
MAPE/ACTUAL AND MSE/ACTUAL						
1981	0.2511	0.2569	0.1820	0.1865	0.1736	0.2616
Signif.	(.013)	(.012)	(.055)	(.051)	(.064)	(.010)
1982	0.2493	0.2728	0.2562	0.2571	0.2972	0.2526
	(.014)	(.008)	(.012)	(.012)	(.004)	(.013)
1983	0.1126	0.1461	0.1958	0.1872	0.1239	0.0764
	(.163)	(.101)	(.043)	(.050)	(.140)	(.253)
MAPE/FORECAST AND MSE/FORECAST						
1981	0.1774	0.1452	0.1098	0.1134	0.0743	0.1276
	(.060)	(.102)	(.169)	(.162)	(.259)	(.133)
1982	0.2283	0.3296	0.3276	0.3253	0.3551	0.1994
	(.022)	(.002)	(.002)	(.002)	(.001)	(.040)
1983	0.1665	0.1960	0.2037	0.1932	0.1744	0.1045
	(.073)	(.043)	(.037)	(.045)	(.063)	(.181)

It is surprising to find that these correlations are so low. The highest correlation is only 0.3551 whilst most are much lower. In addition many of them are not significant even if a low level of significance such as 10% is taken. These results can be contrasted with the correlations for the profit based models and the random walk model reported in table 7 below.

Table 7.

SPEARMAN CORRELATION COEFFICIENTS FOR THE RANDOM WALK MODEL AND PROFIT BASED SEGMENT MODELS.

Model	1	2	3	4	5	6
MAPE/ACTUAL AND MSE/ACTUAL						
1981	0.9971	0.9379	0.8640	0.8670	0.6624	0.9359
1982	0.9893	0.8783	0.7591	0.7815	0.7586	0.9710
1983	0.9818	0.9473	0.9168	0.9231	0.9722	0.9422
MAPE/FORECAST AND MSE/FORECAST						
1981	0.9958	0.9436	0.8745	0.8800	0.6727	0.9442
1982	0.9886	0.8727	0.7441	0.7685	0.7431	0.9769
1983	0.9804	0.9508	0.9273	0.9322	0.9719	0.9443

It is now found that all the correlations are significant at the 1% level with the majority of the correlations being greater than 0.90. Indeed for only one pair is the correlation lower than 0.70. It is not immediately obvious why these results are found, although some possible explanations are suggested in the next chapter.

PART IV. CONCLUSIONS.

Chapter 12.

OVERVIEW AND CONCLUSIONS.

12.1 INTRODUCTION.

The objective of this study was to investigate one aspect of the usefulness of the geographical segment disclosures currently provided by U.K. multinational companies. The decision to invest in a company is, for most shareholders, dependent upon two factors, the expected risk and returns of that investment. Accordingly, investors are primarily interested in the expected future profits of the company and the attendant risk. Therefore, one of the more important criteria that can be used when assessing the usefulness of any item of disclosure is the extent to which it can be used to predict either earnings or risk. This study argued that the evidence suggests that geographical segment data may be more useful in assessing future earnings than in assessing risk. In an attempt to provide evidence on this question, one year ahead forecasts of turnover and earnings were calculated based upon both geographical segment data and consolidated data and the accuracy of these forecasts were then compared.

A sample of 109 large U.K. multinational companies was used. The forecasts were based only upon past consolidated results and segment disclosures. Company specific information such as qualitative information, the list of major subsidiaries and industry data were ignored. While this means that the individual user may be able to generate more accurate company specific forecasts, it is argued that a cross-sectional approach is capable of generating useful conclusions.

The forecasting models used were six naive consolidated models and six segment based forecasts which were applied to both geographical turnover data with an average profit margin and to geographical earnings data. These segment based forecasts were all based upon forecasts of changes in the GNP of individual countries. The country forecasts were then aggregated into segment wide forecasts with the weights based upon the size of total GNP in each country. Four of the forecasts were based upon various assumptions concerning the importance of inflation and two were based upon ex-post changes in GNP. The accuracy of the forecasts were calculated using four alternative error measures. In addition the errors were also truncated at 100%. The relative accuracy of the forecasts was assessed by ranking the errors whilst the significance of the differences in the sizes of the errors was assessed using t-tests.

12.2. PRIOR RESEARCH.

There appears to be an increasing belief that accounting is more than a mapping process that is value free and neutral in effect. This means that there needs to be an explicit consideration of trade-offs between the interests of various groups and the political or social nature of accounting. Such a consideration of the political has been explored to some extent, for example, by Tinker (1985) and Merino and Neimark (1982). Similar arguments have been used by such authors as Watts and Zimmerman (1978, 1979) who argue that companies' demand for accounting methods will be determined by their self-interest whilst accounting theories provide a useful justification to mask such self-interest. The Corporate Report (ASC, 1975) considered the demands of various stakeholder or user groups whilst the economic consequences approach to accounting by such authors as Zeff (1985) has also become popular. Such arguments have been recognised by the FASB, as exemplified by the withdrawal of FAS8 and the consequent introduction of FAS52, and the ASC as evidenced by the withdrawal of ED14 and issuance of ED17. There are obviously very great difficulties involved in such an approach which requires explicit trade-offs as evidenced by Hopwood (1985).

If these views have validity they imply that decisions regarding what information companies should disclose cannot be determined on a purely theoretical basis. Instead, they have to be based upon decisions regarding the desirability of the likely effects of disclosing such information. This view, that the value of accounting information should be assessed in terms of the consequences of disclosure, forms the rationale for this study. The finding that a particular piece of information, in this case, geographical segment data, has or has not got information value is not the same as determining that it should or should not be produced. However, it is an essential first step.

One way to assess the value of any piece of information might be to question users as to their perceived needs. However, this approach has failed to move the disclosure debate forward to any significant extent as demonstrated in chapter 2.

This means that other ways of examining the question of the usefulness of segmental information need to be explored. A piece of information may be considered as valuable if it leads to changes in expectations or changes in the certainty with which such expectations are held, or alternatively expressed, if it alters the perceived probability that future states will occur (Beaver 1981). From the perspective of an investor the relevant information about a security is its expected return and its risk (Haley and Schall 1973). Accordingly, the question of whether geographical segment data might be useful in assessing risk was examined in chapter 3. The risk of a security derives from two, albeit related, sources, namely financial or economic risk and political risk. If a company achieves diversification benefits from being multinational that are not directly available to individual investors then information upon the extent of such multinationality should be relevant and valuable to shareholders for risk assessment. However, it was shown that the evidence regarding this is, at best, fragmentary and, at times, conflicting.

It appears that generally stock market returns are not highly correlated across the stock markets of different countries (Grubel (1968) Levy and Sarnat (1970) Grubel and Fadner (1971) Lessard (1973)). However, the extent to which a shareholder can gain from this depends upon the inter-temporal consistency of such correlations. The evidence regarding this is somewhat contradictory, but there appears to be little pattern in the correlations, at least in the relatively short term (Panton, Lessig and Joy (1976) Watson (1980) Philippato, Christofi and Christofi (1983)). It is not possible to say to what extent any such potential gains can be reaped. In particular, this is because the domestic CAPM is not applicable in an international setting (Adler and Dumas (1983) Stulz (1984)). In addition, the extent that shareholders can invest overseas depends upon the extent of market segmentation. A case has been made for at least mild market segmentation (Errunza and Losq (1985)). The evidence to support the assertion that multinational companies act as a vehicle for shareholders to avoid the problems of market segmentation is mainly based upon fairly simple model building (Adler (1974) Adler and Dumas (1975a) Lee and Sachdeva (1977)). Some evidence exists that shareholders recognise the benefits of multinational diversification (Hughes, Logue and Sweeney (1975) Agmon and Lessard (1977) Yang, Wansley and Lane (1985)). However, there appear to be methodological problems that cast doubts upon the validity of this conclusion (Fatemi (1984) Errunza and Senbet (1981, 1984)).

A review of the evidence concerning economic risk shows that it is very sketchy and bedevilled with methodological problems and disagreements. It appears that geographical disclosures are probably of value to shareholders for assessing economic risk. However, no very firm conclusion is possible.

The evidence concerning the usefulness of geographical data for aiding in assessing political risk is much more clear-cut. Whilst there are disagreements over exactly what is meant by political risk it appears to be widely accepted that such risks are usually very specific. They depend not only upon the specific country that a company operates in but are also industry and project specific (Kobrin (1983) Sethi and Luther (1986)). This implies that geographic disclosures, as currently generally provided, cannot be used to adequately assess political risk. They may provide some indication of the relative importance of a company's operations in countries that face high levels of political instability, but this is very different from indicating what assets are at risk from politically motivated acts.

Given that there is relatively little evidence that such disclosures are of benefit in assessing risk, the possibility that they can be used to aid in assessing expected returns must instead be examined.

Chapter 5 examined the prior work on time series modelling of earnings. Such studies are concerned with both annual and quarterly earnings. This analysis led to the choice of six consolidated models, as explained in chapter 6. These models were chosen to reflect the major classes of naive models that have been used previously, and have been found to provide reasonable forecasts. There is no general consensus regarding which model is the best forecaster, although if only one model was to be used the best candidate is the random walk model. However, it was felt that restricting the consolidated models to only one would be rather premature given that there is some evidence that supports the use of other models.

12.3. FINDINGS FROM THE EMPIRICAL STUDY

Chapter 6 explained how the segment models were derived and examined the assumptions required to operationalise the models. It was shown in chapter 3 that most companies disclose information on a continent by continent or similar basis, rather than by individual countries. Forecasts of expected GNP growth are only available for individual countries and not groups of countries. Therefore, assumptions are necessary before such forecasts can be combined into segment forecasts. The most reasonable assumptions are that a company operates in all the countries covered by the segment and that the importance of its operations in each country varies in direct proportion to the size of the country as measured by its total GNP. Thus a weighted average of country forecasts was used for each segment. The other major assumption required was that an x% increase in GNP will lead to an equal increase in the company's profits. A further problem is whether to use real or nominal changes in GNP. Which is correct depends upon the assumptions one makes regarding the validity of the purchasing power parity (ppp) theorem. Evidence was shown that ppp, at best, holds only imperfectly. This led to the addition of another three models that built-in expected U.K. inflation on to the expected real change in U.K. GNP, expected U.K. inflation times all the segment forecasts and segment specific forecasted inflation rates applied to each segment. In addition, two ex-post models were developed, giving a total of six segment models. Finally, chapter 6 examined the way in which errors should be measured. It was shown that each error metric is based upon an implicit assumption regarding the importance of the errors to the forecaster. Given that no one assumption appears to be clearly superior four error measures were chosen. Namely, mean absolute percentage error and mean squared error, both with denominators of actual and forecast earnings. In addition the errors were also truncated at 100% or 1.0.

This study used a sample of 109 large U.K. multinational companies. As a sample was used it is important to know whether or not these companies differ from the rest of the population of U.K. multinational companies. If they differ in a consistent manner then very great care must be taken in generalising the results found to the larger population. That is, the external validity of the results may be relatively low. Accordingly, chapter 7 examined the characteristics of the sample companies and the rest of the population. The general conclusion from this is that the sample companies are generally larger than the remainder of the population; on average approximately three times larger. In addition, they disclose, on average, no more geographical turnover segments, but more geographical profit segments and more line of business profit and turnover segments. They also appear to operate in many more countries, but the importance of overseas operations is approximately equal for the sample and the rest of the population. These results suggest that the sample companies may not adequately reflect the characteristics of the population. However, the importance of these differences is unclear. Given that overseas operations are not any more important for the sample companies and that the number of turnover segments reported are similar for both groups it seems likely that the results would have been similar if the sample had been a different one.

Chapter 1 stated and explained the five hypotheses that this study has examined. The simplest way to summarise and highlight the most important findings is to restate these hypotheses and summarise the results for each in turn. Once this has been done the importance of these findings and the possible reasons for them can be examined.

Hypothesis one stated that "Geographical turnover data enables more accurate forecasts of next year's turnover to be made than does consolidated turnover data." The overall conclusion is that the evidence fails to support this hypothesis. When the best form of the multiple form models was used and the ranks averaged over the four errors and three years then the consolidated models outperformed the segment models. The only exception being that segment models 2 to 4 (the models with various inflation adjustments built-in) outperformed the moving average model. Very similar results were found for each year. In addition, the majority of the differences were significant. For any one error there was relatively little difference between the size of the errors for the segment models although it was found that in the majority of cases the t-test yielded significant differences. When the prediction models were examined the only major difference was in the relative performance of the regression model which now performed much more poorly. For the consolidated models the best models were those that built in a positive drift. This is probably due to inflation which means that turnover increases even if the sales volume remains constant. Of the segment models the best overall was found to be model 2 (i.e. only the U.K. adjusted for expected inflation), followed by model 4 (all areas times their expected inflation rates), and then model 3 (all areas times U.K. expected inflation). Whilst there are some differences in the relative ranks of the segment models across the three years and four errors one of these three segment models was always the best segment model. Therefore, it is clear that an inflation adjustment is required for the segment based models as well as the consolidated models.

Given these findings it is not at all surprising to find that hypothesis two was not supported. This stated that "Geographical turnover data enables more accurate forecasts of next year's earnings to be made than does consolidated earnings data". Given that segment turnover data fails to provide more accurate forecasts of turnover then it would be expected that segment turnover data will also be of little help in forecasting earnings. This was confirmed in that there was no evidence to support hypothesis two. There were a very few cases when the segment models outperformed the consolidated models. These cases appeared to be due to the existence of a few very large outliers or the serious misspecification of the consolidated model for a few companies. The best models were no longer those with a positive drift. Instead, for the non-truncated errors, on average, the best model was found to be the random walk model. For the truncated errors the random walk was even more clearly superior. This supports mainly USA research on time series modelling of earnings which generally supports the random walk model as the premier naive model of annual earnings. For the non-truncated errors the best segment models were models 2 and 3. For the truncated models the best segment model was model 2, also best in 1983, second behind model 3 in 1981 and second behind model 1 in 1982. These results differ very greatly from those found from prior research using line of business data. These studies all concluded that line of business turnover based forecasts outperformed consolidated forecasts. A major difference between geographical and line of business data is that in most cases the geographical areas disclosed cover a large number of different countries whilst the lines of business disclosed do not cover a number of very different industries in the same manner. This means that assumptions have to be made regarding the countries that a company operates in but no similar assumptions are required for line of business data.

To cope with this problem of most geographical areas covering several countries it was assumed that a company operates in all the countries covered by each segment that it discloses. At the extreme if a company disclosed just two segments, U.K. and overseas, this would mean that it was assumed that the company operates in all countries. This is obviously unrealistic. It would therefore be expected that as the fineness of the disclosures made decreased the realism of this assumption decreased and the potential for error in the segment based forecasts increased. Because of this, hypothesis three stated that "The relative accuracy of forecasts based upon geographical data will be greater for companies that disclose finer geographical segments." To test this 17 companies that disclosed only U.K. and overseas turnover segments were excluded. The overall conclusion was that there was some, albeit limited, evidence that the segment models now performed rather better, as measured by the average ranks of the models. However, they were still outperformed by the consolidated models. The overall ranks of the models changed only slightly, especially for the truncated errors. The best segment models were found to be models 3 and 4 for the non-truncated errors and model 2 for the truncated errors, although, again, the differences in the errors of the segment models were generally very small.

Six consolidated models were used that covered all the major classes of naive forecasting models that the time series literature suggested might be useful. In addition, alternative forms of three of these models were tested. The models were applied to all the sample companies. However, as explained in chapter 5 there is some evidence that different models may apply to different companies. This is especially so if a company has been particularly successful or unsuccessful in any one year. Because of this, hypothesis four stated that; "The relative accuracy of forecasts based upon geographical and consolidated data will depend upon the size of the earnings". When companies were excluded by the use of filters based upon the size of profits the results were somewhat surprising. As the sample size was reduced the relative performances of the various forms of the percentage change, moving average and exponential smoothing models reversed. Often, this led to the optimal form of the model being that which would be expected. However, this change was not reflected in the relative performances of the twelve forecasting models. The relative performances of the segment models tended to slightly decrease. Again, there was very little to choose between the segment models, and this was, again, due to differences in the relative performances when the errors were measured with a denominator of actual or forecasted profits. For the consolidated models the best models were either the random walk or exponential smoothing models for the overall models and the random walk model for the prediction models.

Hypotheses three and four were both tested using segment models based upon turnover data. This was done not only so that the full sample of 109 companies could be used but it was also based upon the results from previous studies using line of business data. These studies had shown that segment earnings data was of marginal or no additional benefit over segment turnover data. Whilst geographical data differs from industry data in certain important respects there did not appear to be any very good reason to expect that the results found here would be very different. For this reason the testing of earnings based segment models was left until after all the other hypotheses were tested. Accordingly, hypothesis five stated that; "Geographical earnings based data enables more accurate forecasts of next year's earnings to be made than does either geographical turnover data or consolidated earnings data". A sample of 78 companies that disclosed turnover and profit segment data on the same basis was used. Given that the results found previously supported the conclusion that the best consolidated model was the random walk model only this one consolidated model was employed. It was found that this hypothesis was supported, although the results were not always clear-cut. For the non-truncated error measures it was found that, on average, all the segment profit models outperformed not only the turnover based models but also the random walk model. The same applied for 1982. In 1983 only model 6 was outperformed by the random walk model. In 1981 only model 2 outperformed the random walk model. Again, it was found that the best segment model was model 2, although the differences in the errors of the profit based forecasts were not large. There were, again, fairly major differences in the ranks of these six models when the errors were calculated with a denominator of actual or forecasted profits. For the truncated error measures the best model both overall and in 1981 was found to be profit based model 4. In 1982 the best models were models 1 and 2, whilst in 1983 the best model was model 3. On average, only the two ex-post models were outperformed by the random walk model, although this did not apply so consistently on a year by year basis. The t-test results showed that the differences in the performance of the truncated error measures for the turnover and profit based models were significant. For the non-truncated error measures the same general conclusion was found, although there were less significant differences. Again this was due to the existence of a few large outliers. It was also found that when the random walk and profit based models were compared there were several significant differences although no clear patterns in these differences exist.

If these results are compared to the studies using line of business data then some very important, and initially surprising, differences emerge. Unlike these studies it was found that turnover based models did not outperform the consolidated models. However, the earnings based models significantly outperformed the segment turnover based models. In addition, they normally outperformed the random walk model, especially in respect of the non-truncated errors and, whilst there was no clear-cut pattern in the incidence of significant cases, the differences in the relative performances were often significant.

12.4 POSSIBLE EXPLANATIONS OF THE RESULTS.

There are several possible reasons why the results found here are so different from those found for line of business data. Whilst none of these explanations were tested the evidence available does provide several clues.

The suggestion that the consolidated models performed well, especially in comparison to turnover based segment models, because this study used more appropriate consolidated models can be dismissed immediately. Whilst Kinney (1971) did not use any of the models used here, Collins (1976) used the random walk model, a regression model and Kinney's models whilst Emmanuel and Pick (1980) used the random walk model. A second possibility that the different results are due to the specific sample used here can also be dismissed. The relative accuracy of the different consolidated models varied considerably when the sample was changed. However, the main conclusions were not affected by the exclusion of companies with very general disclosures or the use of filter rules based upon the size of attributable profits. In addition, in chapter 7, the sample companies were compared with the rest of the population of UK multinationals. There were some significant differences, especially regarding the size of the companies. However, the sample appears to be representative with respect to the importance of overseas operations whilst, if anything, the sample companies disclosed rather more segment information than the rest of the population. The main findings are that, firstly, geographic turnover segment information, as currently provided, does not help in forecasting either turnover or earnings. Secondly, geographic earnings segment information does help in forecasting future earniings.

These results are not very sample specific and there appears to be no reason to believe that if a different sample had been used the conclusions would have been different.

The explanation for these findings, therefore, appears to lie in either the segment models used or in the disclosures made.

As explained in chapter 6 the models were based upon three assumptions, namely;

1. A company operates in all the countries covered by each segment it discloses.

2. The size of its operations in each country varies in direct proportion to the country's total GNP.

3. An x% increase or decrease in GNP results in an equal change in profits.

If the country forecasts, as given in appendix 5, are examined it can be seen that the forecasts vary quite considerably across the countries in each segment. Thus, if a company operates in only a few countries inside any one segment the relevant economic forecast may be considerably different from that used here. No consistent pattern in these differences would be expected. However, given that absolute errors were used there would be no cancelling out of positive and negative errors. Some evidence for this is found when the mean actual percentage errors were compared (see chapter 9, table 18). For 1981 and 1982 models 1 to 3 produced errors that were generally much smaller than those for the consolidated models, although the same did not apply for the other models or for 1983. In addition, the testing of hypothesis three provided limited support for improvement in the segment models as the fineness of the disclosures increased. Whilst this suggests that the relative performance of the turnover based segment model could be increased by, for example, also considering the actual location of the overseas subsidiares, it does not help in explaining the differences in the performance of turnover and earnings based models.

Appendix 6-1 provides details of the population, GNP per capita and total GNP for each country used. It can be seen from this that a medium size total GNP might be due to a large population and small GNP per capita or to a small population coupled with a high GNP per capita. Thus, for example, in 1982 the GNP of India was higher than that of Australia although its average GNP per capita was $260 as opposed to $11,140. It is unrealistic to assume that these two countries will exhibit similar demand patterns. Total GNP and GNP per capita both need to be considered. If assumption 2 could be relaxed it would be expected that the performance of all the segment based models would be improved. However, again it fails to provide a reason for the difference in the performance of turnover and earnings based models.

Assumption 3 implies that each industry can be treated alike. However, the income elasticity of demand will vary across industries depending upon what types of products are manufactured. Therefore, line of business and geographical data need to be combined. This implies that the most useful type of disclosure would be a matrix presentation of industry and geographical data. This would mean that country and industry data could be combined when considering the likely future performance of the company. This would be advantageous as different industries could be exposed to different risks or rates of return in different geographical areas (Radebaugh 1987). However, currently very few companies provide a matrix presentation of segment data.

Another important difference between industry and geographical data appears to be the degree of subjectivity involved in the disclosures. It may be argued that it is easier to decide what a separate line of business segment is than what a separate geographical segment is. FAS14 states that the choice of segments should depend upon economic affinity, similarities in business environment and the degree of the interrelationships between the operations in various countries. However, as shown in chapter 3, most of the sample companies have followed the Stock Exchange advice and based the segment information upon continents. If this choice is not primarily governed by either the operating characteristics of the company or characteristics of the countries then the disclosures made will often be more arbitrary than those for line of business segments. This means that each segment will be more likely to cover semi-independent rather than intergrated parts of a company's total operations. This in turn implies that geographic segments would be more prone to problems of common cost allocations and transfer pricing decisions. It also means that each geographic segment is likely to include countries with very different growth potentials so that the problems inherent in the aggregation of country forecasts are magnified. Such problems of segments being composed of parts with very different economic characteristics is likely to be very much less of a problem for line of business segments. This may be a possible explanation for the apparent superiority of line of business turnover based forecasts but not the superiority of geographical turnover based forecasts. However, more research needs to be done to assess the validity of this explanation.

The most important result found was the large and significant superiority of geographical segment earnings based forecasts over geographical segment turnover based forecasts. This finding is very different from those for line of business data when it was found that segment earnings data led to little or no improvement in forecast accuracy over segment turnover based forecasts. There are some possible explanations of the differences in these findings. The difference between forecasts based upon turnover and earnings data is that the former are not only based upon different segment information but they also use an aggregate profit margin instead of individual segment profit figures. The relative lack of success of the turnover based models could therefore be because the aggregate profit margin fails to adequately act as a proxy for the segment profit margins and that this is more of a problem in the case of geographical segments. It was found that the correlations between consolidated profit and turnover were surprisingly low, namely only 0.52 in 1981, 0.55 in 1982 and 0.59 in 1983. These low correlations were further compounded in the segment forecasts. It was found that the highest spearman rank correlation of the errors from the geographical turnover based models and the same model using earnings data was only 0.36 whilst most were not only smaller but not significant. It thus appears that the geographical segment turnover times consolidated profit margin model is a very poor proxy for geographical segment profit margins. This is, perhaps, not too surprising. It would be expected that often the operating characteristics of a company and, therefore, its profit ratio might vary considerably across geographical areas. This would be the case as different areas have very different labour costs and skill levels which should be reflected in the labour-capital intensities of production and different demand, price and cost patterns. Also foreign operations are often more profitable than domestic operations. This is especially so as higher profit levels are often required to compensate for the higher perceived risk of overseas operations (Radebaugh 1987). Thus profit margins in a geographical context are likely to be subject to more significant variations than line of business margins. area that needs further research.

One further surprising result is that in very many cases the poorest segment models were the two ex-post models. It was argued in chapter 6 that it would be expected that these two models would be the most accurate as they do not involve forecasts of changes in GNP. However, instead they were very often found to be the poorest models. The other difference in these two models is that they included the effects of exchange rate changes over the year. The weightings used for the other models was based upon the GNP in dollars and the expected change in GNP as measured in local currency, so they ignore any exchange rate changes that occur during the year. Model 5 involves calculating the GNP of each country in dollars at the beginning and end of the year so that the forecasts are dependent upon the change in local currency GNP and change in \$/local currency exchange rates. Model 6 is in addition also dependent upon the change in the \$/£ exchange rate. Because of the specific exchange rate changes that occurred over the period 1981 to 1983 these models often produced the most extreme forecasts for the segment models. The poor performance of these models may therefore be specific to the time period examined. As such the analysis needs to replicated for a period when exchange rate changes were less extreme. The actual results of the sample companies are generally more stable than are these forecasts. One possible reason for this may be that companies are able to take actions to reduce the effects of the exchange rate volatility. Whether or not this is the reason for the poor performance of these two models needs to be examined.

12.5. IMPLICATIONS FOR REGULATION AND VOLUNTARY DISCLOSURE OF GEOGRAPHIC SEGMENTS.

The general conclusion from this study is that for forecasting future earnings geographic segment earnings data is much more useful than geographic segment turnover data. Segment turnover data is less useful for forecasting purposes than is consolidated data whilst segment earnings based forecasts very often outperform the premier naive consolidated model, namely the random walk model. These conclusions, which are at odds to those derived using line of business segment data, have some implications for the question of what information companies should disclose.

However, it should be re-emphasised that this study has ignored the costs of disclosure, both direct and indirect. In addition, the possible benefits are very many and only one of these has been considered, namely forecasting ability. Forecasting ability has been examined using mechanical models whilst analysts or other users may use different data or different forecasting techniques. As such, it is not possible to draw any firm conclusions regarding exactly what information companies should disclose from this study.

Whilst it is not possible to draw detailed conclusions regarding desirable legislation from a statistical study of this kind the results imply that companies should disclose geographical earnings data and not just geographical turnover data. This suggests that the current UK stock exchange requirements to report earnings only if they are "abnormal" should be tightened. Further, a case can be made to support an increase in the Companies Act requirements to also include geographical earnings data, as is already the case for line of business information. This conclusion is supported by the findings of Emmanuel, Garrod and Frost (forthcoming) who examined predictions of 1984 earnings made by a sample of U.K. investment analysts based upon real company data for the two preceding years. They found that a significant number of analysts changed their forecasts after being given segmental earnings information and that forecast accuracy also increased.

The process of developing forecasts based upon the information that UK companies currently disclose clearly illustrates some of the problems that arise when using published segment information. Several major assumptions had to be made before the forecasts could be carried out.

Ideally, the information provided should be sufficient to remove the necessity of making such major assumptions. One important assumption made in this study was that the companies operated in all the countries covered by each geographical area reported. It would be expected that the accuracy of the forecasts would increase if this assumption was removed. The Stock Exchange suggests that continents should be used unless any one area accounts for at least 50% of the total. Either this requirement should be considerably tightened or more information should be given on the actual countries that the company operates in. A better approach appears to be one nearer to the U.S.A. requirements which state that if a segment accounts for at least 10% of the total it should be disclosed. If this is not done then, ideally, more information needs to be provided concerning which are the most important countries in each area. At the moment, companies are required to provide a list of their major subsidiaries. However, the detail given varies greatly between companies. For the sample used here, the average number of countries with reported subsidiaries was just over 10, but the number varied greatly, between 0 and 53. At a minimum it would be desirable to know the most important two or three countries in each segment. For example, some companies reported the segment "Americas". However, the economic conditions facing a company in the U.S.A. or Canada will be very different from those facing it in Brazil or Chile. Therefore, it would be desirable to know more about which particular countries are important in such a segment even if such information is purely descriptive and non-quantified.

This study also assumed that the industries a company operates in are irrelevant. This is likely to be very far from the truth. More consideration could be given to the provision of a matrix presentation of industry and geographical information.

It also appears desirable for companies to increase the amount of information about transfers, common costs, the effects of exchange rate changes, political risks or capital invested. However, whilst a case can be made for such information the costs and uses made of such information need to be further investigated.

12.6. AREAS FOR FURTHER RESEARCH.

Several suggestions for further research have already been made and so will not be restated. Looking, firstly, at the forecasting ability of segmental information several extensions of this research are required. The major limitation of the approach used here is that the only company information used was the segment information. Additional company specific information was ignored. Two alternative approaches to forecasting need also to be examined. Firstly, to build the segment forecasts upon the list of major subsidiaries provided by each company rather than using all possible countries. This should avoid some of the problems involved in assumption one mentioned above. Secondly, to use the industry segments to build-in industry as well as country wide economic forecasts. This should, at least partially, obviate the problems of assumption 3.

The sample also needs to be further split down, into industries, by fineness and number of segments disclosed and by size of company. This is required as it is important to know if the accuracy of forecasts depends upon any of these factors. It was argued in chapter 4 that different industries might be expected to exhibit different time series patterns. Similarly chapter 6 argued that different industries face different income elasticities of demand so that segment model applicability would vary across industries. Neither of these arguments have yet been explored in sufficient depth. Silhan (1984) by using simulated mergers found that the accuracy of forecasts based upon line of business information depended upon the size of companies. This needs to be examined for actual disclosures and for geographical data rather than just line of business data. If these additional questions are examined they should allow statements to be made not just about the usefulness of current disclosures but also statements regarding what information should be disclosed and by which companies.

Looking at the slightly wider issue of the extent to which current disclosures adequately reflect the operations of companies, there are areas where further research is required. It was shown in chapter 5 that most U.K. companies disclose segmental information on a continent by continent basis. It needs to be assesssed whether this basis is because the Stock Exchange requirements suggest this as a suitable basis or whether it is used as it best reflects the operating characteristics of companies. Segment data might be most useful if it reflects the company's organisation structure. This would mean that the segments used are as independent of each other as possible. If this was the case then it would be expected that problems of common cost allocations and transfer pricing would be minimised. Alternatively, it might be argued that if foreign operations are dependent primarily upon the economic conditions of the host country then a more useful disclosure basis would be one based upon the similarity of economic conditions, as suggested by FAS 14. This needs to be investigated, but before this question can be examined an assessment needs to be made of the criteria actually used by companies when deciding upon what segments to disclose.

Research also needs to be carried out into how the reader of the accounts actually uses such information. Do they actually use it?. If so what for? What information do they use? Does such information lead to better decision making? Do they combine company specific information with external information? If so, how?. Baldwin (1984) found evidence that line of business data led financial analysts to improve the accuracy of the forecasts they made and decreased the variability of such forecasts. Similar results were found by Emmanuel, Garrod and Frost (forthcoming) for geographical data. In addition, they found that such information was used not only for forecasting purposes but also to enable the analysts to ask pertinent questions to management and to improve their understanding of the company's direction and strategy. However, this type of research needs to be extended.

12.7. CONCLUDING REMARKS.

U.K. companies are required to disclose geographical turnover data and, in certain circumstances, also earnings data. However, very little evidence currently exists regarding the usefulness of such data. To help to rectify this situation this study has been concerned with one aspect of the usefulness of such data. Namely, whether it can be used to predict future turnover and earnings. Whilst a case can be made for suggesting that such data will be more useful for predicting future results than for assessing risk, it should be remembered that this is only one aspect of the usefulness of such data. In addition, the costs of disclosing such information have not been taken into account. In some circumstances such costs may be considerable. For example, Gray and Roberts (forthcoming) found that companies generally perceive narrowly defined segmental disclosures as giving rise to significant competitive disadvantages.

Predictive ability was assessed on a cross-sectional basis. This approach ignores much company specific information. However, it is still capable of generating useful conclusions. The results generated support the overall conclusion that geographical segment earnings data are valuable for prediction purposes but that geographical segment turnover data is not. The main reason for this appears to be that the segment profit margins vary considerably with the result that an aggregate profit margin ignores these differences. This finding is important for two main reasons. Firstly, it conflicts with earlier work using line of business data. Without this study it might have been assumed that the conclusions from prior research using line of business data could be applied to geographical data. This does not appear to be the case. Secondly, the U.K. legislative requirements appear to be based upon the assumption that turnover data is more useful than earnings data. This study suggests that the reverse situation holds. Only one aspect of usefulness has been examined, and as such it would be premature to suggest that geographic segment turnover data serve no useful purpose. However, the findings suggest that, if anything, the current legislative requirements should be increased so that all companies are required to disclose not only geographical turnover data but also earnings data.

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GEOGRAPHICAL SEGMENT DISCLOSURES: USEFULNESS IN FORECASTING TURNOVER AND PROFITS OF U.K. MULTINATIONALS

Volume II

CLARE BARBARA ROBERTS

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VOLUME II.

APPENDICES.

Appendix 1.

U.K. MULTINATIONAL COMPANIES IN THE TIMES 1000, 1981-1982.

Sample Companies

Number	Name	Year End	Industry
10	A.P.V.	December	6
19	Automotive Products	December	9
21	Babcock	December	6
22	William Baird	December	35
25	Bassett Foods	March	25
29	B.B.A.	December	9
30	Beecham	March	27
33	Bestobell	December	6
36	B.I.C.C.	December	4
40	Blackwood Hodge	December	6
42	Blue Circle	December	2
45	Boots	March	34
50	B.P.B. Industries	March	2
53	Bridon	December	6
54	B.P.	December	51
58	John Brown	March	6
59	B.S.G.	December	9
60	B.S.R.	December	29
61	B.T.R.	December	10
64	Bunzl	December	33
65	Burmah Oil	December	51
67	Cadbury Schweppes	December	25
69	Cape Industries	December	2
73	Carpets International	December	35
77	Chamberlain Phipps	March	39
79	Chloride	March	4
81	Chubb	March	6
83	Coates Group	December	42
84	Coats Paton	December	35
86	William Collins	December	32
89	Cookson Group	December	10
92	Costain	December	3
93	Courtaulds	March	35
96	Croda	December	42
100	Davy Corporation	March	5
102	Debenhams	January	34
103	De La Rue	March	46
104	Delta	December	8
105	Distillers	March	22
111	D.R.G.	December	33
112	Dunlop	December	9
113	Duport	January	46
126	Fisons	December	42
130	French Kier	December	3
132	G.E.C.	March	4
133	Gestetner	October	44
134	Gill & Duffus	December	91
136	Glynwed	December	8
140	Great Universal Stores	March	34
145	Haden	December	5

146	Hall Engineering	December	6
147	Matthew Hall	December	5
150	Harrisons & Crosfield	December	91
153	Hepworth Ceramic	December	2
165	I.C.I.	December	42
169	Illingworth Morris	March	35
171	Imperial Group	October	36
176	Johnson Matthey	March	8
180	Ladbroke	December	29
181	John Laing	December	3
182	Laird Group	December	6
184	L.C.P.	March	46
187	Lex Services	December	9
194	Low & Boner	November	46
195	L.R.C.	March	27
200	Marks & Spencer	March	34
207	Metal Box	March	33
208	Metal Closures	December	33
209	Meyer International	March	2
214	Morgan	December	10
215	John Mowlem	December	3
218	Newarthill	October	3
224	Owen Owen	January	34
226	Pauls Int.	March	25
227	S.Pearson	December	46
228	Peglar Hattersley	March	6
233	Portals	December	46
234	Powell Duffryn	March	46
238	Racal	March	4
239	Rank Organisation	October	44
241	Ransome, Sims & Jeffries	December	6
243	Readicutt International	March	35
244	Reckitt & Colman	December	27
245	Redland	March	2
247	Reed Int.	March	33
248	Renold	March	6
253	R.M.C.	December	2
256	Rowntree Mackintosh	December	25
265	Sears Holdings	January	34
273	Simon Engineering	December	5
276	Smith & Nephew	December	27
282	Steetley	December	10
285	Tarmac	December	2
287	Taylor Woodrow	December	3
290	Thorn E.M.I.	March	29
293	Tootal	January	35
294	Tozer, Kemsley & Millbourn	December	91
295	Transport Development Gp.	December	45
298	Trusthouse Forte	October	29
299	T.I. Group	December	6
300	Turner & Newall	December	10
303	U.K.O.	March	46
304	Ultramar	December	51
305	Unigate	March	25
306	Unilever	December	25
308	United Biscuits	December	25
319	Weir Group	December	6
324	Whitbread	February	22
327	George Wimpey	December	3

Companies that changed their year end

6	Allied Lyons
23	Baker Perkins
37	Birmid Qualcast
95	Crest Nicholson
175	Johnson & Firth Brown
201	Marley
275	W. H. Smith

Companies with year ends between April and September.

2	Adwest	June
3	A.E.	September
11	Armstrong Equipment	June
15	Associated Paper Industries	September
20	Avon Rubber	September
32	Berisford	September
43	B.O.C.	September
46	Thomas Borthwick	September
57	Brooke Bond	June
63	H. P. Bulmer	April
90	Cope Allman	June
98	Dalgety	June
106	Dixon's Photographic	April
107	Dobson Park Industries	September
120	Evode	September
122	J.H.Fenner	August
135	Glaxo	June
138	Granada	September
139	Grand Metropolitan	September
143	Arthur Guinness	September
148	Hanson Trust	September
152	Henlys	September
154	Hickson and Welch	September
160	Howden Group	April
166	I.C.L.	September
179	Kenning Motors	September
193	Lonrho	September
196	Lucas	July
205	McCorquodale	September
206	McKechnie Bros.	July
210	Mills and Allen	June
212	Mitchell Cotts	June
225	Paterson Zochonis	May
240	Ranks, Hovis McDougall	August
250	R.H.P.	September
264	Scottish & Newcastle	April
266	Security Services	September
270	S.G. B.	September
277	Smith's Industries	July
286	Tate & Lyle	September
301	Trafalger House	September
307	Unitech	May
321	Westland	September

Companies excluded due to a lack of data.

1	Acrow	March	6
5	Allied Colloids	March	42
12	Associated Book Publishers	December	32
17	Aurora	December	6
18	Austin Reed	January	34
24	Barton Group	December	8
26	B.A.T.	December	36
27	Bath & Portland Cement	October	10
34	B.E.T.	March	46
41	Blagdon Industries	December	6
44	Henry Boot	December	3
47	Boustead	December	91
48	Bowater	December	33
49	Bowthorpe	December	4
52	Brent Chemicals	December	42
55	British Vita	December	42
68	W.Canning	December	10
72	Carless	March	42
74	Carrington Viyella	December	35
78	Chaterhouse Group	December	68
80	Christies International	December	46
82	Church & Co.	December	34
85	A. Cohen	December	8
87	Comben Group	December	3
91	Corah	December	35
94	Courts (Furnishers)	March	34
97	Derek Crouch	December	3
99	Davies & Newman	December	45
101	Dawson International	March	35
108	Robert M. Douglas	March	3
109	Dowty Group	March	6
110	Drake & Scull	October	4
115	Electronic Rentals	March	29
116	B.Elliot	March	6
118	E.R.F.	March	9
121	European Ferries	December	45
123	Ferranti	March	4
124	Fine Art Developments	March	34
125	James Finlay	December	91
128	Forward Technology	December	4
129	Foseco Minsep	December	10
131	Geers Gross	December	46
142	G.K.N.	December	8
155	Hogg Robinson	March	67
157	Holt Lloyd Int.	February	9
159	Howard Machinery	October	6
161	Hunting Associated Indust.	December	46
162	Hunting Petroleum Services	December	51
164	Ibstock Johnson	December	2
167	I.C.Gas	March	51
168	I.D.C.	October	46
170	I.M.I.	December	8
173	Initial Services	March	46
177	Johnston Group	December	46
183	Laporte Industries	December	42
185	Lee Cooper	December	35

186	L.E.P. Group	December	45
189	F.J.C. Lilley	March	3
191	Liverpool Daily Post	December	32
192	L.A.S.M.O.	December	51
197	Donald McPherson	October	2
198	Manders	December	2
199	Marchweil	October	3
202	Marshall's Universal	December	46
204	May & Hassell	March	2
211	Minet	December	67
213	Molins	December	6
217	James Neill	December	6
219	Newman Industries	December	10
220	Northern Engineering	December	5
221	Norcross	March	10
229	Pentos	December	46
230	Pilkington Bros.	March	2
231	Plessey	March	4
232	P. & O.	December	45
235	Prestige	December	39
236	Pritchard Services	December	46
242	Ratcliffes	December	8
249	Rentokil	December	42
252	R.T.Z.	December	81
255	Rothmans	December	36
257	Royal Worcester	December	39
258	Rugby Portland Cement	December	2
260	Sale Tilney	November	6
263	Scapa	March	35
268	Selincourt	January	35
269	Senior Engineering	March	6
274	600 Group	March	6
279	Spirax-Sarco Engineering	December	6
280	Staveley Industries	March	10
281	Steel Brothers	December	91
284	Stocklake	March	91
289	Telephone Rentals	December	44
292	Time Products	January	34
296	Tricentrol	December	51
312	Valor	March	39
313	Vickers	December	6
315	Wagon Industrial	March	6
317	Ward White	December	39
320	Wellman Engineering	March	6
332	W.G.I.	March	6
326	George Wills	December	91
329	Stewart Wrightson	December	67
330	Yule Catto	December	46

Appendix 2.

DESCRIPTIVE STATISTICS; SAMPLE COMPANIES.

	MEAN	STD. DEV.	MINIMUM	MAXIMUM	NO. COMPANIES
TURNOVER					
	1070.455	2782.455	42.186	25755.000	109
UK TURNOVER					
	633.117	1425.485	22.250	11724.000	109
NUMBER OF GEOGRAPHICAL TURNOVER SEGMENTS					
	4.661	1.911	2.000	9.000	109
PROFIT AS USED IN GEOGRAPHICAL SEGMENTS					
	93.282	335.026	-2.390	3086.000	90
UK PROFIT					
	33.567	66.599	-13.000	443.000	90
NUMBER OF GEOGRAPHICAL PROFIT SEGMENTS					
	3.587	2.334	0.000	13.000	109
PRETAX PROFIT					
	71.701	248.895	-23.100	2432.000	109
ATTRIBUTABLE PROFIT BEFORE EXTRAORDINARY ITEMS					
	39.096	115.719	-41.000	1072.000	109
NUMBER OF LINE OF BUSINESS SALES SEGMENTS					
	3.532	2.820	0.000	14.000	109
NUMBER OF LINE OF BUSINESS PROFIT SEGMENTS					
	3.294	2.806	0.000	14.000	109
ORDINARY SHAREHOLDERS SHARE CAPITAL					
	51.401	83.996	2.129	594.000	109
SHAREHOLDERS FUNDS					
	333.209	837.527	14.654	7725.000	109

TOTAL ASSETS LESS CURRENT LIABILITIES

531.591	1799.436	19.424	17754.000	109

NUMBER OF COUNTRIES SUBSIDIARIES IN

10.193	7.725	0.000	53.000	109

NUMBER OF ADDITIONAL COUNTRIES ASSOCIATES IN

2.165	2.271	0.000	14.000	109

PERCENTAGE U.K. TURNOVER

61.495	20.815	13.530	99.587	109

PERCENTAGE U.K. PROFIT

50.188	49.683	-272.727	230.125	90

ATTRIBUTABLE PROFIT PER TURNOVER %

3.136	2.886	-2.931	11.994	109

ATTRIBUTABLES PROFIT PER SHAREHOLDERS FUNDS %

9.234	8.168	-24.405	28.451	109

TURNOVER PER TOTAL NET ASSETS (*100%)

2.854	1.930	0.709	12.447	109

NUMBER OF GEOGRAPHICAL TURNOVER SEGMENTS

NO.	FREQ	ADJ PCT	CUM PCT	NO.	FREQ	ADJ PCT	CUM PCT	NO.	FREQ	ADJ PCT	CUM PCT
2	17	16	16	5	25	23	68	8	5	5	98
3	15	14	29	6	23	21	89	10	1	1	99
4	17	16	45	7	5	5	94	13	1	1	100

NUMBER OF GEOGRAPHICAL PROFIT SEGMENTS

NO.	FREQ	ADJ PCT	CUM PCT	NO.	FREQ	ADJ PCT	CUM PCT	NO.	FREQ	ADJ PCT	CUM PCT
0	19	17	17	4	13	12	59	7	4	4	98
2	17	16	33	5	23	21	80	8	1	1	99
3	15	14	47	6	16	15	94	13	1	1	100

NUMBER OF LINE OF BUSINESS TURNOVER SEGMENTS

NO.	FREQ	ADJ PCT	CUM PCT	NO.	FREQ	ADJ PCT	CUM PCT	NO.	FREQ	ADJ PCT	CUM PCT
0	29	27	27	5	17	16	77	9	2	2	98
2	14	13	39	6	11	10	87	10	1	1	99
3	5	5	44	7	7	6	94	14	1	1	100
4	19	17	61	8	3	3	96				

NUMBER OF LINE OF BUSINESS PROFIT SEGMENTS

NO.	FREQ	ADJ PCT	CUM PCT	NO.	FREQ	ADJ PCT	CUM PCT	NO.	FREQ	ADJ PCT	CUM PCT
0	33	30	30	5	15	14	79	9	2	2	99
2	14	13	43	6	10	9	88	14	1	1	100
3	5	5	48	7	7	6	94				
4	19	17	65	8	3	3	97				

INDUSTRY

CODE	FREQ	ADJ PCT	CUM PCT	CODE	FREQ	ADJ PCT	CUM PCT	CODE	FREQ	ADJ PCT	CUM PCT
2	8	7	7	25	7	6	54	42	5	5	84
3	7	6	13	27	4	4	58	44	2	2	86
4	4	4	17	29	4	4	62	45	1	1	87
5	4	4	20	32	1	1	63	46	8	7	94
6	14	13	33	33	5	5	67	51	3	3	97
8	3	3	36	34	6	6	72	91	3	3	100
9	5	5	41	35	7	6	78				
10	5	5	46	36	1	1	79				
22	2	2	48	39	1	1	80				

NUMBER OF COUNTRIES SUBSIDIARIES IN

NO.	FREQ	ADJ PCT	CUM PCT	NO.	FREQ	ADJ PCT	CUM PCT	NO.	FREQ	ADJ PCT	CUM PCT
0	1	1	1	9	6	6	57	18	5	5	88
1	2	2	3	10	4	4	61	19	2	2	90
2	10	9	12	11	7	6	67	20	1	1	91
3	7	6	18	12	3	3	70	21	3	3	94
4	5	5	23	13	2	2	72	23	1	1	94
5	10	9	32	14	1	1	72	24	3	3	97
6	7	6	39	15	5	5	77	25	1	1	98
7	4	4	42	16	6	6	83	29	1	1	99
8	10	9	51	17	1	1	83	53	1	1	100

NUMBER OF ADDITIONAL COUNTRIES ASSOCIATES IN

NO.	FREQ	ADJ PCT	CUM PCT	NO.	FREQ	ADJ PCT	CUM PCT	NO.	FREQ	ADJ PCT	CUM PCT
0	32	29	29	4	7	6	86	8	2	2	99
1	16	15	44	5	8	7	93	14	1	1	100
2	21	19	63	6	2	2	95				
3	18	17	80	7	2	2	97				

EXCLUDED COMPANIES: DESCRIPTIVE STATISTICS.

	MEAN	STD. DEV.	MINIMUM	MAXIMUM	NO. COMPANIES
TURNOVER	351.227	351.227	33.909	9265.000	104
UK TURNOVER	163.943	375.028	7.254	2956.700	104
NUMBER OF GEOGRAPHICAL TURNOVER SEGMENTS	4.114	2.118	2.000	11.000	104
PROFIT AS USED IN GEOGRAHICAL SEGMENTS	29.257	85.756	-3.272	634.000	73
UK PROFIT	9.559	20.933	-41.200	127.700	73
NUMBER OF GEOGRAPHICAL PROFIT SEGMENTS	2.276	2.069	0.000	10.000	104
PRETAX PROFIT	22.478	76.509	-13.736	684.000	104
ATTRIBUTABLE PROFIT BEFORE EXTRAORDINARY ITEMS	10.610	37.896	-14.571	363.000	104
NUMBER OF LINE OF BUSINESS TURNOVER SEGMENTS	2.962	2.872	0.000	14.000	104
NUMBER OF LINE OF BUSINESS PROFIT SEGMENTS	2.657	2.776	0.000	13.000	104

ORDINARY SHAREHOLDERS SHARE CAPITAL

20.419	36.897	0.183	167.700	104

SHAREHOLDERS FUNDS

116.209	289.527	2.273	914.000	104

TOTAL ASSETS LESS CURRENT LIABILITIES

171.267	502.816	2.273	3709.600	104

NUMBER OF COUNTRIES SUBSIDIARIES IN

2.695	4.429	0.000	21.000	104

NUMBER OF ADDITIONAL COUNTRIES ASSOCIATES IN

0.374	1.076	0.000	9.000	104

PERCENTAGE U.K. TURNOVER

63.646	22.983	9.000	98.157	104

PERCENTAGE U.K. PROFIT

62.405	112.845	-154.307	925.073	73

ATTRIBUTABLE PROFIT PER TURNOVER

3.309	4.060	-7.246	17.588	104

ATTRIBUTABLE PROFIT PER SHAREHOLDERS FUNDS

7.719	19.629	-148.065	63.182	104

TURNOVER PER TOTAL NET ASSETS

3.074	3.100	0.841	23.452	104

NUMBER OF GEOGRAPHICAL TURNOVER SEGMENTS

NO.	FREQ	ADJ PCT	CUM PCT	NO.	FREQ	ADJ PCT	CUM PCT	NO.	FREQ	ADJ PCT	CUM PCT
2	33	32	32	6	14	13	86	10	1	1	99
3	17	16	48	7	7	7	92	11	1	1	100
4	15	14	63	8	5	5	97				
5	10	10	72	9	1	1	98				

NUMBER OF GEOGRAPHICAL PROFIT SEGMENTS

NO.	FREQ	ADJ PCT	CUM PCT	NO.	FREQ	ADJ PCT	CUM PCT	NO.	FREQ	ADJ PCT	CUM PCT
0	31	30	30	4	8	8	86	7	4	4	99
2	38	37	66	5	5	5	90	10	1	1	100
3	12	12	78	6	5	5	95				

NUMBER OF LINE OF BUSINESS PROFIT SEGMENTS

NO.	FREQ	ADJ PCT	CUM PCT	NO.	FREQ	ADJ PCT	CUM PCT	NO.	FREQ	ADJ PCT	CUM PCT
0	41	39	39	5	10	10	87	9	1	1	97
2	10	10	49	6	5	5	91	10	2	2	99
3	16	15	64	7	4	4	95	13	1	1	100
4	13	13	77	8	1	1	96				

NUMBER OF LINE OF BUSINESS TURNOVER SEGMENTS

NO.	FREQ	ADJ PCT	CUM PCT	NO.	FREQ	ADJ PCT	CUM PCT	NO.	FREQ	ADJ PCT	CUM PCT
0	33	32	32	5	10	10	85	9	1	1	96
2	15	14	46	6	6	6	90	10	2	2	98
3	17	16	63	7	4	4	94	12	1	1	99
4	13	13	75	8	1	1	95	14	1	1	100

INDUSTRY

CODE	FREQ	ADJ PCT	CUM PCT	CODE	FREQ	ADJ PCT	CUM PCT	CODE	FREQ	ADJ PCT	CUM PCT
2	5	5	5	29	1	1	46	45	4	4	76
3	6	6	11	32	2	2	48	46	10	10	85
4	5	5	15	34	5	5	53	51	5	5	89
5	1	1	16	35	6	6	59	67	3	3	92
6	17	16	33	36	2	2	61	68	2	2	94
8	5	5	38	39	5	5	66	81	1	1	95
9	2	2	40	42	5	5	71	91	5	5	100
10	6	6	45	44	1	1	72				

NUMBER OF COUNTRIES SUBSIDIARIES IN

NO.	FREQ	ADJ PCT	CUM PCT	NO.	FREQ	ADJ PCT	CUM PCT	NO.	FREQ	ADJ PCT	CUM PCT
0	60	58	58	6	4	4	83	14	1	1	97
1	4	4	62	7	3	3	86	19	1	1	98
2	4	4	65	8	6	6	91	20	1	1	99
3	5	5	70	9	3	3	94	21	1	1	100
4	5	5	75	11	1	1	95				
5	4	4	79	12	1	1	96				

NUMBER OF ADDITIONAL COUNTRIES ASSOCIATES IN

NO.	FREQ	ADJ PCT	CUM PCT	NO.	FREQ	ADJ PCT	CUM PCT	NO.	FREQ	ADJ PCT	CUM PCT
0	84	81	81	3	4	4	97	9	1	1	100
1	11	11	91	4	1	1	98				
2	2	2	93	8	1	1	99				

INDUSTRY CLASSIFICATION NUMBERS.

2. Building materials
3. Contracting and construction
4. Electricals
5. Engineering contractors
6. Mechanical engineering
8. Metals and metal forming
9. Motors
10. Other industrial materials
22. Brewers and distillers
25. Food manufacturing
26. Food retailing
27. Health and household products
29. Leisure
32. Newspapers and publishing
33. Packaging and paper
34. Stores
35. Textiles
36. Tobacco
39. Other consumers
42. Chemicals
44. Office equipment
45. Shipping and transport
46. Miscellaneous
51. Oils
67. Insurance brokers
68. Merchant banks, issueing houses
81. Mining finance
91. Overseas traders

Appendix 3.

T-TESTS 1980/1981 OF SAMPLE AND UNAVAILABLE COMPANIES.

GROUP 1: SAMPLE COMPANIES, 109 COMPANIES
GROUP 2: UNAVAILABLE COMPANIES, 104 COMPANIES

	NUMBER OF CASES	MEAN	STANDARD DEVIATION	VARIANCE ESTIMATE T VALUE	DEGREES OF FREEDOM	2-TAIL PROB.
TURNOVER						
GROUP 1	109	1070.4554	2782.455	2.52	138.71	0.013
GROUP 2	104	351.2267	1042.466			
UK TURNOVER						
GROUP 1	109	633.1170	1425.485	3.32	123.42	0.001
GROUP 2	104	163.9433	375.028			
NUMBER OF GEOGRAPHICAL SALES SEGMENTS						
GROUP 1	109	4.6606	1.911	1.98	212	0.049
GROUP 2	104	4.1143	2.118			
PROFIT AS USED IN GEOGRAPHICAL SEGMENTS						
GROUP 1	90	93.2818	335.026	1.74	102.95	0.084
GROUP 2	73	29.2566	85.756			
UK PROFIT						
GROUP 1	90	33.5671	66.599	3.23	109.74	0.002
GROUP 2	73	9.5586	20.933			
NUMBER OF GEOGRAPHICAL PROFIT SEGMENTS						
GROUP 1	109	3.5872	2.334	4.34	212	0.000
GROUP 2	104	2.2762	2.069			

PRETAX PROFIT						
GROUP 1	109	71.7015	248.895	1.97	128.94	0.051
GROUP 2	104	22.4776	76.509			
ATTRIBUTABLE PROFIT BEFORE EXTRAORDINARY ITEMS						
GROUP 1	109	39.0961	115.719	2.44	131.69	0.016
GROUP 2	104	10.6095	37.896			
NUMBER OF LINE OF BUSINESS TURNOVER SEGMENTS						
GROUP 1	109	3.5321	2.820	1.47	212	0.144
GROUP 2	104	2.9619	2.872			
NUMBER OF LINE OF BUSINESS PROFIT SEGMENTS						
GROUP 1	109	3.2936	2.806	1.67	212	0.097
GROUP 2	104	2.6571	2.776			
ORDINARY SHAREHOLDERS SHARE CAPITAL						
GROUP 1	109	51.4007	83.996	3.51	149.38	0.001
GROUP 2	104	20.4192	36.897			
SHAREHOLDERS FUNDS						
GROUP 1	109	333.2086	837.527	2.55	134.52	0.012
GROUP 2	104	116.1320	289.469			
TOTAL ASSETS LESS CURRENT LIABILITIES						
GROUP 1	109	531.5911	1799.436	2.01	125.36	0.047
GROUP 2	104	171.2668	502.816			
NUMBER OF COUNTRIES SUBSIDIARIES IN						
GROUP 1	109	10.1927	7.725	8.75	173.33	0.000
GROUP 2	104	2.6952	4.429			

NUMBER OF ADDITIONAL COUNTRIES ASSOCIATES IN

GROUP 1	109	2.1651	2.271	7.43	155.47	0.000
GROUP 2	104	0.3714	1.076			

PERCENTAGE U.K. TURNOVER

GROUP 1	109	61.4955	20.815	-0.72	212	0.474
GROUP 2	104	63.6464	22.983			

PERCENTAGE U.K. PROFIT

GROUP 1	90	50.1881	49.683	-0.86	96.12	0.389
GROUP 2	74	62.4053	112.845			

PERCENTAGE ATTRIBUTABLE PROFIT PER TURNOVER

GROUP 1	109	3.1357	2.886	-0.36	187.15	0.720
GROUP 2	104	3.3094	4.060			

PERCENTAGE ATTRIBUTABLE PROFIT PER SHAREHOLDERS FUNDS

GROUP 1	109	9.2345	8.168	0.73	137.90	0.465
GROUP 2	104	7.7191	19.629			

TURNOVER PER TOTAL NET ASSETS

GROUP 1	109	2.8540	1.930	-0.62	172.93	0.535
GROUP 2	104	3.0744	3.100			

If F-value probability is greater than 0.05 then pooled variance estimate is reported, if less than 0.05 then seperate variance estimate reported.

Appendix 4.1

TURNOVER SEGMENTS: BY CUSTOMER LOCATION.

Company Name	Years	U.K	Europe	E.E.C.	Rest Europe	North Amer.	Americas	Austr.	Asia	Africa	Mid. East	Far East	Rest	Other
A.P.V.	73-83	x	x				x	x	x	x				
Babcock	77-82	x	x			x		x	x	x	x			
Baird	73-82	x		x	x	x							x	
	83	x	x										x	
BBA	73-80	x	x			x							x	
	81-83	x	excl.Gr.			x							x	Germany
Beecham	73-79	x	x				x						x	
	80-83	x	x				x	+Asia		x				
BICC	73	x	x			x		x		+ME			x	
	74-75	x		x	x	x		x		+ME			x	
	76-80	x	x			x		x		+ME			x	
	81-83	x	x			x		x		x	x		x	
Blackwood Hodge	73-83	x	x			x		x	x	x				
Blue Circle	81	x					x	x	+ME	x				
	82-83	x				x		x	x	x				Sth.Amer.
Boots	73-83	x	x				x	x	x	+NE				

		UK	Eur.	EEC	Rest Eur.	NAm.	Amers.	Aust.	Asia	Africa	M.Et.	Far Et.	Rest	Other
BSR	75–80	x											x	
	81–83	x	x			x		+Asia		x				Sth.Amer.
BTR	73–76	x	x				x	x		x				
	77	x					x						x	
	78–83	x												Et.Hemisphere
Cape	73–82	x	x				x	+FE		+ME				
Collins	73–74	x				+Carib.		x					x	
	75–83	x	x			x		x		x			x	
Debenhams	76–83	x											x	
Delta	73–74	x	x					x		x			x	
	75	x	x					x		x			x	Sth.Amer.
	76–77	x	x					x		x	x		x	Sth.Amer.
	78–82	x	x			x		x		x	x	x	x	Sth.Amer.
Distillers	77–83	x											x	
DRG	73	x											x	
	74–82	x				x		x		South			x	
	83	x											x	
Dunlop	76	x		x	x		x	+Asia		x				
	77–83	x		x	x	x		+Asia		x				Sth.Amer.
Fisons	73–83	x	x				x	+Asia		x				
Gestetner	73–75	x	x				x						x	
	76–83	x		x	x		x						x	

		UK	Eur. EEC	Rest Eur.	N.Am.	Amers.	Aust.	Asia	Africa	M.Et.	Far Et.	Rest	Other
Gill & Duffus	73-83	x	x		x							x	
Haden	73	x	x		x		x		x			x	
	74-76	x	x		x		x		x				
	77-80	x	x		x		x		x	x			
	81-83	x	x		x		x		+ME			x	
Matthew Hall	73-75	x					x					x	
	76	x	Neth.				x					x	
	77-80	x	Neth,Norw,Irel				x					x	
	81	x	Neth, Irel.		x		x					x	
	82-83	x	Neth.		x		x					x	Brazil
Hepworth Ceramic	77-83	x			x							x	
Imperial	74-75	x										x	
	76-78	x	x		x		x					x	
	79-83	x	x		x							x	
Johnson Matthey	74-83	x	x			x	x	x	x				
Metal Box	73-78	x	x					x	x			x	
	79-82	x	x		x			x	x			x	
Morgan	73-83	x	x			x	x		+ME		x		
Mowlem	73	x						x	x				
	74-76	x						x	x	x			Ireland
	77-83	x	x			x	x	x	x	x			

		UK	Eur.	EEC	Rest Eur.	N.Am.	Amers.	Aust.	Asia	Africa	M.Et.	Far Et.	Rest	Other
Pauls	79–83	x	x							x			x	
Pearson	73–83	x	x				x	x	x	x				
Peglar H.	73–83	x	x				x	+Asia		x				
Portals	73–83	x	x				x	x	x	x				
Racal	73–79		x				x	x	x	x				
	80–83	x	x				x	x	x	x				
R.S.& J.	73–83	x		x	x	x		x	x	x				Sth.Amer.
Readicut	74–82	x	x			x		+FE		+ME				
Reckitt &	73–74	x	x			x		x	x	x				Sth.Amer.
Colman	75–83	x	x			x		+Asia		x				Sth.Amer.
Renold	76	x	x			x		+FE		x			x	
	77–83	x	x			x							x	
Rowntree	73–80	x	x										x	
Mackintosh	81–83	x	x			x		x					x	
Simon	73–74	x	West				x	x	x	x				East Eur.
Eng.	75–76	x		x	x	x		x		x	x	x		E.Eur,S.Amer.
	77–83	x		x	x		x	x		x	x	x		E.Eur.
Smith &	73		x				x	+Asia		+ME				
Nephew	74–83	x	x				x	+Asia		+ME				

		UK	Eur.	EEC	Rest Eur.	N.Am.	Amers.	Aust.	Asia	Africa	M.Et.	Far Et.	Rest	Other
Tarmac	73–74	x	x							x				
	75–76	x	x							x			x	
	77–81	x	x										x	
	82–83	x											x	
Taylor W.	73–83	x	x			x		x		x	x	x		
Thorn	74–79	x	x					x		x			x	
	80–83	x	x				x	x	x	x				
TKM	73		x				x	x		South			x	
	74		x			x		+FE		+ME				Sth.Amer.
	75		x			x		+FE		+ME			x	Sth.Amer.
	76–81	x	x				x	+FE		+ME			x	
	82–83		x				x	+FE		+ME			x	
Tube	75–81	x		x	x	x		x	x	x	x			E.Eur,S.Amer.
	82	x		x	x		x						x	
	83	x		x	x		x	x	x	x	x			
Turner&N.	73–81	x	x				x	+Asia		x				
Unilever	73		x				x			x			x	
	74–83			x	x	x		+Asia		x				S.Amer.
Whitbread	74–75	x											x	
	76–83	x	x				x						x	
Wimpey	73–81	x											x	
	82–83	x				x					x		x	

Appendix 4.2

<u>TURNOVER BY AREA MANUFACTURED IN: SEGMENTS USED.</u>

Company Name	Years	U.K.	Eur.	E.E.C	Rest Eur.	Nth Amer /U.S.A	Amers.	Aust.	Asia	Africa	Mid. East	Far East	Rest	Other
A.P.V	77-83	x	x				x	x	x	x				
Automotive Products	73	x	x					N.Z		South				
	74-76	x	x					N.Z	Japan					
	77-83	x	x			x			Japan					
Babcock	73-75	x	x										x	
	76-79	x												
	80-82	x	x			x							x	
Bassett	77-78	x	x					x						
	79-80	x	x											
	81-82	x	x			x		x						
	83	x											x	
Bestobell	73	x	x			x		x	x	x				
	74-83	x	x			x		x	x	South Central				
BICC	73-82	x											x	
Blue Circle	73	x						x		x				
	74-80	x						x		x			x	
	81-82	x											x	

		UK	Eur.	EEC	Rest Eur.	N.Am.	Amers.	Aust.	Asia	Africa	M.Et.	Far Et.	Rest	Other
BPB	73–74	x											x	
	75–80	x		x		Can.								
	81–83	x		x		x							x	
Bridon	73–82	x											x	
	83	x	x				x			x			x	
B.P	76–79	x	x				x	+ FE		+ME				Internat.
	80–83	x	x				x	x		x				
John Brown	73–83	x	x				x	x	x	x				
BSG	73–78	x	x											
	79–81	x		x		x								
	82–83	x		x										
Bunzl	73–80	x	x				x						x	
	81–83	x	x			x		+Asia						Sth.Amer.
Burmah	73–75	x	x			x		x	x	+FE				S.Am.
	76	x	x			x		x	x	x				S.Am. Shipping
	77–83	x	x				x	x	x	x				Shipping
Cadbury	73–74	x	x										x	
	75–77	x	x			x		x		x			x	
	78–83	x	x			x		x					x	
Carpets Internat.	73	x						+FE						
	74–76	x						+FE					x	
	77–79	x				x		x				x		
	80–82		x			x		x	x					
	83		x			x			x					

		UK	Eur. EEC	Rest Eur.	N.Am.	Amers.	Aust.	Asia	Africa	M.Et.	Far Et.	Rest	Other
Chamberlain Phipps	73–82	x										x	
Chloride	73		x		x		x	x	x				
	74–83	x	x		x		x	x	x				
Chubb	73–78	x	x		x		x		x			x	
	79–80	x	x		x		x		x		x	x	
	81–83	x	x		x		x		x		x		
Coates Bros.	73–82		x				x	x	x				Carib.
	83	x	x				x	x	x				Carib.
Coats Patons	73–83	x	x		x							x	S.Amer.
Cookson	75–83	x	x		x		x		x				India
Costain	73–82	x			x		x	x	x				Benelux
	83		x		x		x	x	x				
Courtaulds	74–79	x										x	
	80–83	x	x		x				x			x	
Croda	73–77	x	x		x		x	Japan	South				
	78–79	x	x			x	x	Japan	South				
	80–83	x	x			x	x	x	South				
Davy	73–83	x										x	

		UK	Eur.	EEC	Rest Eur.	N.Am.	Amers.	Aust.	Asia	Africa	M.Et.	Far Et.	Rest	Other
De La Rue	74	x	x				x	x	x	x				
	75–77	x	x				x	x		x				
	78	x	x				x			x				
	79–83	x	x				x							
Duport	73	x	x			x		x		+ME			x	
	74	x	West			x		x		+ME			x	Et.Eur.
	75–83	x		x	EFTA	x		x		+ME			x	Et.Eur.
French Kier	73–82	x											x	
GEC	73–83	x	x				x	x	x	x				
Glynwed	73–83	x											x	
G.U.S.	73–83	x											x	
Hall Eng.	73–82	x											x	
	83	x				x				x				
Harrison & Crosfield	73–83	x				x			x					
I.C.I.	73–75	x	x				x	x					x	
	76–83	x	x				x	x					x	India
Illingworth Morris	74–77	x	x					x			South			
	78–80	x	x					x						
	81–83	x	x			x		x						

		UK	Eur. EEC	Rest Eur.	N.Am.	Amers.	Aust.	Asia	Africa	M.Et.	Far Et.	Rest	Other
Ladbroke	73	x											Malta
	74–82	x										x	
	83	x	x		x								
Laing	73	x										x	
	74–76	x	x							x			
	77	x	x		x				x	x			
	78–82	x	x		x				+S.Amer	x			
Laird	73–79	x	x										
	80–82	x										x	
SALES	83	x	x		x							x	
LCP	77–82	x										x	
	83	x			x								France
Lex	73–82	x			x								
	83	x	Gr+Ir		x								
Low & Bonar	73–79	x			x				x				
	80–83	x			x		x		x				
LRC	74–83	x	x		x				+FE				
Marks & Spencer	75	x	x										
	76–83	x	x		x								
Metal Closures	75–82		x						South				
	83	x	Italy						South				

		UK	Eur.	EEC	Rest Eur.	N.Am.	Amers.	Aust.	Asia	Africa	M.Et.	Far Et.	Rest	Other
Meyer	73–77	x											x	
	78–82	x	x										x	
	83	x											x	
Newarthill	73	x						x						Carib.
	74–82	x											x	
Owen Owen	74–83	x				x								
Powell Duffryn	73–83	x	x				x	x		+ME				
Rank	73	x	x			x							x	
	74–80	x	x			x		x					x	
	81–83	x	x			x		x	x					
Redland	74–82	x	x			x								Germany
	83	x	x			x		+FE					x	
Reed	74–76	x				x		x					x	
	77–80	x	x			x		x		x				
	81–83	x	x			x							x	
RMC	73–83	x											x	Germany
Sears	76–83	x		x		x								
Steetley	73–76	x		x		x		x						
	77	x		x		x		x		South				
	78–80	x		x		x		x		+ME				
	81–83	x		x		x		x			x			
Tootal	74–83	x	x			x		x	x	x				

		UK	Eur. EEC	Rest Eur.	N.Am.	Amers.	Aust.	Asia	Africa	M.Et.	Far Et.	Rest	Other
Transport	73–80	x	x				x						
D.G.	81–83	x	x		x		x						
Trusthouse F.	73–83	x	x		x								
UKO	73–83	x										x	
Ultramar	73–74				x							x	S.Amer
	75–76		x			x		x					
	77	x	x			x		x					
	78–83		x			x		x					
Unigate	74	x										x	
	75–76	x	x		x		x						
	77–80	x			x		x					x	
	81–83	x			x							x	
United Biscuits	73	x	x		x								
	74–78	x	x		x							x	
	79–83	x			x							x	
Weir SALES	73–82	x	x		x							x	
	83		x		x							x	

Appendix 4.3

PROFIT SEGMENTS: BY CUSTOMER LOCATION.

Company Name	Years	U.K	Europe	E.E.C.	Rest Europe	North Amer.	Americas	Austr.	Asia	Africa	Mid. East	Far East	Rest	Other
BBA	73–80	x	x			x							x	
	81–83	x	x			x							x	
Beecham	73–79	x	x				x						x	
	80–83	x	x				x	+Asia		x				
Blackwood Hodge	73–83	x	x			x		x	x	x				
Blue Circle	81–82	x					x	x	+ME	x				
	83	x				x		x	x	x				Sth.Amer.
Boots	75–76	x	x				x	x	x	+NE				
	77	x											x	
	78–84	x	x				x	x	x	+NE				
BTR	73–76	x	x				x	x		x				
	77	x					x						x	
	78–83	x												Et.Hemisphere Wt.Hemisphere
Cape	73–82	x	x				x	+FE		+ME				
Fisons	73–83	x	x				x	+Asia		x				
Gestetner	73–75	x	x				x						x	
	76–83	x		x	x		x						x	

		UK	Eur. EEC	Rest Eur.	N.Am.	Amers.	Aust.	Asia	Africa	M.Et.	Far Et.	Rest	Other
Haden	73	x	x		x		x		x			x	
	74-76	x	x		x		x		x				
	77-80	x	x		x		x		x	x			
	81-83	x	x		x		x		+ME			x	
Hepworth Ceramic	77-83	x			x							x	
Imperial	74-75	x										x	
	76-78	x	x		x		x					x	
	79-83	x	x		x							x	
Johnson Matthey	74-84	x	x			x	x	x	x				
Pauls	79-83	x	x						x			x	
Pearson	73-83	x	x			x	x	x	x				
Portals	73-83	x	x			x	x	x	x				
Reckitt & Colman	73-74	x	x		x		x	x	x				Sth.Amer.
	75-83	x	x		x		+Asia		x				Sth.Amer.
Renold	76	x	x		x		+FE		x			x	
	77-83	x	x		x							x	
Smith & Nephew	73		x			x	+Asia		+ME				
	74-83	x	x			x	+Asia		+ME				

		UK	Eur.	EEC	Rest Eur.	N.Am.	Amers.	Aust.	Asia	Africa	M.Et.	Far Et.	Rest	Other
Tarmac	73–74	x	x							x				
	75–76	x	x							x			x	
	77–81	x	x										x	
	82–83	x											x	
Taylor W.	73–83	x	x			x		x		x	x	x		
Unilever	73		x				x			x			x	
	74–83			x	x	x		+Asia		x				S.Amer.

Appendix 4.4

PROFIT BY AREA MANUFACTURED IN: SEGMENTS USED.

Company Name	Years	U.K.	Eur.	E.E.C	Rest Eur.	Nth Amer /U.S.A	Amers.	Aust.	Asia	Africa	Mid. East	Far East	Rest	Other
A.P.V	77–83	x	x				x	x	x	x				
Automotive Products	79–83	x	x			x			Japan					
Babcock	73–75	x	x										x	
	76–79	x												
	80–82	x	x			x							x	
Bassett	77–78	x	x					x						
	79–80	x	x											
	81–82	x	x			x		x						
	83	x											x	
Bestobell	73	x	x			x		x	x	x				
	74–83	x	x			x		x	x	South Central				
Blue Circle	73	x						x		x				
	74–80	x						x		x			x	
	81–82	x											x	
BPB	73–74	x											x	
	75–80	x		x		Can.								
	81–83	x		x		x							x	

		UK.	Eur.	EEC	Rest Eur.	N.Am.	Amers.	Aust.	Asia	Africa	M.Et.	Far Et.	Rest	Other
Bridon	73–82	x											x	
	83	x	x				x			x			x	
B.P	76–79	x	x				x	+ FE		+ME				Internat.
	80–83	x	x				x	x		x				
BSG	73–78	x	x											
	79–81	x		x		x								
	82–83	x		x										
Bunzl	73–80	x	x				x						x	
	81–83	x	x			x		+Asia						Sth.Amer.
Burmah	73–75	x	x			x		x	x	+FE				S.Am.
	76	x	x			x		x	x	x				S.Am. Shipping
	77–83	x	x				x	x	x	x				Shipping
Cadbury	73–74	x	x										x	
	75–77	x	x			x		x		x			x	
	78–83	x	x			x		x					x	
Carpets Internat.	73	x						+FE						
	74–76	x						+FE					x	
	77–79	x				x		x				x		
	80–82		x			x		x	x					
	83		x			x			x					
Chamberlain Phipps	73–82	x											x	
Chloride	73		x			x		x	x	x				
	74–83	x	x			x		x	x	x				

		UK	Eur.	EEC	Rest Eur.	N.Amer.	Amers.	Aust.	Asia	Africa	M.Et.	Far Et.	Rest	Other
Chubb	73–78	x	x			x		x		x			x	
	79–80	x	x			x		x		x		x	x	
	81–83	x	x			x		x		x		x		
Coates	73–82		x					x	x	x				Carib.
Bros.	83	x	x					x	x	x				Carib.
Coats														
Patons	73–83	x	x			x							x	S.Amer.
Cookson	75–83	x	x			x		x		x				India
Courtaulds	80–83	x	x			x				x			x	
Croda	73–77	x	x			x		x	Japan	South				
	78–79	x	x				x	x	Japan	South				
	80–83	x	x				x	x	x	South				
Davy	73–83	x											x	
De La Rue	74	x	x				x	x	x	x				
	75–77	x	x				x	x		x				
	78	x	x				x			x				
	79–83	x	x				x							
Duport	73	x	x			x		x		+ME			x	
	74	x	West			x		x		+ME			x	Et.Eur.
	75–83	x		x	EFTA	x		x		+ME			x	Et.Eur.
French Kier	73–82	x											x	
GEC	73–83	x	x				x	x	x	x				

		UK	Eur. EEC	Rest Eur.	N.Amer.	Amers.	Aust.	Asia	Africa	M.Et.	Far Et.	Rest	Other
Glynwed	73–83	x									x		
G.U.S.	73–83	x									x		
Hall Eng.	73–82	x									x		
	83	x			x				x				
Harrison & Crosfield	73–83	x			x			x					
I.C.I.	73–75	x	x			x	x				x		
	76–83	x	x			x	x				x	India	
Ladbroke	73	x										Malta	
	74–82	x									x		
	83	x	x		x								
Laird	73–79	x	x										
	80–82	x									x		
SALES	83	x	x		x						x		
LCP	77–82	x									x		
	83	x			x							France	
Lex	73–82	x			x								
	83	x	Gr+Ir		x								
Low & Bonar	73–79	x			x				x				
	80–83	x			x		x		x				
LRC	74–83	x	x		x				+FE				

		UK	Eur. EEC	Rest Eur.	N.Amer.	Amers.	Aust.	Asia	Africa	M.Et.	Far Et.	Rest	Other
Marks &	75	x	x										
Spencer	76–83	x	x		x								
Metal	75–82		x						South				
Closures	83	x	Italy						South				
Meyer	73–77	x										x	
	78–82	x	x									x	
	83	x										x	
Newarthill	73	x					x						Carib.
	74–82	x										x	
Owen Owen	74–83	x			x								
Powell Duffryn	73–83	x	x			x	x		+ME				
Rank	73	x	x		x							x	
	74–80	x	x		x		x					x	
	81–83	x	x		x		x	x					
Reed	74–76	x			x		x					x	
	77–80	x	x		x		x		x				
	81–83	x	x		x							x	
RMC	73–83	x										x	Germany
Sears	76–83	x		x	x								

		UK	Eur. EEC	Rest Eur.	N.Amer.	Amers.	Aust.	Asia	Africa	M.Et.	Far Et.	Rest	Other
Steetley	73–76	x		x	x		x						
	77	x		x	x		x		South				
	78–80	x		x	x		x		+ME				
	81–83	x		x	x		x			x			
Tootal	74–83	x	x		x		x	x	x				
Transport D.G.	73–80	x	x				x						
	81–83	x	x		x		x						
Trusthouse F.	73–83	x	x		x								
Ultramar	73–74				x							x	S.Amer
	75–76		x			x		x					
	77	x	x			x		x					
	78–83		x			x		x					
Unigate	74	x										x	
	75–76	x	x		x		x						
	77–80	x			x		x					x	
	81–83	x			x							x	
United Biscuits	73	x	x		x								
	74–78	x	x		x							x	
	79–83	x			x							x	
Weir SALES	73–82	x	x		x							x	
	83		x		x							x	

Appendix 4.5

TURNOVER SEGMENT FREQUENCIES.

	VALID CASES	MISSING CASES	% VALID CASES	% MISSING CASES
ALL YEARS.				
UK	726	37	95.2	4.8
EUROPE	525	238	68.8	31.2
EEC	56	707	7.3	92.7
NORTH AMERICA	375	388	49.1	50.9
SOUTH AMERICA	55	708	7.2	92.8
AMERICAS	211	552	27.7	72.3
ASIA	224	539	29.4	70.6
AFRICA	356	407	46.7	53.3
MIDDLE EAST	59	704	7.7	92.3
FAR EAST	43	720	5.6	94.4
AUSTRALIA	352	411	46.1	53.9
REST	323	440	42.3	57.7
OTHER	35	728	4.6	95.4
EUROPE EXCL. EEC	54	709	7.1	92.9
1977/1978.				
UK	103	6	94.5	5.5
EUROPE	71	38	65.1	34.9
EEC	8	101	7.3	92.7
NORTH AMERICA	47	62	43.1	56.9
SOUTH AMERICA	7	102	6.4	93.6
AMERICAS	28	81	25.7	74.3
ASIA	30	79	27.5	72.5
AFRICA	51	58	46.8	53.2
MIDDLE EAST	7	102	6.4	93.6
FAR EAST	5	104	4.6	95.4
AUSTRALIA	52	57	47.7	52.3
REST	47	62	43.1	56.9
OTHER	3	106	2.8	97.2
EUROPE EXCL. EEC	8	101	7.3	92.7
1978/1979.				
UK	104	5	95.4	4.6
EUROPE	74	35	67.9	32.1
EEC	9	100	8.3	91.7
NORTH AMERICA	48	61	44.0	56.0
SOUTH AMERICA	7	102	6.4	93.6
AMERICAS	29	80	26.6	73.4
ASIA	30	79	27.5	73.5
AFRICA	50	59	45.9	54.1
MIDDLE EAST	7	102	6.4	93.6
FAR EAST	7	102	6.4	93.6
AUSTRALIA	53	56	48.6	51.4
REST	47	62	43.1	56.9
OTHER	4	105	3.7	96.3
EUROPE EXCL. EEC	8	101	7.3	92.7

1979/1980.

UK	105	4	96.3	3.7
EUROPE	75	34	68.8	31.2
EEC	8	101	7.3	92.7
NORTH AMERICA	51	58	46.8	53.2
SOUTH AMERICA	7	102	6.4	93.6
AMERICAS	31	78	28.4	71.6
ASIA	31	78	28.4	71.6
AFRICA	53	56	48.6	51.4
MIDDLE EAST	7	102	6.4	93.6
FAR EAST	7	102	6.4	93.6
AUSTRALIA	52	57	47.7	52.3
REST	44	65	40.4	59.6
OTHER	6	103	5.5	94.5
EUROPE EXCL. EEC	8	101	7.3	92.7

1980/1981.

UK	104	5	95.4	4.6
EUROPE	76	33	69.7	30.3
EEC	8	101	7.3	92.7
NORTH AMERICA	54	55	49.5	50.5
SOUTH AMERICA	7	102	6.4	93.6
AMERICAS	31	78	28.4	71.6
ASIA	33	76	30.3	69.7
AFRICA	51	58	46.8	53.2
MIDDLE EAST	8	101	7.3	92.7
FAR EAST	6	103	5.5	94.5
AUSTRALIA	50	59	45.9	54.1
REST	46	63	42.2	57.8
OTHER	6	103	5.5	94.5
EUROPE EXCL. EEC	8	101	7.3	92.7

1981/1982.

UK	104	5	95.4	4.6
EUROPE	77	32	70.6	29.4
EEC	8	101	7.3	92.7
NORTH AMERICA	59	50	54.1	45.9
SOUTH AMERICA	9	100	8.3	91.7
AMERICAS	30	79	27.5	72.5
ASIA	34	75	31.2	68.8
AFRICA	51	58	46.8	53.2
MIDDLE EAST	9	100	8.3	91.7
FAR EAST	7	102	6.4	93.6
AUSTRALIA	50	59	45.9	54.1
REST	45	64	41.3	58.7
OTHER	6	103	5.5	94.5
EUROPE EXCL. EEC	8	101	7.3	92.7

1982/1983.

UK	104	5	95.4	4.6
EUROPE	75	34	68.8	31.2
EEC	8	101	7.3	92.7
NORTH AMERICA	59	50	54.1	45.9
SOUTH AMERICA	9	100	8.3	91.7
AMERICAS	31	78	28.4	71.6
ASIA	32	77	29.4	70.6
AFRICA	50	59	45.9	54.1
MIDDLE EAST	10	99	9.2	90.8
FAR EAST	6	103	5.5	94.5
AUSTRALIA	49	60	45.0	55.0
REST	46	63	42.2	57.8
OTHER	5	104	4.6	95.4
EUROPE EXCL. EEC	8	101	7.3	92.7

1983/1984.

UK	102	7	93.6	6.4
EUROPE	77	32	70.6	29.4
EEC	7	102	6.4	93.6
NORTH AMERICA	57	52	52.3	47.7
SOUTH AMERICA	9	100	8.3	91.7
AMERICAS	31	78	28.4	71.6
ASIA	34	75	31.2	68.8
AFRICA	50	59	45.9	54.1
MIDDLE EAST	11	98	10.1	89.9
FAR EAST	5	104	4.6	95.4
AUSTRALIA	46	63	42.2	57.8
REST	48	61	44.0	56.0
OTHER	5	104	4.6	95.4
EUROPE EXCL. EEC	6	103	5.5	94.5

Appendix 4.6

PROFIT SEGMENTS FREQUENCIES

	VALID CASES	MISSING CASES	% VALID CASES	% MISSING CASES
ALL YEARS.				
UK	494	50	90.8	9.2
EUROPE	350	194	64.3	35.7
EEC	29	515	5.3	94.7
NORTH AMERICA	273	271	50.2	49.8
SOUTH AMERICA	25	519	4.6	95.4
AMERICAS	125	419	23.0	77.0
ASIA	150	394	27.6	72.4
AFRICA	218	326	40.1	59.9
MIDDLE EAST	31	513	5.7	94.3
FAR EAST	24	520	4.4	95.6
AUSTRALIA	221	323	40.6	59.4
REST	203	341	37.3	62.7
OTHER	29	515	5.3	94.7
EUROPE EXCL. EEC	9	535	1.7	98.3
1977/1978.				
UK	70	7	90.9	9.1
EUROPE	47	30	61.0	39.0
EEC	4	73	5.2	94.8
NORTH AMERICA	35	42	45.5	54.5
SOUTH AMERICA	4	73	5.2	94.8
AMERICAS	17	60	22.1	77.9
ASIA	19	58	24.7	75.3
AFRICA	32	45	41.6	58.4
MIDDLE EAST	3	74	3.9	96.1
FAR EAST	3	74	3.9	96.1
AUSTRALIA	32	45	41.6	58.4
REST	30	47	40.0	60.0
OTHER	3	74	3.9	96.1
EUROPE EXCL. EEC	2	75	2.6	97.4
1978/1979.				
UK	72	5	93.5	6.5
EUROPE	51	26	66.2	33.8
EEC	3	74	3.9	96.1
NORTH AMERICA	36	41	46.8	53.2
SOUTH AMERICA	3	74	3.9	96.1
AMERICAS	18	59	23.4	76.6
ASIA	18	59	23.4	76.6
AFRICA	31	46	40.3	59.7
MIDDLE EAST	4	73	5.2	94.8
FAR EAST	4	73	5.2	94.8
AUSTRALIA	34	43	44.2	55.8
REST	31	46	39.0	61.0
OTHER	4	73	5.2	94.8
EUROPE EXCL. EEC	1	76	1.3	98.7

1979/1980.

UK	74	4	94.9	5.1
EUROPE	52	26	66.7	33.3
EEC	4	74	5.1	94.9
NORTH AMERICA	40	38	51.3	48.7
SOUTH AMERICA	3	75	3.8	96.2
AMERICAS	18	60	23.1	76.9
ASIA	22	56	28.2	71.8
AFRICA	34	44	43.6	56.4
MIDDLE EAST	4	74	5.1	94.9
FAR EAST	5	73	6.4	93.6
AUSTRALIA	34	44	43.6	56.4
REST	28	50	35.9	64.1
OTHER	5	73	6.4	93.6
EUROPE EXCL. EEC	2	76	2.6	97.4

1980/1981.

UK	72	5	93.5	6.5
EUROPE	53	24	68.8	31.2
EEC	3	74	3.9	96.1
NORTH AMERICA	41	36	53.2	46.8
SOUTH AMERICA	3	74	3.9	96.1
AMERICAS	18	59	23.4	76.6
ASIA	22	55	28.6	71.4
AFRICA	31	46	40.3	59.7
MIDDLE EAST	5	72	6.5	93.5
FAR EAST	3	74	3.9	96.1
AUSTRALIA	32	45	41.6	58.4
REST	29	48	37.7	62.3
OTHER	5	72	6.5	93.5
EUROPE EXCL. EEC	1	76	1.3	98.7

1981/1982.

UK	73	5	93.6	6.4
EUROPE	52	26	66.7	33.3
EEC	4	74	5.1	94.9
NORTH AMERICA	42	36	53.8	46.2
SOUTH AMERICA	4	74	5.1	94.9
AMERICAS	18	60	23.1	76.9
ASIA	23	55	29.5	70.5
AFRICA	31	47	39.7	60.3
MIDDLE EAST	5	73	6.4	93.6
FAR EAST	4	74	5.1	94.9
AUSTRALIA	31	47	39.7	60.3
REST	30	48	38.5	61.5
OTHER	5	73	6.4	93.6
EUROPE EXCL. EEC	1	77	1.3	98.7

1982/1983.

UK	72	6	92.3	27.7
EUROPE	50	28	64.1	35.9
EEC	5	73	6.4	93.6
NORTH AMERICA	41	37	52.6	47.4
SOUTH AMERICA	4	74	5.1	94.9
AMERICAS	18	60	23.1	76.9
ASIA	23	55	29.5	70.5
AFRICA	31	47	39.7	60.3
MIDDLE EAST	5	73	6.4	93.6
FAR EAST	3	75	3.8	96.2
AUSTRALIA	30	48	38.5	61.5
REST	31	47	39.7	60.3
OTHER	4	74	5.1	94.9
EUROPE EXCL. EEC	1	77	1.3	98.7

1983/1984.

UK	60	18	76.9	23.1
EUROPE	45	33	57.7	42.3
EEC	6	72	7.7	92.3
NORTH AMERICA	37	41	47.4	52.6
SOUTH AMERICA	4	74	5.1	94.9
AMERICAS	18	60	23.1	76.9
ASIA	23	55	29.5	70.5
AFRICA	28	50	35.9	64.1
MIDDLE EAST	5	73	6.4	93.6
FAR EAST	2	76	2.6	97.4
AUSTRALIA	28	50	35.9	64.1
REST	24	54	30.8	69.2
OTHER	3	75	3.8	96.2
EUROPE EXCL. EEC	1	77	1.3	98.7

Appendix 5.

E.I.U. WORLD OUTLOOK 19XX Forecasts of real GNP or GDP. Percentage Change

COUNTRY	1978	1979	1980	1981	1982	1983	1984
NORTH AMERICA							
Canada	4.6	4.0	1.0	1.2	1.6	1.3	3.4
U.S.A.	4.6	2.7	-0.1	1.1	-0.7	1.7	4.6
WESTERN EUROPE							
Austria	1.5	2.5	2.2	1.6	2.0	1.5	0.5
Belgium	3-3.5	2.5-3.5	2.0	0.5-1.0	1.0	1.5	1.5
Denmark	1.5	1.5-3.0	0.0-1.0	0.9	4.0	0.0	2.0
Finland	2-2.5	4.0	4.0	2.0	0.5	1.5	2.0
France	3.4	6.0	1.8	1.4	2.3	1.6	0.1
Greece	N/A	3.0	3.0	<3.0	1.5	0.75	1-1.5

Iceland	3.8	0.0	1.0	N/A	1.0	-2.0	-4_-2
Ireland	6.0	6.5	3.0	2.0	1.0	1.0	3.0
Italy	1.5	4.0	1.3	1.5	1.0	-1.0	1.4
Luxemburg	2.0-3.0	2.5-3.0	1.0	0.5-1.0	<0.5	1.0	-1.5
Netherlands	2.5	2.0	0.0-0.5	-0.5_-1.0	1.0	-1.25	1.0-1-5
Norway (excl. oil)	2.0	0.5-1.0	3.0-3.5	1.0	1.5	0.6	1.3
Portugal	3.0	3.0-4.0	N/A	3.5	2.0	1.0-1.5	-1.0_-2.0
Spain	1.0	3.0	2.0	1.5	2.0-3.0	1.5-2.0	1.0-1.5
Sweden	1.0	5.4	3.5	-0.7-1.0	1.6-2.2	1.0	1.8
Switzerland	2.0	1.5	1.0	1.0	0.0	0.0-1.0	1.0-2.0
U.K.	3.5	2.7	-1.5	-2.0	0.9	1.9	2.6
West Germany	3.1	4.0	2.6	-1.0	0.7	3.5_4.0	2.3
AUSTRALASIA							
Australia	3.25	2.7	2.75	2.6	3.6	-1.0_-1.5	4.0
New Zealand	-2.0	2.0	0.0	-1.0	2.0	-1.0	1.5

EASTERN EUROPE							
U.S.S.R.	3.9	3.0-4.0	4.5	3.4	>2.0	N/A	4.0
MIDDLE EAST							
Bahrain	N/A	N/A	N/A	N/A	N/A	6.0-7.0	N/A
Cyprus	N/A	N/A	N/A	N/A	N/A	3.4	N/A
Egypt	8.5-10.0	9.0-10.0	9.0	10.0	10.0	N/A	6.5-8.0
Iran	15.0-17.0	<0.0	N/A	-2.0_-3.0	N/A	2.0-3.0	8.0-9.0
Iraq	9.0-10.0	12.0	15.0	12.0-15.0	12.0-15.0	N/A	N/A
Isreal	4.0-5.0	N/A	<5.0	N/A	<5.0	<5.0	N/A
Jordan	N/A	10.5	N/A	10.0	N/A	N/A	4.0
Oman	N/A	N/A	N/A	N/A	N/A	N/A	6.0
Saudi Arabia	N/A	N/A	N/A	N/A	N/A	N/A	1.0-2.0
Syria	N/A	8.0-10.0	>12.0	8.0	4.0	N/A	N/A
Turkey	N/A	N/A	N/A	N/A	5.0	4.3	4.0
North Yeman	N/A	N/A	N/A	N/A	N/A	>3.0	N/A

AFRICA

Algeria	N/A	>8.0	12.5	8.0-10.0	10.5	10.0	>8.0
Benin	N/A	8.0	N/A	N/A	N/A	N/A	N/A
Botswana	N/A	N/A	>10.0	<10.0	5.0	0.0	10.0
Burundi	3.0	<6.0	N/A	N/A	N/A	3.6	N/A
Cameroon	N/A	N/A	6.0	>6.0	6.0	>7.0	<6.0
Central African Rep.	N/A	N/A	N/A	N/A	N/A	5.0	N/A
Congo	N/A	N/A	N/A	N/A	N/A	8.0-10.0	<12.0
Djibouti	N/A	N/A	N/A	N/A	N/A	3.0	N/A
Ethiopia	N/A	N/A	N/A	N/A	N/A	<5.0	N/A
Gabon	N/A	N/A	N/A	N/A	N/A	10.0	0.0
Ghana	N/A	N/A	N/A	N/A	<0.0	N/A	>-5.0
Ivory Coast	N/A	2.0-3.0	<8.0	0.0	0.0	4.0-5.0	-3.0
Kenya	<7.0	<6.0	3.0	2.0	5.0	2.0	4.9
Lesotho	N/A	N/A	10.0	N/A	N/A	2.0	N/A
Liberia	N/A	N/A	N/A	N/A	N/A	>0.0	<0.0
Madagascar	N/A	<6.0	N/A	N/A	N/A	N/A	N/A
Malawi	7.8	7.8	<7.8	-2.0_-3.0	N/A	1.0-2.0	1.0-2.0
Mali	0.0	7.0	N/A	N/A	N/A	N/A	N/A

Mauritania	N/A	N/A	N/A	N/A	N/A	0.0	N/A
Mauritius	0.0	0.0	N/A	<11.0	3.0-3.5	>3.5	N/A
Morocco	6.0	5.0	0.0	5.6	2.0	4.0	4.0
Niger	N/A	N/A	N/A	>8.0	N/A	N/A	0.0
Nigeria	12.0-15.0	5.0	9.0	8.0	5.0	0.0	N/A
Senegal	2.0-4.0	N/A	<2.5	N/A	-6.0	10.0	0.0
Seyechelles	N/A	N/A	N/A	N/A	N/A	>0.0	N/A
Sierre Leone	N/A	N/A	N/A	N/A	N/A	1.0-2.0	N/A
South Africa	N/A	2.5-3.0	>4.0	6.0	2.0	-2.0	1.0-2.0
Sudan	N/A	N/A	N/A	N/A	N/A	1.0-2.0	1.5-2.0
Togo	8.0	N/A	N/A	N/A	<6.5	N/A	-5.0
Tunisia	N/A	4.1	6.0	6.7	N/A	N/A	>4.5
Upper Volta	N/A	N/A	N/A	N/A	N/A	4.0-6.0	N/A
Zaire	N/A	N/A	0.0	0.0	1.0	N/A	<0.0
Zambia	<0.0	-5.0	0.5	N/A	3.0	<3.0	2.0
Zimbabwe	-10.0	<-7.0	<5.0	<10.0	10.0	2.0-3.0	2.0

LATIN AMERICA

Argentina	4.0-5.0	3.0	2.0-3.0	2.0	4.5-6.5	<5.0	5.0
Bolivia	5.0	0.0	0.0	0.0	<0.0	>-5.0	-2.0_-3.0
Brazil	>6.0	4.0-5.0	7.0-8.0	5.0	3.0-4.0	-3.0	-4.0
Barbados	N/A	4.5	N/A	5.0	-2.0-0.0	N/A	2.0
Chile	4.0-6.0	4.0-5.0	7.0-8.0	<8.0	4.0	1.0-2.0	2.0-3.0
Columbia	4.0	<7.0	7.0-8.0	4.0-5.0	4.0	1.5-2.0	3.5
Costa Rica	5.0-6.0	4.0-5.0	3.0-4.0	2.0-3.0	0.0-2.0	0.0	1.0
Dominican Republic	5.0	N/A	N/A	<5.5	3.0	-1.0_2.0	1.0
Ecuador	6.0-7.0	5.0-6.0	5.0-5.5	5.5-6.0	4.0	0.0	>0.0
El Salvador	4.0	3.0	-2.0_-3.0	0.0	-6.0	-3.4	-2.0_-3.0
Guatemala	N/A	N/A	4.0-5.0	4.0	2.0	-2.0	0.0
Haiti	4.0-4.5	1.0-2.0	2.0	0.0	0.0	1.0-2.0	N/A
Honduras	N/A	8.0	6.0-7.0	5.0-6.0	4.0-5.0	0.0-1.0	0.0-1.0
Mexico	3.5-5.0	4.0-5.0	8.0-9.0	6.0-7.0	5.5-7.0	-6.8	1.0
Nigaragua	4.0-5.0	N/A	18.0	N/A	10.0	3.0	2.0
Panama	2.0	4.0	>5.0	5.0-6.0	5.5	2.0	1.0-2.0
Paraguay	7.0-8.0	8.0	10.0	9.0-10.0	<10.0	>0.0	4.0
Peru	-5.0	1.5	4.0-5.0	6.0	4.0-5.0	0.0	0.7

Puerto Rico	N/A	N/A	N/A	N/A	N/A	>0.0	3.0-4.0
Uruguay	2.0	3.0-4.0	7.0	3.0	-2.0_-3.0	-2.0	1.0
Venezuela	7.0	4.0-5.0	5.0-6.0	2.0-2.5	2.0	<1.0-2.0	0.0
SOUTH AND EAST ASIA							
Bangladesh	7.0	5.6	<7.0	N/A	<7.0	<6.0	4.0-5.0
Burma	0.0	N/A	N/A	<6.0	5.7	N/A	5.0
Hong Kong	8.0	7.2	10.0	11.0	8.0-9.0	3.0-4.0	6.0
India	7.0	3.5	1.0-2.0	5.0	4.5-5.0	N/A	6.0
Indonesia	8.0	<6.5	7.0-8.0	7.0	8.0	3.0	3.0-4.0
Japan	6.1	5.5	2.4	2.5	3.5	2.8	3.9
Malaysia	7.0	7.2	6.5-7.0	6.5-7.5	<7.2	5.0	6.0-8.0
Pakistan	N/A	N/A	N/A	5.0-6.0	6.5	N/A	6.0
Philippines	N/A	6.0-7.0	4.5-5.0	5.5	5.0	4.0	-1.0_-2.0
Singapore	6.0-7.0	6.0-8.0	6.0-7.0	8.0-8.5	9.0	8.0	8.5
South Korea	10.0-11.0	9.0	<7.0	4.0	6.0	7.0	7.5
Sri Lanka	5.0	5.1	5.25	5.25	5.0	5.0-5.25	N/A
Taiwan	8.8	8.5	<7.5	8.0	5.0-6.0	4.0-5.5	7.0
Thailand	N/A	7.0	5.0-7.0	6.5	6.7-7.0	6.0	6.5-7.0

Appendix 6

WORLD BANK, WORLD DEVELOPMENT REPORT G.N.P. STATISTICS;
for countries with G.N.P. forecasts. ($million)

COUNTRY	1979	1980	1981	1982	1983
NORTH AMERICA					
Canada	215,730	228,468	242,107	275,880	278,472
U.S.A.	2,128,021	2,376,868	2,586,672	2,946,036	3,046,540
WESTERN EUROPE					
Austria	52,725	64,725	76,725	77,596	75,088
Belgium	89,082	107,016	119,364	118,008	106,524
Denmark	50,592	60,692	66,045	66,912	63,597
Finland	32,736	39,168	47,628	51,264	51,744
France	440,258	531,330	627,555	658,260	635,392
Greece	30,550	36,828	42,048	42,874	42,042
Ireland	11,104	13,893	16,104	17,782	18,025
Italy	218,295	298,200	368,712	391,152	385,092
Netherlands	116,899	143,220	161,727	167,418	156,299
Norway (ex.oil)	38,981	43,870	51,865	57,646	58,548
Portugal	19,502	21,364	23,226	24,696	24,745
Spain	128,737	162,060	201,960	214,320	205,797
Sweden	84,743	99,019	112,216	123,421	116,532
Switzerland	76,230	90,480	106,860	111,552	108,864
U.K.	280,674	353,288	442,728	510,160	539,028
Wt. Germany	587,254	717,876	827,631	829,865	767,536
AUSTRALASIA					
Australia	113,458	130,416	142,390	165,092	169,328
New Zealand	15,328	18,976	23,397	25,410	25,344
MIDDLE EAST					
Egypt	15,561	18,672	23,084	28,145	N/A
Iran	77,328	N/A	N/A	N/A	N/A
Iraq	22,692	30,366	39,562	N/A	N/A
Isreal	N/A	15,770	N/A	20,640	20,360
Jordan	3,150	N/A	4,544	N/A	N/A
Syria	7,533	8,858	12,060	14,601	N/A
Turkey	N/A	N/A	N/A	70,070	63,705
North Yeman	N/A	N/A	N/A	N/A	3,750

AFRICA

Algeria	22,176	28,938	35,343	41,944	46,765
Benin	759	N/A	N/A	N/A	N/A
Burundi	630	N/A	N/A	N/A	1,204
Cameroon	N/A	4,592	5,628	7,656	8,277
CentralAfr.Rep.	N/A	N/A	N/A	N/A	720
Congo	N/A	N/A	N/A	N/A	2,006
Ethiopia	N/A	N/A	N/A	N/A	4,606
Ghana	N/A	N/A	N/A	4,720	N/A
Ivory Coast	6,522	8,528	9,545	10,200	8,455
Kenya	4,851	5,814	6,678	7,308	7,059
Lesotho	N/A	442	N/A	N/A	714
Liberia	N/A	N/A	N/A	N/A	980
Madagascar	2,075	N/A	N/A	N/A	2,944
Malawi	1,026	1,160	1,403	N/A	1,365
Mali	756	N/A	N/A	N/A	N/A
Mauritania	N/A	N/A	N/A	N/A	752
Morocco	12,663	14,430	18,180	17,974	17,661
Niger	N/A	N/A	1,749	N/A	N/A
Nigeria	45,136	55,342	85,547	76,212	77,916
Senegal	N/A	2,365	N/A	2,537	2,940
South Africa	40,996	49,020	67,370	81,715	81,168
Sudan	N/A	N/A	N/A	N/A	8,888
Togo	N/A	N/A	N/A	1,026	N/A
Tunisia	5,700	6,944	8,384	N/A	N/A
Upper Volta	N/A	N/A	N/A	N/A	1,365
Zaire	N/A	7,150	6,226	6,258	N/A
Zambia	2,544	2,800	N/A	3,480	3,840
Zimbabwe	3,312	3,337	4,662	6,264	6,375

LATIN AMERICA

Argentina	50,424	60,879	66,203	72,192	71,568
Bolivia	2,703	2,970	3,192	3,420	3,363
Brazil	187,615	207,370	243,335	267,510	284,032
Chile	15,087	18,421	23,865	28,928	25,415
Columbia	21,760	26,361	31,506	36,432	39,420
Costa Rica	3,234	4,004	3,806	3,289	3,289
Dominican Rep.	N/A	N/A	6,264	7,056	7,581
Ecuador	6,864	8,505	10,160	10,148	10,800
El Salvador	2,838	2,948	2,970	3,055	3,570
Guatemala	N/A	6,936	7,884	8,550	8,701
Haiti	1,248	1,274	1,350	1,530	1,560
Honduras	1,632	1,908	2,072	2,280	2,640
Mexico	84,366	107,420	145,882	160,200	165,937
Nigaragua	N/A	1,716	N/A	2,408	2,668
Panama	2,322	2,520	3,114	3,629	4,028
Paraguay	2,465	3,210	4,160	5,053	4,991
Peru	12,432	12,483	16,182	19,890	22,794
Uruguay	4,669	6,090	8,149	8,178	7,685
Venezuela	40,740	45,240	54,087	64,988	69,138

SOUTH AND EAST ASIA

Bangladesh	7,623	8,001	N/A	12,698	13,006
Burma	N/A	N/A	5,916	6,479	N/A
Hong Kong	13,984	18,800	21,624	26,520	27,768
India	115,902	125,248	161,568	179,452	N/A
Indonesia	48,960	52,873	63,038	79,235	88,508
Japan	836,472	1,019,317	1,155,152	1,185,408	1,193,472
Malaysia	14,497	17,947	22,518	26,128	26,970
Pakistan	N/A	N/A	24,660	29,575	N/A
Philippines	23,256	28,020	33,810	39,184	41,574
Singapore	7,567	9,192	10,632	12,576	14,775
South Korea	42,456	55,944	58,064	66,130	75,063
Sri Lanka	2,707	3,335	3,969	4,500	4,864
Taiwan	23,940	N/A	N/A	N/A	N/A
Thailand	21,805	26,845	31,490	36,960	38,315

Appendix 6.1

G.N.P. STATISTICS FROM THE WORLD BANK: WORLD DEVELOPMENT REPORT, 1980-1984.

LOW INCOME	1978			1979			1980		
COUNTRIES	POPN.	GNP	GNP	POPN.	GNP	GNP	POPN.	GNP	GNP
	mill	p.c.	$m.	mill.	p.c.	$m.	mill.	p.c.	$m
Afghanistan	14.6	240	3504	15.5	170	2635	15.9		
Angola	6.7	300	2010	6.9	440	3036	7.1	470	3337
Bangladesh	84.7	90	7623	88.9	90	8001	88.5	130	11505
Benin	3.3	230	759	3.4	250	850	3.4	310	1054
Bhutun	1.2	100	120	1.3	80	104	1.3	80	104
Burma	32.2	150	4830	32.9	160	5264	34.8	170	5196
Burundi	4.5	140	630	4.0	180	720	4.1	200	810
Central African Rep.	1.9	250	475	2.0	290	580	2.3	300	690
Chad	4.3	140	602	4.4	110	440	4.5	120	540
Ethiopia	31.0	120	3720	30.9	130	4017	31.1	140	4354
Guinea	5.1	210	1071	5.3	280	1484	5.4	290	1566
Haiti	4.8	260	1248	4.9	260	1274	5.0	270	1350
India	643.9	180	115902	659.2	190	125248	673.2	240	161568
Indonesia	136.0	360	48960	142.9	370	52873	146.6	430	63038

Kenya	14.7	330	4851	15.3	380	5814	15.9	420	6678
Lao PDR	3.3	90	297						
Lesotho	1.3	280	364	1.3	340	442	1.3	420	546
Madagascar	8.3	250	2075	8.5	290	2465	8.7	350	3045
Malawi	5.7	180	1026	5.8	200	1160	6.1	230	1403
Mali	6.3	120	756	6.8	140	952	7.0	190	1330
Mauritania	1.5	270	405	1.6	320	512	1.5	440	660
Mozambique	9.9	140	1386	10.2	250	2550	12.1	230	2783
Nepal	13.6	120	1632	14.0	130	1820	14.6	140	2044
Niger	5.0	220	1110	5.2	270	1404	5.3	330	1749
Pakistan	77.3	230	17779	79.7	260	20722	82.2	300	24660
Rawanda	4.5	180	810	4.9	200	980	5.2	200	1040
Senegal	5.4	340	1836	5.5	430	2365	5.7	450	2565
Sierra Leone	3.3	210	693	3.4	250	850	3.5	280	980
Somalia	3.7	130	481						
Sri Lanka	14.3	190	2717	14.5	230	3335	14.7	270	3969
Sudan	17.4	320	5568	17.9	370	6623	18.7	410	7667
Tanzania	16.9	230	3887	18.0	260	4680	18.7	280	5236
Togo	2.4	320	768	2.4	350	840	2.5	410	1025
Uganda	12.4	280	3472	12.8	290	3712	12.6	300	3780
Upper Volta	5.6	160	896	5.6	180	1008	6.1	210	1281
Viet Nam	51.7	170	8789						
Zaire	26.8	210	5628	27.5	260	7150	28.3	220	6226

Middle Income Countries:

Algeria	17.6	1260	22176	18.2	1590	28938	18.9	1870	35343
Argentina	26.4	1910	50424	27.3	2230	60879	27.7	2390	66203
Bolivia	5.3	510	2703	5.4	550	2970	5.6	570	3192
Brazil	119.5	1570	187615	116.5	1780	207370	118.7	2050	243335
Cameroon	8.1	460	3726	8.2	560	4592	8.4	670	5628
Chile	10.7	1410	15087	10.9	1690	18421	11.1	2150	23865
Columbia	25.6	850	21760	26.1	1010	26361	26.7	1180	31506
Congo, Poeple's Rep.	1.5	540	810	1.5	630	945	1.6	900	1440
Costa Rica	2.1	1540	3234	2.2	1820	4004	2.2	1730	3806
Dominican Rep.	5.1	910	4641	5.3	990	5247	5.4	1160	6264
Ecuador	7.8	880	6864	8.1	1050	8505	8.0	1270	10160
El Salvador	4.3	660	2838	4.4	670	2948	4.5	660	2970
Eygpt	39.9	390	15561	38.9	480	18672	39.8	580	23084
Ghana	11.0	390	4290	11.3	400	4520	11.7	420	4914
Greece	9.4	3250	30550	9.3	3960	36828	9.6	4380	42048
Guatemala	6.6	910	6006	6.8	1020	6936	7.3	1080	7884
Honduras	3.4	480	1632	3.6	530	1908	3.7	560	2072
Hong Kong	4.6	3040	13984	5.0	3760	18800	5.1	4240	21624
Isreal	3.7	3500	12950	3.8	4150	15770	3.9	4500	17550
Ivory Coast	7.8	840	6552	8.2	1040	8528	8.3	1150	9545

Jamaica	2.1	1110	2331	2.2	1260	2772	2.2	1040	2288
Jordan	3.0	1050	3150	3.1	1180	3658	3.2	1420	4544
Korea Dem. Rep.				17.5	1130	19775			
Korea Rep. of	36.6	1160	42456	37.8	1480	55944	38.2	1520	58064
Liberia	1.7	460	782	1.8	500	900	1.9	530	1007
Malaysia	13.3	1090	14497	13.1	1370	17947	13.9	1620	22518
Mexico	65.4	1290	84366	65.5	1640	107420	69.8	2090	145882
Morocco	18.9	670	12663	19.5	740	14430	20.2	900	18180
Nicaragua	2.5	840	2100	2.6	660	1716	2.6	740	1924
Nigeria	80.6	560	45136	82.6	670	55342	84.7	1010	85547
Panama	1.8	1290	2322	1.8	1400	2520	1.8	1730	3114
Papua New Guinea	2.9	560	1624	2.9	660	1914	3.0	780	2340
Paraguay	2.9	850	2465	3.0	1070	3210	3.2	1300	4160
Peru	16.8	740	12432	17.1	730	12483	17.4	930	16182
Philippines	45.6	510	23256	46.7	600	28020	49.0	690	33810
Portugal	9.8	1990	19502	9.8	2180	21364	9.8	2370	23226
Singapore	2.3	3290	7567	2.4	3830	9192	2.4	4430	10632
Spain	37.1	3470	128737	37.0	4380	162060	37.4	5400	201960
South Africa	27.7	1480	40996	28.5	1720	49020	29.3	2300	67390
Syrian Arab Rep.	8.1	930	7533	8.6	1030	8858	9.0	1340	12060
Taiwan	17.1	1400	23940						
Thailand	44.5	490	21805	45.5	590	26845	47.0	670	31490
Trinidad & Tobago	1.1	2910	3201	1.2	3390	4068	1.2	4370	5244

Tunisia	6.0	950	5700	6.2	1120	6944	6.4	1310	8384
Turkey	43.1	1200	51720	44.2	1330	58786	44.9	1470	66003
Uruguay	2.9	1610	4669	2.9	2100	6090	2.9	2810	8149
Venezuela	14.0	2910	40740	14.5	3120	45240	14.9	3630	54087
Yemen Arab Rep.	5.6	520	2912	5.7	420	2394	7.0	430	3010
Yemen PDR	1.8	420	756	1.9	480	912	1.9	420	798
Yugoslavia	22.0	2380	52360	22.1	2430	53703	22.3	2620	58426
Zambia	5.3	480	2544	5.6	500	2800	5.8	560	3248
Zimbabwe	6.9	480	3312	7.1	470	3337	7.4	630	4662
Industrialised Countries:									
Australia	14.2	7990	113458	14.3	9120	130416	14.5	9820	142390
Austria	7.5	7030	52725	7.5	8630	64725	7.5	10230	76725
Belgium	9.8	9090	89082	9.8	10920	107016	9.8	12180	119364
Canada	23.5	9180	215730	23.7	9640	228468	23.9	10130	242107
Denmark	5.1	9920	50592	5.1	11900	60690	5.1	12950	66045
Finland	4.8	6820	32736	4.8	8160	39168	4.9	9720	47628
France	53.3	8260	440258	53.4	9950	531330	53.5	11730	627555
Germany Fed. Rep.	61.3	9580	587254	61.2	11730	717876	60.9	13590	827631
Ireland	3.2	3470	11104	3.3	4210	13893	3.3	4880	16104
Italy	56.7	3850	218295	56.8	5250	298200	56.9	6480	368712

Japan	114.9	7280	836472	115.7	8810	1019317	116.8	9890	1155152
Netherlands	13.9	8410	116899	14.0	10230	143220	14.1	11470	161727
New Zealand	3.2	4790	15328	3.2	5930	18976	3.3	7090	23397
Norway	4.1	9510	38991	4.1	10700	43870	4.1	12650	51865
Sweden	8.3	10210	84743	8.3	11930	99019	8.3	13520	112216
Switzerland	6.3	12100	76230	6.5	13920	90480	6.5	16440	106860
U.K.	55.8	5030	280674	55.9	6320	353288	55.9	7920	442728
U.S.A.	221.9	9590	2128021	223.6	10630	2376868	227.7	11360	2586672
Capital Surplus Oil Exporters:									
Iraq	12.2	1860	22692	12.6	2410	30366	13.1	3020	39562
Iran	35.8	2160	77328						
Kuwait	1.2	14890	17868	1.3	17100	22230	1.4	19830	27762
Libya	2.7	6910	18657	2.9	8170	23693	3.0	8640	25920
Saudi Arabia	8.2	7690	63058	8.6	7280	62608	9.0	11260	101340
U.A.E.							1.0	26850	26850

LOW INCOME COUNTRIES	1981 POPN. mill	GNP p.c.	GNP $m.	1982 POPN. mill.	GNP p.c.	GNP $m.
Bangladesh	90.7	140	12698	92.9	140	13006
Benin	3.6	320	1152	3.7	310	1147
Bhutun	1.3	80	104			
Burma	34.1	190	6479	34.9	190	6631
Burundi	4.2	230	966	4.3	280	1204
Central African Rep.	2.4	320	768	2.4	310	720
Chad	4.5	110	495	4.6	80	368
China	991.3	300	297390	1008.2	310	312542
Ethiopia	32.0	140	4480	32.9	140	4606
Guinea	5.6	300	1680	5.7	310	1767
Haiti	5.1	300	1530	5.2	300	1560
India	690.2	260	179452	717.0	260	186420
Indonesia	149.5	530	79235	152.6	580	88508
Kenya	17.4	420	7308	18.1	390	7059
Lao PDR	3.5	80	280			
Lesotho	1.4	540	756	1.4	510	714
Madagascar	9.0	330	2970	9.2	320	2944
Malawi	6.2	200	1240	6.5	210	1365
Mali	6.9	190	1311	7.1	180	1278
Mauritania	1.6	460	736	1.6	470	752
Nepal	15.0	150	2250	15.4	170	2618
Niger	5.7	330	1881	5.9	310	1829
Pakistan	84.5	350	29575	87.1	380	33098
Rawanda	5.3	250	1325	5.5	260	1430
Senegal	5.9	430	2537	6.0	490	2940
Sierra Leone	3.6	320	1152	3.2	390	1248
Somalia	4.4	280	1232	4.5	290	1305
Sri Lanka	15.0	300	4500	15.2	320	4864
Sudan	19.2	380	7296	20.2	440	8888
Tanzania	19.1	280	5348	19.8	280	5544
Togo	2.7	380	1026	2.8	340	952
Uganda	13.0	220	2860	13.5	230	3105
Upper Volta	6.3	240	1512	6.5	210	1365
Zaire	29.8	210	6258	30.7	190	5833

Middle Income Countries:

Algeria	19.6	2140	41944	19.9	2350	46765
Argentina	28.2	2560	72192	28.4	2520	71568
Bolivia	5.7	600	3420	5.9	570	3363
Brazil	120.5	2220	267510	126.8	2240	284032
Cameroon	8.7	880	7656	9.3	890	8277
Chile	11.3	2560	28928	11.5	2210	25415
Columbia	26.4	1380	36432	27.0	1460	39420
Congo, Poeple's Rep.	1.7	1110	1887	1.7	1180	2006
Costa Rica	2.3	1430	3289	2.3	1430	3289
Dominican Rep.	5.6	1260	7056	5.7	1330	7581
Ecuador	8.6	1180	10148	8.0	1350	10800
El Salvador	4.7	650	3055	5.1	700	3570
Eygpt	43.3	650	28145	44.3	690	30567
Ghana	11.8	400	4720	12.2	360	4392
Greece	9.7	4420	42874	9.8	4290	42042
Guatemala	7.5	1140	8550	7.7	1130	8701
Honduras	3.8	600	2280	4.0	660	2640
Hong Kong	5.2	5100	26520	5.2	5340	27768
Isreal	4.0	5160	20640	4.0	5090	20360
Ivory Coast	8.5	1200	10200	8.9	950	8455
Jamaica	2.2	1180	2596			
Jordan	3.4	1620	5508	3.1	1690	5239
Korea Rep. of	38.9	1700	66130	39.3	1910	75063
Liberia	1.9	520	988	2.0	490	980
Malaysia	14.2	1840	26128	14.5	1860	26970
Mexico	71.2	2250	160200	73.1	2270	165937
Morocco	20.9	860	17974	20.3	870	17661
Nicaragua	2.8	860	2408	2.9	920	2668
Nigeria	87.6	870	76212	90.6	860	77916
Panama	1.9	1910	3629	1.9	2120	4028
Papua New Guinea	3.1	840	2604	3.1	820	2542
Paraguay	3.1	1630	5053	3.1	1610	4991
Peru	17.0	1170	19890	17.4	1310	22794
Philippines	49.6	790	39184	50.7	820	41574
Portugal	9.8	2520	24696	10.1	2450	24745
Singapore	2.4	5240	12576	2.5	5910	14775
Spain	38.0	5640	214320	37.9	5430	205797
South Africa	29.5	2770	81715	30.4	2670	81168

Syrian Arab Rep.	9.3	1570	14601	9.5	1680	15960
Thailand	48.0	770	36960	48.5	790	38315
Trinidad & Tobago	1.2	5670	6804	1.1	6840	7524
Tunisia	6.5	1420	9230	6.7	1390	9313
Turkey	45.5	1540	70070	46.5	1370	63705
Uruguay	2.9	2820	8178	2.9	2650	7685
Venezuela	15.4	4220	64988	16.7	4140	69138
Yemen Arab Rep.	7.3	460	3358	7.5	500	3750
Yemen PDR	2.0	460	920	2.0	470	940
Yugoslavia	22.5	2790	62775	22.6	2800	63280
Zambia	5.8	600	3480	6.0	640	3840
Zimbabwe	7.2	870	6264	7.5	850	6375

Industrialised Countries:

Australia	14.9	11080	165092	15.2	11140	169328
Austria	7.6	10210	77596	7.6	9880	75088
Belgium	9.9	11920	118008	9.9	10760	106524
Canada	24.2	11400	275880	24.6	11320	278472
Denmark	5.1	13120	66912	5.1	12470	63597
Finland	4.8	10680	51264	4.8	10780	51744
France	54.0	12190	658260	54.4	11680	635392
Germany Fed. Rep.	61.7	13450	829865	61.6	12460	767536
Ireland	3.4	5230	17782	3.5	5150	18025
Italy	56.2	6960	391152	56.3	6840	385092
Japan	117.6	10080	1185408	118.4	10080	1193472
Netherlands	14.2	11790	167418	14.3	10930	156299
New Zealand	3.3	7700	25410	3.2	7920	25344
Norway	4.1	14060	57646	4.1	14280	58548
Sweden	8.3	14870	123421	8.3	14040	116532
Switzerland	6.4	17430	111552	6.4	17010	108864
U.K.	56.0	9110	510160	55.8	9660	539028
U.S.A.	229.8	12820	2946036	231.5	13160	3046540

Capital Surplus Oil Exporters:

Kuwait	1.5	20900	31350	1.6	19870	31792
Libya	3.1	8450	26195	3.2	8510	27232
Oman				1.1	6090	6699
Saudi Arabia	9.3	12600	117180	10.0	16000	160000
U.A.E.	1.1	24660	27126	1.1	23770	26147

Country groupings as for 1978.

Appendix 7.

REGIONAL FORECASTS OF G.N.P. GROWTH (PERCENTAGE).

Based upon EIU country forecasts weighted by actual G.N.P.

	1979	1980	1981	1982	1983
U.K.	2.7	-1.5	-2.0	0.9	1.9
E.E.C. (incl. U.K.)	4.08	1.35	-0.02	1.27	1.69
Rest of Western Europe	3.04	2.49	1.36	1.64	1.20
Western Europe (incl. U.K.)	3.87	1.58	0.30	1.35	1.59
E.E.C. (excl. U.K.)	4.34	1.89	0.38	1.36	1.64
Western Europe (excl. U.K.)	4.03	2.03	0.61	1.43	1.53
U.S.A.	2.7	-0.01	1.1	-0.07	1.7
North America	2.82	0.00	1.11	-0.50	1.67
South America	4.36	6.68	4.85	4.18	-1.98
All America	3.06	1.11	1.79	0.34	1.01
Australasia	2.62	2.40	2.09	3.39	0.09
Africa	2.72	6.54	6.67	4.39	2.16
Middle East	4.13	10.98	11.44	5.95	4.41
(excl. Iran)	10.65				
South + East Asia	5.63	3.05	3.41	4.31	3.27
(excl. Japan)	5.97	4.95	5.80	6.16	4.96
Overseas	3.89	2.04	1.94	1.69	1.61

If any data was unavailable that country for that year is ignored, i.e. it is assumed that the forecast for that country is the same as that for the rest of the region.

Appendix 7-2.

INFLATION FORECASTS.

Forecasts in the movement in the consumer price index year on year. (Percentage increase)

Country	1981	1982	1983
U.K.	10.7	10.7	7.6
France	11.5	12.5	9.0
West Germany	4.0	5.0	3.5
Italy	13.0	17.0	15.5
Western Europe	9.4	10.6	8.8
Australia	9.0	10.8	N/A
U.S.A.	11.5	7.5	5.5
Canada	5.5	11.5	8.0
North America	11.0	7.8	5.7
All O.E.C.D. Countries excluding U.K.	10.7	8.5	6.8

Source: National Institute Economic Review (Febuary 1981-1983).

Appendix 7-3.

PERCENTAGE CHANGE IN G.N.P. (MEASURED IN U.S.A. $)

	1981	1982	1983
U.K.	25.316	15.231	5.659
EEC (Excluding U.K.)	17.283	3.618	-4.638
Western Europe (Excl. U.K.)	16.820	2.847	-5.198
Western Europe (Excl. EEC)	18.836	6.164	-2.845
North America	8.576	13.898	3.200
South America	21.094	11.376	4.296
Americas	10.654	13.436	3.400
Australasia	10.974	14.908	2.190
Middle East	29.035	21.631	-7.326
Africa	34.391	6.837	3.048
South and East Asia	12.964	8.379	2.143
All	14.563	9.310	0.665

Appendix 7-4.

CHANGES IN G.N.P. (MEASURED IN UK #)

	1980	1981	1982	1983
Exchange rate used; $/# (average for year)	2.3258	2.0243	1.7480	1.5159

	1981	1982	1983
U.K.	9.071	-0.497	-8.370
EEC (Excl. U.K.)	2.079	-10.525	-17.300
Western Europe (Excl. U.K.)	1.676	-11.191	-17.786
Western Europe (Excl. EEC)	3.431	-8.327	-15.745
North America	-5.499	-1.648	-10.403
South America	5.396	-3.826	-9.552
Americas	-3.690	-2.047	-10.329
Australasia	-3.412	-0.776	-11.379
Middle East	12.308	5.029	-19.631
Africa	16.970	-7.745	-10.634
South and East Asia	-1.680	-6.414	-11.420
All	-0.288	-5.610	-12.701

Source: Federal Reserve Bulletin, January 1982,1984, Table 3

Appendix 7-5.

MODELS EMPLOYED FOR THE THE SEGMENT BASED FORECASTS.

Segment model 1;

1981 (UK0 x 0.98) + (EUR0 x 1.0061) + (EEC0 x 1.0038) + (NAMER0 x 1.0111) + (SAMER0 x 1.0485) + (AMER0 x 1.0179) + (ASIA0 x 1.058) + (AFR0 x 1.0667) + ((FARET0 + MIDET0) x 1.1144) + (AUST0 x 1.0209) + ((REST0 + OTHER0) x 1.0194) + (EUREX0 x 1.003)

1982 (UK1 x 1.009) + (EUR1 x 1.0143) + (EEC1 x 1.0136) + (NAMER1 x 0.995) + (SAMER1 x 1.0418) + (AMER1 x 1.0034) + (ASIA1 x 1.0616) + (AFR1 x 1.0439) + ((FARET1 + MIDET1) x 1.0595) + (AUST1 x 1.0339) + ((REST1 + OTHER1) x 1.0169) + (EUREX1 x 1.0135)

1983 (UK2 x 1.019) + (EUR2 x 1.0153) + (EEC2 x 1.0164) + (NAMER2 x 1.0167) + (SAMER2 x 0.9802) + (AMER2 x 1.0101) + (ASIA2 x 1.0496) + (AFR2 x 1.0216) + ((FARET2 + MIDET2) x 1.0441) + (AUST2 x 1.0009) + ((REST2 + OTHER2) x 1.0161) + (EUREX2 x 1.0159)

Segment model 2;

As model 1 with UK segment mutiplied by;

1981	1.107
1982	1.107
1983	1.076

Segment model 3;

As model 1 with all segments multiplied by inflation forecast used in model 2.

Segment model 4;

As model 2 with additional multipliers of;

	1981	1982	1983
EUR., EEC, EUREX	1.094	1.106	1.088
NAMER, AMER	1.11	1.078	1.057
SAMER, ASIA, AFR, MIDET, FARET, REST, OTHER	1.107	1.085	1.068
AUST	1.09	1.108	1.068

Segment model 5;

1981 (UK0 x 1.25316) + (EUR0 x 1.1682) + (EEC0 x 1.17283) + (NAMER0 x 1.08576) + (SAMER0 x 1.21094) + (AMER0 x 1.10654) + ((ASIA0 x 1.12964) + (AFR0 x 1.34391) + ((MIDET0 + FARET0) x 1.29035) + (AUST0 x 1.10974) + ((REST0 + OTHER0) x 1.14563) + (EUREX0 x 1.18836)

1982 (UK1 x 1.15231) + (EUR1 x 1.02847) + (EEC1 x 1.03618) + (NAMER1 x 1.13898) + (SAMER1 x 1.11376) + (AMER1 x 1.13436) + (ASIA1 x 1.08379) + (AFR1 x 1.06837) + ((MIDET1 + FARET1) x 1.21631) + (AUST1 x 1.4908) + ((REST1 + OTHER1) x 0.9539) + (EUREX1 x 1.06164)

1983 (UK2 x 1.05659) + (EUR2 x 0.94802) + (EEC2 x 0.95362) + (NAMER2 x 1.032) + (SAMER2 x 1.05296) + (AMER2 x 1.034) + (ASIA2 x 1.02153) + (AFR2 x 1.03048) + ((MIDET2 + FARET2) x x 0.92674) + (AUST2 x 1.0219) + ((REST2 + OTHER2) x 1.00665) + (EUREX2 x 0.97155)

Segment model 6;

1981 (UK0 x 1.09071) + (EUR0 x 1.01676) + (EEC0 x 1.02079) + (NAMER0 x 0.94501) + (SAMER0 x 1.05396) + (AMER0 x 0.9631) + ((ASIA0 x 0.9832) + (AFR0 x 1.1697) + ((MIDET0 + FARET0) x 1.12308) + (AUST0 x 0.96588) + ((REST0 + OTHER0) x 0.99712) + (EUREX0 x 1.03531)

1982 (UK1 x 0.99503) + (EUR1 x 0.88809) + (EEC1 x 0.89475) + (NAMER1 x 0.98352) + (SAMER1 x 0.96174) + (AMER1 x 0.97953) + (ASIA1 x 0.93586) + (AFR1 x 0.92255) + ((MIDET1 + FARET1) x 1.05029) + (AUST1 x 0.99224) + ((REST1 + OTHER1) x 0.9539) + (EUREX1 x 0.9539)

1983 (UK2 x 0.9163) + (EUR2 x 0.82214) + (EEC2 x 0.827) + (NAMER2 x 0.89497) + (SAMER2 x 0.90448) + (AMER2 x 0.89671) + (ASIA2 x 0.8858) + (AFR2 x 0.89366) + ((MIDET2 + FARET2) x 0.80369) + (AUST2 x 0.88621) + ((REST2 + OTHER2) x 0.87299) + (EUREX2 x 0.85255)

Appendix 8.

ERROR MEASURES FOR TURNOVER FORECASTS (109 COMPANIES).

	NON-TRUNCATED					TRUNCATED (max. 1.0)		
	MEAN	STD. ERROR	STD. DEV.	RANGE	MINIMUM	MEAN	STD. ERROR	STD. DEV.
ABSOLUTE CHANGE								
MAPE/ACTUAL								
1980								
1yr.	0.108	0.010	0.104	0.498	0.001			
2yr.	0.096	0.009	0.093	0.431	0.001			
3yr.	0.092	0.008	0.104	0.498	0.001			
4yr.	0.098	0.009	0.089	0.466	0.001			
5yr.	0.091	0.008	0.085	0.448	0.001			
1981								
1yr.	0.102	0.010	0.108	0.587	0.003			
2yr.	0.092	0.011	0.119	0.956	0.002			
3yr.	0.087	0.011	0.115	0.954	0.001			
4yr.	0.087	0.012	0.122	1.081	0.002	0.087	0.011	0.116
5yr.	0.086	0.012	0.126	1.173	0.003	0.084	0.011	0.113
1982								
1yr.	0.110	0.014	0.151	1.155	0.001	0.109	0.014	0.141
2yr.	0.093	0.012	0.130	0.849	0.000			
3yr.	0.085	0.011	0.112	0.590	0.001			
4yr.	0.084	0.011	0.110	0.554	0.000			
5yr.	0.082	0.010	0.106	0.545	0.000			
1983								
1yr.	0.101	0.012	0.123	0.755	0.002			
2yr.	0.099	0.011	0.115	0.683	0.002			
3yr.	0.104	0.011	0.115	0.647	0.001			
4yr.	0.099	0.011	0.110	0.599	0.004			
5yr.	0.099	0.011	0.111	0.598	0.002			
MSE/ACTUAL								
1980								
1yr.	0.022	0.004	0.043	0.399	0.000			
2yr.	0.018	0.003	0.034	0.187	0.000			
3yr.	0.016	0.003	0.030	0.176	0.000			
4yr.	0.017	0.003	0.033	0.218	0.000			
5yr.	0.016	0.003	0.031	0.202	0.000			

1981

1yr.	0.022	0.005	0.052	0.348	0.000			
2yr.	0.022	0.009	0.092	0.917	0.000			
3yr.	0.021	0.009	0.090	0.912	0.000			
4yr.	0.022	0.011	0.113	1.173	0.000	0.021	0.009	0.097
5yr.	0.023	0.013	0.133	1.382	0.000	0.020	0.009	0.097

1982

1yr.	0.035	0.013	0.136	1.336	0.000	0.032	0.010	0.107
2yr.	0.025	0.008	0.084	0.722	0.000			
3yr.	0.020	0.005	0.056	0.349	0.000			
4yr.	0.019	0.005	0.053	0.307	0.000			
5yr.	0.018	0.005	0.049	0.298	0.000			

1983

1yr.	0.025	0.007	0.072	0.573	0.000
2yr.	0.023	0.006	0.065	0.469	0.000
3yr.	0.024	0.006	0.063	0.420	0.000
4yr.	0.022	0.005	0.057	0.363	0.000
5yr.	0.022	0.005	0.057	0.360	0.000

<u>MAPE/FORECAST</u>

1980

1yr.	0.099	0.010	0.101	0.777	0.001
2yr.	0.090	0.009	0.096	0.759	0.001
3yr.	0.087	0.009	0.091	0.712	0.001
4yr.	0.091	0.009	0.091	0.723	0.001
5yr.	0.086	0.009	0.090	0.747	0.001

1981

1yr.	0.174	0.068	0.713	7.408	0.001	0.115	0.014	0.150
2yr.	0.094	0.011	0.114	0.623	0.002			
3yr.	0.087	0.010	0.102	0.553	0.001			
4yr.	0.086	0.009	0.097	0.518	0.002			
5yr.	0.082	0.008	0.088	0.538	0.003			

1982

1yr.	0.108	0.016	0.171	1.423	0.002	0.104	0.014	0.144
2yr.	0.108	0.017	0.179	1.364	0.002	0.103	0.014	0.145
3yr.	0.114	0.017	0.179	1.394	0.001	0.109	0.014	0.146
4yr.	0.089	0.013	0.133	0.814	0.000			
5yr.	0.085	0.012	0.121	0.812	0.000			

1983

1yr.	0.108	0.016	0.171	1.423	0.002	0.104	0.014	0.144
2yr.	0.108	0.017	0.179	1.364	0.002	0.103	0.014	0.145
3yr.	0.114	0.017	0.179	1.394	0.001	0.109	0.014	0.146
4yr.	0.103	0.015	0.155	1.429	0.004	0.099	0.012	0.122
5yr.	0.103	0.015	0.151	1.395	0.002	0.104	0.011	0.119

MSE/FORECAST

1980

1yr.	0.022	0.004	0.043	0.249	0.000			
2yr.	0.017	0.006	0.058	0.578	0.000			
3yr.	0.016	0.005	0.051	0.508	0.000			
4yr.	0.017	0.005	0.053	0.524	0.000			
5yr.	0.016	0.005	0.055	0.561	0.000			

1981

1yr.	0.041	0.016	0.162	1.558	0.000	0.036	0.011	0.116
2yr.	0.022	0.006	0.060	0.391	0.000			
3yr.	0.018	0.005	0.048	0.307	0.000			
4yr.	0.017	0.004	0.044	0.270	0.000			
5yr.	0.014	0.004	0.037	0.292	0.000			

1982

1yr.	0.535	0.503	5.255	54.886	0.000	0.040	0.014	0.142
2yr.	0.320	0.292	3.048	31.829	0.000	0.037	0.014	0.144
3yr.	0.030	0.012	0.121	0.943	0.000			
4yr.	0.025	0.009	0.092	0.664	0.000			
5yr.	0.022	0.008	0.080	0.660	0.000			

1983

1yr.	0.041	0.020	0.204	2.029	0.000	0.031	0.011	0.116
2yr.	0.043	0.022	0.225	1.865	0.000	0.031	0.013	0.135
3yr.	0.045	0.021	0.223	1.946	0.000	0.033	0.013	0.135
4yr.	0.034	0.019	0.197	2.051	0.000	0.025	0.009	0.099
5yr.	0.033	0.018	0.188	1.951	0.000	0.025	0.009	0.099

PERCENTAGE CHANGE

MAPE/ACTUAL

1980

1yr.	0.126	0.013	0.132	0.124	0.001			
2yr.	0.124	0.012	0.130	0.696	0.001			
3yr.	0.132	0.009	0.094	0.645	0.001			
4yr.	0.172	0.014	0.151	0.873	0.002			
5yr.	0.177	0.011	0.118	1.007	0.014	0.177	0.011	0.117

1981

1yr.	0.108	0.012	0.125	0.704	0.002			
2yr.	0.107	0.013	0.131	0.982	0.005			
3yr.	0.105	0.013	0.131	0.997	0.000			
4yr.	0.115	0.014	0.143	1.089	0.001	0.114	0.013	0.138
5yr.	0.139	0.016	0.162	1.177	0.000	0.137	0.015	0.152

1982

1yr.	0.113	0.012	0.126	0.618	0.001
2yr.	0.097	0.011	0.118	0.583	0.001
3yr.	0.100	0.011	0.119	0.667	0.000
4yr.	0.104	0.013	0.131	0.659	0.002
5yr.	0.107	0.013	0.139	0.721	0.000

1983

1yr.	0.107	0.013	0.136	0.826	0.000
2yr.	0.102	0.011	0.119	0.771	0.001
3yr.	0.110	0.012	0.124	0.748	0.001
4yr.	0.112	0.013	0.132	0.719	0.000
5yr.	0.116	0.013	0.131	0.702	0.000

MSE/ACTUAL

1980

1yr.	0.033	0.007	0.076	0.631	0.000
2yr.	0.032	0.007	0.073	0.485	0.000
3yr.	0.011	0.003	0.036	0.380	0.000
4yr.	0.052	0.010	0.104	0.765	0.000
5yr.	0.037	0.006	0.058	0.492	0.000

1981

1yr.	0.027	0.007	0.073	0.498	0.000			
2yr.	0.028	0.010	0.101	0.974	0.000			
3yr.	0.028	0.010	0.104	0.994	0.000			
4yr.	0.033	0.012	0.124	1.189	0.000	0.032	0.010	0.107
5yr.	0.045	0.015	0.154	1.386	0.000	0.042	0.012	0.124

1982

1yr.	0.029	0.006	0.063	0.383	0.000
2yr.	0.023	0.005	0.055	0.341	0.000
3yr.	0.024	0.006	0.064	0.445	0.000
4yr.	0.028	0.007	0.074	0.436	0.000
5yr.	0.031	0.008	0.071	0.520	0.000

1983

1yr.	0.030	0.009	0.091	0.682	0.000
2yr.	0.024	0.007	0.071	0.596	0.000
3yr.	0.027	0.007	0.073	0.562	0.000
4yr.	0.030	0.008	0.080	0.517	0.000
5yr.	0.030	0.007	0.071	0.493	0.000

MAPE/FORECAST

1980

1yr.	0.110	0.010	0.108	0.742	0.001			
2yr.	0.107	0.010	0.102	0.660	0.001			
3yr.	0.111	0.006	0.065	0.391	0.001			
4yr.	0.138	0.009	0.096	0.465	0.002			
5yr.	0.154	0.007	0.075	0.538	0.012			

1981

1yr.	0.117	0.014	0.149	0.963	0.002			
2yr.	0.103	0.011	0.113	0.586	0.005			
3yr.	0.098	0.010	0.104	0.535	0.000			
4yr.	0.102	0.010	0.103	0.521	0.001			
5yr.	0.114	0.009	0.099	0.541	0.000			

1982

1yr.	0.106	0.015	0.158	1.389	0.000	0.102	0.012	0.130
2yr.	0.098	0.013	0.136	1.243	0.001	0.096	0.011	0.118
3yr.	0.106	0.013	0.135	1.216	0.001	0.104	0.011	0.120
4yr.	0.097	0.012	0.120	0.745	0.002			
5yr.	0.097	0.011	0.120	0.714	0.000			

1983

1yr.	0.106	0.015	0.158	1.389	0.000	0.102	0.012	0.130
2yr.	0.098	0.013	0.136	1.243	0.001	0.096	0.011	0.118
3yr.	0.106	0.013	0.135	1.216	0.001	0.104	0.011	0.120
4yr.	0.103	0.013	0.138	1.227	0.000	0.101	0.012	0.121
5yr.	0.104	0.011	0.119	0.937	0.000			

MSE/FORECAST

1980

1yr.	0.033	0.007	0.076	0.631	0.000			
2yr.	0.022	0.005	0.050	0.437	0.000			
3yr.	0.003	0.004	0.043	0.470	0.000			
4yr.	0.028	0.004	0.038	0.218	0.000			
5yr.	0.020	0.003	0.027	0.253	-0.136			

1981

1yr.	0.036	0.011	0.110	0.930	0.000			
2yr.	0.023	0.006	0.058	0.349	0.000			
3yr.	0.020	0.005	0.049	0.287	0.000			
4yr.	0.021	0.004	0.045	0.272	0.000			
5yr.	0.023	0.004	0.043	0.292	0.000			

1982

1yr.	0.042	0.014	0.149	1.142	0.000	0.041	0.013	0.140
2yr.	0.031	0.011	0.110	0.890	0.000			
3yr.	0.024	0.007	0.078	0.595	0.000			
4yr.	0.024	0.007	0.073	0.558	0.000			
5yr.	0.024	0.007	0.070	0.510	0.000			

1983

1yr.	0.036	0.018	0.187	1.930	0.000	0.027	0.010	0.102
2yr.	0.028	0.014	0.149	1.546	0.000	0.023	0.009	0.098
3yr.	0.029	0.014	0.143	1.482	0.000	0.025	0.009	0.098
4yr.	0.030	0.014	0.146	1.506	0.000	0.025	0.009	0.099
5yr.	0.025	0.008	0.088	0.879	0.000			

MOVING AVERAGE

MAPE/ACTUAL

1980

2yr.	0.127	0.008	0.085	0.541	0.001
3yr.	0.168	0.009	0.094	0.572	0.010
4yr.	0.206	0.010	0.102	0.625	0.007
5yr.	0.251	0.010	0.108	0.666	0.012
6yr.	0.295	0.011	0.112	0.701	0.014

1981

2yr.	0.132	0.014	0.148	1.428	0.002	0.128	0.011	0.115
3yr.	0.165	0.015	0.156	1.464	0.002	0.161	0.012	0.123
4yr.	0.204	0.016	0.163	1.528	0.005	0.199	0.012	0.127
5yr.	0.241	0.015	0.162	1.504	0.006	0.236	0.012	0.129
6yr.	0.283	0.015	0.156	1.426	0.003	0.279	0.012	0.130

1982

2yr.	0.150	0.010	0.105	0.634	0.003			
3yr.	0.178	0.012	0.128	1.029	0.001	0.178	0.012	0.126
4yr.	0.212	0.013	0.139	1.168	0.014	0.210	0.012	0.128
5yr.	0.245	0.014	0.149	1.303	0.011	0.242	0.012	0.130
6yr.	0.276	0.015	0.153	1.335	0.012	0.273	0.013	0.133

1983

2yr.	0.150	0.011	0.119	0.687	0.007			
3yr.	0.183	0.013	0.139	0.801	0.003			
4yr.	0.210	0.015	0.156	1.095	0.003	0.210	0.015	0.151
5yr.	0.241	0.016	0.165	1.294	0.009	0.238	0.014	0.149
6yr.	0.269	0.017	0.177	1.471	0.009	0.265	0.014	0.150

MSE/ACTUAL

1980

2yr.	0.023	0.003	0.035	0.295	0.000
3yr.	0.037	0.004	0.042	0.338	0.000
4yr.	0.053	0.005	0.051	0.399	0.000
5yr.	0.075	0.006	0.061	0.459	0.000
6yr.	0.100	0.007	0.071	0.512	0.000

1981								
2yr.	0.039	0.019	0.195	2.045	0.000	0.030	0.009	0.097
3yr.	0.051	0.020	0.206	2.147	0.000	0.041	0.010	0.099
4yr.	0.068	0.022	0.225	2.349	0.000	0.056	0.010	0.103
5yr.	0.084	0.021	0.219	2.280	0.000	0.072	0.010	0.105
6yr.	0.104	0.019	0.198	2.042	0.000	0.094	0.010	0.109
1982								
2yr.	0.033	0.005	0.054	0.406	0.000			
3yr.	0.048	0.010	0.106	1.061	0.000	0.047	0.010	0.100
4yr.	0.064	0.013	0.137	1.396	0.000	0.060	0.010	0.102
5yr.	0.082	0.016	0.168	1.726	0.000	0.075	0.010	0.105
6yr.	0.100	0.017	0.177	1.815	0.000	0.092	0.010	0.108
1983								
2yr.	0.037	0.007	0.070	0.483	0.000			
3yr.	0.053	0.009	0.095	0.646	0.000			
4yr.	0.069	0.013	0.139	1.207	0.000	0.067	0.012	0.124
5yr.	0.085	0.017	0.177	1.697	0.000	0.079	0.012	0.122
6yr.	0.103	0.021	0.220	2.189	0.000	0.092	0.012	0.124

MAPE/FORECAST

1980								
2yr.	0.154	0.014	0.143	1.186	0.001	0.153	0.013	0.131
3yr.	0.217	0.016	0.172	1.382	0.009	0.213	0.014	0.150
4yr.	0.281	0.020	0.208	1.700	0.007	0.275	0.016	0.169
5yr.	0.367	0.024	0.249	2.090	0.012	0.357	0.019	0.195
6yr.	0.460	0.028	0.292	2.503	0.014	0.446	0.021	0.219
1981								
2yr.	0.149	0.011	0.119	0.609	0.002			
3yr.	0.199	0.015	0.153	0.882	0.002			
4yr.	0.261	0.018	0.184	1.127	0.005	0.260	0.017	0.178
5yr.	0.326	0.020	0.213	1.425	0.006	0.322	0.019	0.195
6yr.	0.410	0.024	0.248	1.758	0.003	0.402	0.020	0.214
1982								
2yr.	0.178	0.014	0.146	1.004	0.003	0.178	0.014	0.146
3yr.	0.216	0.015	0.157	1.008	0.001	0.216	0.015	0.156
4yr.	0.271	0.017	0.182	1.119	0.014	0.270	0.017	0.176
5yr.	0.330	0.020	0.209	1.247	0.011	0.327	0.019	0.198
6yr.	0.393	0.023	0.238	1.381	0.012	0.386	0.020	0.214
1983								
2yr.	0.183	0.021	0.219	1.884	0.007	0.174	0.016	0.164
3yr.	0.233	0.025	0.262	2.153	0.003	0.219	0.018	0.184
4yr.	0.276	0.028	0.291	2.415	0.003	0.257	0.018	0.193
5yr.	0.331	0.031	0.323	2.651	0.009	0.308	0.020	0.207
6yr.	0.389	0.035	0.366	3.022	0.009	0.359	0.022	0.226

MSE/FORECAST

1980

2yr.	0.044	0.013	0.139	1.410	0.000	0.040	0.010	0.102
3yr.	0.076	0.018	0.193	1.935	0.000	0.068	0.011	0.114
4yr.	0.122	0.028	0.293	2.951	0.000	0.104	0.013	0.136
5yr.	0.196	0.042	0.437	4.417	0.000	0.165	0.017	0.175
6yr.	0.296	0.060	0.624	6.334	0.000	0.246	0.022	0.225

1981

2yr.	0.036	0.006	0.059	0.373	0.000			
3yr.	0.063	0.010	0.103	0.781	0.000			
4yr.	0.102	0.016	0.163	1.282	0.000	0.099	0.014	0.145
5yr.	0.151	0.023	0.240	2.049	0.000	0.142	0.017	0.175
6yr.	0.229	0.034	0.354	3.101	0.000	0.207	0.021	0.219

1982

2yr.	0.053	0.012	0.121	1.014	0.000	0.053	0.011	0.120
3yr.	0.071	0.012	0.123	1.018	0.000	0.071	0.012	0.122
4yr.	0.106	0.016	0.163	1.283	0.000	0.104	0.014	0.146
5yr.	0.152	0.021	0.215	1.583	0.000	0.146	0.017	0.177
6yr.	0.210	0.027	0.284	1.941	0.000	0.195	0.020	0.204

1983

2yr.	0.081	0.034	0.358	3.576	0.000	0.057	0.014	0.147
3yr.	0.122	0.046	0.479	4.647	0.000	0.081	0.016	0.169
4yr.	0.160	0.057	0.599	5.847	0.000	0.103	0.017	0.175
5yr.	0.213	0.070	0.730	7.075	0.000	0.137	0.018	0.192
6yr.	0.284	0.090	0.941	9.188	0.000	0.180	0.021	0.219

EXPONENTIAL SMOOTHING

MAPE/ACTUAL

1980

0.95	0.090	0.007	0.076	0.506	0.005
0.90	0.093	0.007	0.077	0.515	0.000
0.85	0.097	0.008	0.078	0.519	0.001
0.80	0.101	0.008	0.080	0.526	0.000
0.75	0.107	0.008	0.081	0.533	0.000
0.70	0.115	0.008	0.082	0.533	0.007
0.65	0.123	0.008	0.084	0.546	0.003
0.60	0.133	0.008	0.086	0.558	0.001
0.55	0.144	0.008	0.088	0.571	0.001
0.50	0.159	0.009	0.090	0.580	0.006
0.45	0.176	0.009	0.093	0.597	0.005
0.40	0.196	0.009	0.097	0.617	0.004
0.35	0.221	0.010	0.100	0.639	0.004
0.30	0.252	0.010	0.102	0.650	0.019
0.25	0.289	0.010	0.105	0.656	0.043
0.20	0.333	0.011	0.111	0.716	0.018
0.15	0.386	0.011	0.115	0.744	0.030
0.10	0.451	0.011	0.116	0.808	0.012
0.05	0.528	0.011	0.116	0.811	0.063

1981

0.95	0.113	0.012	0.124	1.175	0.002	0.111	0.011	0.111
0.90	0.115	0.012	0.126	1.205	0.000	0.113	0.011	0.111
0.85	0.118	0.012	0.129	1.226	0.005	0.116	0.011	0.111
0.80	0.122	0.013	0.131	1.256	0.000	0.120	0.011	0.111
0.75	0.125	0.013	0.133	1.279	0.002	0.124	0.011	0.112
0.70	0.131	0.013	0.136	1.301	0.003	0.128	0.011	0.112
0.65	0.137	0.013	0.138	1.322	0.004	0.134	0.011	0.113
0.60	0.145	0.013	0.141	1.341	0.004	0.142	0.011	0.115
0.55	0.154	0.014	0.143	1.361	0.001	0.151	0.011	0.117
0.50	0.166	0.014	0.146	1.363	0.011	0.162	0.011	0.119
0.45	0.180	0.014	0.148	1.376	0.004	0.177	0.012	0.121
0.40	0.199	0.014	0.148	1.370	0.007	0.196	0.012	0.123
0.35	0.222	0.014	0.148	1.359	0.003	0.219	0.012	0.124
0.30	0.252	0.014	0.146	1.329	0.003	0.249	0.012	0.125
0.25	0.275	0.014	0.151	1.101	0.005	0.286	0.012	0.126
0.20	0.334	0.013	0.137	1.193	0.011	0.332	0.012	0.126
0.15	0.390	0.012	0.129	1.079	0.014	0.389	0.012	0.125
0.10	0.459	0.012	0.121	0.889	0.049			
0.05	0.544	0.011	0.115	0.763	0.096			

1982

0.95	0.118	0.009	0.090	0.489	0.004			
0.90	0.121	0.009	0.089	0.489	0.004			
0.85	0.126	0.009	0.090	0.491	0.004			
0.80	0.130	0.009	0.091	0.495	0.001			
0.75	0.135	0.009	0.093	0.497	0.001			
0.70	0.141	0.009	0.095	0.500	0.001			
0.65	0.148	0.009	0.097	0.516	0.006			
0.60	0.156	0.010	0.100	0.596	0.002			
0.55	0.166	0.010	0.103	0.672	0.004			
0.50	0.177	0.010	0.107	0.742	0.012			
0.45	0.191	0.011	0.111	0.820	0.008			
0.40	0.207	0.011	0.116	0.895	0.002			
0.35	0.228	0.012	0.120	0.957	0.002			
0.30	0.254	0.012	0.125	1.008	0.001	0.254	0.012	0.124
0.25	0.287	0.012	0.130	1.016	0.022	0.287	0.012	0.128
0.20	0.328	0.013	0.138	1.037	0.003	0.328	0.013	0.136
0.15	0.384	0.013	0.139	0.987	0.018			
0.10	0.458	0.013	0.134	0.896	0.021			
0.05	0.553	0.012	0.127	0.722	0.123			

1983

0.95	0.114	0.010	0.104	0.634	0.001			
0.90	0.118	0.010	0.106	0.636	0.001			
0.85	0.122	0.010	0.107	0.639	0.001			
0.80	0.127	0.010	0.108	0.643	0.001			
0.75	0.132	0.011	0.111	0.647	0.001			
0.70	0.138	0.011	0.113	0.652	0.001			
0.65	0.144	0.011	0.116	0.656	0.002			
0.60	0.152	0.011	0.120	0.664	0.000			
0.55	0.161	0.012	0.123	0.664	0.008			
0.50	0.172	0.012	0.127	0.679	0.001			
0.45	0.185	0.012	0.130	0.719	0.004			
0.40	0.201	0.013	0.133	0.807	0.015			
0.35	0.221	0.013	0.138	0.920	0.002			
0.30	0.244	0.014	0.144	1.012	0.008	0.244	0.014	0.143
0.25	0.274	0.014	0.146	0.995	0.005			
0.20	0.315	0.015	0.158	1.168	0.001	0.313	0.014	0.150
0.15	0.371	0.015	0.159	1.141	0.054	0.369	0.014	0.151
0.10	0.446	0.015	0.160	1.155	0.006	0.445	0.015	0.154
0.05	0.547	0.015	0.159	1.012	0.026	0.547	0.015	0.158

MSE/ACTUAL

1980

0.95	0.014	0.003	0.030	0.262	0.000
0.90	0.015	0.003	0.030	0.266	0.000
0.85	0.015	0.003	0.031	0.271	0.000
0.80	0.017	0.003	0.031	0.277	0.000
0.75	0.018	0.003	0.032	0.284	0.000
0.70	0.020	0.003	0.033	0.292	0.000
0.65	0.022	0.003	0.034	0.302	0.000
0.60	0.025	0.003	0.036	0.313	0.000
0.55	0.029	0.004	0.038	0.326	0.000
0.50	0.033	0.004	0.040	0.343	0.000
0.45	0.039	0.004	0.043	0.362	0.000
0.40	0.048	0.005	0.047	0.385	0.000
0.35	0.059	0.005	0.052	0.413	0.000
0.30	0.074	0.006	0.058	0.447	0.000
0.25	0.095	0.006	0.065	0.487	0.002
0.20	0.123	0.007	0.074	0.538	0.000
0.15	0.162	0.008	0.085	0.598	0.001
0.10	0.217	0.009	0.098	0.673	0.000
0.05	0.292	0.011	0.115	0.759	0.004

1981

0.95	0.028	0.013	0.133	1.387	0.000	0.025	0.009	0.097
0.90	0.029	0.013	0.139	1.451	0.000	0.025	0.009	0.096
0.85	0.030	0.014	0.145	1.515	0.000	0.026	0.009	0.096
0.80	0.032	0.014	0.151	1.578	0.000	0.027	0.009	0.096
0.75	0.033	0.015	0.157	1.640	0.000	0.028	0.009	0.096
0.70	0.035	0.016	0.163	1.701	0.000	0.029	0.009	0.097
0.65	0.038	0.016	0.168	1.758	0.000	0.031	0.009	0.097
0.60	0.041	0.017	0.173	1.811	0.000	0.033	0.009	0.097
0.55	0.044	0.017	0.177	1.855	0.000	0.036	0.009	0.098
0.50	0.048	0.017	0.181	1.888	0.000	0.040	0.009	0.098
0.45	0.054	0.017	0.182	1.904	0.000	0.046	0.009	0.099
0.40	0.061	0.017	0.182	1.895	0.000	0.053	0.010	0.100
0.35	0.071	0.017	0.178	1.855	0.000	0.063	0.010	0.101
0.30	0.085	0.016	0.172	1.774	0.000	0.077	0.010	0.103
0.25	0.103	0.015	0.161	1.642	0.000	0.097	0.010	0.106
0.20	0.130	0.014	0.146	1.450	0.000	0.126	0.011	0.110
0.15	0.169	0.012	0.129	1.194	0.000	0.167	0.011	0.115
0.10	0.226	0.011	0.116	0.878	0.002			
0.05	0.310	0.011	0.119	0.728	0.009			

1982

0.95	0.022	0.004	0.039	0.243	0.000			
0.90	0.023	0.004	0.039	0.244	0.000			
0.85	0.024	0.004	0.039	0.245	0.000			
0.80	0.025	0.004	0.039	0.246	0.000			
0.75	0.027	0.004	0.040	0.248	0.000			
0.70	0.029	0.004	0.041	0.250	0.000			
0.65	0.031	0.004	0.044	0.272	0.000			
0.60	0.034	0.005	0.049	0.359	0.000			
0.55	0.038	0.005	0.056	0.457	0.000			
0.50	0.043	0.006	0.064	0.567	0.000			
0.45	0.049	0.007	0.074	0.686	0.000			
0.40	0.056	0.008	0.085	0.806	0.000			
0.35	0.066	0.009	0.095	0.921	0.000			
0.30	0.080	0.010	0.105	1.017	0.000	0.080	0.010	0.104
0.25	0.011	0.002	0.113	1.077	0.000	0.098	0.010	0.107
0.20	0.126	0.011	0.117	1.083	0.000	0.126	0.011	0.111
0.15	0.167	0.011	0.118	1.009	0.000	0.167	0.011	0.118
0.10	0.227	0.011	0.119	0.841	0.000			
0.05	0.321	0.012	0.127	0.699	0.015			

1983

0.95	0.024	0.005	0.052	0.402	0.000			
0.90	0.025	0.005	0.053	0.406	0.000			
0.85	0.026	0.005	0.054	0.410	0.000			
0.80	0.028	0.005	0.056	0.414	0.000			
0.75	0.030	0.006	0.058	0.420	0.000			
0.70	0.032	0.006	0.060	0.426	0.000			
0.65	0.034	0.006	0.063	0.433	0.000			
0.60	0.037	0.006	0.066	0.441	0.000			
0.55	0.041	0.007	0.070	0.450	0.000			
0.50	0.045	0.007	0.076	0.462	0.000			
0.45	0.051	0.008	0.083	0.522	0.000			
0.40	0.058	0.009	0.093	0.675	0.000			
0.35	0.068	0.010	0.106	0.850	0.000			
0.30	0.080	0.012	0.121	1.039	0.000	0.080	0.011	0.118
0.25	0.098	0.013	0.136	1.222	0.000	0.096	0.012	0.120
0.20	0.124	0.014	0.150	1.367	0.000	0.120	0.012	0.124
0.15	0.163	0.015	0.160	1.425	0.003	0.159	0.013	0.131
0.10	0.224	0.016	0.162	1.348	0.000	0.221	0.014	0.142
0.05	0.324	0.015	0.161	1.007	0.001	0.324	0.015	0.158

MAPE/FORECAST

1980

0.95	0.103	0.011	0.117	1.042	0.000	0.102	0.011	0.113
0.90	0.107	0.012	0.120	1.065	0.000	0.106	0.011	0.115
0.85	0.112	0.012	0.124	1.085	0.001	0.112	0.011	0.117
0.80	0.119	0.012	0.127	1.111	0.000	0.118	0.011	0.120
0.75	0.127	0.013	0.131	1.140	0.000	0.126	0.012	0.122
0.70	0.137	0.013	0.136	1.168	0.007	0.136	0.012	0.124
0.65	0.149	0.014	0.141	1.215	0.003	0.147	0.012	0.127
0.60	0.163	0.014	0.148	1.268	0.001	0.161	0.013	0.131
0.55	0.181	0.015	0.156	1.332	0.001	0.178	0.013	0.135
0.50	0.202	0.016	0.165	1.406	0.006	0.199	0.013	0.140
0.45	0.229	0.017	0.177	1.507	0.005	0.225	0.014	0.147
0.40	0.263	0.018	0.192	1.634	0.004	0.258	0.015	0.156
0.35	0.308	0.020	0.210	1.797	0.004	0.300	0.016	0.167
0.30	0.366	0.022	0.233	2.000	0.020	0.356	0.017	0.181
0.25	0.442	0.025	0.265	2.276	0.045	0.430	0.019	0.201
0.20	0.545	0.030	0.312	2.736	0.017	0.526	0.021	0.224
0.15	0.691	0.036	0.381	3.391	0.029	0.650	0.023	0.240
0.10	0.910	0.048	0.497	4.548	0.012	0.797	0.023	0.237
0.05	1.265	0.071	0.738	6.847	0.067	0.907	0.018	0.193

1981

0.95	0.124	0.010	0.105	0.538	0.002			
0.90	0.127	0.010	0.105	0.546	0.000			
0.85	0.131	0.010	0.106	0.547	0.005			
0.80	0.136	0.010	0.108	0.557	0.000			
0.75	0.141	0.011	0.110	0.560	0.002			
0.70	0.148	0.011	0.113	0.563	0.003			
0.65	0.157	0.011	0.117	0.566	0.004			
0.60	0.168	0.012	0.123	0.569	0.004			
0.55	0.182	0.012	0.130	0.617	0.001			
0.50	0.199	0.013	0.139	0.688	0.011			
0.45	0.222	0.014	0.149	0.792	0.004			
0.40	0.253	0.016	0.162	0.909	0.007			
0.35	0.293	0.017	0.178	1.062	0.003	0.292	0.017	0.175
0.30	0.347	0.019	0.199	1.257	0.003	0.344	0.018	0.189
0.25	0.421	0.022	0.228	1.517	0.009	0.415	0.020	0.205
0.20	0.525	0.026	0.270	1.898	0.011	0.510	0.021	0.222
0.15	0.677	0.032	0.338	2.497	0.014	0.636	0.022	0.229
0.10	0.916	0.044	0.460	3.538	0.052	0.797	0.021	0.222
0.05	1.334	0.071	0.736	5.962	0.106	0.921	0.017	0.181

1982

0.95	0.135	0.012	0.130	0.966	0.004			
0.90	0.140	0.012	0.130	0.970	0.004			
0.85	0.145	0.013	0.131	0.976	0.004			
0.80	0.151	0.013	0.133	0.984	0.001			
0.75	0.158	0.013	0.135	0.991	0.001			
0.70	0.166	0.013	0.137	1.001	0.001	0.166	0.013	0.137
0.65	0.176	0.013	0.139	1.009	0.006	0.175	0.013	0.138
0.60	0.187	0.014	0.142	1.028	0.002	0.187	0.013	0.141
0.55	0.201	0.014	0.147	1.048	0.004	0.200	0.014	0.144
0.50	0.218	0.015	0.152	1.069	0.012	0.217	0.014	0.148
0.45	0.239	0.015	0.160	1.110	0.008	0.238	0.015	0.154
0.40	0.266	0.016	0.170	1.166	0.002	0.265	0.016	0.163
0.35	0.303	0.018	0.183	1.234	0.002	0.300	0.017	0.173
0.30	0.352	0.019	0.203	1.328	0.001	0.349	0.018	0.190
0.25	0.420	0.022	0.231	1.435	0.023	0.414	0.020	0.210
0.20	0.517	0.026	0.275	1.638	0.003	0.504	0.023	0.237
0.15	0.669	0.033	0.340	2.017	0.018	0.634	0.025	0.260
0.10	0.921	0.043	0.454	2.998	0.022	0.796	0.025	0.258
0.05	1.392	0.070	0.726	5.314	0.140	0.911	0.020	0.206

1983

0.95	0.133	0.018	0.185	1.734	0.001	0.127	0.013	0.131
0.90	0.138	0.018	0.188	1.754	0.001	0.131	0.013	0.134
0.85	0.144	0.018	0.192	1.778	0.001	0.137	0.013	0.137
0.80	0.151	0.019	0.196	1.806	0.001	0.143	0.013	0.140
0.75	0.158	0.019	0.201	1.839	0.001	0.150	0.014	0.145
0.70	0.166	0.020	0.207	1.877	0.001	0.158	0.014	0.149
0.65	0.175	0.021	0.214	1.921	0.002	0.167	0.015	0.155
0.60	0.186	0.021	0.223	1.976	0.000	0.177	0.015	0.161
0.55	0.200	0.022	0.232	2.034	0.007	0.190	0.016	0.168
0.50	0.216	0.023	0.243	2.121	0.001	0.206	0.017	0.174
0.45	0.238	0.024	0.255	2.217	0.004	0.225	0.017	0.179
0.40	0.264	0.026	0.271	2.333	0.015	0.250	0.018	0.185
0.35	0.299	0.028	0.292	2.512	0.002	0.281	0.018	0.193
0.30	0.345	0.031	0.320	2.731	0.008	0.323	0.020	0.205
0.25	0.409	0.034	0.360	3.052	0.005	0.381	0.021	0.224
0.20	0.505	0.040	0.418	3.531	0.001	0.465	0.024	0.249
0.15	0.659	0.049	0.507	4.245	0.057	0.592	0.026	0.275
0.10	0.921	0.064	0.671	5.719	0.006	0.754	0.027	0.281
0.05	1.445	0.101	1.059	9.112	0.025	0.890	0.023	0.241

MSE/FORECAST

1980

0.95	0.024	0.010	0.106	1.097	0.000	0.023	0.009	0.097
0.90	0.026	0.010	0.110	1.135	0.000	0.025	0.009	0.097
0.85	0.028	0.011	0.114	1.180	0.000	0.026	0.009	0.097
0.80	0.030	0.011	0.119	1.234	0.000	0.028	0.009	0.098
0.75	0.033	0.012	0.126	1.300	0.000	0.031	0.009	0.090
0.70	0.037	0.013	0.134	1.381	0.000	0.034	0.009	0.099
0.65	0.042	0.014	0.144	1.483	0.000	0.038	0.010	0.100
0.60	0.048	0.015	0.157	1.612	0.000	0.043	0.010	0.102
0.55	0.057	0.017	0.173	1.777	0.000	0.050	0.010	0.104
0.50	0.068	0.019	0.195	1.994	0.000	0.059	0.008	0.081
0.45	0.084	0.021	0.223	2.283	0.000	0.072	0.011	0.113
0.40	0.106	0.025	0.263	2.681	0.000	0.091	0.012	0.121
0.35	0.138	0.030	0.318	3.245	0.000	0.118	0.013	0.135
0.30	0.188	0.038	0.400	4.079	0.000	0.159	0.015	0.158
0.25	0.265	0.051	0.528	5.382	0.002	0.225	0.019	0.198
0.20	0.393	0.071	0.742	7.581	0.000	0.326	0.023	0.245
0.15	0.622	0.109	1.142	11.696	0.001	0.480	0.028	0.292
0.10	1.073	0.194	2.026	20.800	0.000	0.691	0.030	0.314
0.05	2.140	0.445	4.647	47.797	0.004	0.859	0.026	0.271

1981

0.95	0.026	0.005	0.049	0.292	0.000			
0.90	0.027	0.005	0.048	0.299	0.000			
0.85	0.028	0.005	0.049	0.304	0.000			
0.80	0.030	0.005	0.049	0.310	0.000			
0.75	0.032	0.005	0.051	0.315	0.000			
0.70	0.035	0.005	0.054	0.320	0.000			
0.65	0.038	0.005	0.057	0.325	0.000			
0.60	0.043	0.006	0.063	0.329	0.000			
0.55	0.050	0.007	0.070	0.382	0.000			
0.50	0.059	0.008	0.081	0.489	0.000			
0.45	0.071	0.009	0.097	0.634	0.000			
0.40	0.090	0.011	0.120	0.838	0.000			
0.35	0.117	0.015	0.153	1.134	0.000	0.116	0.014	0.145
0.30	0.159	0.020	0.204	1.588	0.000	0.154	0.016	0.171
0.25	0.228	0.028	0.288	2.328	0.000	0.214	0.020	0.206
0.20	0.348	0.042	0.436	3.645	0.000	0.309	0.024	0.253
0.15	0.572	0.070	0.729	6.306	0.000	0.456	0.027	0.284
0.10	1.048	0.137	1.434	12.886	0.003	0.683	0.029	0.299
0.05	2.317	0.374	3.901	36.814	0.011	0.881	0.024	0.253

1982

0.95	0.035	0.010	0.107	0.942	0.000			
0.90	0.036	0.010	0.108	0.950	0.000			
0.85	0.038	0.010	0.109	0.959	0.000			
0.80	0.040	0.011	0.110	0.970	0.000			
0.75	0.043	0.011	0.111	0.985	0.000			
0.70	0.046	0.011	0.113	1.003	0.000	0.046	0.011	0.113
0.65	0.050	0.011	0.116	1.028	0.000	0.050	0.011	0.114
0.60	0.055	0.011	0.120	1.062	0.000	0.054	0.011	0.115
0.55	0.062	0.012	0.125	1.107	0.000	0.061	0.011	0.117
0.50	0.070	0.013	0.133	1.167	0.000	0.069	0.012	0.120
0.45	0.082	0.014	0.143	1.250	0.000	0.080	0.012	0.125
0.40	0.100	0.015	0.159	1.365	0.000	0.096	0.013	0.134
0.35	0.125	0.017	0.182	1.528	0.000	0.120	0.014	0.148
0.30	0.164	0.021	0.218	1.765	0.000	0.157	0.017	0.174
0.25	0.229	0.027	0.279	2.123	0.001	0.215	0.020	0.208
0.20	0.343	0.037	0.388	2.694	0.000	0.310	0.024	0.251
0.15	0.563	0.058	0.610	4.144	0.000	0.469	0.029	0.304
0.10	1.052	0.112	1.167	9.120	0.000	0.699	0.032	0.333
0.05	2.461	0.319	3.329	29.733	0.020	0.871	0.027	0.280

1983

0.95	0.052	0.028	0.289	3.009	0.000	0.033	0.010	0.104
0.90	0.054	0.028	0.297	3.081	0.000	0.035	0.010	0.106
0.85	0.057	0.029	0.306	3.166	0.000	0.037	0.010	0.109
0.80	0.061	0.030	0.316	3.266	0.000	0.040	0.011	0.112
0.75	0.065	0.031	0.328	3.384	0.000	0.043	0.011	0.116
0.70	0.070	0.033	0.343	3.526	0.000	0.047	0.012	0.121
0.65	0.076	0.035	0.361	3.698	0.000	0.052	0.012	0.128
0.60	0.061	0.016	0.168	1.664	0.000	0.055	0.011	0.111
0.55	0.093	0.039	0.410	4.168	0.000	0.064	0.014	0.147
0.50	0.105	0.043	0.445	4.499	0.000	0.072	0.015	0.155
0.45	0.121	0.047	0.490	4.930	0.000	0.082	0.015	0.161
0.40	0.143	0.053	0.550	5.510	0.000	0.096	0.016	0.171
0.35	0.174	0.061	0.633	6.319	0.000	0.116	0.017	0.179
0.30	0.220	0.072	0.754	7.502	0.000	0.146	0.018	0.192
0.25	0.296	0.090	0.942	9.345	0.000	0.195	0.021	0.218
0.20	0.429	0.121	1.258	12.474	0.000	0.278	0.025	0.258
0.15	0.689	0.179	1.864	18.499	0.003	0.426	0.030	0.317
0.10	1.293	0.315	3.291	32.785	0.000	0.647	0.034	0.352
0.05	3.200	0.800	8.357	83.488	0.001	0.849	0.029	0.307

Appendix 9.

<u>ERRORS FOR THE ABSOLUTE CHANGE MODELS FOR FORECASTING TURNOVER.</u>

SPEARMAN CORRELATION COEFFICIENTS

MAPE/ACTUAL AND MSE/ACTUAL.

	2 yr.	3 yr.	4 yr.	5 yr.
1980				
1 yr.	0.7059	0.6217	0.6425	0.6111
2 yr.		0.8780	0.8189	0.7985
3 yr.			0.9162	0.8612
4 yr.				0.9616
1981				
	0.7046	0.5536	0.4425	0.3649
		0.8340	0.6910	0.6306
			0.8984	0.8282
				0.9299
1982				
	0.6197	0.6836	0.6285	0.5744
		0.8109	0.7236	0.6687
			0.8562	0.7926
				0.8931
1983				
	0.3290	0.6182	0.6286	0.5229
		0.3124	0.3306	0.2567
			0.9375	0.8574
				0.9396

MAPE/FORECAST AND MSE/FORECAST.

1980

0.6868	0.5881	0.6148	0.5920
	0.9676	0.8058	0.7823
		0.9088	0.8517
			0.9614

1981

0.7206	0.5601	0.4323	0.3546
	0.8339	0.6804	0.6155
		0.8914	0.8221
			0.9261

1982

0.6466	0.6886	0.6317	0.5850
	0.8043	0.7269	0.6704
		0.8636	0.8021
			0.8934

1983

0.3084	0.6317	0.6314	0.5361
	0.2934	0.3223	0.2459
		0.9365	0.8515
			0.9373

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MAPE/ACTUAL

1980

	(DIFFERENCE) MEAN	STANDARD DEVIATION	STANDARD ERROR	CORR.	2-TAIL PROB.	T VALUE	2-TAIL PROB.
1/2	0.0120	0.054	0.005	0.854	0.000	2.31	0.023
1/3	0.0155	0.065	0.006	0.783	0.000	2.50	0.014
1/4	0.0099	0.067	0.006	0.772	0.000	1.55	0.123
1/5	0.0163	0.069	0.007	0.751	0.000	2.46	0.015
2/3	0.0035	0.034	0.003	0.930	0.000	1.08	0.281
2/4	-0.0021	0.043	0.004	0.892	0.000	-0.51	0.613
2/5	0.0043	0.045	0.004	0.873	0.000	0.99	0.326
3/4	-0.0056	0.024	0.002	0.964	0.000	-2.46	0.015
3/5	0.0008	0.029	0.003	0.943	0.000	0.28	0.783
4/5	0.0064	0.015	0.001	0.987	0.000	4.53	0.000

1981

1/2	0.0099	0.065	0.006	0.843	0.000	1.60	0.113
1/3	0.0146	0.073	0.007	0.786	0.000	2.07	0.040
1/4	0.0142	0.084	0.008	0.742	0.000	1.78	0.079
1/5	0.0154	0.093	0.009	0.694	0.000	1.73	0.087
2/3	0.0047	0.029	0.003	0.970	0.000	1.69	0.095
2/4	0.0043	0.042	0.004	0.938	0.000	1.07	0.289
2/5	0.0056	0.051	0.005	0.915	0.000	1.13	0.261
3/4	-0.0003	0.025	0.002	0.979	0.000	-0.15	0.885
3/5	0.0009	0.036	0.003	0.959	0.000	0.25	0.803
4/5	0.0012	0.020	0.002	0.987	0.000	0.63	0.532

1982

1/2	0.0174	0.064	0.006	0.907	0.000	2.85	0.005
1/3	0.0257	0.084	0.008	0.834	0.000	3.19	0.002
1/4	0.0267	0.091	0.009	0.799	0.000	3.05	0.003
1/5	0.0283	0.104	0.010	0.722	0.000	2.83	0.005
2/3	0.0083	0.045	0.004	0.940	0.000	1.92	0.058
2/4	0.0093	0.058	0.006	0.897	0.000	1.68	0.097
2/5	0.0109	0.070	0.007	0.842	0.000	1.62	0.108
3/4	0.0009	0.024	0.002	0.976	0.000	0.40	0.688
3/5	0.0026	0.036	0.003	0.948	0.000	0.76	0.451
4/5	0.0016	0.022	0.002	0.981	0.000	0.79	0.433

1983

1/2	0.0020	0.074	0.007	0.810	0.000	0.28	0.779
1/3	-0.0029	0.082	0.008	0.761	0.000	-0.37	0.713
1/4	0.0022	0.081	0.008	0.765	0.000	0.28	0.779
1/5	0.0017	0.086	0.008	0.731	0.000	0.21	0.835
2/3	-0.0049	0.038	0.004	0.945	0.000	-1.34	0.183
2/4	0.0002	0.055	0.005	0.881	0.000	0.04	0.970
2/5	-0.0003	0.063	0.006	0.846	0.000	-0.04	0.966
3/4	0.0051	0.032	0.003	0.961	0.000	1.66	0.100
3/5	0.0046	0.043	0.004	0.928	0.000	1.12	0.264
4/5	-0.0005	0.020	0.002	0.983	0.000	-0.23	0.816

MSE/ACTUAL

1980

1/2	0.0046	0.020	0.002	0.892	0.000	2.42	0.017
1/3	0.0064	0.026	0.002	0.808	0.000	2.58	0.011
1/4	0.0048	0.025	0.002	0.810	0.000	1.98	0.050
1/5	0.0067	0.026	0.003	0.795	0.000	2.65	0.009
2/3	0.0018	0.012	0.001	0.935	0.000	1.51	0.134
2/4	0.0002	0.015	0.001	0.903	0.000	0.13	0.893
2/5	0.0021	0.016	0.002	0.890	0.000	1.39	0.167
3/4	-0.0016	0.007	0.001	0.978	0.000	-2.28	0.024
3/5	0.0003	0.008	0.001	0.968	0.000	0.41	0.686
4/5	0.0019	0.005	0.000	0.992	0.000	4.18	0.000

1981

1/2	-0.0006	0.060	0.006	0.782	0.000	-0.10	0.924
1/3	0.0014	0.061	0.006	0.756	0.000	0.23	0.815
1/4	-0.0004	0.084	0.008	0.719	0.000	-0.05	0.963
1/5	-0.0013	0.104	0.010	0.685	0.000	-0.13	0.895
2/3	0.0019	0.007	0.001	0.997	0.000	2.68	0.009
2/4	0.0002	0.027	0.003	0.987	0.000	0.07	0.944
2/5	-0.0008	0.047	0.005	0.978	0.000	-0.17	0.865
3/4	-0.0017	0.026	0.002	0.995	0.000	-0.71	0.482
3/5	-0.0027	0.046	0.004	0.988	0.000	-0.61	0.543
4/5	-0.0010	0.021	0.002	0.998	0.000	-0.48	0.632

1982

1/2	0.0093	0.064	0.006	0.941	0.000	1.51	0.133
1/3	0.0151	0.108	0.010	0.653	0.000	1.46	0.148
1/4	0.0156	0.114	0.011	0.574	0.000	1.42	0.157
1/5	0.0168	0.124	0.012	0.420	0.000	1.42	0.159
2/3	0.0058	0.047	0.005	0.844	0.000	1.29	0.200
2/4	0.0063	0.055	0.005	0.765	0.000	1.20	0.234
2/5	0.0076	0.064	0.006	0.640	0.000	1.22	0.224
3/4	0.0005	0.011	0.001	0.981	0.000	0.46	0.648
3/5	0.0017	0.020	0.002	0.939	0.000	0.92	0.358
4/5	0.0012	0.010	0.001	0.982	0.000	1.25	0.216

1983

1/2	0.0022	0.037	0.004	0.857	0.000	0.62	0.536
1/3	0.0012	0.041	0.004	0.829	0.000	0.30	0.762
1/4	0.0033	0.037	0.004	0.859	0.000	0.92	0.357
1/5	0.0031	0.039	0.004	0.846	0.000	0.84	0.402
2/3	-0.0010	0.013	0.001	0.979	0.000	-0.82	0.413
2/4	0.0011	0.029	0.003	0.896	0.000	0.39	0.697
2/5	0.0009	0.032	0.003	0.869	0.000	0.29	0.774
3/4	0.0021	0.021	0.002	0.944	0.000	1.06	0.293
3/5	0.0019	0.024	0.002	0.922	0.000	0.83	0.411
4/5	-0.0002	0.007	0.001	0.992	0.000	-0.28	0.779

MAPE/FORECAST

1980

1/2	0.0091	0.056	0.005	0.840	0.000	1.71	0.091
1/3	0.0114	0.062	0.006	0.798	0.000	1.93	0.057
1/4	0.0077	0.060	0.006	0.807	0.000	1.32	0.188
1/5	0.0127	0.061	0.006	0.804	0.000	2.19	0.031
2/3	0.0022	0.034	0.003	0.933	0.000	0.68	0.497
2/4	-0.0015	0.041	0.004	0.905	0.000	-0.37	0.710
2/5	0.0036	0.043	0.004	0.894	0.000	0.88	0.383
3/4	-0.0037	0.022	0.002	0.971	0.000	-1.76	0.081
3/5	0.0014	0.028	0.003	0.951	0.000	0.50	0.616
4/5	0.0051	0.014	0.001	0.987	0.000	3.67	0.000

1981

1/2	0.0236	0.088	0.008	0.862	0.000	2.80	0.006
1/3	0.0303	0.100	0.010	0.820	0.000	3.16	0.002
1/4	0.0314	0.106	0.010	0.790	0.000	3.08	0.003
1/5	0.0356	0.118	0.011	0.726	0.000	3.16	0.002
2/3	0.0066	0.033	0.003	0.959	0.000	2.08	0.040
2/4	0.0078	0.048	0.005	0.908	0.000	1.68	0.097
2/5	0.0120	0.059	0.006	0.863	0.000	2.13	0.036
3/4	0.0011	0.027	0.003	0.964	0.000	0.44	0.663
3/5	0.0053	0.038	0.004	0.931	0.000	1.47	0.144
4/5	0.0042	0.022	0.002	0.975	0.000	1.96	0.053

1982

1/2	0.0288	0.179	0.017	0.993	0.000	1.68	0.095
1/3	0.0814	0.618	0.059	0.706	0.000	1.37	0.172
1/4	0.0848	0.645	0.062	0.586	0.000	1.37	0.172
1/5	0.0883	0.679	0.065	0.365	0.000	1.36	0.177
2/3	0.0526	0.448	0.043	0.759	0.000	1.22	0.223
2/4	0.0560	0.475	0.045	0.645	0.000	1.23	0.221
2/5	0.0595	0.509	0.049	0.434	0.000	1.22	0.225
3/4	0.0034	0.033	0.003	0.977	0.000	1.06	0.289
3/5	0.0069	0.065	0.006	0.900	0.000	1.11	0.269
4/5	0.0035	0.037	0.004	0.961	0.000	0.99	0.326

1983

1/2	0.0004	0.134	0.013	0.708	0.000	0.03	0.978
1/3	-0.0056	0.136	0.013	0.698	0.000	-0.43	0.668
1/4	0.0050	0.105	0.010	0.796	0.000	0.49	0.623
1/5	0.0052	0.110	0.011	0.773	0.000	0.49	0.626
2/3	-0.0060	0.038	0.004	0.977	0.000	-1.63	0.106
2/4	0.0046	0.089	0.009	0.867	0.000	0.54	0.591
2/5	0.0048	0.100	0.010	0.828	0.000	0.50	0.618
3/4	0.0106	0.072	0.007	0.917	0.000	1.54	0.127
3/5	0.0108	0.084	0.008	0.883	0.000	1.34	0.183
4/5	0.0002	0.023	0.002	0.989	0.000	0.09	0.926

MSE/FORECAST

1980

1/2	0.0027	0.016	0.002	0.964	0.000	1.75	0.083
1/3	0.0040	0.020	0.002	0.950	0.000	2.09	0.039
1/4	0.0033	0.019	0.002	0.953	0.000	1.79	0.077
1/5	0.0043	0.017	0.002	0.961	0.000	2.65	0.009
2/3	0.0013	0.013	0.001	0.976	0.000	1.01	0.317
2/4	0.0005	0.013	0.001	0.974	0.000	0.42	0.676
2/5	0.0016	0.012	0.001	0.978	0.000	1.39	0.166
3/4	-0.0007	0.005	0.000	0.996	0.000	-1.60	0.112
3/5	0.0003	0.009	0.001	0.989	0.000	0.38	0.701
4/5	0.0011	0.006	0.001	0.995	0.000	1.88	0.062

1981							
1/2	0.0190	0.119	0.011	0.807	0.000	1.67	0.099
1/3	0.0228	0.128	0.012	0.792	0.000	1.87	0.064
1/4	0.0240	0.133	0.013	0.753	0.000	1.89	0.062
1/5	0.0263	0.142	0.014	0.625	0.000	1.93	0.056
2/3	0.0039	0.016	0.002	0.979	0.000	2.45	0.016
2/4	0.0050	0.026	0.002	0.926	0.000	2.00	0.048
2/5	0.0073	0.035	0.003	0.845	0.000	2.16	0.033
3/4	0.0011	0.014	0.001	0.958	0.000	0.83	0.407
3/5	0.0034	0.022	0.002	0.901	0.000	1.64	0.104
4/5	0.0023	0.012	0.001	0.970	0.000	2.06	0.042
1982							
1/2	0.2144	2.208	0.212	1.000	0.000	1.01	0.313
1/3	0.5046	5.166	0.495	0.744	0.000	1.02	0.310
1/4	0.5091	5.210	0.499	0.503	0.000	1.02	0.310
1/5	0.5127	5.245	0.502	0.135	0.162	1.02	0.310
2/3	0.2902	2.958	0.283	0.755	0.000	1.02	0.308
2/4	0.2947	3.001	0.287	0.518	0.000	1.03	0.308
2/5	0.2983	3.037	0.291	0.152	0.115	1.03	0.307
3/4	0.0046	0.044	0.004	0.951	0.000	1.09	0.280
3/5	0.0082	0.079	0.008	0.761	0.000	1.07	0.285
4/5	0.0036	0.036	0.003	0.924	0.000	1.06	0.294
1983							
1/2	-0.0026	0.152	0.015	0.753	0.000	-0.18	0.857
1/3	-0.0038	0.140	0.013	0.789	0.000	-0.29	0.776
1/4	0.0064	0.068	0.006	0.944	0.000	0.99	0.325
1/5	0.0074	0.068	0.007	0.943	0.000	1.14	0.258
2/3	-0.0012	0.021	0.002	0.996	0.000	-0.60	0.551
2/4	0.0090	0.125	0.012	0.834	0.000	0.76	0.452
2/5	0.0100	0.130	0.012	0.815	0.000	0.80	0.424
3/4	0.0102	0.108	0.010	0.875	0.000	0.99	0.326
3/5	0.0112	0.114	0.011	0.858	0.000	1.02	0.308
4/5	0.0010	0.013	0.001	0.999	0.000	0.79	0.429

Appendix 10.

ERRORS FOR PERCENTAGE CHANGE FORECASTS OF TURNOVER.

SPEARMAN CORRELATION COEEFICIENTS.

MAPE/ACTUAL AND MSE/ACTUAL.

	2 yr.	3 yr.	4 yr.	5 yr.
1980				
1 yr.	0.7136	0.6003	0.5688	0.4817
2 yr.		0.8723	0.7538	0.6524
3 yr.			0.8774	0.7380
4 yr.				0.8709
1981				
	0.6569	0.4144	0.3363	0.1482 (.062)
		0.7778	0.6953	0.4797
			0.8704	0.6417
				0.7688
1982				
	0.5797	0.5333	0.4568	0.4003
		0.7712	0.6119	0.4916
			0.7952	0.6407
				0.8605
1983				
	0.3799	0.5545	0.4972	0.4483
		0.3967	0.3727	0.3183
			0.8228	0.7008
				0.8999

MAPE/FORECAST AND MSE/FORECAST.

1980				
	0.6828	0.5749	0.5616	0.4704
		0.8635	0.7414	0.6372
			0.8660	0.7156
				0.8620
1981				
	0.6549	0.4254	0.3358	0.1391 (.075)
		0.7732	0.6871	0.4660
			0.8595	0.6077
				0.7495
1982				
	0.5892	0.5352	0.4501	0.3963
		0.7780	0.6104	0.4944
			0.8011	0.6498
				0.8623

1983

0.3825	0.5611	0.4997	0.4381
	0.3836	0.3490	0.2996
		0.8155	0.6733
			0.8968

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	(DIFFERENCE) MEAN	STANDARD DEVIATION	STANDARD ERROR	CORR.	2-TAIL PROB.	T VALUE	2-TAIL PROB.
<u>MAPE/ACTUAL</u>							
1980							
1/2	0.0022	0.075	0.007	0.838	0.000	0.31	0.759
1/3	-0.0028	0.099	0.009	0.694	0.000	-0.30	0.767
1/4	-0.0458	0.113	0.011	0.688	0.000	-4.23	0.000
1/5	-0.0579	0.121	0.012	0.620	0.000	-5.00	0.000
2/3	-0.0050	0.055	0.005	0.906	0.000	-0.95	0.344
2/4	-0.0480	0.077	0.007	0.861	0.000	-6.55	0.000
2/5	-0.0601	0.090	0.009	0.787	0.000	-6.96	0.000
3/4	-0.0430	0.064	0.006	0.915	0.000	-7.02	0.000
3/5	-0.0551	0.080	0.008	0.832	0.000	-7.21	0.000
4/5	-0.0121	0.053	0.005	0.936	0.000	-2.37	0.020
1981							
1/2	0.0014	0.075	0.007	0.831	0.000	0.19	0.847
1/3	0.0030	0.095	0.009	0.726	0.000	0.33	0.742
1/4	-0.0062	0.101	0.010	0.726	0.000	-0.64	0.523
1/5	-0.0305	0.127	0.012	0.635	0.000	-2.51	0.014
2/3	0.0016	0.041	0.004	0.950	0.000	0.40	0.686
2/4	-0.0076	0.062	0.006	0.901	0.000	-1.27	0.206
2/5	-0.0319	0.095	0.009	0.809	0.000	-3.51	0.001
3/4	-0.0092	0.042	0.004	0.958	0.000	-2.30	0.024
3/5	-0.0335	0.081	0.008	0.869	0.000	-4.34	0.000
4/5	-0.0244	0.057	0.005	0.938	0.000	-4.47	0.000
1982							
1/2	0.0162	0.090	0.009	0.729	0.000	1.88	0.063
1/3	0.0129	0.091	0.009	0.725	0.000	1.48	0.141
1/4	0.0091	0.097	0.009	0.715	0.000	0.98	0.330
1/5	0.0061	0.115	0.011	0.630	0.000	0.55	0.582
2/3	-0.0033	0.050	0.005	0.910	0.000	-0.68	0.497
2/4	-0.0071	0.073	0.007	0.831	0.000	-1.01	0.314
2/5	-0.0101	0.082	0.008	0.808	0.000	-1.29	0.200
3/4	-0.0038	0.046	0.004	0.937	0.000	-0.88	0.383
3/5	-0.0069	0.066	0.006	0.879	0.000	-1.08	0.282
4/5	-0.0030	0.039	0.004	0.959	0.000	-0.81	0.422

1983

1/2	0.0052	0.076	0.007	0.827	0.000	0.72	0.476
1/3	-0.0028	0.099	0.010	0.710	0.000	-0.29	0.771
1/4	-0.0050	0.110	0.011	0.661	0.000	-0.47	0.640
1/5	-0.0093	0.116	0.011	0.623	0.000	-0.84	0.404
2/3	-0.0080	0.058	0.006	0.885	0.000	-1.44	0.154
2/4	-0.0102	0.070	0.007	0.848	0.000	-1.51	0.133
2/5	-0.0145	0.079	0.008	0.805	0.000	-1.93	0.057
3/4	-0.0022	0.046	0.004	0.939	0.000	-0.50	0.616
3/5	-0.0065	0.057	0.005	0.902	0.000	-1.19	0.235
4/5	-0.0043	0.041	0.004	0.951	0.000	-1.09	0.278

MSE/ACTUAL

1980

1/2	0.0012	0.045	0.004	0.822	0.000	0.29	0.771
1/3	0.0030	0.068	0.006	0.524	0.000	0.46	0.647
1/4	-0.0188	0.076	0.007	0.682	0.000	-2.57	0.012
1/5	-0.0211	0.077	0.007	0.622	0.000	-2.87	0.005
2/3	0.0017	0.037	0.004	0.868	0.000	0.49	0.622
2/4	-0.0201	0.048	0.005	0.912	0.000	-4.36	0.000
2/5	-0.0223	0.049	0.005	0.866	0.000	-4.80	0.000
3/4	-0.0218	0.058	0.006	0.894	0.000	-3.94	0.000
3/5	-0.0240	0.053	0.005	0.870	0.000	-4.78	0.000
4/5	-0.0022	0.027	0.003	0.969	0.000	-0.88	0.380

1981

1/2	-0.0012	0.063	0.006	0.779	0.000	-0.20	0.842
1/3	-0.0008	0.071	0.007	0.733	0.000	-0.12	0.907
1/4	-0.0062	0.079	0.008	0.795	0.000	-0.82	0.414
1/5	-0.0180	0.101	0.010	0.832	0.000	-1.86	0.066
2/3	0.0004	0.014	0.001	0.991	0.000	0.31	0.759
2/4	-0.0050	0.032	0.003	0.979	0.000	-1.61	0.111
2/5	-0.0168	0.072	0.007	0.923	0.000	-2.43	0.017
3/4	-0.0054	0.029	0.003	0.983	0.000	-1.97	0.052
3/5	-0.0173	0.070	0.007	0.925	0.000	-2.57	0.012
4/5	-0.0118	0.044	0.004	0.973	0.000	-2.80	0.006

1982

1/2	0.0055	0.046	0.004	0.715	0.000	1.25	0.212
1/3	0.0046	0.048	0.005	0.713	0.000	0.99	0.325
1/4	0.0008	0.046	0.004	0.790	0.000	0.19	0.850
1/5	-0.0021	0.061	0.006	0.706	0.000	-0.36	0.723
2/3	-0.0009	0.023	0.002	0.934	0.000	-0.41	0.684
2/4	-0.0046	0.042	0.004	0.826	0.000	-1.14	0.257
2/5	-0.0075	0.052	0.005	0.805	0.000	-1.50	0.136
3/4	-0.0037	0.030	0.003	0.917	0.000	-1.29	0.198
3/5	-0.0066	0.047	0.005	0.838	0.000	-1.46	0.146
4/5	-0.0029	0.027	0.003	0.953	0.000	-1.12	0.263

1983

1/2	0.0054	0.045	0.004	0.876	0.000	1.25	0.214
1/3	0.0025	0.059	0.006	0.764	0.000	0.44	0.662
1/4	-0.0002	0.070	0.007	0.677	0.000	-0.03	0.973
1/5	-0.0007	0.066	0.006	0.701	0.000	-0.12	0.906
2/3	-0.0029	0.030	0.003	0.916	0.000	-1.02	0.311
2/4	-0.0056	0.041	0.004	0.858	0.000	-1.43	0.156
2/5	-0.0061	0.038	0.004	0.856	0.000	-1.67	0.098
3/4	-0.0027	0.032	0.003	0.918	0.000	-0.89	0.373
3/5	-0.0032	0.022	0.002	0.956	0.000	-1.56	0.121
4/5	-0.0005	0.033	0.003	0.908	0.000	-0.16	0.871

<u>MAPE/FORECAST</u>

1980

1/2	0.0027	0.060	0.006	0.835	0.000	0.46	0.643
1/3	-0.0015	0.079	0.008	0.691	0.000	-0.19	0.849
1/4	-0.0283	0.094	0.009	0.583	0.000	-3.15	0.002
1/5	-0.0367	0.105	0.010	0.453	0.000	-3.66	0.000
2/3	-0.0041	0.045	0.004	0.895	0.000	-0.95	0.342
2/4	-0.0310	0.069	0.007	0.757	0.000	-4.68	0.000
2/5	-0.0394	0.085	0.008	0.610	0.000	-4.82	0.000
3/4	-0.0269	0.045	0.004	0.884	0.000	-6.19	0.000
3/5	-0.0353	0.066	0.006	0.728	0.000	-5.54	0.000
4/5	-0.0084	0.042	0.004	0.899	0.000	-2.07	0.041

1981

1/2	0.0145	0.083	0.008	0.836	0.000	1.83	0.070
1/3	0.0199	0.104	0.010	0.716	0.000	1.99	0.049
1/4	0.0152	0.109	0.010	0.680	0.000	1.46	0.148
1/5	0.0030	0.137	0.013	0.447	0.000	0.23	0.820
2/3	0.0054	0.041	0.004	0.932	0.000	1.37	0.174
2/4	0.0008	0.060	0.006	0.850	0.000	0.14	0.892
2/5	-0.0115	0.087	0.008	0.673	0.000	-1.38	0.171
3/4	-0.0046	0.038	0.004	0.931	0.000	-1.25	0.213
3/5	-0.0168	0.068	0.007	0.773	0.000	-2.57	0.012
4/5	-0.0122	0.053	0.005	0.860	0.000	-2.39	0.019

1982

1/2	0.0178	0.100	0.010	0.805	0.000	1.86	0.066
1/3	0.0230	0.118	0.011	0.713	0.000	2.04	0.043
1/4	0.0236	0.128	0.012	0.649	0.000	1.92	0.057
1/5	0.0235	0.138	0.013	0.584	0.000	1.78	0.078
2/3	0.0053	0.054	0.005	0.932	0.000	1.01	0.314
2/4	0.0058	0.073	0.007	0.865	0.000	0.84	0.405
2/5	0.0057	0.081	0.008	0.827	0.000	0.74	0.464
3/4	0.0006	0.035	0.003	0.958	0.000	0.16	0.870
3/5	0.0005	0.049	0.005	0.915	0.000	0.10	0.923
4/5	-0.0001	0.028	0.003	0.972	0.000	-0.03	0.973

1983

1/2	0.0074	0.071	0.007	0.892	0.000	1.09	0.280
1/3	0.0002	0.085	0.008	0.842	0.000	0.02	0.983
1/4	0.0024	0.093	0.009	0.808	0.000	0.27	0.790
1/5	0.0020	0.108	0.010	0.730	0.000	0.19	0.846
2/3	-0.0072	0.048	0.005	0.937	0.000	-1.58	0.118
2/4	-0.0050	0.058	0.006	0.909	0.000	-0.90	0.370
2/5	-0.0054	0.074	0.007	0.839	0.000	-0.76	0.447
3/4	0.0022	0.039	0.004	0.960	0.000	0.60	0.550
3/5	0.0018	0.059	0.006	0.901	0.000	0.33	0.746
4/5	-0.0004	0.040	0.004	0.961	0.000	-0.10	0.922

MSE/FORECAST

1980

1/2	0.0019	0.021	0.002	0.939	0.000	0.94	0.352
1/3	0.0033	0.043	0.004	0.702	0.000	0.80	0.428
1/4	-0.0047	0.055	0.005	0.420	0.000	-0.89	0.375
1/5	-0.0061	0.060	0.006	0.280	0.003	-1.06	0.290
2/3	0.0014	0.028	0.003	0.852	0.000	0.52	0.604
2/4	-0.0066	0.041	0.004	0.593	0.000	-1.67	0.097
2/5	-0.0079	0.046	0.004	0.453	0.000	-1.79	0.076
3/4	-0.0080	0.021	0.002	0.833	0.000	-4.00	0.000
3/5	-0.0093	0.026	0.002	0.700	0.000	-3.74	0.000
4/5	-0.0014	0.013	0.001	0.938	0.000	-1.10	0.272

1981

1/2	0.0125	0.071	0.007	0.815	0.000	1.84	0.069
1/3	0.0156	0.079	0.008	0.764	0.000	2.06	0.042
1/4	0.0149	0.083	0.008	0.733	0.000	1.88	0.063
1/5	0.0131	0.096	0.009	0.490	0.000	1.42	0.160
2/3	0.0031	0.016	0.002	0.972	0.000	2.09	0.039
2/4	0.0024	0.027	0.003	0.897	0.000	0.95	0.344
2/5	0.0006	0.042	0.004	0.692	0.000	0.14	0.887
3/4	-0.0007	0.017	0.002	0.938	0.000	-0.44	0.659
3/5	-0.0026	0.031	0.003	0.774	0.000	-0.86	0.393
4/5	-0.0018	0.020	0.002	0.898	0.000	-0.97	0.334

1982

1/2	0.0112	0.099	0.009	0.750	0.000	1.18	0.239
1/3	0.0185	0.114	0.011	0.660	0.000	1.69	0.093
1/4	0.0186	0.118	0.011	0.623	0.000	1.64	0.104
1/5	0.0187	0.122	0.012	0.589	0.000	1.60	0.113
2/3	0.0073	0.039	0.004	0.974	0.000	1.95	0.053
2/4	0.0074	0.047	0.005	0.946	0.000	1.63	0.106
2/5	0.0075	0.053	0.005	0.924	0.000	1.47	0.145
3/4	0.0001	0.013	0.001	0.988	0.000	0.08	0.938
3/5	0.0002	0.020	0.002	0.969	0.000	0.09	0.925
4/5	0.0001	0.011	0.001	0.990	0.000	0.08	0.934

1983

1/2	0.0078	0.046	0.004	0.988	0.000	1.78	0.078
1/3	0.0065	0.054	0.005	0.981	0.000	1.24	0.217
1/4	0.0063	0.054	0.005	0.977	0.000	1.21	0.230
1/5	0.0110	0.107	0.010	0.952	0.000	1.07	0.287
2/3	-0.0013	0.017	0.002	0.994	0.000	-0.85	0.398
2/4	-0.0015	0.018	0.002	0.992	0.000	-0.87	0.384
2/5	0.0032	0.067	0.006	0.971	0.000	0.49	0.623
3/4	-0.0002	0.011	0.001	0.997	0.000	-0.18	0.858
3/5	0.0045	0.059	0.006	0.983	0.000	0.80	0.427
4/5	0.0047	0.061	0.006	0.987	0.000	0.81	0.422

Appendix 11.

ERRORS FOR MOVING AVERAGE FORECASTS OF TURNOVER.

SPEARMAN CORRELATION COEFFICIENTS

MAPE/ACTUAL AND MSE/ACTUAL.

	3 yr.	4 yr.	5 yr.	6 yr.
1980				
2 yr.	0.9344	0.8188	0.7213	0.6557
3 yr.		0.9523	0.8785	0.8231
4 yr.			0.9730	0.9363
5 yr.				0.9880
1981				
	0.9225	0.8716	0.8250	0.7957
		0.9766	0.9347	0.8977
			0.9809	0.9484
				0.9869
1982				
	0.9489	0.8731	0.8114	0.7577
		0.9620	0.9141	0.8670
			0.9831	0.9516
				0.9861
1983				
	0.9375	0.8583	0.7393	0.7059
		0.9706	0.8838	0.8570
			0.9466	0.9341
				0.9830

MAPE/FORECAST AND MSE/FORECAST.

1980				
	0.9340	0.8143	0.6781	0.6029
		0.9460	0.8383	0.7712
			0.9531	0.9051
				0.9871
1981				
	0.9017	0.8450	0.8028	0.7775
		0.9723	0.9286	0.8912
			0.9801	0.9466
				0.9868
1982				
	0.9570	0.8948	0.8040	0.7384
		0.9676	0.8852	0.8218
			0.9551	0.9046
				0.9834

1983

	0.9484	0.8687	0.7246	0.6962
		0.9646	0.8468	0.8268
			0.9262	0.9186
				0.9809

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	(DIFFERENCE) MEAN	STANDARD DEVIATION	STANDARD ERROR	CORR.	2-TAIL PROB.	T VALUE	2-TAIL PROB.
MAPE/ACTUAL							
1980							
2/3	-0.0628	0.051	0.005	0.965	0.000	-12.96	0.000
2/4	-0.1269	0.098	0.009	0.909	0.000	-13.54	0.000
2/5	-0.2126	0.146	0.014	0.857	0.000	-15.16	0.000
2/6	-0.3060	0.191	0.018	0.830	0.000	-16.74	0.000
3/4	-0.0641	0.054	0.005	0.976	0.000	-12.29	0.000
3/5	-0.1499	0.105	0.010	0.940	0.000	-14.83	0.000
3/6	-0.2432	0.152	0.015	0.915	0.000	-16.73	0.000
4/5	-0.0857	0.055	0.005	0.988	0.000	-16.28	0.000
4/6	-0.1791	0.104	0.010	0.970	0.000	-18.02	0.000
5/6	-0.0934	0.052	0.005	0.994	0.000	-18.81	0.000
1981							
2/3	-0.0506	0.059	0.006	0.937	0.000	-9.02	0.000
2/4	-0.1125	0.096	0.009	0.885	0.000	-12.24	0.000
2/5	-0.1775	0.130	0.012	0.839	0.000	-14.26	0.000
2/6	-0.2615	0.169	0.016	0.802	0.000	-16.20	0.000
3/4	-0.0619	0.046	0.004	0.979	0.000	-14.03	0.000
3/5	-0.1269	0.086	0.008	0.941	0.000	-15.40	0.000
3/6	-0.2109	0.128	0.012	0.903	0.000	-17.18	0.000
4/5	-0.0649	0.045	0.004	0.985	0.000	-15.02	0.000
4/6	-0.1489	0.090	0.009	0.957	0.000	-17.33	0.000
5/6	-0.0840	0.480	0.005	0.990	0.000	-18.36	0.000
1982							
2/3	-0.0381	0.047	0.005	0.954	0.000	-8.47	0.000
2/4	-0.0926	0.086	0.008	0.886	0.000	-11.29	0.000
2/5	-0.1521	0.123	0.012	0.818	0.000	-12.93	0.000
2/6	-0.2149	0.159	0.015	0.759	0.000	-14.15	0.000
3/4	-0.0545	0.046	0.004	0.973	0.000	-12.28	0.000
3/5	-0.1140	0.086	0.008	0.929	0.000	-13.81	0.000
3/6	-0.1767	0.124	0.012	0.883	0.000	-14.94	0.000
4/5	-0.0595	0.043	0.004	0.985	0.000	-14.34	0.000
4/6	-0.1223	0.084	0.008	0.955	0.000	-15.25	0.000
5/6	-0.0628	0.044	0.004	0.989	0.000	-14.91	0.000

1983

2/3	-0.0502	0.063	0.006	0.982	0.000	-8.36	0.000
2/4	-0.0930	0.100	0.010	0.962	0.000	-9.68	0.000
2/5	-0.1849	0.162	0.016	0.933	0.000	-11.90	0.000
2/6	-0.2065	0.186	0.018	0.919	0.000	-11.61	0.000
3/4	-0.0429	0.046	0.004	0.992	0.000	-9.72	0.000
3/5	-0.1347	0.115	0.011	0.967	0.000	-12.28	0.000
3/6	-0.1563	0.139	0.013	0.955	0.000	-11.73	0.000
4/5	-0.0919	0.077	0.007	0.986	0.000	-12.49	0.000
4/6	-0.1135	0.100	0.010	0.980	0.000	-11.91	0.000
5/6	-0.0216	0.040	0.004	0.995	0.000	-5.61	0.000

MSE/ACTUAL

1980

2/3	-0.0139	0.013	0.001	0.962	0.000	-11.05	0.000
2/4	-0.0295	0.026	0.002	0.892	0.000	-12.02	0.000
2/5	-0.0514	0.039	0.004	0.807	0.000	-13.74	0.000
2/6	-0.0764	0.050	0.005	0.747	0.000	-15.83	0.000
3/4	-0.0156	0.014	0.001	0.972	0.000	-11.48	0.000
3/5	-0.0376	0.028	0.003	0.916	0.000	-13.91	0.000
3/6	-0.0625	0.040	0.004	0.867	0.000	-16.32	0.000
4/5	-0.0220	0.015	0.001	0.980	0.000	-15.22	0.000
4/6	-0.0469	0.027	0.003	0.948	0.000	-17.82	0.000
5/6	-0.0249	0.013	0.001	0.991	0.000	-19.94	0.000

1981

2/3	-0.0123	0.018	0.002	0.997	0.000	-7.26	0.000
2/4	-0.0288	0.038	0.004	0.994	0.000	-7.92	0.000
2/5	-0.0446	0.041	0.004	0.987	0.000	-11.38	0.000
2/6	-0.0647	0.047	0.004	0.972	0.000	-14.43	0.000
3/4	-0.0165	0.022	0.002	0.999	0.000	-7.75	0.000
3/5	-0.0323	0.026	0.002	0.995	0.000	-13.04	0.000
3/6	-0.0524	0.038	0.004	0.983	0.000	-14.44	0.000
4/5	-0.0158	0.015	0.001	0.998	0.000	-11.24	0.000
4/6	-0.0359	0.041	0.004	0.990	0.000	-9.22	0.000
5/6	-0.0201	0.028	0.003	0.996	0.000	-7.56	0.000

1982

2/3	-0.0144	0.064	0.006	0.880	0.000	-2.36	0.020
2/4	-0.0305	0.097	0.009	0.826	0.000	-3.27	0.001
2/5	-0.0487	0.130	0.012	0.790	0.000	-3.92	0.000
2/6	-0.0661	0.140	0.013	0.775	0.000	-4.94	0.000
3/4	-0.0161	0.035	0.003	0.992	0.000	-4.84	0.000
3/5	-0.0343	0.067	0.006	0.981	0.000	-5.30	0.000
3/6	-0.0516	0.079	0.008	0.971	0.000	-6.85	0.000
4/5	-0.0182	0.033	0.003	0.997	0.000	-5.70	0.000
4/6	-0.0356	0.045	0.004	0.991	0.000	-8.21	0.000
5/6	-0.0174	0.014	0.001	0.998	0.000	-12.58	0.000

1983

2/3	-0.0161	0.045	0.004	0.891	0.000	-3.71	0.000
2/4	-0.0320	0.113	0.011	0.595	0.000	-2.97	0.004
2/5	-0.0562	0.153	0.015	0.446	0.000	-3.83	0.000
2/6	-0.0669	0.207	0.020	0.334	0.000	-3.37	0.001
3/4	-0.0159	0.071	0.007	0.884	0.000	-2.35	0.021
3/5	-0.0401	0.114	0.011	0.783	0.000	-3.69	0.000
3/6	-0.0508	0.167	0.016	0.701	0.000	-3.17	0.002
4/5	-0.0242	0.045	0.004	0.978	0.000	-5.56	0.000
4/6	-0.0349	0.098	0.009	0.950	0.000	-3.73	0.000
5/6	-0.0107	0.055	0.005	0.990	0.000	-2.01	0.047

<u>MAPE/FORECAST</u>

1980

2/3	-0.0628	0.051	0.005	0.965	0.000	-12.96	0.000
2/4	-0.1269	0.098	0.009	0.909	0.000	-13.54	0.000
2/5	-0.2126	0.146	0.014	0.857	0.000	-15.16	0.000
2/6	-0.3060	0.191	0.018	0.830	0.000	-16.74	0.000
3/4	-0.0641	0.054	0.005	0.976	0.000	-12.29	0.000
3/5	-0.1499	0.105	0.010	0.940	0.000	-14.83	0.000
3/6	-0.2432	0.152	0.015	0.915	0.000	-16.73	0.000
4/5	-0.0857	0.055	0.005	0.988	0.000	-16.28	0.000
4/6	-0.1791	0.104	0.010	0.970	0.000	-18.02	0.000
5/6	-0.0934	0.052	0.005	0.994	0.000	-18.81	0.000

1981

2/3	-0.0506	0.059	0.006	0.937	0.000	-9.02	0.000
2/4	-0.1125	0.096	0.009	0.895	0.000	-12.24	0.000
2/5	-0.1775	0.130	0.012	0.839	0.000	-14.26	0.000
2/6	-0.2615	0.169	0.016	0.802	0.000	-16.20	0.000
3/4	-0.0619	0.046	0.004	0.979	0.000	-14.03	0.000
3/5	-0.1269	0.086	0.008	0.941	0.000	-15.40	0.000
3/6	-0.2109	0.128	0.012	0.903	0.000	-17.18	0.000
4/5	-0.0649	0.045	0.004	0.985	0.000	-15.02	0.000
4/6	-0.1489	0.090	0.009	0.957	0.000	-17.33	0.000
5/6	-0.0840	0.048	0.005	0.990	0.000	-18.36	0.000

1982

2/3	-0.0381	0.047	0.005	0.954	0.000	-8.47	0.000
2/4	-0.0926	0.086	0.008	0.886	0.000	-11.29	0.000
2/5	-0.1521	0.123	0.012	0.818	0.000	-12.93	0.000
2/6	-0.2149	0.159	0.015	0.759	0.000	-14.15	0.000
3/4	-0.0545	0.046	0.004	0.973	0.000	-12.28	0.000
3/5	-0.1140	0.086	0.008	0.929	0.000	-13.81	0.000
3/6	-0.1767	0.124	0.012	0.883	0.000	-14.94	0.000
4/5	-0.0595	0.043	0.004	0.985	0.000	-14.34	0.000
4/6	-0.1223	0.084	0.008	0.955	0.000	-15.25	0.000
5/6	-0.0628	0.044	0.004	0.989	0.000	-14.91	0.000

1983

2/3	-0.0502	0.063	0.006	0.982	0.000	-8.36	0.000
2/4	-0.0930	0.100	0.010	0.962	0.000	-9.68	0.000
2/5	-0.1849	0.162	0.016	0.933	0.000	-11.90	0.000
2/6	-0.2065	0.186	0.018	0.919	0.000	-11.61	0.000
3/4	-0.0429	0.046	0.004	0.992	0.000	-9.72	0.000
3/5	-0.1347	0.115	0.011	0.967	0.000	-12.28	0.000
3/6	-0.1563	0.139	0.013	0.955	0.000	-11.73	0.000
4/5	-0.0919	0.077	0.007	0.986	0.000	-12.49	0.000
4/6	-0.1135	0.100	0.010	-0.980	0.000	-11.91	0.000
5/6	-0.0216	0.040	0.004	0.995	0.000	-5.61	0.000

<u>MSE/FORECAST</u>

1980

2/3	-0.0322	0.058	0.006	0.991	0.000	-5.78	0.000
2/4	-0.0776	0.159	0.015	0.980	0.000	-5.10	0.000
2/5	-0.1520	0.304	0.029	0.970	0.000	-5.23	0.000
2/6	-0.2523	0.491	0.047	0.967	0.000	-5.37	0.000
3/4	-0.0454	0.103	0.010	0.995	0.000	-4.62	0.000
3/5	-0.1198	0.248	0.024	0.988	0.000	-5.05	0.000
3/6	-0.2201	0.435	0.042	0.984	0.000	-5.28	0.000
4/5	-0.0744	0.146	0.014	0.998	0.000	-5.32	0.000
4/6	-0.1747	0.334	0.032	0.995	0.000	-5.47	0.000
5/6	-0.1003	0.188	0.018	0.999	0.000	-5.56	0.000

1981

2/3	-0.0268	0.054	0.005	0.922	0.000	-5.18	0.000
2/4	-0.0656	0.116	0.011	0.862	0.000	-5.92	0.000
2/5	-0.1150	0.195	0.019	0.814	0.000	-6.17	0.000
2/6	-0.1932	0.311	0.030	0.778	0.000	-6.49	0.000
3/4	-0.0388	0.064	0.006	0.981	0.000	-6.30	0.000
3/5	-0.0883	0.145	0.014	0.948	0.000	-6.34	0.000
3/6	-0.1664	0.262	0.025	0.921	0.000	-6.63	0.000
4/5	-0.0494	0.084	0.008	0.986	0.000	-6.15	0.000
4/6	-0.1276	0.201	0.019	0.970	0.000	-6.64	0.000
5/6	-0.0782	0.118	0.011	0.995	0.000	-6.91	0.000

1982

2/3	-0.0183	0.034	0.003	0.960	0.000	-5.54	0.000
2/4	-0.0533	0.081	0.008	0.879	0.000	-6.85	0.000
2/5	-0.0996	0.140	0.013	0.796	0.000	-7.45	0.000
2/6	-0.1576	0.215	0.021	0.718	0.000	-7.66	0.000
3/4	-0.0350	0.053	0.005	0.970	0.000	-6.85	0.000
3/5	-0.0813	0.113	0.011	0.918	0.000	-7.50	0.000
3/6	-0.1393	0.189	0.018	0.861	0.000	-7.69	0.000
4/5	-0.0463	0.062	0.006	0.984	0.000	-7.82	0.000
4/6	-0.1043	0.139	0.013	0.950	0.000	-7.83	0.000
5/6	-0.0580	0.079	0.008	0.989	0.000	-7.69	0.000

1983

2/3	-0.0416	0.130	0.012	0.994	0.000	-3.34	0.001
2/4	-0.0793	0.247	0.024	0.994	0.000	-3.35	0.001
2/5	-0.1730	0.509	0.049	0.992	0.000	-3.55	0.001
2/6	-0.2032	0.590	0.057	0.989	0.000	-3.60	0.000
3/4	-0.0377	0.122	0.012	0.999	0.000	-3.22	0.002
3/5	-0.1315	0.389	0.037	0.995	0.000	-3.53	0.001
3/6	-0.1617	0.469	0.045	0.992	0.000	-3.60	0.000
4/5	-0.0938	0.267	0.026	0.998	0.000	-3.66	0.000
4/6	-0.1240	0.348	0.033	0.996	0.000	-3.71	0.000
5/6	-0.0302	0.090	0.009	0.999	0.000	-3.51	0.001

Appendix 12.

ERROR TERMS FOR TURNOVER FORECASTS BASED UPON EXPONENTIAL SMOOTHING MODELS.

SPEARMAN CORRELATION COEFFICIENTS.

MAPE/ACTUAL AND MSE/ACTUAL

1980

	0.90	0.85	0.80	0.75	0.70	0.65	0.60	0.55	0.50
0.95	.9888	.9650	.9314	.8942	.8549	.8058	.7609	.7294	.7008
0.90		.9914	.9687	.9376	.9015	.8547	.8109	.7772	.7454
0.85			.9902	.9682	.9387	.8983	.8572	.8230	.7905
0.80				.9913	.9718	.9400	.9057	.8736	.8420
0.75					.9929	.9719	.9451	.9179	.8880
0.70						.9909	.9724	.9509	.9260
0.65							.9924	.9784	.9593
0.60								.9945	.9822
0.55									.9947

	0.45	0.40	0.35	0.30	0.25	0.20	0.15	0.10	0.05
0.95	.6634	.6106	.5544	.5178	.4782	.4502	.4218	.3898	.3507
0.90	.7051	.6496	.5897	.5480	.5047	.4711	.4381	.4015	.3560
0.85	.7491	.6921	.6295	.5824	.5354	.4649	.4596	.4178	.3656
0.80	.8004	.7425	.6781	.6262	.5758	.5337	.4931	.4472	.3902
0.75	.8492	.7936	.7285	.6737	.6204	.5758	.5325	.4824	.4200
0.70	.8891	.8364	.7732	.7181	.6635	.6187	.5746	.5230	.4581
0.65	.9282	.8813	.8219	.7680	.7129	.6690	.6251	.5729	.5075
0.60	.9569	.9153	.8622	.8113	.7575	.7147	.6717	.6188	.5516
0.55	.9775	.9432	.8967	.8507	.7997	.7592	.7176	.6650	.5970
0.50	.9921	.9661	.9277	.8877	.8409	.8039	.7648	.7143	.6476
0.45		.9877	.9600	.9282	.8887	.8556	.8201	.7723	.7077
0.40			.9897	.9701	.9419	.9145	.8819	.8370	.7741
0.35				.9991	.9915	.9559	.9276	.8871	.8273
0.30					.9935	.9807	.9595	.9260	.8719
0.25						.9945	.9804	.9541	.9061
0.20							.9942	.9761	.9373
0.15								.9924	.9652
0.10									.9882

1981

	0.90	0.85	0.80	0.75	0.70	0.65	0.60	0.55	0.50
0.95	.9957	.9869	.9753	.9531	.9280	.8950	.8493	.8176	.7757
0.90		.9963	.9887	.9720	.9505	.9212	.8791	.8486	.8082
0.85			.9971	.9867	.9706	.9466	.9101	.8826	.8452
0.80				.9944	.9828	.9635	.9324	.9082	.8742
0.75					.9953	.9833	.9599	.9399	.9101
0.70						.9946	.9781	.9622	.9375
0.65							.9926	.9815	.9622
0.60								.9962	.9854
0.55									.9951

	0.45	0.40	0.35	0.30	0.25	0.20	0.15	0.10	0.05
0.95	.7499	.7377	.7197	.6993	.6765	.6523	.6290	.6000	.5484
0.90	.7830	.7711	.7527	.7329	.7104	.6858	.6609	.6292	.5755
0.85	.8219	.8102	.7919	.7721	.7490	.7229	.6953	.6602	.6017
0.80	.8524	.8420	.8247	.8053	.7828	.7562	.7280	.6915	.6318
0.75	.8909	.8805	.8629	.8439	.8212	.7936	.7630	.7216	.6580
0.70	.9204	.9092	.8922	.8739	.8518	.8235	.7917	.7489	.6827
0.65	.9478	.9363	.9197	.9023	.8807	.8518	.8189	.7744	.7066
0.60	.9747	.9636	.9486	.9327	.9117	.8832	.8491	.8034	.7338
0.55	.9879	.9785	.9659	.9517	.9325	.9056	.8717	.8266	.7566
0.50	.9970	.9897	.9805	.9689	.9522	.9274	.8945	.8511	.7811
0.45		.9960	.9887	.9792	.9644	.9422	.9110	.8685	.7990
0.40			.9965	.9897	.9775	.9586	.9310	.8904	.8232
0.35				.9973	.9897	.9753	.9518	.9157	.8510
0.30					.9966	.9866	.9672	.9351	.8739
0.25						.9955	.9822	.9562	.9008
0.20							.9939	.9757	.9287
0.15								.9919	.9592
0.10									.9824

1982

	0.90	0.85	0.80	0.75	0.70	0.65	0.60	0.55	0.50
0.95	.9902	.9783	.9666	.9494	.9321	.9099	.8814	.8583	.8236
0.90		.9961	.9890	.9770	.9637	.9445	.9192	.8979	.8659
0.85			.9972	.9898	.9802	.9646	.9430	.9239	.8953
0.80				.9966	.9900	.9773	.9588	.9418	.9164
0.75					.9975	.9897	.9761	.9624	.9416
0.70						.9964	.9869	.9758	.9582
0.65							.9962	.9894	.9763
0.60								.9975	.9897
0.55									.9960

	0.45	0.40	0.35	0.30	0.25	0.20	0.15	0.10	0.05
0.95	.7916	.7519	.6895	.6236	.5598	.5141	.4794	.4503	.4052
0.90	.8355	.7961	.7345	.6686	.6041	.5572	.5208	.4903	.4414
0.85	.8668	.8288	.7682	.7027	.6375	.5898	.5520	.5201	.4692
0.80	.8899	.8531	.7936	.7282	.6627	.6148	.5761	.5430	.4901
0.75	.9185	.8839	.8262	.7609	.6943	.6461	.6057	.5698	.5127
0.70	.9379	.9057	.8505	.7866	.7205	.6720	.6307	.5930	.5328
0.65	.9599	.9310	.8787	.8164	.7506	.7029	.6615	.6216	.5583
0.60	.9775	.9521	.9029	.8430	.7771	.7299	.6879	.6457	.5789
0.55	.9872	.9652	.9193	.8622	.7972	.7506	.7088	.6655	.5976
0.50	.9958	.9784	.9376	.8848	.8230	.7782	.7376	.6943	.6264
0.45		.9915	.9598	.9144	.8581	.8154	.7751	.7313	.6624
0.40			.9856	.9532	.9082	.8694	.8300	.7856	.7153
0.35				.9890	.9623	.9318	.8963	.8546	.7865
0.30					.9901	.9690	.9402	.9034	.8408
0.25						.9911	.9719	.9433	.8887
0.20							.9934	.9746	.9305
0.15								.9919	.9600
0.10									.9863

1983

	0.90	0.85	0.80	0.75	0.70	0.65	0.60	0.55	0.50
0.95	.9952	.9834	.9645	.9374	.9103	.8870	.8617	.8460	.8307
0.90		.9950	.9819	.9605	.9367	.9155	.8914	.8759	.8612
0.85			.9946	.9804	.9622	.9446	.9235	.9080	.8937
0.80				.9944	.9829	.9690	.9507	.9367	.9228
0.75					.9957	.9875	.9746	.9628	.9503
0.70						.9968	.9886	.9790	.9669
0.65							.9964	.9894	.9793
0.60								.9960	.9883
0.55									.9967

	0.45	0.40	0.35	0.30	0.25	0.20	0.15	0.10	0.05
0.95	.8039	.7712	.7191	.6560	.5659	.5218	.4562	.4079	.3714
0.90	.8359	.8045	.7535	.6919	.6331	.5582	.4902	.4397	.4009
0.85	.8699	.8384	.7867	.7242	.6639	.5879	.5177	.4649	.4217
0.80	.8997	.8681	.8159	.7517	.6899	.6132	.4966	.4506	.4409
0.75	.9291	.8987	.8466	.7822	.7195	.6420	.5695	.5133	.4614
0.70	.9467	.9163	.8623	.7979	.7337	.6554	.5819	.5240	.4688
0.65	.9617	.9331	.8814	.8167	.7525	.6736	.5996	.5399	.4816
0.60	.9733	.9465	.8964	.8333	.7996	.6904	.6152	.5536	.4913
0.55	.9858	.9638	.9199	.8605	.7991	.7207	.6466	.5834	.5186
0.50	.9949	.9783	.9416	.8873	.8294	.7535	.6809	.6177	.5514
0.45		.9920	.9656	.9203	.8674	.7951	.7242	.6600	.5911
0.40			.9885	.9573	.9134	.8463	.7773	.7115	.6420
0.35				.9879	.9569	.8998	.8363	.7699	.7010
0.30					.9879	.9487	.8941	.8302	.7631
0.25						.9840	.9433	.8858	.8234
0.20							.9796	.9350	.8816
0.15								.9849	.9487
0.10									.9838

<u>MAPE/FORECAST</u> <u>AND</u> <u>MSE/FORECAST.</u>

1980

	0.90	0.85	0.80	0.75	0.70	0.65	0.60	0.55	0.50
0.95	.9906	.9697	.9378	.9069	.8712	.8255	.7880	.7531	.7173
0.90		.9921	.9703	.9442	.9113	.8678	.8310	.7942	.7564
0.85			.9901	.9717	.9452	.9074	.8723	.8359	.7985
0.80				.9930	.9761	.9471	.9177	.8846	.8494
0.75					.9936	.9740	.9508	.9233	.8918
0.70						.9917	.9750	.9533	.9269
0.65							.9930	.9783	.9567
0.60								.9940	.9795
0.55									.9937

	0.45	0.40	0.35	0.30	0.25	0.20	0.15	0.10	0.05
0.90	.7117	.6691	.6284	.5901	.5510	.5172	.4818	.4423	.3936
0.85	.7534	.7094	.6661	.6241	.5826	.5446	.5054	.4615	.4064
0.80	.8048	.7599	.7150	.6688	.6246	.5827	.5400	.4918	.4316
0.75	.8502	.8079	.7631	.7157	.6701	.6268	.5823	.5308	.4660
0.70	.8889	.8497	.8062	.7588	.7127	.6697	.6243	.5715	.5046
0.65	.9234	.8894	.8487	.8029	.7568	.7149	.6702	.6166	.5489
0.60	.9528	.9241	.8893	.8472	.8034	.7630	.7191	.6652	.5964
0.55	.9759	.9537	.9247	.8879	.8478	.8098	.7677	.7144	.6454
0.50	.9929	.9778	.9558	.9251	.8898	.8553	.8155	.7645	.6967
0.45		.9941	.9806	.9580	.9294	.8992	.8632	.8156	.7503
0.40			.9942	.9799	.9580	.9329	.9004	.8560	.7931
0.35				.9938	.9796	.9601	.9320	.8921	.8329
0.30					.9944	.9821	.9608	.9273	.8730
0.25						.9946	.9806	.9543	.9063
0.20							.9942	.9761	.9373
0.15								.9924	.9652
0.10									.9882

1981

	0.95	0.90	0.85	0.80	0.75	0.70	0.65	0.60	0.55
0.95	.9970	.9902	.9794	.9628	.9425	.9160	.8850	.8583	.8245
0.90		.9971	.9901	.9774	.9601	.9365	.9084	.8835	.8512
0.85			.9972	.9888	.9756	.9558	.9311	.9085	.8784
0.80				.9964	.9899	.9868	.9717	.9509	.9308
0.75					.9960	.9860	.9699	.9556	.9291
0.70						.9976	.9837	.9706	.9508
0.65							.9952	.9866	.9719
0.60								.9967	.9877
0.55									.9959

	0.45	0.40	0.35	0.30	0.25	0.20	0.15	0.10	0.05
0.95	.7994	.7858	.7653	.7430	.7164	.6798	.6328	.5858	.5268
0.90	.8273	.8145	.7941	.7723	.7464	.7100	.6618	.6132	.5522
0.85	.8564	.8446	.8247	.8034	.7775	.7405	.6907	.6394	.5748
0.80	.8833	.8720	.8526	.8320	.8068	.7697	.7189	.6653	.5987
0.75	.9103	.8993	.8805	.8605	.8358	.7983	.7460	.6891	.6194
0.70	.9345	.9234	.9055	.8864	.8622	.8246	.7719	.7129	.6421
0.65	.9586	.9490	.9326	.9149	.8920	.8547	.8018	.7415	.6688
0.60	.9775	.9675	.9524	.9359	.9135	.8767	.8225	.7609	.6863
0.55	.9886	.9799	.9672	.9526	.9321	.8974	.8442	.7836	.7084
0.50	.9968	.9897	.9804	.9683	.9505	.9182	.8662	.8073	.7321
0.45		.9962	.9889	.9789	.9631	.9335	.8832	.8251	.7505
0.40			.9964	.9893	.9762	.9505	.9045	.8486	.7763
0.35				.9971	.9889	.9686	.9276	.8767	.8068
0.30					.9964	.9817	.9463	.9002	.8342
0.25						.9927	.9655	.9268	.8668
0.20							.9879	.9609	.9067
0.15								.9898	.9556
0.10									.9823

1982

	0.90	0.85	0.80	0.75	0.70	0.65	0.60	0.55	0.50
0.95	.9934	.9806	.9667	.9499	.9305	.9072	.8822	.8587	.8171
0.90		.9955	.9871	.9750	.9601	.9402	.9183	.8967	.8572
0.85			.9968	.9896	.9790	.9634	.9453	.9261	.8901
0.80				.9967	.9899	.9775	.9623	.9454	.9127
0.75					.9972	.9895	.9780	.9643	.9364
0.70						.9965	.9888	.9777	.9541
0.65							.9969	.9898	.9720
0.60								.9970	.9852
0.55									.9634

	0.45	0.40	0.35	0.30	0.25	0.20	0.15	0.10	0.05
0.95	.7696	.7236	.6766	.6331	.5913	.5604	.5356	.5062	.4583
0.90	.8113	.7655	.7178	.6723	.6268	.5878	.5555	.5207	.4683
0.85	.8471	.8030	.7551	.7086	.6595	.6156	.5779	.5384	.4818
0.80	.8724	.8295	.7818	.7354	.6853	.6389	.5980	.5557	.4956
0.75	.9004	.8604	.8147	.7691	.7184	.6710	.6276	.5825	.5182
0.70	.9224	.8857	.8425	.7983	.7485	.7003	.6548	.6074	.5396
0.65	.9459	.9138	.8745	.8333	.7852	.7385	.6932	.6443	.5745
0.60	.9649	.9375	.9023	.8646	.8183	.7729	.7273	.6770	.6049
0.55	.9796	.9570	.9268	.8932	.8504	.8067	.7616	.7106	.6385
0.50	.9941	.9794	.9569	.9299	.8923	.8520	.8080	.7569	.6849
0.45		.9942	.9802	.9594	.9278	.8914	.8489	.7972	.7239
0.40			.9941	.9802	.9560	.9245	.8847	.8340	.7610
0.35				.9944	.9791	.9542	.9199	.8743	.8066
0.30					.9934	.9764	.9483	.9089	.8474
0.25						.9922	.9729	.9416	.8876
0.20							.9929	.9724	.9282
0.15								.9914	.9595
0.10									.9864

1983

	0.90	0.85	0.80	0.75	0.70	0.65	0.60	0.55	0.50
0.95	.9946	.9831	.9659	.9405	.9172	.8913	.8681	.8457	.8208
0.90		.9951	.9836	.9638	.9443	.9207	.8998	.8779	.8542
0.85			.9951	.9824	.9671	.9473	.9285	.9087	.8863
0.80				.9948	.9848	.9689	.9521	.9339	.9128
0.75					.9962	.9864	.9739	.9588	.9399
0.70						.9959	.9872	.9755	.9590
0.65							.9963	.9888	.9759
0.60								.9957	.9860
0.55									.9956

	0.45	0.40	0.35	0.30	0.25	0.20	0.15	0.10	0.05
0.95	.7860	.7471	.6922	.6388	.5809	.5211	.4716	.4306	.3853
0.90	.8209	.7829	.7278	.6747	.6160	.5551	.5027	.4590	.4105
0.85	.8544	.8174	.7623	.7082	.6486	.5869	.5330	.4873	.4349
0.80	.8822	.8460	.7902	.7354	.6746	.6120	.5577	.5101	.4543
0.75	.9113	.8768	.8213	.7662	.7046	.6421	.5866	.5367	.4764
0.70	.9325	.9001	.8458	.7916	.7296	.6674	.6108	.5586	.4949
0.65	.9536	.9245	.8729	.8201	.7582	.6962	.6379	.5822	.5142
0.60	.9670	.9412	.8925	.8425	.7824	.7211	.6619	.6038	.5325
0.55	.9821	.9614	.9201	.8744	.8177	.7588	.7010	.6421	.5688
0.50	.9938	.9798	.9474	.9077	.8564	.8014	.7460	.6874	.6134
0.45		.9935	.9724	.9405	.8952	.8436	.7898	.7301	.6531
0.40			.9905	.9692	.9337	.8900	.8408	.7828	.7073
0.35				.9921	.9693	.9348	.8932	.8385	.7662
0.30					.9911	.9683	.9349	.8858	.8185
0.25						.9910	.9700	.9307	.8711
0.20							.9917	.9655	.9176
0.15								.9886	.9545
0.10									.9839

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<u>MAPE/ACTUAL</u>

1980.

	(DIFFERENCE) MEAN	STANDARD DEVIATION	STANDARD ERROR	CORR.	2-TAIL PROB.	T VALUE	2-TAIL PROB.
0.95/.90	0.0030	0.007	0.001	0.996	0.000	-4.51	0.000
0.95/.85	-0.0067	0.014	0.001	0.985	0.000	-5.05	0.000
0.95/.80	-0.0113	0.020	0.002	0.968	0.000	-5.83	0.000
0.95/.75	-0.0173	0.026	0.002	0.948	0.000	-6.97	0.000
0.95/.70	-0.0245	0.032	0.003	0.922	0.000	-8.04	0.000
0.95/.65	-0.0327	0.039	0.004	0.888	0.000	-8.86	0.000
0.95/.60	-0.0425	0.045	0.004	0.850	0.000	-9.81	0.000
0.95/.55	-0.0542	0.052	0.005	0.807	0.000	-10.82	0.000
0.95/.50	-0.0685	0.059	0.006	0.762	0.000	-12.12	0.000
0.95/.45	-0.0854	0.067	0.006	0.709	0.000	-13.40	0.000
0.95/.40	-0.1059	0.075	0.007	0.646	0.000	-14.70	0.000
0.95/.35	-0.1311	0.083	0.008	0.581	0.000	-16.45	0.000
0.95/.30	-0.1621	0.090	0.009	0.518	0.000	-18.79	0.000
0.95/.25	-0.1989	0.099	0.009	0.440	0.000	-20.96	0.000
0.95/.20	-0.2425	0.111	0.011	0.345	0.000	-22.83	0.000
0.95/.15	-0.2959	0.118	0.011	0.296	0.002	-26.28	0.000
0.95/.10	-0.3606	0.120	0.012	0.274	0.004	-31.35	0.000
0.95/.05	-0.4379	0.121	0.012	0.258	0.007	-37.78	0.000
0.90/.85	-0.0037	0.007	0.001	0.996	0.000	-5.43	0.000
0.90/.80	-0.0083	0.014	0.001	0.985	0.000	-6.24	0.000
0.90/.75	-0.0143	0.020	0.002	0.969	0.000	-7.47	0.000
0.90/.70	-0.0215	0.026	0.003	0.947	0.000	-8.53	0.000
0.90/.65	-0.0298	0.034	0.003	0.916	0.000	-9.27	0.000
0.90/.60	-0.0396	0.041	0.004	0.881	0.000	-10.17	0.000
0.90/.55	-0.0512	0.048	0.005	0.839	0.000	-11.14	0.000
0.90/.50	-0.0655	0.055	0.005	0.795	0.000	-12.42	0.000
0.90/.45	-0.0825	0.063	0.006	0.742	0.000	-13.65	0.000
0.90/.40	-0.1029	0.072	0.007	0.679	0.000	-14.91	0.000

0.90/.35	-0.1281	0.080	0.008	0.614	0.000	-16.64	0.000
0.90/.30	-0.1592	0.088	0.008	0.551	0.000	-18.98	0.000
0.90/.25	-0.1959	0.097	0.009	0.471	0.000	-21.12	0.000
0.90/.20	-0.2395	0.109	0.010	0.375	0.000	-22.94	0.000
0.90/.15	-0.2930	0.116	0.011	0.322	0.001	-26.37	0.000
0.90/.10	-0.3576	0.119	0.011	0.297	0.002	-31.41	0.000
0.90/.05	-0.4349	0.120	0.012	0.277	0.004	-37.78	0.000
0.85/.80	-0.0046	0.007	0.001	0.996	0.000	-6.45	0.000
0.85/.75	-0.0106	0.014	0.001	0.985	0.000	-7.90	0.000
0.85/.70	-0.0178	0.021	0.002	0.967	0.000	-8.93	0.000
0.85/.65	-0.0261	0.028	0.003	0.941	0.000	-9.57	0.000
0.85/.60	-0.0359	0.036	0.003	0.908	0.000	-10.43	0.000
0.85/.55	-0.0475	0.044	0.004	0.869	0.000	-11.36	0.000
0.85/.50	-0.0618	0.051	0.005	0.826	0.000	-12.62	0.000
0.85/.45	-0.0788	0.060	0.006	0.774	0.000	-13.81	0.000
0.85/.40	-0.0992	0.069	0.007	0.711	0.000	-15.03	0.000
0.85/.35	-0.1244	0.078	0.007	0.646	0.000	-16.74	0.000
0.85/.30	-0.1555	0.085	0.008	0.582	0.000	-19.09	0.000
0.85/.25	-0.1922	0.095	0.009	0.502	0.000	-21.20	0.000
0.85/.20	-0.2358	0.107	0.010	0.405	0.000	-22.98	0.000
0.85/.15	-0.2893	0.114	0.011	0.349	0.000	-26.38	0.000
0.85/.10	-0.3539	0.118	0.011	0.319	0.001	-31.39	0.000
0.85/.05	-0.4312	0.119	0.011	0.294	0.002	-37.70	0.000
0.80/.75	-0.0060	0.007	0.001	0.996	0.000	-8.71	0.000
0.80/.70	-0.0132	0.015	0.001	0.984	0.000	-9.50	0.000
0.80/.65	-0.0215	0.023	0.002	0.963	0.000	-9.96	0.000
0.80/.60	-0.0313	0.030	0.003	0.935	0.000	-10.76	0.000
0.80/.55	-0.0429	0.038	0.004	0.900	0.000	-11.64	0.000
0.80/.50	-0.0572	0.046	0.004	0.859	0.000	-12.88	0.000
0.80/.45	-0.0741	0.055	0.005	0.809	0.000	-14.04	0.000
0.80/.40	-0.0946	0.065	0.006	0.747	0.000	-15.22	0.000
0.80/.35	-0.1198	0.074	0.007	0.683	0.000	-16.92	0.000
0.80/.30	-0.1508	0.082	0.008	0.620	0.000	-19.28	0.000
0.80/.25	-0.1876	0.092	0.009	0.540	0.000	-21.37	0.000
0.80/.20	-0.2312	0.104	0.010	0.442	0.000	-23.10	0.000
0.80/.15	-0.2846	0.112	0.011	0.384	0.000	-26.50	0.000
0.80/.10	-0.3493	0.116	0.011	0.351	0.000	-31.51	0.000
0.80/.05	-0.4266	0.118	0.011	0.322	0.001	-37.73	0.000
0.75/.70	-0.0072	0.008	0.001	0.996	0.000	-9.90	0.000
0.75/.65	-0.0155	0.016	0.002	0.982	0.000	-10.21	0.000
0.75/.60	-0.0253	0.024	0.002	0.960	0.000	-11.03	0.000
0.75/.55	-0.0369	0.032	0.003	0.930	0.000	-11.89	0.000
0.75/.50	-0.0512	0.041	0.004	0.893	0.000	-13.14	0.000
0.75/.45	-0.0682	0.050	0.005	0.846	0.000	-14.27	0.000
0.75/.40	-0.0886	0.060	0.006	0.787	0.000	-15.41	0.000
0.75/.35	-0.1138	0.069	0.007	0.725	0.000	-17.13	0.000
0.75/.30	-0.1449	0.077	0.007	0.664	0.000	-19.53	0.000
0.75/.25	-0.1816	0.088	0.008	0.584	0.000	-21.61	0.000
0.75/.20	-0.2252	0.101	0.010	0.486	0.000	-23.28	0.000
0.75/.15	-0.2787	0.109	0.010	0.425	0.000	-26.69	0.000
0.75/.10	-0.3434	0.113	0.011	0.389	0.000	-31.72	0.000
0.75/.05	-0.4207	0.115	0.011	0.356	0.000	-38.03	0.000
0.70/.65	-0.0083	0.008	0.001	0.995	0.000	-10.41	0.000
0.70/.60	-0.0180	0.017	0.002	0.981	0.000	-11.26	0.000
0.70/.55	-0.0297	0.026	0.002	0.957	0.000	-12.12	0.000
0.70/.50	-0.0440	0.034	0.003	0.926	0.000	-13.41	0.000
0.70/.45	-0.0609	0.044	0.004	0.883	0.000	-14.50	0.000
0.70/.40	-0.0814	0.054	0.005	0.828	0.000	-15.61	0.000
0.70/.35	-0.1066	0.064	0.006	0.769	0.000	-17.37	0.000

0.70/.30	-0.1376	0.072	0.007	0.710	0.000	-19.83	0.000
0.70/.25	-0.1744	0.083	0.008	0.632	0.000	-21.89	0.000
0.70/.20	-0.2180	0.097	0.009	0.534	0.000	-23.51	0.000
0.70/.15	-0.2714	0.105	0.010	0.473	0.000	-26.94	0.000
0.70/.10	-0.3361	0.110	0.010	0.434	0.000	-32.04	0.000
0.70/.05	-0.4131	0.112	0.011	0.398	0.000	-38.40	0.000
0.65/.60	-0.0098	0.009	0.001	0.995	0.000	-11.32	0.000
0.65/.55	-0.0215	0.018	0.002	0.979	0.000	-12.28	0.000
0.65/.50	-0.0357	0.027	0.003	0.954	0.000	-13.64	0.000
0.65/.45	-0.0527	0.037	0.004	0.917	0.000	-14.71	0.000
0.65/.40	-0.0731	0.048	0.005	0.867	0.000	-15.80	0.000
0.65/.35	-0.0984	0.058	0.006	0.813	0.000	-17.61	0.000
0.65/.30	-0.1294	0.067	0.006	0.756	0.000	-20.16	0.000
0.65/.25	-0.1662	0.078	0.007	0.681	0.000	-22.21	0.000
0.65/.20	-0.2098	0.092	0.009	0.585	0.000	-23.75	0.000
0.65/.15	-0.2632	0.101	0.010	0.523	0.000	-27.22	0.000
0.65/.10	-0.3279	0.106	0.010	0.482	0.000	-32.40	0.000
0.65/.05	-0.4052	0.109	0.010	0.443	0.000	-38.82	0.000
0.60/.55	-0.0117	0.010	0.001	0.994	0.000	-12.80	0.000
0.60/.50	-0.0259	0.019	0.002	0.978	0.000	-14.17	0.000
0.60/.45	-0.0429	0.030	0.003	0.949	0.000	-15.14	0.000
0.60/.40	-0.0633	0.041	0.004	0.907	0.000	-16.16	0.000
0.60/.35	-0.0886	0.051	0.005	0.859	0.000	-18.06	0.000
0.60/.30	-0.1196	0.060	0.006	0.808	0.000	-20.73	0.000
0.60/.25	-0.1564	0.072	0.007	0.737	0.000	-22.75	0.000
0.60/.20	-0.2000	0.086	0.008	0.644	0.000	-24.18	0.000
0.60/.15	-0.2534	0.095	0.009	0.582	0.000	-27.72	0.000
0.60/.10	-0.3181	0.101	0.010	0.540	0.000	-33.03	0.000
0.60/.05	-0.3954	0.104	0.010	0.500	0.000	-39.58	0.000
0.55/.50	-0.0143	0.010	0.001	0.994	0.000	-14.58	0.000
0.50/.45	-0.0312	0.021	0.002	0.975	0.000	-15.51	0.000
0.55/.40	-0.0517	0.033	0.003	0.942	0.000	-16.49	0.000
0.55/.35	-0.0769	0.043	0.004	0.902	0.000	-18.55	0.000
0.55/.30	-0.1079	0.053	0.005	0.856	0.000	-21.39	0.000
0.55/.25	-0.1447	0.065	0.006	0.791	0.000	-23.35	0.000
0.55/.20	-0.1883	0.080	0.008	0.703	0.000	-24.63	0.000
0.55/.15	-0.2417	0.089	0.009	0.643	0.000	-28.25	0.000
0.55/.10	-0.3064	0.095	0.009	0.600	0.000	-33.72	0.000
0.55/.05	-0.3837	0.099	0.009	0.558	0.000	-40.41	0.000
0.50/.45	-0.0170	0.011	0.001	0.993	0.000	-16.05	0.000
0.50/.40	-0.0374	0.023	0.002	0.972	0.000	-16.89	0.000
0.50/.35	-0.0626	0.034	0.003	0.941	0.000	-19.24	0.000
0.50/.30	-0.0937	0.044	0.004	0.903	0.000	-22.32	0.000
0.50/.25	-0.1304	0.056	0.005	0.845	0.000	-24.15	0.000
0.50/.20	-0.1740	0.072	0.007	0.764	0.000	-25.20	0.000
0.50/.15	-0.2275	0.082	0.008	0.706	0.000	-28.94	0.000
0.50/.10	-0.2922	0.088	0.008	0.664	0.000	-34.65	0.000
0.50/.05	-0.3695	0.093	0.009	0.621	0.000	-41.55	0.000
0.45/.40	-0.0204	0.012	0.001	0.992	0.000	-17.30	0.000
0.45/.35	-0.0457	0.023	0.002	0.973	0.000	-20.33	0.000
0.45/.30	-0.0767	0.034	0.003	0.944	0.000	-23.66	0.000
0.45/.25	-0.1135	0.047	0.005	0.895	0.000	-25.14	0.000
0.45/.20	-0.1571	0.064	0.006	0.822	0.000	-25.82	0.000
0.45/.15	-0.2105	0.074	0.007	0.768	0.000	-29.74	0.000
0.45/.10	-0.2752	0.080	0.008	0.727	0.000	-35.74	0.000
0.45/.05	-0.3525	0.086	0.008	0.684	0.000	-42.87	0.000
0.40/.35	-0.0252	0.012	0.001	0.994	0.000	-22.78	0.000
0.40/.30	-0.0563	0.023	0.002	0.975	0.000	-25.56	0.000
0.40/.25	-0.0930	0.037	0.004	0.936	0.000	-26.17	0.000

0.40/.20	-0.1366	0.054	0.005	0.874	0.000	-26.33	0.000
0.40/.15	-0.1901	0.065	0.006	0.825	0.000	-30.51	0.000
0.40/.10	-0.2547	0.072	0.007	0.786	0.000	-36.87	0.000
0.40/.05	-0.3320	0.078	0.008	0.743	0.000	-44.22	0.000
0.35/.30	-0.0310	0.012	0.001	0.993	0.000	-26.48	0.000
0.35/.25	-0.0678	0.027	0.003	0.967	0.000	-26.46	0.000
0.35/.20	-0.1114	0.044	0.004	0.918	0.000	-26.37	0.000
0.35/.15	-0.1648	0.055	0.005	0.877	0.000	-31.15	0.000
0.35/.10	-0.2295	0.063	0.006	0.841	0.000	-38.08	0.000
0.35/.05	-0.3068	0.070	0.007	0.800	0.000	-45.76	0.000
0.30/.25	-0.0368	0.015	0.001	0.991	0.000	-26.38	0.000
0.30/.20	-0.0804	0.032	0.003	0.959	0.000	-26.24	0.000
0.30/.15	-0.1338	0.043	0.004	0.927	0.000	-32.24	0.000
0.30/.10	-0.1985	0.052	0.005	0.896	0.000	-40.08	0.000
0.30/.05	-0.2758	0.060	0.006	0.857	0.000	-48.15	0.000
0.25/.20	-0.0436	0.017	0.002	0.989	0.000	-26.07	0.000
0.25/.15	-0.0970	0.029	0.003	0.969	0.000	-34.67	0.000
0.25/.10	-0.1617	0.039	0.004	0.943	0.000	-43.42	0.000
0.25/.05	-0.2390	0.049	0.005	0.908	0.000	-51.40	0.000
0.20/.15	-0.0534	0.013	0.001	0.994	0.000	-41.48	0.000
0.20/.10	-0.1181	0.026	0.002	0.975	0.000	-47.60	0.000
0.20/.05	-0.1954	0.038	0.004	0.945	0.000	-53.76	0.000
0.15/.10	-0.0647	0.014	0.001	0.993	0.000	-49.27	0.000
0.15/.05	-0.1420	0.027	0.003	0.973	0.000	-55.06	0.000
0.10/.05	-0.0773	0.014	0.001	0.993	0.000	-57.95	0.000

1981

0.95/.90	-0.0025	0.005	0.001	0.999	0.000	-4.77	0.000
0.95/.85	-0.0055	0.011	0.001	0.997	0.000	-5.23	0.000
0.95/.80	-0.0090	0.017	0.002	0.993	0.000	-5.59	0.000
0.95/.75	-0.0132	0.023	0.002	0.987	0.000	-6.04	0.000
0.95/.70	-0.0184	0.029	0.003	0.979	0.000	-6.60	0.000
0.95/.65	-0.0246	0.036	0.003	0.968	0.000	-7.18	0.000
0.95/.60	-0.0321	0.043	0.004	0.955	0.000	-7.82	0.000
0.95/.55	-0.0412	0.050	0.005	0.940	0.000	-8.60	0.000
0.95/.50	-0.0528	0.058	0.006	0.921	0.000	-9.58	0.000
0.95/.45	-0.0673	0.065	0.006	0.901	0.000	-10.86	0.000
0.95/.40	-0.0861	0.069	0.007	0.885	0.000	-12.99	0.000
0.95/.35	-0.1096	0.074	0.007	0.866	0.000	-15.48	0.000
0.95/.30	-0.1389	0.078	0.008	0.843	0.000	-18.48	0.000
0.95/.25	-0.1757	0.083	0.008	0.814	0.000	-22.10	0.000
0.95/.20	-0.2210	0.089	0.009	0.771	0.000	-25.88	0.000
0.95/.15	-0.2773	0.098	0.009	0.705	0.000	-29.65	0.000
0.95/.10	-0.3466	0.110	0.011	0.596	0.000	-32.80	0.000
0.95/.05	-0.4316	0.130	0.012	0.410	0.000	-34.59	0.000
0.90/.85	-0.0030	0.006	0.001	0.999	0.000	-5.61	0.000
0.90/.80	-0.0065	0.012	0.001	0.997	0.000	-5.92	0.000
0.90/.75	-0.0108	0.018	0.002	0.992	0.000	-6.37	0.000
0.90/.70	-0.0159	0.024	0.002	0.986	0.000	-6.93	0.000
0.90/.65	-0.0221	0.031	0.003	0.977	0.000	-7.52	0.000
0.90/.60	-0.0296	0.038	0.004	0.965	0.000	-8.14	0.000
0.90/.55	-0.0388	0.045	0.004	0.951	0.000	-8.92	0.000
0.90/.50	-0.0503	0.053	0.005	0.934	0.000	-9.90	0.000
0.90/.45	-0.0648	0.060	0.006	0.914	0.000	-11.21	0.000
0.90/.40	-0.0836	0.065	0.006	0.899	0.000	-13.42	0.000
0.90/.35	-0.1071	0.070	0.007	0.881	0.000	-15.97	0.000
0.90/.30	-0.1365	0.075	0.007	0.859	0.000	-19.03	0.000

0.90/.25	-0.1732	0.080	0.008	0.830	0.000	-22.69	0.000
0.90/.20	-0.2186	0.086	0.008	0.787	0.000	-26.42	0.000
0.90/.15	-0.2748	0.096	0.009	0.722	0.000	-30.04	0.000
0.90/.10	-0.3441	0.109	0.010	0.613	0.000	-32.97	0.000
0.90/.05	-0.4292	0.130	0.012	0.426	0.000	-34.54	0.000
0.85/.80	-0.0035	0.006	0.001	0.999	0.000	-6.20	0.000
0.85/.75	-0.0078	0.012	0.001	0.996	0.000	-6.68	0.000
0.85/.70	-0.0129	0.019	0.002	0.992	0.000	-7.28	0.000
0.85/.65	-0.0191	0.025	0.002	0.984	0.000	-7.86	0.000
0.85/.60	-0.0266	0.033	0.003	0.974	0.000	-8.47	0.000
0.85/.55	-0.0357	0.040	0.004	0.962	0.000	-9.25	0.000
0.85/.50	-0.0473	0.048	0.005	0.946	0.000	-10.25	0.000
0.85/.45	-0.0618	0.056	0.005	0.928	0.000	-11.58	0.000
0.85/.40	-0.0806	0.061	0.006	0.914	0.000	-13.88	0.000
0.85/.35	-0.1041	0.066	0.006	0.896	0.000	-16.52	0.000
0.85/.30	-0.1334	0.071	0.007	0.874	0.000	-19.64	0.000
0.85/.25	-0.1702	0.076	0.007	0.846	0.000	-23.32	0.000
0.85/.20	-0.2156	0.083	0.008	0.804	0.000	-26.98	0.000
0.85/.15	-0.2718	0.093	0.009	0.739	0.000	-30.44	0.000
0.85/.10	-0.3411	0.107	0.010	0.631	0.000	-33.14	0.000
0.85/.05	-0.4261	0.129	0.012	0.443	0.000	-34.47	0.000
0.80/.75	-0.0042	0.006	0.001	0.999	0.000	-7.05	0.000
0.80/.70	-0.0094	0.013	0.001	0.996	0.000	-7.68	0.000
0.80/.65	-0.0156	0.020	0.002	0.991	0.000	-8.24	0.000
0.80/.60	-0.0231	0.027	0.003	0.982	0.000	-8.84	0.000
0.80/.55	-0.0322	0.035	0.003	0.971	0.000	-9.61	0.000
0.80/.50	-0.0438	0.043	0.004	0.957	0.000	-10.62	0.000
0.80/.45	-0.0583	0.051	0.005	0.941	0.000	-11.98	0.000
0.80/.40	-0.0771	0.056	0.005	0.927	0.000	-14.40	0.000
0.80/.35	-0.1006	0.061	0.006	0.910	0.000	-17.11	0.000
0.80/.30	-0.1299	0.067	0.006	0.889	0.000	-20.29	0.000
0.80/.25	-0.1667	0.073	0.007	0.862	0.000	-23.98	0.000
0.80/.20	-0.2120	0.080	0.008	0.821	0.000	-27.56	0.000
0.80/.15	-0.2683	0.091	0.009	0.756	0.000	-30.83	0.000
0.80/.10	-0.3376	0.106	0.010	0.648	0.000	-33.26	0.000
0.80/.05	-0.4226	0.128	0.012	0.460	0.000	-34.36	0.000
0.75/.70	-0.0052	0.007	0.001	0.999	0.000	-8.18	0.000
0.75/.65	-0.0114	0.014	0.001	0.996	0.000	-8.67	0.000
0.75/.60	-0.0188	0.021	0.002	0.989	0.000	-9.23	0.000
0.75/.55	-0.0280	0.029	0.003	0.980	0.000	-9.99	0.000
0.75/.50	-0.0396	0.037	0.004	0.968	0.000	-11.03	0.000
0.75/.45	-0.0540	0.045	0.004	0.953	0.000	-12.43	0.000
0.75/.40	-0.0729	0.051	0.005	0.940	0.000	-14.99	0.000
0.75/.35	-0.0963	0.057	0.005	0.924	0.000	-17.78	0.000
0.75/.30	-0.1257	0.062	0.006	0.904	0.000	-21.01	0.000
0.75/.25	-0.1624	0.069	0.007	0.878	0.000	-24.71	0.000
0.75/.20	-0.2078	0.077	0.007	0.837	0.000	-28.15	0.000
0.75/.15	-0.2640	0.088	0.008	0.774	0.000	-31.20	0.000
0.75/.10	-0.3334	0.104	0.010	0.667	0.000	-33.36	0.000
0.75/.05	-0.4184	0.128	0.012	0.479	0.000	-34.23	0.000
0.70/.65	-0.0062	0.007	0.001	0.999	0.000	-9.06	0.000
0.70/.60	-0.0137	0.015	0.001	0.995	0.000	-9.61	0.000
0.70/.55	-0.0228	0.023	0.002	0.988	0.000	-10.37	0.000
0.70/.50	-0.0344	0.031	0.003	0.978	0.000	-11.44	0.000
0.70/.45	-0.0489	0.040	0.004	0.964	0.000	-12.90	0.000
0.70/.40	-0.0677	0.045	0.004	0.953	0.000	-15.61	0.000
0.70/.35	-0.0912	0.052	0.005	0.938	0.000	-18.48	0.000
0.70/.30	-0.1205	0.058	0.006	0.918	0.000	-21.71	0.000
0.70/.25	-0.1573	0.065	0.006	0.892	0.000	-25.36	0.000

0.70/.20	-0.2027	0.074	0.007	0.853	0.000	-28.62	0.000
0.70/.15	-0.2589	0.086	0.008	0.790	0.000	-31.41	0.000
0.70/.10	-0.3282	0.103	0.010	0.684	0.000	-33.30	0.000
0.70/.05	-0.4132	0.127	0.012	0.496	0.000	-33.96	0.000
0.65/.60	-0.0075	0.008	0.001	0.999	0.000	-10.05	0.000
0.65/.55	-0.0166	0.016	0.002	0.994	0.000	-10.76	0.000
0.65/.50	-0.0282	0.025	0.002	0.986	0.000	-11.88	0.000
0.65/.45	-0.0427	0.033	0.003	0.975	0.000	-13.41	0.000
0.65/.40	-0.0615	0.039	0.004	0.965	0.000	-16.31	0.000
0.65/.35	-0.0850	0.046	0.004	0.950	0.000	-19.23	0.000
0.65/.30	-0.1143	0.053	0.005	0.931	0.000	-22.42	0.000
0.65/.25	-0.1511	0.061	0.006	0.907	0.000	-25.97	0.000
0.65/.20	-0.1964	0.071	0.007	0.868	0.000	-28.99	0.000
0.65/.15	-0.2527	0.084	0.008	0.806	0.000	-31.49	0.000
0.65/.10	-0.3220	0.101	0.010	0.700	0.000	-33.12	0.000
0.65/.05	-0.4070	0.126	0.012	0.513	0.000	-33.60	0.000
0.60/.55	-0.0092	0.009	0.001	0.998	0.000	-11.04	0.000
0.60/.50	-0.0207	0.018	0.002	0.993	0.000	-12.35	0.000
0.60/.45	-0.0352	0.026	0.003	0.985	0.000	-13.99	0.000
0.60/.40	-0.0540	0.033	0.003	0.975	0.000	-17.14	0.000
0.60/.35	-0.0775	0.040	0.004	0.962	0.000	-20.05	0.000
0.60/.30	-0.1069	0.048	0.005	0.944	0.000	-23.14	0.000
0.60/.25	-0.1436	0.056	0.005	0.920	0.000	-26.54	0.000
0.60/.20	-0.1890	0.067	0.006	0.882	0.000	-29.27	0.000
0.60/.15	-0.2452	0.081	0.008	0.822	0.000	-31.49	0.000
0.60/.10	-0.3145	0.100	0.010	0.718	0.000	-32.87	0.000
0.60/.05	-0.3996	0.126	0.012	0.532	0.000	-33.20	0.000
0.55/.50	-0.0116	0.009	0.001	0.998	0.000	-13.12	0.000
0.55/.45	-0.0260	0.018	0.002	0.993	0.000	-14.87	0.000
0.55/.40	-0.0449	0.026	0.002	0.985	0.000	-18.29	0.000
0.55/.35	-0.0683	0.034	0.003	0.973	0.000	-21.07	0.000
0.55/.30	-0.0977	0.043	0.004	0.957	0.000	-23.96	0.000
0.55/.25	-0.1344	0.052	0.005	0.934	0.000	-27.13	0.000
0.55/.20	-0.1798	0.064	0.006	0.898	0.000	-29.54	0.000
0.55/.15	-0.2360	0.078	0.008	0.840	0.000	-31.45	0.000
0.55/.10	-0.3054	0.098	0.009	0.739	0.000	-32.60	0.000
0.55/.05	-0.3904	0.124	0.012	0.555	0.000	-32.78	0.000
0.50/.45	-0.0145	0.009	0.001	0.998	0.000	-16.11	0.000
0.50/.40	-0.0333	0.018	0.002	0.993	0.000	-19.58	0.000
0.50/.35	-0.0568	0.027	0.003	0.983	0.000	-21.96	0.000
0.50/.30	-0.0861	0.037	0.004	0.968	0.000	-24.54	0.000
0.50/.25	-0.1229	0.047	0.004	0.948	0.000	-27.49	0.000
0.50/.20	-0.1683	0.059	0.006	0.914	0.000	-29.59	0.000
0.50/.15	-0.2245	0.075	0.007	0.858	0.000	-31.25	0.000
0.50/.10	-0.2938	0.095	0.009	0.760	0.000	-32.22	0.000
0.50/.05	-0.3788	0.122	0.012	0.580	0.000	-32.30	0.000
0.45/.40	-0.0188	0.010	0.001	0.998	0.000	-20.19	0.000
0.45/.35	-0.0423	0.020	0.002	0.991	0.000	-22.35	0.000
0.45/.30	-0.0717	0.030	0.003	0.979	0.000	-24.77	0.000
0.45/.25	-0.1084	0.041	0.004	0.961	0.000	-27.61	0.000
0.45/.20	-0.1538	0.054	0.005	0.930	0.000	-29.50	0.000
0.45/.15	-0.2100	0.071	0.007	0.877	0.000	-30.97	0.000
0.45/.10	-0.2793	0.092	0.009	0.784	0.000	-31.80	0.000
0.45/.05	-0.3644	0.120	0.011	0.610	0.000	-31.81	0.000
0.40/.35	-0.0235	0.010	0.001	0.998	0.000	-23.46	0.000
0.40/.30	-0.0528	0.022	0.002	0.989	0.000	-25.53	0.000
0.45/.25	-0.0896	0.033	0.003	0.975	0.000	-28.25	0.000
0.45/.20	-0.1349	0.047	0.005	0.948	0.000	-29.78	0.000
0.45/.15	-0.1912	0.064	0.006	0.901	0.000	-30.99	0.000

0.45/.10	-0.2605	0.086	0.008	0.814	0.000	-31.59	0.000
0.45/.05	-0.3455	0.115	0.011	0.646	0.000	-31.44	0.000
0.35/.30	-0.0294	0.012	0.001	0.997	0.000	-26.28	0.000
0.35/.25	-0.0661	0.024	0.002	0.987	0.000	-28.98	0.000
0.35/.20	-0.1115	0.039	0.004	0.966	0.000	-30.09	0.000
0.35/.15	-0.1677	0.056	0.005	0.926	0.000	-31.02	0.000
0.35/.10	-0.2370	0.079	0.008	0.846	0.000	-31.40	0.000
0.35/.05	-0.3221	0.108	0.010	0.687	0.000	-31.09	0.000
0.30/.25	-0.0367	0.013	0.001	0.996	0.000	-29.46	0.000
0.30/.20	-0.0821	0.028	0.003	0.982	0.000	-30.20	0.000
0.30/.15	-0.1383	0.047	0.004	0.950	0.000	-30.92	0.000
0.30/.10	-0.2077	0.070	0.007	0.880	0.000	-31.11	0.000
0.30/.05	-0.2927	0.100	0.010	0.733	0.000	-30.66	0.000
0.25/.20	-0.0454	0.016	0.001	0.994	0.000	-30.33	0.000
0.25/.15	-0.1016	0.034	0.003	0.972	0.000	-30.87	0.000
0.25/.10	-0.1709	0.058	0.006	0.916	0.000	-30.86	0.000
0.25/.05	-0.2560	0.088	0.008	0.784	0.000	-30.26	0.000
0.20/.15	-0.0562	0.019	0.002	0.991	0.000	-30.92	0.000
0.20/.10	-0.1256	0.043	0.004	0.952	0.000	-30.61	0.000
0.20/.05	-0.2106	0.074	0.007	0.843	0.000	-29.84	0.000
0.15/.10	-0.0693	0.024	0.002	0.984	0.000	-30.15	0.000
0.15/.05	-0.1544	0.055	0.005	0.905	0.000	-29.28	0.000
0.10/.05	-0.0850	0.031	0.003	0.967	0.000	-28.54	0.000

1982

0.95/.90	-0.0038	0.008	0.001	0.996	0.000	-5.16	0.000
0.95/.85	-0.0079	0.015	0.001	0.985	0.000	-5.31	0.000
0.95/.80	-0.0124	0.024	0.002	0.966	0.000	-5.48	0.000
0.95/.75	-0.0175	0.032	0.003	0.939	0.000	-5.69	0.000
0.95/.70	-0.0235	0.040	0.004	0.905	0.000	-6.07	0.000
0.95/.65	-0.0306	0.049	0.005	0.865	0.000	-6.53	0.000
0.95/.60	-0.0388	0.058	0.006	0.819	0.000	-7.00	0.000
0.95/.55	-0.0484	0.067	0.006	0.766	0.000	-7.52	0.000
0.95/.50	-0.0597	0.077	0.007	0.707	0.000	-8.11	0.000
0.95/.45	-0.0732	0.087	0.008	0.641	0.000	-8.75	0.000
0.95/.40	-0.0897	0.098	0.009	0.570	0.000	-9.53	0.000
0.95/.35	-0.1107	0.108	0.010	0.506	0.000	-10.73	0.000
0.95/.30	-0.1367	0.118	0.011	0.430	0.000	-12.08	0.000
0.95/.25	-0.1694	0.130	0.012	0.338	0.000	-13.55	0.000
0.95/.20	-0.2102	0.146	0.014	0.229	0.016	-15.02	0.000
0.95/.15	-0.2661	0.152	0.015	0.174	0.070	-18.28	0.000
0.95/.10	-0.3401	0.149	0.014	0.161	0.095	-23.86	0.000
0.95/.05	-0.4349	0.145	0.014	0.137	0.157	-31.23	0.000
0.90/.85	-0.0041	0.008	0.001	0.996	0.000	-5.45	0.000
0.90/.80	-0.0086	0.016	0.002	0.984	0.000	-5.63	0.000
0.90/.75	-0.0137	0.024	0.002	0.964	0.000	-5.85	0.000
0.90/.70	-0.0197	0.033	0.003	0.938	0.000	-6.27	0.000
0.90/.65	-0.0268	0.041	0.004	0.904	0.000	-6.77	0.000
0.90/.60	-0.0350	0.050	0.005	0.863	0.000	-7.25	0.000
0.90/.55	-0.0446	0.060	0.006	0.816	0.000	-7.79	0.000
0.90/.50	-0.0559	0.070	0.007	0.762	0.000	-8.38	0.000
0.90/.45	-0.0694	0.080	0.008	0.700	0.000	-9.03	0.000
0.90/.40	-0.0859	0.091	0.009	0.632	0.000	-9.81	0.000
0.90/.35	-0.1069	0.101	0.010	0.569	0.000	-11.04	0.000
0.90/.30	-0.1329	0.112	0.011	0.494	0.000	-12.40	0.000
0.90/.25	-0.1656	0.125	0.012	0.400	0.000	-13.86	0.000
0.90/.20	-0.2065	0.141	0.014	0.287	0.002	-15.27	0.000

0.90/.15	-0.2624	0.148	0.014	0.227	0.018	-18.57	0.000
0.90/.10	-0.3364	0.145	0.014	0.207	0.031	-24.21	0.000
0.90/.05	-0.4311	0.143	0.014	0.170	0.077	-31.55	0.000
0.85/.80	-0.0045	0.008	0.001	0.996	0.000	-5.80	0.000
0.85/.75	-0.0096	0.017	0.002	0.984	0.000	-6.03	0.000
0.85/.70	-0.0156	0.025	0.002	0.964	0.000	-6.51	0.000
0.85/.65	-0.0227	0.034	0.003	0.938	0.000	-7.05	0.000
0.85/.60	-0.0309	0.043	0.004	0.903	0.000	-7.55	0.000
0.85/.55	-0.0405	0.052	0.005	0.862	0.000	-8.09	0.000
0.85/.50	-0.0518	0.062	0.006	0.813	0.000	-8.69	0.000
0.85/.45	-0.0653	0.073	0.007	0.756	0.000	-9.33	0.000
0.85/.40	-0.0818	0.084	0.008	0.692	0.000	-10.12	0.000
0.85/.35	-0.1028	0.094	0.009	0.631	0.000	-11.38	0.000
0.85/.30	-0.1288	0.106	0.010	0.557	0.000	-12.75	0.000
0.85/.25	-0.1615	0.119	0.011	0.462	0.000	-14.18	0.000
0.85/.20	-0.2024	0.136	0.013	0.346	0.000	-15.53	0.000
0.85/.15	-0.2583	0.143	0.014	0.281	0.003	-18.85	0.000
0.85/.10	-0.3323	0.141	0.014	0.254	0.008	-24.56	0.000
0.85/.05	-0.4270	0.140	0.013	0.205	0.032	-31.83	0.000
0.80/.75	-0.0051	0.008	0.001	0.996	0.000	-6.24	0.000
0.80/.70	-0.0111	0.017	0.002	0.984	0.000	-6.84	0.000
0.80/.65	-0.0182	0.026	0.002	0.965	0.000	-7.41	0.000
0.80/.60	-0.0264	0.035	0.003	0.937	0.000	-7.90	0.000
0.80/.55	-0.0359	0.044	0.004	0.902	0.000	-8.44	0.000
0.80/.50	-0.0473	0.055	0.005	0.859	0.000	-9.04	0.000
0.80/.45	-0.0608	0.066	0.006	0.808	0.000	-9.68	0.000
0.80/.40	-0.0773	0.077	0.007	0.749	0.000	-10.46	0.000
0.80/.35	-0.0982	0.087	0.008	0.690	0.000	-11.75	0.000
0.80/.30	-0.1243	0.099	0.009	0.618	0.000	-13.11	0.000
0.80/.25	-0.1570	0.113	0.011	0.524	0.000	-14.51	0.000
0.80/.20	-0.1978	0.131	0.013	0.405	0.000	-15.79	0.000
0.80/.15	-0.2537	0.139	0.013	0.336	0.000	-19.13	0.000
0.80/.10	-0.3277	0.138	0.013	0.301	0.001	-24.88	0.000
0.80/.05	-0.4225	0.138	0.013	0.240	0.012	-32.06	0.000
0.75/.70	-0.0060	0.009	0.001	0.996	0.000	-7.35	0.000
0.75/.65	-0.0131	0.017	0.002	0.984	0.000	-7.87	0.000
0.75/.60	-0.0213	0.027	0.003	0.964	0.000	-8.32	0.000
0.75/.55	-0.0309	0.036	0.003	0.936	0.000	-8.84	0.000
0.75/.50	-0.0422	0.047	0.004	0.900	0.000	-9.43	0.000
0.75/.45	-0.0557	0.058	0.006	0.854	0.000	-10.05	0.000
0.75/.40	-0.0722	0.070	0.007	0.800	0.000	-10.82	0.000
0.75/.35	-0.0932	0.080	0.008	0.746	0.000	-12.14	0.000
0.75/.30	-0.1192	0.092	0.009	0.676	0.000	-13.49	0.000
0.75/.25	-0.1519	0.107	0.010	0.583	0.000	-14.84	0.000
0.75/.20	-0.1927	0.126	0.012	0.463	0.000	-16.03	0.000
0.75/.15	-0.2487	0.134	0.013	0.390	0.000	-19.39	0.000
0.75/.10	-0.3227	0.134	0.013	0.349	0.000	-25.18	0.000
0.75/.05	-0.4174	0.135	0.013	0.276	0.004	-32.21	0.000
0.70/.65	-0.0071	0.009	0.001	0.996	0.000	-8.32	0.000
0.70/.60	-0.0153	0.018	0.002	0.984	0.000	-8.73	0.000
0.70/.55	-0.0249	0.028	0.003	0.963	0.000	-9.25	0.000
0.70/.50	-0.0362	0.038	0.004	0.934	0.000	-9.82	0.000
0.70/.45	-0.0497	0.050	0.005	0.896	0.000	-10.42	0.000
0.70/.40	-0.0662	0.062	0.006	0.848	0.000	-11.19	0.000
0.70/.35	-0.0872	0.073	0.007	0.797	0.000	-12.55	0.000
0.70/.30	-0.1132	0.085	0.008	0.731	0.000	-13.89	0.000
0.70/.25	-0.1459	0.100	0.010	0.641	0.000	-15.18	0.000
0.70/.20	-0.1867	0.120	0.011	0.521	0.000	-16.27	0.000
0.70/.15	-0.2427	0.129	0.012	0.446	0.000	-19.65	0.000

0.70/.10	-0.3167	0.130	0.012	0.398	0.000	-25.47	0.000
0.70/.05	-0.4114	0.133	0.013	0.313	0.001	-32.34	0.000
0.65/.60	-0.0082	0.009	0.001	0.996	0.000	-9.10	0.000
0.65/.55	-0.0178	0.019	0.002	0.983	0.000	-9.65	0.000
0.65/.50	-0.0291	0.030	0.003	0.962	0.000	-10.22	0.000
0.65/.45	-0.0426	0.041	0.004	0.931	0.000	-10.81	0.000
0.65/.40	-0.0591	0.053	0.005	0.890	0.000	-11.56	0.000
0.65/.35	-0.0801	0.064	0.006	0.845	0.000	-12.98	0.000
0.65/.30	-0.1061	0.077	0.007	0.784	0.000	-14.31	0.000
0.65/.25	-0.1388	0.093	0.009	0.697	0.000	-15.53	0.000
0.65/.20	-0.1796	0.114	0.011	0.579	0.000	-16.50	0.000
0.65/.15	-0.2356	0.124	0.012	0.502	0.000	-19.90	0.000
0.65/.10	-0.3096	0.125	0.012	0.448	0.000	-25.77	0.000
0.65/.05	-0.4043	0.130	0.012	0.352	0.000	-32.46	0.000
0.60/.55	-0.0096	0.010	0.001	0.996	0.000	-10.13	0.000
0.60/.50	-0.0209	0.020	0.002	0.983	0.000	-10.68	0.000
0.60/.45	-0.0344	0.032	0.003	0.960	0.000	-11.23	0.000
0.60/.40	-0.0509	0.044	0.004	0.927	0.000	-11.97	0.000
0.60/.35	-0.0719	0.056	0.005	0.888	0.000	-13.46	0.000
0.60/.30	-0.0979	0.069	0.007	0.832	0.000	-14.76	0.000
0.60/.25	-0.1306	0.086	0.008	0.750	0.000	-15.87	0.000
0.60/.20	-0.1715	0.107	0.010	0.635	0.000	-16.71	0.000
0.60/.15	-0.2274	0.118	0.011	0.557	0.000	-20.14	0.000
0.60/.10	-0.3014	0.121	0.012	0.498	0.000	-26.04	0.000
0.60/.05	-0.3961	0.127	0.012	0.393	0.000	-32.50	0.000
0.55/.50	-0.0113	0.011	0.001	0.996	0.000	-11.15	0.000
0.55/.45	-0.0248	0.022	0.002	0.981	0.000	-11.64	0.000
0.55/.40	-0.0413	0.035	0.003	0.957	0.000	-12.38	0.000
0.55/.35	-0.0623	0.047	0.004	0.925	0.000	-13.99	0.000
0.55/.30	-0.0884	0.061	0.006	0.875	0.000	-15.21	0.000
0.55/.25	-0.1210	0.078	0.007	0.800	0.000	-16.20	0.000
0.55/.20	-0.1619	0.100	0.010	0.690	0.000	-16.87	0.000
0.55/.15	-0.2178	0.112	0.011	0.611	0.000	-20.35	0.000
0.55/.10	-0.2918	0.116	0.011	0.548	0.000	-26.26	0.000
0.55/.05	-0.3865	0.124	0.012	0.434	0.000	-32.46	0.000
0.50/.45	-0.0135	0.012	0.001	0.995	0.000	-12.04	0.000
0.50/.40	-0.0300	0.024	0.002	0.979	0.000	-12.82	0.000
0.50/.35	-0.0510	0.036	0.003	0.955	0.000	-14.58	0.000
0.50/.30	-0.0770	0.051	0.005	0.913	0.000	-15.68	0.000
0.50/.25	-0.1097	0.069	0.007	0.845	0.000	-16.49	0.000
0.50/.20	-0.1505	0.093	0.009	0.742	0.000	-16.99	0.000
0.50/.15	-0.2065	0.105	0.010	0.665	0.000	-20.52	0.000
0.50/.10	-0.2805	0.111	0.011	0.598	0.000	-26.45	0.000
0.50/.05	-0.3752	0.121	0.012	0.476	0.000	-32.33	0.000
0.45/.40	-0.0165	0.013	0.001	0.995	0.000	-13.36	0.000
0.45/.35	-0.0375	0.026	0.002	0.979	0.000	-15.32	0.000
0.45/.30	-0.0635	0.041	0.004	0.945	0.000	-16.13	0.000
0.45/.25	-0.0962	0.060	0.006	0.887	0.000	-16.72	0.000
0.45/.20	-0.1370	0.084	0.008	0.793	0.000	-17.03	0.000
0.45/.15	-0.1930	0.098	0.009	0.719	0.000	-20.65	0.000
0.45/.10	-0.2670	0.105	0.010	0.650	0.000	-26.59	0.000
0.45/.05	-0.3617	0.118	0.011	0.522	0.000	-32.11	0.000
0.40/.35	-0.0210	0.014	0.001	0.994	0.000	-15.85	0.000
0.40/.30	-0.0470	0.030	0.003	0.971	0.000	-16.30	0.000
0.40/.25	-0.0797	0.050	0.005	0.924	0.000	-16.73	0.000
0.40/.20	-0.1206	0.074	0.007	0.842	0.000	-16.92	0.000
0.40/.15	-0.1765	0.089	0.009	0.772	0.000	-20.71	0.000
0.40/.10	-0.2505	0.098	0.009	0.702	0.000	-26.69	0.000
0.40/.05	-0.3452	0.113	0.011	0.571	0.000	-31.83	0.000

0.35/.30	-0.0261	0.017	0.002	0.992	0.000	-16.48	0.000
0.35/.25	-0.0587	0.036	0.003	0.960	0.000	-16.81	0.000
0.35/.20	-0.0996	0.062	0.006	0.895	0.000	-16.87	0.000
0.35/.15	-0.1555	0.077	0.007	0.834	0.000	-21.06	0.000
0.35/.10	-0.2295	0.088	0.008	0.767	0.000	-27.27	0.000
0.35/.05	-0.3242	0.106	0.010	0.636	0.000	-31.99	0.000
0.30/.25	-0.0327	0.020	0.002	0.988	0.000	-16.85	0.000
0.30/.20	-0.0735	0.046	0.004	0.944	0.000	-16.77	0.000
0.30/.15	-0.1294	0.062	0.006	0.895	0.000	-21.72	0.000
0.30/.10	-0.2034	0.075	0.007	0.833	0.000	-28.21	0.000
0.30/.05	-0.2982	0.096	0.009	0.707	0.000	-32.27	0.000
0.25/.20	-0.0409	0.026	0.002	0.983	0.000	-16.61	0.000
0.25/.15	-0.0968	0.044	0.004	0.950	0.000	-23.11	0.000
0.25/.10	-0.1708	0.060	0.006	0.897	0.000	-29.65	0.000
0.25/.05	-0.2655	0.085	0.008	0.780	0.000	-32.48	0.000
0.20/.15	-0.0559	0.022	0.002	0.987	0.000	-26.27	0.000
0.20/.10	-0.1299	0.044	0.004	0.948	0.000	-30.80	0.000
0.20/.05	-0.2246	0.074	0.007	0.848	0.000	-31.78	0.000
0.15/.10	-0.0740	0.026	0.002	0.983	0.000	-30.17	0.000
0.15/.05	-0.1687	0.058	0.006	0.910	0.000	-30.45	0.000
0.10/.05	-0.0947	0.034	0.003	0.968	0.000	-29.47	0.000

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0.95/.90	-0.0036	0.007	0.001	0.998	0.000	-5.79	0.000
0.95/.85	-0.0079	0.012	0.001	0.993	0.000	-6.72	0.000
0.95/.80	-0.0127	0.019	0.002	0.985	0.000	-6.98	0.000
0.95/.75	-0.0177	0.026	0.003	0.972	0.000	-7.03	0.000
0.95/.70	-0.0234	0.034	0.003	0.955	0.000	-7.19	0.000
0.95/.65	-0.0299	0.042	0.004	0.933	0.000	-7.45	0.000
0.95/.60	-0.0372	0.051	0.005	0.905	0.000	-7.59	0.000
0.95/.55	-0.0462	0.059	0.006	0.876	0.000	-8.12	0.000
0.95/.50	-0.0571	0.068	0.007	0.842	0.000	-8.74	0.000
0.95/.45	-0.0706	0.077	0.007	0.803	0.000	-9.52	0.000
0.95/.40	-0.0868	0.088	0.008	0.755	0.000	-10.34	0.000
0.95/.35	-0.1062	0.100	0.010	0.694	0.000	-11.11	0.000
0.95/.30	-0.1301	0.114	0.011	0.616	0.000	-11.87	0.000
0.95/.25	-0.1602	0.132	0.013	0.519	0.000	-12.69	0.000
0.95/.20	-0.2003	0.150	0.014	0.408	0.000	-13.96	0.000
0.95/.15	-0.2568	0.161	0.015	0.313	0.001	-16.69	0.000
0.95/.10	-0.3316	0.171	0.016	0.212	0.027	-20.20	0.000
0.95/.05	-0.4327	0.180	0.017	0.109	0.257	-25.03	0.000
0.90/.85	-0.0043	0.006	0.001	0.998	0.000	-7.12	0.000
0.90/.80	-0.0090	0.013	0.001	0.993	0.000	-7.11	0.000
0.90/.75	-0.0141	0.021	0.002	0.983	0.000	-7.06	0.000
0.90/.70	-0.0197	0.029	0.003	0.968	0.000	-7.19	0.000
0.90/.65	-0.0263	0.037	0.004	0.949	0.000	-7.46	0.000
0.90/.60	-0.0336	0.046	0.004	0.923	0.000	-7.58	0.000
0.90/.55	-0.0426	0.055	0.005	0.896	0.000	-8.13	0.000
0.90/.50	-0.0535	0.064	0.006	0.864	0.000	-8.77	0.000
0.90/.45	-0.0670	0.073	0.007	0.826	0.000	-9.55	0.000
0.90/.40	-0.0832	0.084	0.008	0.780	0.000	-10.39	0.000
0.90/.35	-0.1026	0.096	0.009	0.720	0.000	-11.16	0.000
0.90/.30	-0.1265	0.111	0.011	0.643	0.000	-11.91	0.000
0.90/.25	-0.1566	0.129	0.012	0.548	0.000	-12.71	0.000
0.90/.20	-0.1967	0.147	0.014	0.437	0.000	-13.98	0.000
0.90/.15	-0.2532	0.158	0.015	0.340	0.000	-16.71	0.000
0.90/.10	-0.3280	0.170	0.016	0.235	0.014	-20.18	0.000

0.90/.05	-0.4291	0.180	0.017	0.125	0.194	-24.94	0.000
0.85/.80	-0.0047	0.007	0.001	0.998	0.000	-7.06	0.000
0.85/.75	-0.0098	0.015	0.001	0.992	0.000	-6.98	0.000
0.85/.70	-0.0154	0.023	0.002	0.981	0.000	-7.15	0.000
0.85/.65	-0.0220	0.031	0.003	0.965	0.000	-7.44	0.000
0.85/.60	-0.0292	0.040	0.004	0.942	0.000	-7.55	0.000
0.85/.55	-0.0383	0.049	0.005	0.918	0.000	-8.13	0.000
0.85/.50	-0.0492	0.059	0.006	0.888	0.000	-8.78	0.000
0.85/.45	-0.0626	0.068	0.007	0.851	0.000	-9.58	0.000
0.85/.40	-0.0788	0.079	0.008	0.806	0.000	-10.41	0.000
0.85/.35	-0.0983	0.092	0.009	0.747	0.000	-11.17	0.000
0.85/.30	-0.1222	0.107	0.010	0.671	0.000	-11.89	0.000
0.85/.25	-0.1522	0.125	0.012	0.575	0.000	-12.68	0.000
0.85/.20	-0.1924	0.144	0.014	0.464	0.000	-13.94	0.000
0.85/.15	-0.2489	0.156	0.015	0.365	0.000	-16.67	0.000
0.85/.10	-0.3237	0.168	0.016	0.256	0.007	-20.11	0.000
0.85/.05	-0.4248	0.179	0.017	0.140	0.146	-24.80	0.000
0.80/.75	-0.0050	0.008	0.001	0.998	0.000	-6.89	0.000
0.80/.70	-0.0107	0.016	0.002	0.991	0.000	-7.13	0.000
0.80/.65	-0.0173	0.024	0.002	0.979	0.000	-7.45	0.000
0.80/.60	-0.0245	0.034	0.003	0.960	0.000	-7.53	0.000
0.80/.55	-0.0336	0.043	0.004	0.939	0.000	-8.15	0.000
0.80/.50	-0.0445	0.053	0.005	0.911	0.000	-8.83	0.000
0.80/.45	-0.0579	0.063	0.006	0.876	0.000	-9.63	0.000
0.80/.40	-0.0741	0.074	0.007	0.833	0.000	-10.47	0.000
0.80/.35	-0.0936	0.087	0.008	0.775	0.000	-11.20	0.000
0.80/.30	-0.1174	0.103	0.010	0.700	0.000	-11.89	0.000
0.80/.25	-0.1475	0.122	0.012	0.604	0.000	-12.65	0.000
0.80/.20	-0.1877	0.141	0.014	0.493	0.000	-13.89	0.000
0.80/.15	-0.2441	0.153	0.015	0.393	0.000	-16.62	0.000
0.80/.10	-0.3190	0.166	0.016	0.280	0.003	-20.04	0.000
0.80/.05	-0.4201	0.178	0.017	0.158	0.102	-24.65	0.000
0.75/.70	-0.0057	0.008	0.001	0.998	0.000	-7.21	0.000
0.75/.65	-0.0122	0.017	0.002	0.990	0.000	-7.52	0.000
0.75/.60	-0.0195	0.027	0.003	0.976	0.000	-7.55	0.000
0.75/.55	-0.0286	0.036	0.003	0.957	0.000	-8.24	0.000
0.75/.50	-0.0394	0.046	0.004	0.933	0.000	-8.93	0.000
0.75/.45	-0.0529	0.057	0.005	0.901	0.000	-9.74	0.000
0.75/.40	-0.0691	0.068	0.007	0.860	0.000	-10.57	0.000
0.75/.35	-0.0885	0.082	0.008	0.805	0.000	-11.27	0.000
0.75/.30	-0.1124	0.098	0.009	0.731	0.000	-11.92	0.000
0.75/.25	-0.1425	0.118	0.011	0.636	0.000	-12.64	0.000
0.75/.20	-0.1826	0.137	0.013	0.525	0.000	-13.87	0.000
0.75/.15	-0.2391	0.150	0.014	0.425	0.000	-16.60	0.000
0.75/.10	-0.3139	0.164	0.016	0.308	0.001	-19.98	0.000
0.75/.05	-0.4150	0.177	0.017	0.179	0.063	-24.50	0.000
0.70/.65	-0.0066	0.009	0.001	0.997	0.000	-7.63	0.000
0.70/.60	-0.0138	0.019	0.002	0.988	0.000	-7.56	0.000
0.70/.55	-0.0229	0.029	0.003	0.974	0.000	-8.37	0.000
0.70/.50	-0.0338	0.039	0.004	0.954	0.000	-9.09	0.000
0.70/.45	-0.0472	0.050	0.005	0.925	0.000	-9.91	0.000
0.70/.40	-0.0634	0.062	0.006	0.887	0.000	-10.72	0.000
0.70/.35	-0.0829	0.076	0.007	0.835	0.000	-11.37	0.000
0.70/.30	-0.1067	0.093	0.009	0.763	0.000	-11.97	0.000
0.70/.25	-0.1368	0.113	0.011	0.670	0.000	-12.64	0.000
0.70/.20	-0.1770	0.133	0.013	0.560	0.000	-13.85	0.000
0.70/.15	-0.2334	0.147	0.014	0.458	0.000	-16.57	0.000
0.70/.10	-0.3083	0.162	0.016	0.337	0.000	-19.88	0.000
0.70/.05	-0.4094	0.176	0.017	0.199	0.038	-24.27	0.000

0.65/.60	-0.0072	0.010	0.001	0.997	0.000	-7.48	0.000
0.65/.55	-0.0163	0.020	0.002	0.988	0.000	-8.59	0.000
0.65/.50	-0.0272	0.031	0.003	0.972	0.000	-9.30	0.000
0.65/.45	-0.0406	0.042	0.004	0.948	0.000	-10.12	0.000
0.65/.40	-0.0568	0.054	0.005	0.914	0.000	-10.90	0.000
0.65/.35	-0.0763	0.069	0.007	0.865	0.000	-11.50	0.000
0.65/.30	-0.1002	0.087	0.008	0.797	0.000	-12.03	0.000
0.65/.25	-0.1302	0.107	0.010	0.706	0.000	-12.65	0.000
0.65/.20	-0.1704	0.129	0.012	0.598	0.000	-13.83	0.000
0.65/.15	-0.2269	0.143	0.014	0.495	0.000	-16.55	0.000
0.65/.10	-0.3017	0.159	0.015	0.370	0.000	-19.79	0.000
0.65/.05	-0.4028	0.175	0.017	0.222	0.021	-24.03	0.000
0.60/.55	-0.0091	0.010	0.001	0.997	0.000	-9.11	0.000
0.60/.50	-0.0200	0.022	0.002	0.986	0.000	-9.64	0.000
0.60/.45	-0.0334	0.034	0.003	0.967	0.000	-10.40	0.000
0.60/.40	-0.0496	0.046	0.004	0.938	0.000	-11.14	0.000
0.60/.35	-0.0690	0.062	0.006	0.894	0.000	-11.65	0.000
0.60/.30	-0.0929	0.080	0.008	0.830	0.000	-12.10	0.000
0.60/.25	-0.1230	0.101	0.010	0.744	0.000	-12.66	0.000
0.60/.20	-0.1632	0.123	0.012	0.638	0.000	-13.81	0.000
0.60/.15	-0.2196	0.139	0.013	0.535	0.000	-16.53	0.000
0.60/.10	-0.2945	0.156	0.015	0.406	0.000	-19.69	0.000
0.60/.05	-0.3956	0.174	0.017	0.249	0.009	-23.77	0.000
0.55/.50	-0.0109	0.011	0.001	0.996	0.000	-9.97	0.000
0.55/.45	-0.0243	0.024	0.002	0.984	0.000	-10.71	0.000
0.55/.40	-0.0405	0.037	0.004	0.962	0.000	-11.42	0.000
0.55/.35	-0.0600	0.053	0.005	0.924	0.000	-11.82	0.000
0.55/.30	-0.0838	0.072	0.007	0.867	0.000	-12.19	0.000
0.55/.25	-0.1139	0.094	0.009	0.785	0.000	-12.69	0.000
0.55/.20	-0.1541	0.116	0.011	0.684	0.000	-13.82	0.000
0.55/.15	-0.2105	0.133	0.013	0.583	0.000	-16.56	0.000
0.55/.10	-0.2854	0.152	0.015	0.450	0.000	-19.65	0.000
0.55/.05	-0.3865	0.171	0.016	0.285	0.003	-23.57	0.000
0.50/.45	-0.0134	0.013	0.001	0.995	0.000	-11.09	0.000
0.50/.40	-0.0296	0.026	0.003	0.981	0.000	-11.75	0.000
0.50/.35	-0.0491	0.043	0.004	0.952	0.000	-12.01	0.000
0.50/.30	-0.0730	0.062	0.006	0.902	0.000	-12.27	0.000
0.50/.25	-0.1030	0.085	0.008	0.829	0.000	-12.70	0.000
0.50/.20	-0.1432	0.108	0.010	0.733	0.000	-13.83	0.000
0.50/.15	-0.1997	0.126	0.012	0.635	0.000	-16.61	0.000
0.50/.10	-0.2745	0.146	0.014	0.501	0.000	-19.63	0.000
0.50/.05	-0.3756	0.168	0.016	0.329	0.000	-23.39	0.000
0.45/.40	-0.0162	0.014	0.001	0.995	0.000	-12.00	0.000
0.45/.35	-0.0357	0.031	0.003	0.975	0.000	-12.06	0.000
0.45/.30	-0.0595	0.051	0.005	0.936	0.000	-12.26	0.000
0.45/.25	-0.0896	0.074	0.007	0.873	0.000	-12.67	0.000
0.45/.20	-0.1298	0.098	0.009	0.786	0.000	-13.82	0.000
0.45/.15	-0.1862	0.117	0.011	0.692	0.000	-16.68	0.000
0.45/.10	-0.2611	0.139	0.013	0.558	0.000	-19.63	0.000
0.45/.05	-0.3622	0.163	0.016	0.379	0.000	-23.22	0.000
0.40/.35	-0.0194	0.017	0.002	0.993	0.000	-12.03	0.000
0.40/.30	-0.0433	0.037	0.004	0.967	0.000	-12.23	0.000
0.40/.25	-0.0734	0.061	0.006	0.917	0.000	-12.65	0.000
0.40/.20	-0.1136	0.086	0.008	0.841	0.000	-13.86	0.000
0.40/.15	-0.1700	0.105	0.010	0.755	0.000	-16.86	0.000
0.40/.10	-0.2449	0.130	0.012	0.623	0.000	-19.72	0.000
0.40/.05	-0.3460	0.156	0.015	0.441	0.000	-23.12	0.000
0.35/.30	-0.0239	0.020	0.002	0.990	0.000	-12.25	0.000
0.35/.25	-0.0539	0.044	0.004	0.957	0.000	-12.69	0.000

0.35/.20	-0.0941	0.070	0.007	0.896	0.000	-14.00	0.000
0.35/.15	-0.1506	0.091	0.009	0.820	0.000	-17.19	0.000
0.35/.10	-0.2254	0.118	0.011	0.694	0.000	-19.90	0.000
0.35/.05	-0.3265	0.148	0.014	0.512	0.000	-23.04	0.000
0.30/.25	-0.0301	0.024	0.002	0.988	0.000	-12.83	0.000
0.30/.20	-0.0702	0.051	0.005	0.946	0.000	-14.24	0.000
0.30/.15	-0.1267	0.075	0.007	0.883	0.000	-17.68	0.000
0.30/.10	-0.2015	0.105	0.010	0.768	0.000	-20.10	0.000
0.30/.05	-0.3026	0.138	0.013	0.589	0.000	-22.89	0.000
0.25/.20	-0.0402	0.028	0.003	0.984	0.000	-14.78	0.000
0.25/.15	-0.0966	0.055	0.005	0.939	0.000	-18.48	0.000
0.25/.10	-0.1715	0.088	0.008	0.841	0.000	-20.32	0.000
0.25/.05	-0.2726	0.126	0.012	0.674	0.000	-22.67	0.000
0.20/.15	-0.0565	0.031	0.003	0.981	0.000	-19.23	0.000
0.20/.10	-0.1313	0.068	0.006	0.910	0.000	-20.26	0.000
0.20/.05	-0.2324	0.109	0.010	0.764	0.000	-22.25	0.000
0.15/.10	-0.0748	0.039	0.004	0.971	0.000	-20.24	0.000
0.15/.05	-0.1759	0.084	0.008	0.862	0.000	-21.96	0.000
0.10/.05	-0.1011	0.050	0.005	0.952	0.000	-21.32	0.000

Appendix 13.

COMPARISON OF THE BEST FORM OF EACH MODEL FOR FORECASTING TURNOVER.

BEST MODEL

	Non-Trunc.	Truncated
Absolute Change	5 yr.	5 yr.
Percentage Change	2 yr.	2 yr.
Moving Average	2 yr.	2 yr.
Exponential Smoothing	0.95	0.95

	NON-TRUNCATED					TRUNCATED (Max. 1.0)		
	MEAN	STD. ERROR	STD. DEV.	RANGE	MINIMUM	MEAN	STD. ERROR	STD. DEV.
MAPE/ACTUAL								
1981								
Rand.W.	0.111	0.012	0.122	1.143	0.007	0.110	0.011	0.111
Abs.Ch.	0.086	0.012	0.126	1.173	0.003	0.084	0.011	0.113
Per.Ch.	0.107	0.012	0.125	0.704	0.002			
Mov.Av.	0.132	0.014	0.148	1.428	0.002	0.128	0.011	0.115
Exp.Sm.	0.113	0.012	0.124	1.175	0.002	0.111	0.011	0.111
Regres.	0.099	0.012	0.128	1.037	0.000	0.099	0.012	0.125
Seg.1	0.104	0.014	0.142	1.116	0.000	0.103	0.013	0.135
Seg.2	0.089	0.015	0.159	1.313	0.000	0.086	0.013	0.138
Seg.3	0.092	0.016	0.165	1.342	0.000	0.089	0.014	0.143
Seg.4	0.091	0.016	0.165	1.340	0.000	0.088	0.014	0.143
Seg.5	0.155	0.019	0.201	1.665	0.000	0.148	0.015	0.153
Seg.6	0.091	0.015	0.160	1.319	0.000	0.088	0.013	0.139
1982								
Rand.W.	0.114	0.009	0.090	0.488	0.003			
Abs.Ch.	0.082	0.010	0.106	0.545	0.000			
Per.Ch.	0.097	0.011	0.118	0.583	0.001			
Mov.Av.	0.150	0.010	0.105	0.634	0.003			
Exp.Sm.	0.118	0.009	0.090	0.489	0.004			
Regres.	0.086	0.011	0.110	0.568	0.000			
Seg.1	0.096	0.013	0.135	1.127	0.000	0.095	0.013	0.126
Seg.2	0.089	0.014	0.146	1.249	0.000	0.087	0.012	0.128
Seg.3	0.094	0.015	0.157	1.354	0.000	0.091	0.013	0.133
Seg.4	0.095	0.015	0.158	1.361	0.000	0.092	0.013	0.133
Seg.5	0.099	0.015	0.159	1.362	0.000	0.096	0.013	0.134
Seg.6	0.113	0.013	0.131	1.040	0.000	0.113	0.012	0.128

1983

Rand.W.	0.111	0.010	0.103	0.632	0.000			
Abs.Ch.	0.099	0.011	0.111	0.598	0.002			
Per.Ch.	0.102	0.011	0.119	0.771	0.001			
Mov.Av.	0.150	0.011	0.119	0.687	0.007			
Exp.Sm.	0.114	0.010	0.104	0.634	0.001			
Regres.	0.135	0.013	0.139	0.776	0.000			
Seg.1	0.096	0.015	0.157	1.297	0.000	0.093	0.013	0.137
Seg.2	0.095	0.016	0.167	1.389	0.000	0.092	0.014	0.141
Seg.3	0.103	0.017	0.177	1.471	0.000	0.098	0.014	0.146
Seg.4	0.102	0.017	0.176	1.467	0.000	0.098	0.014	0.146
Seg.5	0.095	0.015	0.158	1.311	0.000	0.092	0.013	0.138
Seg.6	0.150	0.013	0.136	1.005	0.000	0.150	0.013	0.136

MSE/ACTUAL

1981

Rand.W.	0.027	0.012	0.127	1.323	0.000	0.024	0.009	0.097
Abs.Ch.	0.023	0.013	0.133	1.382	0.000	0.020	0.009	0.097
Per.Ch.	0.028	0.010	0.073	0.498	0.000			
Mov.Av.	0.039	0.019	0.195	2.045	0.000	0.030	0.009	0.097
Exp.Sm.	0.028	0.013	0.133	1.387	0.000	0.025	0.009	0.097
Regres.	0.026	0.010	0.106	1.077	0.000	0.025	0.009	0.098
Seg.1	0.031	0.013	0.131	1.246	0.000	0.029	0.011	0.111
Seg.2	0.033	0.017	0.179	1.723	0.000	0.026	0.011	0.119
Seg.3	0.035	0.018	0.192	1.802	0.000	0.028	0.012	0.128
Seg.4	0.035	0.018	0.191	1.795	0.000	0.028	0.012	0.128
Seg.5	0.064	0.028	0.290	2.771	0.000	0.045	0.013	0.136
Seg.6	0.034	0.017	0.180	1.741	0.000	0.027	0.011	0.119

1982

Rand.W.	0.021	0.004	0.039	0.242	0.000			
Abs.Ch.	0.018	0.005	0.049	0.298	0.000			
Per.Ch.	0.023	0.005	0.055	0.341	0.000			
Mov.Av.	0.033	0.005	0.054	0.406	0.000			
Exp.Sm.	0.022	0.004	0.039	0.243	0.000			
Regres.	0.019	0.005	0.052	0.322	0.000			
Seg.1	0.027	0.012	0.125	1.269	0.000	0.025	0.010	0.101
Seg.2	0.029	0.015	0.153	1.559	0.000	0.024	0.010	0.103
Seg.3	0.033	0.017	0.180	1.833	0.000	0.026	0.010	0.104
Seg.4	0.034	0.017	0.182	1.852	0.000	0.026	0.010	0.105
Seg.5	0.035	0.017	0.182	1.855	0.000	0.027	0.010	0.105
Seg.6	0.030	0.010	0.108	1.081	0.000	0.029	0.010	0.101

1983

Rand.W.	0.023	0.005	0.051	0.399	0.000			
Abs.Ch.	0.022	0.005	0.057	0.360	0.000			
Per.Ch.	0.024	0.007	0.071	0.596	0.000			
Mov.Av.	0.037	0.007	0.070	0.483	0.000			
Exp.Sm.	0.024	0.005	0.052	0.402	0.000			
Regres.	0.038	0.008	0.081	0.605	0.000			
Seg.1	0.034	0.016	0.167	1.681	0.000	0.027	0.010	0.107
Seg.2	0.037	0.018	0.191	1.929	0.000	0.028	0.010	0.109
Seg.3	0.042	0.021	0.214	2.164	0.000	0.031	0.011	0.112
Seg.4	0.041	0.020	0.213	2.152	0.000	0.031	0.011	0.112
Seg.5	0.034	0.016	0.171	1.720	0.000	0.027	0.010	0.108
Seg.6	0.041	0.010	0.107	1.009	0.000	0.041	0.010	0.106

<u>MAPE/FORECAST</u>

1981

Rand.W.	0.122	0.010	0.106	0.528	0.007
Abs.Ch.	0.082	0.008	0.088	0.538	0.003
Per.Ch.	0.103	0.014	0.149	0.963	0.002
Mov.Av.	0.149	0.011	0.119	0.609	0.002
Exp.Sm.	0.124	0.010	0.105	0.538	0.002
Regres.	0.110	0.013	0.132	0.585	0.000
Seg.1	0.249	0.031	0.323	0.999	0.001
Seg.2	0.223	0.032	0.329	0.999	0.001
Seg.3	0.219	0.031	0.328	0.999	0.001
Seg.4	0.219	0.031	0.328	0.999	0.001
Seg.5	0.260	0.030	0.310	0.993	0.007
Seg.6	0.225	0.032	0.330	0.999	0.001

1982

Rand.W.	0.129	0.017	0.182	1.707	0.000	0.122	0.012	0.129
Abs.Ch.	0.085	0.012	0.121	0.812	0.000			
Per.Ch.	0.098	0.013	0.136	1.243	0.001	0.096	0.011	0.118
Mov.Av.	0.178	0.014	0.146	1.004	0.003	0.178	0.014	0.146
Exp.Sm.	0.135	0.012	0.130	0.966	0.004			
Regres.	0.092	0.012	0.126	0.819	0.000			
Seg.1	0.242	0.032	0.332	0.999	0.001			
Seg.2	0.225	0.032	0.334	0.993	0.007			
Seg.3	0.223	0.032	0.332	1.000	0.000			
Seg.4	0.223	0.032	0.331	0.998	0.002			
Seg.5	0.227	0.032	0.330	0.999	0.001			
Seg.6	0.269	0.031	0.327	1.074	0.005	0.269	0.031	0.325

1983

Rand.W.	0.129	0.017	0.182	1.717	0.000	0.122	0.012	0.129
Abs.Ch.	0.103	0.015	0.151	1.395	0.002	0.104	0.011	0.119
Per.Ch.	0.098	0.013	0.136	1.243	0.001	0.096	0.011	0.118
Mov.Av.	0.183	0.021	0.219	1.884	0.007	0.174	0.016	0.164
Exp.Sm.	0.133	0.018	0.185	1.734	0.001	0.127	0.013	0.131
Regres.	0.122	0.014	0.144	1.247	0.002	0.120	0.012	0.126
Seg.1	0.241	0.034	0.354	1.673	0.000	0.235	0.032	0.334
Seg.2	0.232	0.034	0.353	1.566	0.000	0.227	0.032	0.337
Seg.3	0.233	0.033	0.348	1.484	0.001	0.229	0.032	0.335
Seg.4	0.233	0.033	0.349	1.485	0.002	0.229	0.032	0.335
Seg.5	0.237	0.034	0.354	1.649	0.001	0.231	0.032	0.335
Seg.6	0.329	0.033	0.345	2.045	0.011	0.319	0.030	0.309

MSE/FORECAST

1981

Rand.W.	0.026	0.005	0.050	0.286	0.000			
Abs.Ch.	0.014	0.004	0.037	0.292	0.000			
Per.Ch.	0.023	0.006	0.058	0.349	0.000			
Mov.Av.	0.036	0.006	0.059	0.373	0.000			
Exp.Sm.	0.026	0.005	0.049	0.292	0.000			
Regres.	0.029	0.006	0.065	0.342	0.000			
Seg.1	0.165	0.033	0.340	1.000	0.000			
Seg.2	0.157	0.033	0.342	1.000	0.000			
Seg.3	0.155	0.033	0.342	1.000	0.000			
Seg.4	0.155	0.033	0.342	1.000	0.000			
Seg.5	0.163	0.032	0.339	1.000	0.000			
Seg.6	0.158	0.033	0.342	1.000	0.000			

1982

Rand.W.	0.034	0.010	0.107	0.934	0.000			
Abs.Ch.	0.022	0.008	0.080	0.660	0.000			
Per.Ch.	0.031	0.011	0.110	0.890	0.000			
Mov.Av.	0.053	0.012	0.121	1.014	0.000	0.053	0.011	0.120
Exp.Sm.	0.035	0.010	0.107	0.942	0.000			
Regres.	0.024	0.008	0.081	0.671	0.000			
Seg.1	0.168	0.034	0.350	1.000	0.000			
Seg.2	0.161	0.033	0.348	1.000	0.000			
Seg.3	0.159	0.033	0.345	1.000	0.000			
Seg.4	0.158	0.033	0.345	1.000	0.000			
Seg.5	0.159	0.033	0.345	1.000	0.000			
Seg.6	0.179	0.034	0.354	1.164	0.000	0.177	0.034	0.350

1983

Rand.W.	0.049	0.027	0.283	2.947	0.000	0.031	0.010	0.102
Abs.Ch.	0.033	0.018	0.188	1.951	0.000	0.025	0.009	0.099
Per.Ch.	0.028	0.014	0.149	1.546	0.000	0.023	0.009	0.098
Mov.Av.	0.081	0.034	0.358	3.576	0.000	0.057	0.014	0.147
Exp.Sm.	0.052	0.028	0.289	3.009	0.000	0.033	0.010	0.104
Regres.	0.035	0.014	0.151	1.559	0.000	0.030	0.009	0.099
Seg.1	0.182	0.041	0.425	2.800	0.000	0.166	0.034	0.351
Seg.2	0.177	0.039	0.406	2.451	0.000	0.164	0.034	0.351
Seg.3	0.175	0.038	0.394	2.204	0.000	0.164	0.034	0.351
Seg.4	0.175	0.038	0.394	2.210	0.000	0.164	0.034	0.351
Seg.5	0.180	0.040	0.421	2.723	0.000	0.165	0.034	0.351
Seg.6	0.226	0.049	0.511	4.226	0.000	0.196	0.033	0.344

OPTIMAL ANNUAL MODEL

The only difference is in 1981 for the percentage change model, which then becomes as follows;

MAPE/A.	0.105	0.013	0.131	0.997	0.000
MSE/A.	0.011	0.003	0.036	0.380	-0.194
MAPE/F.	0.098	0.010	0.104	0.535	0.000
MSE/F.	0.020	0.005	0.049	0.287	0.000

OPTIMAL PREDICTION MODEL

The only differences are the regression model and, for 1982, the percentage change model which becomes as follows;

MAPE/A.	0.100	0.011	0.119	0.667	0.000			
MSE/A.	0.020	0.005	0.056	0.349	0.000			
MAPE/F.	0.106	0.013	0.135	1.216	0.001	0.104	0.011	0.120
MSE/F.	0.024	0.007	0.078	0.595	0.000			

REGRESSION MODEL;

MAPE/ACTUAL.

1981	0.137	0.017	0.181	1.749	0.001	0.130	0.012	0.125
1982	0.167	0.015	0.154	1.115	0.003	0.166	0.014	0.147
1983	0.173	0.016	0.165	1.175	0.008	0.171	0.015	0.155

MSE/ACTUAL.

1981	0.051	0.028	0.293	3.061	0.000	0.032	0.010	0.099
1982	0.051	0.013	0.132	1.250	0.000	0.049	0.011	0.111
1983	0.057	0.014	0.150	1.400	0.000	0.053	0.011	0.118

MAPE/FORECAST.

1981	0.143	0.013	0.136	0.947	0.001			
1982	0.201	0.018	0.187	0.937	0.003			
1983	0.207	0.025	0.263	1.747	0.008	0.193	0.018	0.190

MSE/FORECAST.

1981	0.039	0.009	0.098	0.899	0.000			
1982	0.075	0.014	0.147	0.883	0.000			
1983	0.112	0.040	0.422	3.080	0.000	0.073	0.017	0.173

Appendix 14.

SPEARMAN CORRELATIONS OF THE OPTIMAL SINGLE FORECASTS FOR TURNOVER (109 COS.)

1981 MAPE/ACTUAL AND MSE/ACTUAL

	ABS.CH	PER.CH.	MOV.AV.	EXP.SM.	REG.	SEG.1	SEG.2	SEG.3	SEG.4	SEG.5	SEG.6
RW	0.2317	0.1770	0.8545	0.9968	0.0670	0.6525	0.4177	0.1250	0.1407	-0.2641	0.3938
	.008	.033	.001	.001	.244	.001	.001	.098	.072	.003	.001
ABS.CH.		0.5278	0.1660	0.2218	0.3702	0.0700	0.3257	0.3708	0.3783	0.1640	0.3279
		.001	.042	.010	.001	.235	.001	.001	.001	.044	.001
PER.CH.			0.0991	0.1628	0.3735	0.0948	0.2531	0.2857	0.2855	0.1700	0.2635
			.153	.045	.001	.163	.004	.001	.001	.039	.003
MOV.AV.				0.8829	-0.0162	0.6041	0.3598	0.0563	0.0731	-0.3077	0.3360
				.001	.434	.001	.001	.280	.225	.001	.001
EXP.SM.					0.0491	0.6595	0.4168	0.1206	0.1368	-0.2722	0.3912
					.360	.001	.001	.106	.078	.002	.001
REG.						0.0757	0.1102	0.0991	0.1049	0.0608	0.1140
						.217	.127	.153	.139	.265	.119
SEG.1							0.7197	0.4103	0.4236	0.0721	0.7036
							.001	.001	.001	.228	.001
SEG.2								0.7730	0.7909	0.4182	0.9887
								.001	.001	.001	.001
SEG.3									0.9982	0.7201	0.7710
									.001	.001	.001

	SEG.5	SEG.6
SEG.4	0.7083 .001	0.7873 .001
SEG.5		0.4229 .001

MAPE/FORECAST AND MSE/FORECAST

	ABS.CH.	PER.CH.	MOV.AV.	EXP.SM.	REG.	SEG.1	SEG.2	SEG.3	SEG.4	SEG.5	SEG.6
RW	0.2460 .005	0.1778 .032	0.8686 .001	0.9970 .001	0.0666 .246	0.5344 .001	0.3062 .001	0.0070 .471	0.0213 .413	-0.3435 .001	0.2851 .001
ABS.CH.		0.5622 .001	0.1868 .026	0.2334 .007	0.3521 .001	0.2497 .004	0.5035 .001	0.5367 .001	0.5476 .001	0.3426 .001	0.5034 .001
PER.CH.			0.0977 .156	0.1594 .049	0.3747 .001	0.1810 .030	0.3496 .001	0.3703 .001	0.3740 .001	0.2839 .001	0.3568 .001
MOV.AV.				0.8958 .001	-0.0051 .479	0.4957 .001	0.2547 .004	-0.0442 .324	-0.0304 .377	-0.3758 .001	0.2346 .007
EXP.SM.					0.0456 .319	0.5323 .001	0.2956 .001	-0.0075 .469	0.0072 .470	-0.3587 .001	0.2732 .002
REG.						0.1184 .110	0.1484 .062	0.1318 .086	0.1398 .074	0.1136 .120	0.1485 .062
SEG.1							0.7274 .001	0.4130 .001	0.4258 .001	0.1191 .109	0.7144 .001

	SEG.3	SEG.4	SEG.5	SEG.6
SEG.2	0.7723	0.7908	0.4526	0.9897
	.001	.001	.001	.001
SEG.3		0.9982	0.7390	0.7687
		.001	.001	.001
SEG.4			0.7300	0.7851
			.001	.001
SEG.5				0.4539
				.001

1982

<u>MAPE/ACTUAL</u> <u>AND</u> <u>MSE/ACTUAL</u>

	ABS.CH.	PER.CH.	MOV.AV.	EXP.SM.	REG.	SEG.1	SEG.2	SEG.3	SEG.4	SEG.5	SEG.6
RW	0.4774	0.4611	0.8030	0.9905	0.4481	0.5971	0.2797	-0.0677	-0.0283	-0.1087	0.5553
	.001	.001	.001	.001	.001	.001	.002	.242	.385	.130	.001
ABS.CH.		0.5242	0.3100	0.4814	0.7878	0.3424	0.4380	0.2618	0.2901	0.2133	0.2358
		.001	.001	.001	.001	.001	.001	.003	.001	.013	.007
PER.CH.			0.3153	0.4602	0.5154	0.2963	0.2201	0.1480	0.1657	0.1338	0.2456
			.001	.001	.001	.001	.011	.062	.043	.083	.005
MOV.AV.				0.8599	0.3046	0.4686	0.2281	-0.1016	-0.0696	-0.1323	0.4615
				.001	.001	.001	.009	.147	.236	.085	.001

	REG.	SEG.1	SEG.2	SEG.3	SEG.4	SEG.5	SEG.6
EXP.SM.	0.4558 .001	0.5976 .001	0.3001 .001	-0.0587 .272	-0.0179 .427	-0.0988 .153	0.5573 .001
REG.		0.3720 .001	0.3358 .001	0.1858 .027	0.2220 .010	0.1773 .033	0.3222 .001
SEG.1			0.6892 .001	0.3635 .001	0.3996 .001	0.3289 .001	0.9170 .001
SEG.2				0.7872 .001	0.8235 .001	0.7768 .001	0.5376 .001
SEG.3					0.9934 .001	0.9563 .001	0.2240 .010
SEG.4						0.9591 .001	0.2532 .004
SEG.5							0.1755 .034

MAPE/FORECAST AND MSE/FORECAST

	ABS.CH.	PER.CH.	MOV.AV.	EXP.SM.	REG.	SEG.1	SEG.2	SEG.3	SEG.4	SEG.5	SEG.6
RW	0.4700	0.4532	0.8109	0.9938	0.4390	0.6694	0.3816	0.0079	0.0582	-0.0269	0.6442
	.001	.001	.001	.001	.001	.001	.001	.468	.274	.391	.001
ABS.CH.		0.5380	0.2968	0.4689	0.7859	0.4579	0.5651	0.3895	0.4203	0.3476	0.3665
		.001	.001	.001	.001	.001	.001	.001	.001	.001	.001
PER.CH.			0.2914	0.4496	0.5239	0.3562	0.3005	0.2225	0.2455	0.1960	0.3200
			.001	.001	.001	.001	.001	.010	.005	.021	.001
MOV.AV.				0.8594	0.2899	0.5384	0.3157	-0.0399	0.0040	-0.0660	0.5348
				.001	.001	.001	.001	.340	.484	.248	.001
EXP.SM.					0.4409	0.6641	0.3906	0.0099	0.0612	-0.0247	0.6400
					.001	.001	.001	.459	.264	.400	.001
REG.						0.4169	0.3897	0.2389	0.2792	0.2292	0.3747
						.001	.001	.006	.002	.008	.001
SEG.1							0.7111	0.3655	0.4103	0.3340	0.9298
							.001	.001	.001	.001	.001
SEG.2								0.7687	0.8117	0.7655	0.5868
								.001	.001	.001	.001
SEG.3									0.9920	0.9550	0.2523
									.001	.001	.004
SEG.4										0.9567	0.2908
										.001	.001
SEG.5											0.2084
											.015

1983 MAPE/ACTUAL AND MSE/ACTUAL

	ABS.CH.	PER.CH.	MOV.AV.	EXP.SM.	REG.	SEG.1	SEG.2	SEG.3	SEG.4	SEG.5	SEG.6
RW	0.4570	-0.0584	0.8180	0.9934	0.1427	0.5411	0.2715	0.0541	0.0668	0.4699	0.3460
	.001	.273	.001	.001	.069	.001	.002	.288	.245	.001	.001
ABS.CH.		0.6050	0.2342	0.4356	0.5458	0.3425	0.5058	0.4783	0.4798	0.4133	-0.0518
		.001	.007	.001	.001	.001	.001	.001	.001	.001	.292
PER.CH.			-0.0111	0.0330	0.2543	0.1783	0.2900	0.3531	0.3462	0.2235	-0.1562
			.454	.367	.004	.032	.001	.001	.001	.010	.052
MOV.AV.				0.8530	0.0832	0.3530	0.1195	-0.0459	-0.0332	0.2673	0.3657
				.001	.195	.001	.108	.318	.366	.002	.001
EXP.SM.					0.1432	0.5251	0.2588	0.0372	0.0502	0.4538	0.3599
					.069	.001	.003	.350	.302	.001	.001
REG.						0.1354	0.3081	0.3482	0.3445	0.2067	-0.0998
						.080	.001	.001	.001	.016	.151
SEG.1							0.7755	0.5794	0.5925	0.9538	0.6704
							.001	.001	.001	.001	.001
SEG.2								0.8826	0.8974	0.8818	0.3737
								.001	.001	.001	.001
SEG.3									0.9980	0.6789	0.1913
									.001	.001	.023
SEG.4										0.6956	0.2054
										.001	.016
SEG.5											0.5828
											.001

1983 MAPE/FORECAST AND MSE/FORECAST

	ABS.CH.	PER.CH.	MOV.AV.	EXP.SM.	REG.	SEG.1	SEG.2	SEG.3	SEG.4	SEG.5	SEG.6
RW	0.4480	-0.0788	0.8353	0.9948	0.1395	0.6558	0.3792	0.1536	0.1669	0.5846	0.5062
	.001	.208	.001	.001	.074	.001	.001	.055	.041	.001	.001
ABS.CH.		0.5743	0.2276	0.4385	0.5501	0.3767	0.5419	0.5113	0.5143	0.4484	0.0208
		.001	.009	.001	.001	.001	.001	.001	.001	.001	.415
PER CH.			-0.0538	0.0120	0.2333	0.2227	0.3305	0.3960	0.3872	0.2695	-0.0704
			.289	.451	.007	.010	.001	.001	.001	.002	.233
MOV.AV.				0.8658	0.0711	0.5370	0.2970	0.1138	0.1291	0.4538	0.5767
				.001	.231	.001	.001	.119	.090	.001	.001
EXP.SM.					0.1478	0.6428	0.3724	0.1459	0.1599	0.5719	0.5125
					.063	.001	.001	.065	.048	.001	.001
REG.						0.1249	0.2992	0.3418	0.3387	0.1985	-0.0994
						.098	.001	.001	.001	.019	.152
SEG.1							0.7694	0.5630	0.5775	0.9540	0.7092
							.001	.001	.001	.001	.001
SEG.2								0.8805	0.8960	0.8808	0.4051
								.001	.001	.001	.001
SEG.3									0.9980	0.6699	0.2151
									.001	.001	.012
SEG.4										0.6877	0.2313
										.001	.008
SEG.5											0.6199
											.001

Appendix 15.

T-TESTS OF THE OPTIMAL SINGLE MODELS FOR FORECASTING TURNOVER.

	(DIFFERENCE) MEAN	STANDARD DEVIATION	STANDARD ERROR	CORR.	2-TAIL PROB.	T VALUE	2-TAIL PROB.
1981							
MAPE/ACTUAL							
RW/Abs.Ch.	0.0248	0.070	0.007	0.842	0.000	3.70	0.000
RW/Per.Ch.	0.0038	0.096	0.009	0.717	0.000	0.41	0.679
RW/Mov.Av.	-0.0213	0.051	0.005	0.947	0.000	-4.37	0.000
RW/Exp.Sm.	-0.0020	0.005	0.001	0.999	0.000	-3.84	0.000
RW/Reg.	-0.0114	0.103	0.010	0.663	0.000	-1.16	0.249
RW/Seg.1	0.0071	0.091	0.009	0.773	0.000	0.81	0.421
RW/Seg.2	0.0216	0.107	0.010	0.742	0.000	2.11	0.037
RW/Seg.3	0.0189	0.123	0.012	0.669	0.000	1.60	0.113
RW/Seg.4	0.0196	0.123	0.012	0.672	0.000	1.67	0.098
RW/Seg.5	-0.0441	0.172	0.016	0.525	0.000	-2.68	0.008
RW/Seg.6	0.0200	0.107	0.010	0.742	0.000	1.95	0.054
Abs/Per.Ch.	-0.0210	0.071	0.007	0.846	0.000	-3.07	0.003
Abs/Mov.Av.	-0.0461	0.095	0.009	0.771	0.000	-5.06	0.000
Abs/Exp.Sm.	-0.0268	0.072	0.007	0.836	0.000	-3.89	0.000
Abs/Reg.	0.0134	0.087	0.008	0.769	0.000	1.62	0.109
Abs/Seg.1	-0.0178	0.110	0.011	0.670	0.000	-1.68	0.095
Abs/Seg.2	-0.0032	0.103	0.010	0.763	0.000	-0.33	0.743
Abs/Seg.3	-0.0059	0.108	0.010	0.759	0.000	-0.58	0.566
Abs/Seg.4	-0.0052	0.107	0.010	0.760	0.000	-0.51	0.611
Abs/Seg.5	-0.0689	0.147	0.014	0.686	0.000	-4.91	0.000
Abs/Seg.6	-0.0048	0.104	0.010	0.763	0.000	-0.48	0.630
Per/Mov.Av.	-0.0251	0.117	0.011	0.651	0.000	-2.23	0.028
Per/Exp.Sm.	-0.0058	0.098	0.009	0.709	0.000	-0.62	0.538
Per/Reg.	-0.0076	0.104	0.010	0.676	0.000	-0.76	0.447
Per/Seg.1	0.0033	0.127	0.012	0.571	0.000	0.27	0.790
Per/Seg.2	0.0178	0.125	0.012	0.642	0.000	1.48	0.142
Per/Seg.3	0.0151	0.131	0.013	0.630	0.000	1.20	0.232
Per/Seg.4	0.0158	0.131	0.013	0.631	0.000	1.26	0.210
Per/Seg.5	-0.0479	0.170	0.016	0.542	0.000	-2.94	0.004
Per/Seg.6	0.0162	0.125	0.012	0.645	0.000	1.35	0.180
Mov/Exp.Sm.	0.0193	0.046	0.004	0.958	0.000	4.40	0.000
Mov/Reg.	-0.0327	0.127	0.012	0.585	0.000	-2.69	0.008
Mov/Seg.1	0.0283	0.104	0.010	0.743	0.000	2.84	0.005
Mov/Seg.2	0.0428	0.118	0.011	0.707	0.000	3.79	0.000
Mov/Seg.3	0.0401	0.136	0.013	0.630	0.000	3.09	0.003
Mov/Seg.4	0.0408	0.135	0.013	0.633	0.000	3.16	0.002
Mov/Seg.5	-0.0229	0.179	0.017	0.508	0.000	-1.33	0.185
Mov/Seg.6	0.0413	0.118	0.011	0.707	0.000	3.64	0.000
Exp/Reg.	-0.0134	0.105	0.010	0.655	0.000	-1.33	0.186
Exp/Seg.1	0.0090	0.091	0.009	0.774	0.000	1.03	0.304
Exp/Seg.2	0.0235	0.107	0.010	0.741	0.000	2.30	0.024
Exp/Seg.3	0.0209	0.124	0.012	0.667	0.000	1.76	0.081
Exp/Seg.4	0.0215	0.123	0.012	0.670	0.000	1.83	0.070
Exp/Seg.5	-0.0421	0.172	0.016	0.526	0.000	-2.56	0.012

Exp/Seg.6	0.0220	0.108	0.010	0.742	0.000	2.13	0.035
Reg/Seg.1	-0.0044	0.132	0.013	0.529	0.000	-0.35	0.730
Reg/Seg.2	0.0102	0.136	0.013	0.573	0.000	0.78	0.436
Reg/Seg.3	0.0075	0.141	0.013	0.563	0.000	0.55	0.581
Reg/Seg.4	0.0082	0.141	0.013	0.563	0.000	0.61	0.546
Reg/Seg.5	-0.0555	0.173	0.017	0.521	0.000	-3.35	0.001
Reg/Seg.6	0.0086	0.136	0.013	0.574	0.000	0.66	0.510
Seg.1/2	0.0145	0.053	0.005	0.944	0.000	2.86	0.005
Seg.1/3	0.0118	0.078	0.008	0.880	0.000	1.58	0.118
Seg.1/4	0.0125	0.077	0.007	0.884	0.000	1.70	0.093
Seg.1/5	-0.0512	0.138	0.013	0.725	0.000	-3.86	0.000
Seg.1/6	0.0130	0.055	0.005	0.941	0.000	2.47	0.015
Seg.2/3	-0.0027	0.038	0.004	0.973	0.000	-0.73	0.467
Seg.2/4	-0.0020	0.037	0.004	0.975	0.000	-0.57	0.571
Seg.2/5	-0.0657	0.103	0.010	0.862	0.000	-6.68	0.000
Seg.2/6	-0.0015	0.009	0.001	0.998	0.000	-1.83	0.070
Seg.3/4	0.0007	0.002	0.000	1.000	0.000	2.91	0.004
Seg.3/5	-0.0630	0.078	0.007	0.928	0.000	-8.44	0.000
Seg.3/6	0.0011	0.041	0.004	0.969	0.000	0.29	0.773
Seg.4/5	-0.0637	0.079	0.008	0.925	0.000	-8.42	0.000
Seg.4/6	0.0005	0.039	0.004	0.971	0.000	0.12	0.905
Seg.5/6	0.0641	0.104	0.010	0.858	0.000	6.45	0.000

<u>MSE/ACTUAL</u>

RW/Abs.Ch.	0.0039	0.019	0.002	0.990	0.000	2.14	0.035
RW/Per.Ch.	-0.0013	0.051	0.005	0.925	0.000	-0.27	0.790
RW/Mov.Av.	-0.0120	0.071	0.007	0.994	0.000	-1.77	0.080
RW/Exp.Sm.	-0.0009	0.006	0.001	1.000	0.000	-1.57	0.120
RW/Reg.	-0.0010	0.039	0.004	0.962	0.000	-0.27	0.789
RW/Seg.1	-0.0037	0.058	0.006	0.899	0.000	-0.67	0.505
RW/Seg.2	-0.0059	0.083	0.008	0.907	0.000	-0.74	0.459
RW/Seg.3	-0.0083	0.100	0.010	0.882	0.000	-0.87	0.385
RW/Seg.4	-0.0081	0.099	0.009	0.882	0.000	-0.85	0.395
RW/Seg.5	-0.0368	0.187	0.018	0.884	0.000	-2.05	0.043
RW/Seg.6	-0.0065	0.083	0.008	0.912	0.000	-0.82	0.412
Abs/Per.Ch.	-0.0052	0.049	0.005	0.947	0.000	-1.09	0.277
Abs/Mov.Av.	-0.0158	0.068	0.007	0.986	0.000	-2.42	0.017
Abs/Exp.Sm.	-0.0048	0.018	0.002	0.990	0.000	-2.74	0.007
Abs/Reg.	0.0029	0.040	0.004	0.970	0.000	0.75	0.452
Abs/Seg.1	-0.0076	0.061	0.006	0.894	0.000	-1.31	0.194
Abs/Seg.2	-0.0098	0.080	0.008	0.911	0.000	-1.28	0.204
Abs/Seg.3	-0.0122	0.095	0.009	0.891	0.000	-1.34	0.183
Abs/Seg.4	-0.0120	0.095	0.009	0.890	0.000	-1.32	0.190
Abs/Seg.5	-0.0407	0.180	0.017	0.899	0.000	-2.36	0.020
Abs/Seg.6	-0.0104	0.080	0.008	0.915	0.000	-1.37	0.175
Per/Mov.Av.	-0.0107	0.111	0.011	0.916	0.000	-1.00	0.317
Per/Exp.Sm.	0.0004	0.056	0.005	0.923	0.000	0.07	0.946
Per/Reg.	-0.0023	0.043	0.004	0.916	0.000	-0.56	0.575
Per/Seg.1	-0.0024	0.073	0.007	0.832	0.000	-0.34	0.731
Per/Seg.2	-0.0046	0.108	0.010	0.845	0.000	-0.45	0.656
Per/Seg.3	-0.0070	0.122	0.012	0.828	0.000	-0.60	0.550
Per/Seg.4	-0.0068	0.122	0.012	0.827	0.000	-0.58	0.561
Per/Seg.5	-0.0355	0.214	0.020	0.830	0.000	-1.73	0.086
Per/Seg.6	-0.0052	0.109	0.010	0.849	0.000	-0.50	0.616
Mov/Exp.Sm.	0.0110	0.064	0.006	0.995	0.000	1.79	0.077
Mov/Reg.	-0.0130	0.100	0.010	0.955	0.000	-1.36	0.177
Mov/Seg.1	0.0082	0.097	0.009	0.895	0.000	0.88	0.379

Mov/Seg.2	0.0060	0.083	0.008	0.907	0.000	0.76	0.447
Mov/Seg.3	0.0037	0.094	0.009	0.883	0.000	0.41	0.685
Mov/Seg.4	0.0039	0.094	0.009	0.882	0.000	0.43	0.668
Mov/Seg.5	-0.0249	0.147	0.014	0.888	0.000	-1.76	0.081
Mov/Seg.6	0.0054	0.081	0.008	0.911	0.000	0.71	0.482
Exp/Reg.	-0.0019	0.043	0.004	0.962	0.000	-0.47	0.638
Exp/Seg.1	-0.0028	0.059	0.006	0.899	0.000	-0.49	0.625
Exp/Seg.2	-0.0050	0.081	0.008	0.908	0.000	-0.65	0.520
Exp/Seg.3	-0.0074	0.097	0.009	0.883	0.000	-0.79	0.429
Exp/Seg.4	-0.0072	0.097	0.009	0.882	0.000	-0.77	0.441
Exp/Seg.5	-0.0359	0.183	0.018	0.885	0.000	-2.05	0.043
Exp/Seg.6	-0.0056	0.080	0.008	0.912	0.000	-0.73	0.468
Reg/Seg.1	-0.0047	0.066	0.006	0.865	0.000	-0.74	0.459
Reg/Seg.2	-0.0069	0.100	0.010	0.880	0.000	-0.72	0.470
Reg/Seg.3	-0.0093	0.115	0.011	0.859	0.000	-0.85	0.398
Reg/Seg.4	-0.0091	0.114	0.011	0.858	0.000	-0.83	0.407
Reg/Seg.5	-0.0378	0.206	0.020	0.866	0.000	-1.92	0.057
Reg/Seg.6	-0.0075	0.100	0.010	0.884	0.000	-0.79	0.434
Seg.1/2	-0.0022	0.050	0.005	0.995	0.000	-0.46	0.647
Seg.1/3	-0.0046	0.064	0.006	0.990	0.000	-0.74	0.458
Seg.1/4	-0.0044	0.064	0.006	0.990	0.000	-0.72	0.475
Seg.1/5	-0.0331	0.165	0.016	0.975	0.000	-2.10	0.038
Seg.1/6	-0.0028	0.051	0.005	0.995	0.000	-0.57	0.569
Seg.2/3	-0.0024	0.018	0.002	0.997	0.000	-1.36	0.177
Seg.2/4	-0.0022	0.018	0.002	0.997	0.000	-1.27	0.208
Seg.2/5	-0.0309	0.115	0.011	0.991	0.000	-2.81	0.006
Seg.2/6	-0.0006	0.004	0.000	1.000	0.000	-1.68	0.096
Seg.3/4	0.0002	0.001	0.000	1.000	0.000	2.60	0.011
Seg.3/5	-0.0285	0.101	0.010	0.995	0.000	-2.95	0.004
Seg.3/6	0.0018	0.020	0.002	0.996	0.000	0.94	0.352
Seg.4/5	-0.0287	0.102	0.010	0.995	0.000	-2.95	0.004
Seg.4/6	0.0016	0.020	0.002	0.996	0.000	0.84	0.404
Seg.5/6	0.0303	0.114	0.011	0.991	0.000	2.77	0.007

<u>MAPE/FORECAST</u>

RW/Abs.Ch.	0.0402	0.073	0.007	0.728	0.000	5.74	0.000
RW/Per.Ch.	0.0189	0.092	0.009	0.645	0.000	2.14	0.035
RW/Mov.Av.	-0.0269	0.066	0.006	0.831	0.000	-4.23	0.000
RW/Exp.Sm.	-0.0023	0.006	0.001	0.998	0.000	-3.74	0.000
RW/Reg.	-0.0123	0.140	0.013	0.323	0.000	-0.92	0.358
RW/Seg.1	-0.1275	0.317	0.030	0.215	0.025	-4.20	0.000
RW/Seg.2	-0.1012	0.329	0.032	0.159	0.099	-3.21	0.002
RW/Seg.3	-0.0973	0.334	0.032	0.100	0.301	-3.04	0.003
RW/Seg.4	-0.0969	0.334	0.032	0.103	0.289	-3.03	0.003
RW/Seg.5	-0.1384	0.329	0.032	-0.022	0.818	-4.39	0.000
RW/Seg.6	-0.1033	0.329	0.032	0.166	0.085	-3.28	0.001
Abs/Per.Ch.	-0.0213	0.066	0.006	0.812	0.000	-3.36	0.001
Abs/Mov.Av.	-0.0672	0.111	0.011	0.456	0.000	-6.30	0.000
Abs/Exp.Sm.	-0.0425	0.076	0.007	0.708	0.000	-5.87	0.000
Abs/Reg.	0.0279	0.117	0.011	0.493	0.000	2.49	0.014
Abs/Seg.1	-0.1678	0.311	0.030	0.262	0.006	-5.62	0.000
Abs/Seg.2	-0.1414	0.316	0.030	0.279	0.003	-4.67	0.000
Abs/Seg.3	-0.1376	0.316	0.030	0.265	0.005	-4.54	0.000
Abs/Seg.4	-0.1372	0.316	0.030	0.266	0.005	-4.53	0.000
Abs/Seg.5	-0.1787	0.305	0.029	0.201	0.036	-6.12	0.000
Abs/Seg.6	-0.1436	0.316	0.030	0.284	0.003	-4.74	0.000
Per/Mov.Av.	-0.0459	0.126	0.012	0.413	0.000	-3.80	0.000

Per/Exp.Sm.	-0.0212	0.095	0.009	0.624	0.000	-2.33	0.021
Per/Reg.	0.0066	0.127	0.012	0.472	0.000	0.54	0.588
Per/Seg.1	-0.1465	0.318	0.030	0.218	0.023	-4.81	0.000
Per/Seg.2	-0.1201	0.323	0.031	0.223	0.020	-3.88	0.000
Per/Seg.3	-0.1163	0.326	0.031	0.195	0.043	-3.73	0.000
Per/Seg.4	-0.1159	0.326	0.031	0.196	0.041	-3.72	0.000
Per/Seg.5	-0.1574	0.316	0.030	0.127	0.188	-5.20	0.000
Per/Seg.6	-0.1223	0.323	0.031	0.232	0.015	-3.96	0.000
Mov/Exp.Sm.	0.0246	0.060	0.006	0.862	0.000	4.26	0.000
Mov/Reg.	-0.0866	0.110	0.011	0.683	0.000	-8.23	0.000
Mov/Seg.1	-0.1006	0.328	0.031	0.139	0.149	-3.20	0.002
Mov/Seg.2	-0.0742	0.342	0.033	0.075	0.438	-2.27	0.025
Mov/Seg.3	-0.0704	0.348	0.033	0.011	0.908	-2.11	0.037
Mov/Seg.4	-0.0700	0.348	0.033	0.014	0.886	-2.10	0.038
Mov/Seg.5	-0.1115	0.344	0.033	-0.108	0.262	-3.39	0.001
Mov/Seg.6	-0.0764	0.341	0.033	0.080	0.408	-2.34	0.021
Exp/Reg.	-0.0146	0.142	0.014	0.302	0.001	-1.08	0.284
Exp/Seg.1	-0.1253	0.318	0.030	0.207	0.031	-4.11	0.000
Exp/Seg.2	-0.0989	0.330	0.032	0.149	0.123	-3.12	0.002
Exp/Seg.3	-0.0951	0.336	0.032	0.089	0.360	-2.96	0.004
Exp/Seg.4	-0.0946	0.335	0.032	0.091	0.346	-2.95	0.004
Exp/Seg.5	-0.1361	0.331	0.032	-0.035	0.717	-4.30	0.000
Exp/Seg.6	-0.1011	0.330	0.032	0.155	0.107	-3.20	0.002
Reg/Seg.1	-0.1399	0.336	0.032	0.105	0.279	-4.35	0.000
Reg/Seg.2	-0.1135	0.342	0.033	0.105	0.279	-3.47	0.001
Reg/Seg.3	-0.1097	0.341	0.033	0.098	0.312	-3.35	0.001
Reg/Seg.4	-0.1093	0.341	0.033	0.098	0.309	-3.34	0.001
Reg/Seg.5	-0.1507	0.327	0.031	0.076	0.435	-4.81	0.000
Reg/Seg.6	-0.1157	0.342	0.033	0.107	0.266	-3.54	0.001
Seg.1/2	0.0264	0.052	0.005	0.987	0.000	5.27	0.000
Seg.1/3	0.0302	0.078	0.007	0.971	0.000	4.03	0.000
Seg.1/4	0.0306	0.077	0.007	0.972	0.000	4.16	0.000
Seg.1/5	-0.0109	0.127	0.012	0.921	0.000	-0.90	0.372
Seg.1/6	0.0242	0.054	0.005	0.987	0.000	4.71	0.000
Seg.2/3	0.0038	0.039	0.004	0.993	0.000	1.01	0.315
Seg.2/4	0.0042	0.038	0.004	0.993	0.000	1.16	0.248
Seg.2/5	-0.0372	0.094	0.009	0.959	0.000	-4.16	0.000
Seg.2/6	-0.0022	0.011	0.001	0.999	0.000	-2.13	0.035
Seg.3/4	0.0004	0.002	0.000	1.000	0.000	1.84	0.068
Seg.3/5	-0.0411	0.067	0.006	0.979	0.000	-6.37	0.000
Seg.3/6	-0.0060	0.044	0.004	0.991	0.000	-1.42	0.158
Seg.4/5	-0.0415	0.068	0.007	0.979	0.000	-6.34	0.000
Seg.4/6	-0.0064	0.043	0.004	0.992	0.000	-1.57	0.120
Seg.5/6	0.0351	0.097	0.009	0.956	0.000	3.78	0.000

<u>MSE/FORECAST</u>

RW/Abs.Ch.	0.0115	0.025	0.002	0.871	0.000	4.78	0.000
RW/Per.Ch.	0.0026	0.038	0.004	0.766	0.000	0.72	0.476
RW/Mov.Av.	-0.0103	0.041	0.004	0.726	0.000	-2.60	0.011
RW/Exp.Sm.	-0.0005	0.003	0.000	0.998	0.000	-1.66	0.099
RW/Reg.	0.0033	0.064	0.006	0.404	0.000	0.54	0.591
RW/Seg.1	-0.1395	0.338	0.032	0.106	0.271	-4.31	0.000
RW/Seg.2	-0.1312	0.341	0.033	0.085	0.381	-4.02	0.000
RW/Seg.3	-0.1288	0.343	0.033	0.064	0.510	-3.93	0.000
RW/Seg.4	-0.1287	0.343	0.033	0.064	0.506	-3.92	0.000
RW/Seg.5	-0.1369	0.341	0.033	0.039	0.689	-4.19	0.000
RW/Seg.6	-0.1325	0.341	0.033	0.091	0.348	-4.06	0.000

Abs/Per.Ch.	-0.0089	0.034	0.003	0.835	0.000	-2.76	0.007
Abs/Mov.Av.	-0.0218	0.049	0.005	0.571	0.000	-4.66	0.000
Abs/Exp.Sm.	-0.0120	0.025	0.002	0.863	0.000	-4.98	0.000
Abs/Reg.	0.0148	0.057	0.005	0.486	0.000	2.69	0.008
Abs/Seg.1	-0.1510	0.338	0.032	0.111	0.252	-4.67	0.000
Abs/Seg.2	-0.1427	0.340	0.033	0.104	0.283	-4.38	0.000
Abs/Seg.3	-0.1403	0.341	0.033	0.094	0.333	-4.30	0.000
Abs/Seg.4	-0.1402	0.341	0.033	0.094	0.332	-4.30	0.000
Abs/Seg.5	-0.1484	0.338	0.032	0.085	0.378	-4.58	0.000
Abs/Seg.6	-0.1440	0.340	0.033	0.107	0.269	-4.42	0.000
Per/Mov.Av.	-0.0129	0.060	0.006	0.469	0.000	-2.22	0.028
Per/Exp.Sm.	-0.0031	0.039	0.004	0.746	0.000	-0.83	0.411
Per/Reg.	0.0059	0.066	0.006	0.436	0.000	0.94	0.352
Per/Seg.1	-0.1421	0.341	0.033	0.071	0.465	-4.35	0.000
Per/Seg.2	-0.1338	0.344	0.033	0.055	0.572	-4.07	0.000
Per/Seg.3	-0.1314	0.345	0.033	0.034	0.724	-3.98	0.000
Per/Seg.4	-0.1313	0.345	0.033	0.035	0.720	-3.97	0.000
Per/Seg.5	-0.1395	0.343	0.033	0.014	0.888	-4.24	0.000
Per/Seg.6	-0.1351	0.343	0.033	0.061	0.529	-4.11	0.000
Mov/Exp.Sm.	0.0098	0.039	0.004	0.762	0.000	2.65	0.009
Mov/Reg.	-0.0070	0.079	0.008	0.202	0.035	-0.92	0.358
Mov/Seg.1	-0.1292	0.344	0.033	0.021	0.832	-3.92	0.000
Mov/Seg.2	-0.1209	0.347	0.033	0.006	0.950	-3.64	0.000
Mov/Seg.3	-0.1185	0.348	0.033	-0.009	0.930	-3.56	0.001
Mov/Seg.4	-0.1185	0.348	0.033	-0.008	0.933	-3.56	0.001
Mov/Seg.5	-0.1266	0.346	0.033	-0.026	0.786	-3.82	0.000
Mov/Seg.6	-0.1222	0.346	0.033	0.010	0.918	-3.68	0.000
Exp/Reg.	0.0028	0.064	0.006	0.395	0.000	0.46	0.649
Exp/Seg.1	-0.1390	0.338	0.032	0.102	0.292	-4.29	0.000
Exp/Seg.2	-0.1307	0.341	0.033	0.081	0.405	-4.00	0.000
Exp/Seg.3	-0.1283	0.343	0.033	0.060	0.534	-3.91	0.000
Exp/Seg.4	-0.1282	0.343	0.033	0.061	0.531	-3.91	0.000
Exp/Seg.5	-0.1364	0.341	0.033	0.036	0.713	-4.18	0.000
Exp/Seg.6	-0.1320	0.341	0.033	0.087	0.371	-4.04	0.000
Reg/Seg.1	-0.1362	0.343	0.033	0.041	0.670	-4.14	0.000
Reg/Seg.2	-0.1279	0.346	0.033	0.038	0.693	-3.86	0.000
Reg/Seg.3	-0.1255	0.346	0.033	0.032	0.738	-3.78	0.000
Reg/Seg.4	-0.1254	0.346	0.033	0.032	0.737	-3.78	0.000
Reg/Seg.5	-0.1336	0.344	0.033	0.030	0.760	-4.06	0.000
Reg/Seg.6	-0.1292	0.346	0.033	0.039	0.686	-3.90	0.000
Seg.1/2	0.0083	0.020	0.002	0.998	0.000	4.24	0.000
Seg.1/3	0.0107	0.031	0.003	0.996	0.000	3.60	0.000
Seg.1/4	0.0107	0.031	0.003	0.996	0.000	3.64	0.000
Seg.1/5	0.0026	0.051	0.005	0.989	0.000	0.52	0.605
Seg.1/6	0.0070	0.020	0.002	0.998	0.000	3.72	0.000
Seg.2/3	0.0024	0.014	0.001	0.999	0.000	1.81	0.072
Seg.2/4	0.0025	0.014	0.001	0.999	0.000	1.88	0.062
Seg.2/5	-0.0057	0.033	0.003	0.995	0.000	-1.82	0.071
Seg.2/6	-0.0013	0.007	0.001	1.000	0.000	-1.98	0.050
Seg.3/4	0.0001	0.001	0.000	1.000	0.000	1.08	0.282
Seg.3/5	-0.0081	0.022	0.002	0.998	0.000	-3.90	0.000
Seg.3/6	-0.0037	0.020	0.002	0.998	0.000	-1.97	0.052
Seg.4/5	-0.0082	0.022	0.002	0.998	0.000	-3.88	0.000
Seg.4/6	-0.0037	0.019	0.002	0.998	0.000	-2.01	0.047
Seg.5/6	0.0044	0.037	0.003	0.994	0.000	1.27	0.206

MAPE/ACTUAL

RW/Abs.Ch.	0.0322	0.063	0.006	0.804	0.000	5.33	0.000
RW/Per.Ch.	0.0171	0.079	0.008	0.738	0.000	2.25	0.026
RW/Mov.Av.	-0.0360	0.070	0.007	0.750	0.000	-5.34	0.000
RW/Exp.Sm.	-0.0035	0.007	0.001	0.997	0.000	-4.91	0.000
RW/Reg.	-0.0282	0.069	0.007	0.780	0.000	-4.26	0.000
RW/Seg.1	0.0184	0.118	0.011	0.509	0.000	1.63	0.107
RW/Seg.2	0.0253	0.137	0.013	0.405	0.000	1.93	0.056
RW/Seg.3	0.0199	0.156	0.015	0.296	0.002	1.33	0.187
RW/Seg.4	0.0216	0.154	0.015	0.313	0.001	1.47	0.146
RW/Seg.5	0.0150	0.159	0.015	0.279	0.003	0.98	0.329
RW/Seg.6	0.0012	0.115	0.011	0.508	0.000	0.11	0.913
Abs/Per.Ch.	-0.0151	0.065	0.006	0.835	0.000	-2.43	0.017
Abs/Mov.Av.	-0.0682	0.094	0.009	0.602	0.000	-7.57	0.000
Abs/Ex.Sm.	-0.0357	0.064	0.006	0.799	0.000	-5.83	0.000
Abs/Reg.	0.0040	0.036	0.003	0.945	0.000	1.16	0.247
Abs/Seg.1	-0.0138	0.138	0.013	0.364	0.000	-1.04	0.299
Abs/Seg.2	-0.0070	0.143	0.014	0.387	0.000	-0.51	0.612
Abs/Seg.3	-0.0124	0.155	0.015	0.360	0.000	-0.83	0.406
Abs/Seg.4	-0.0107	0.153	0.015	0.366	0.000	-0.73	0.467
Abs/Seg.5	-0.0173	0.157	0.015	0.354	0.000	-1.15	0.251
Abs/Seg.6	-0.0310	0.141	0.014	0.306	0.001	-2.30	0.024
Per/Mov.Av.	-0.0531	0.104	0.010	0.567	0.000	-5.32	0.000
Per/Ex.Sm.	-0.0206	0.080	0.008	0.736	0.000	-2.70	0.008
Per/Reg.	-0.0111	0.071	0.007	0.811	0.000	-1.64	0.103
Per/Seg.1	0.0013	0.146	0.014	0.335	0.000	0.09	0.925
Per/Seg.2	0.0082	0.154	0.015	0.331	0.000	0.55	0.582
Per/Seg.3	0.0028	0.166	0.016	0.294	0.002	0.17	0.862
Per/Seg.4	0.0044	0.164	0.016	0.302	0.001	0.28	0.778
Per/Seg.5	-0.0022	0.167	0.016	0.295	0.002	-0.14	0.893
Per/Seg.6	-0.0159	0.147	0.014	0.308	0.001	-1.13	0.260
Mov/Ex.Sm.	0.0325	0.063	0.006	0.801	0.000	5.38	0.000
Mov/Reg.	-0.0642	0.101	0.010	0.558	0.000	-6.62	0.090
Mov/Seg.1	0.0544	0.134	0.013	0.397	0.000	4.24	0.000
Mov/Seg.2	0.0613	0.150	0.014	0.317	0.001	4.26	0.000
Mov/Seg.3	0.0559	0.171	0.016	0.198	0.039	3.42	0.001
Mov/Seg.4	0.0576	0.168	0.016	0.218	0.023	3.58	0.001
Mov/Seg.5	0.0509	0.173	0.017	0.188	0.050	3.07	0.003
Mov/Seg.6	0.0372	0.131	0.013	0.403	0.000	2.97	0.004
Exp/Reg.	-0.0317	0.070	0.007	0.772	0.000	-4.70	0.000
Exp/Seg.1	0.0219	0.118	0.011	0.509	0.000	1.94	0.055
Exp/Seg.2	0.0287	0.137	0.013	0.405	0.000	2.20	0.030
Exp/Seg.3	0.0234	0.157	0.015	0.291	0.002	1.56	0.122
Exp/Seg.4	0.0250	0.154	0.015	0.309	0.001	1.70	0.092
Exp/Seg.5	0.0184	0.159	0.015	0.274	0.004	1.21	0.230
Exp/Seg.6	0.0047	0.115	0.011	0.509	0.000	0.43	0.671
Reg/Seg.1	-0.0098	0.141	0.014	0.352	0.000	-0.72	0.471
Reg/Seg.2	-0.0030	0.150	0.014	0.338	0.000	-0.21	0.838
Reg/Seg.3	-0.0083	0.163	0.016	0.301	0.001	-0.54	0.594
Reg/Seg.4	-0.0067	0.161	0.015	0.308	0.001	-0.43	0.666
Reg/Seg.5	-0.0133	0.164	0.016	0.297	0.002	-0.84	0.401
Reg/Seg.6	-0.0270	0.142	0.014	0.317	0.001	-1.98	0.050
Seg.1/2	0.0068	0.052	0.005	0.934	0.000	1.37	0.174
Seg.1/3	0.0014	0.082	0.008	0.853	0.000	0.18	0.854
Seg.1/4	0.0031	0.078	0.007	0.866	0.000	0.42	0.676
Seg.1/5	-0.0035	0.087	0.008	0.837	0.000	-0.42	0.676

Seg.1/6	-0.0172	0.032	0.003	0.972	0.000	-5.62	0.000
Seg.2/3	-0.0054	0.042	0.004	0.964	0.000	-1.33	0.186
Seg.2/4	-0.0037	0.037	0.004	0.972	0.000	-1.05	0.296
Seg.2/5	-0.0103	0.044	0.004	0.962	0.000	-2.45	0.016
Seg.2/6	-0.0241	0.074	0.007	0.861	0.000	-3.38	0.001
Seg.3/4	0.0017	0.007	0.001	0.999	0.000	2.61	0.010
Seg.3/5	-0.0049	0.019	0.002	0.993	0.000	-2.76	0.007
Seg.3/6	-0.0187	0.105	0.010	0.749	0.000	-1.86	0.066
Seg.4/5	-0.0066	0.020	0.002	0.992	0.000	-3.50	0.001
Seg.4/6	-0.0203	0.101	0.010	0.765	0.000	-2.10	0.038
Seg.5/6	-0.0137	0.109	0.010	0.735	0.000	-1.32	0.189

MSE/ACTUAL

RW/Abs.Ch.	0.0033	0.023	0.002	0.885	0.000	1.46	0.147
RW/Per.Ch.	-0.0020	0.030	0.003	0.851	0.000	-0.70	0.488
RW/Mov.Av.	-0.0124	0.041	0.004	0.654	0.000	-3.14	0.002
RW/Exp.Sm.	-0.0007	0.002	0.000	0.999	0.000	-4.28	0.000
RW/Reg	-0.0017	0.026	0.002	0.872	0.000	-0.66	0.508
RW/Seg.1	-0.0061	0.122	0.012	0.228	0.017	-0.52	0.602
RW/Seg.2	-0.0078	0.151	0.014	0.188	0.051	-0.54	0.591
RW/Seg.3	-0.0123	0.178	0.017	0.153	0.113	-0.72	0.474
RW/Seg.4	-0.0115	0.174	0.017	0.157	0.102	-0.69	0.494
RW/Seg.5	-0.0137	0.180	0.017	0.154	0.110	-0.79	0.430
RW/Seg.6	-0.0087	0.105	0.010	0.270	0.005	-0.86	0.390
Abs/Per.Ch.	-0.0053	0.025	0.002	0.892	0.000	-2.21	0.029
Abs/Mov.Av.	-0.0157	0.046	0.004	0.615	0.000	-3.58	0.001
Abs/Exp.Sm.	-0.0040	0.024	0.002	0.878	0.000	-1.72	0.088
Abs/Reg.	0.0016	0.009	0.001	0.985	0.000	1.86	0.065
Abs/Seg.1	-0.0094	0.127	0.012	0.163	0.091	-0.78	0.440
Abs/Seg.2	-0.0111	0.154	0.015	0.154	0.111	-0.75	0.453
Abs/Seg.3	-0.0155	0.179	0.017	0.143	0.137	-0.90	0.368
Abs/Seg.4	-0.0148	0.176	0.017	0.145	0.133	-0.88	0.383
Abs/Seg.5	-0.0170	0.182	0.017	0.146	0.129	-0.98	0.332
Abs/Seg.6	-0.0120	0.111	0.011	0.172	0.073	-1.12	0.263
Per/Mov.Av.	-0.0103	0.048	0.005	0.617	0.000	-2.25	0.027
Per/Exp.Sm.	0.0013	0.031	0.003	0.846	0.000	0.46	0.650
Per/Reg.	-0.0037	0.026	0.002	0.887	0.000	-1.49	0.140
Per/Seg.1	-0.0041	0.129	0.012	0.148	0.125	-0.33	0.740
Per/Seg.2	-0.0058	0.156	0.015	0.130	0.179	-0.39	0.700
Per/Seg.3	-0.0102	0.182	0.017	0.112	0.247	-0.59	0.558
Per/Seg.4	-0.0095	0.179	0.017	0.114	0.236	-0.55	0.582
Per/Seg.5	-0.0116	0.184	0.018	0.115	0.235	-0.66	0.510
Per/Seg.6	-0.0066	0.113	0.011	0.170	0.078	-0.61	0.540
Mov/Exp.Sm.	0.0117	0.040	0.004	0.677	0.000	3.05	0.003
Mov/Reg.	-0.0140	0.048	0.005	0.582	0.000	-3.02	0.003
Mov/Seg.1	0.0062	0.129	0.012	0.152	0.116	0.50	0.615
Mov/Seg.2	0.0046	0.156	0.015	0.123	0.202	0.30	0.761
Mov/Seg.3	0.0001	0.183	0.018	0.093	0.336	0.01	0.995
Mov/Seg.4	0.0009	0.179	0.017	0.097	0.315	0.05	0.959
Mov/Seg.5	-0.0013	0.185	0.018	0.095	0.326	-0.07	0.942
Mov/Seg.6	0.0037	0.112	0.011	0.184	0.056	0.35	0.731
Exp/Reg.	-0.0023	0.125	0.012	0.319	0.001	-2.46	0.015
Exp/Seg.1	-0.0055	0.027	0.003	0.864	0.000	-0.91	0.362
Exp/Seg.2	-0.0071	0.151	0.014	0.188	0.051	-0.49	0.624
Exp/Seg.3	-0.0116	0.178	0.017	0.152	0.116	-0.68	0.499
Exp/Seg.4	-0.0108	0.174	0.017	0.156	0.105	-0.65	0.520
Exp/Seg.5	-0.0130	0.180	0.017	0.153	0.113	-0.75	0.454
Exp/Seg.6	-0.0080	0.105	0.010	0.272	0.004	-0.80	0.428

Reg/Seg.1	-0.0078	0.128	0.012	0.148	0.123	-0.63	0.527
Reg/Seg.2	-0.0095	0.155	0.015	0.134	0.166	-0.64	0.526
Reg/Seg.3	-0.0139	0.181	0.017	0.124	0.200	-0.80	0.423
Reg/Seg.4	-0.0131	0.177	0.017	0.125	0.195	-0.77	0.441
Reg/Seg.5	-0.0153	0.183	0.018	0.125	0.195	-0.87	0.384
Reg/Seg.6	-0.0103	0.112	0.011	0.160	0.097	-0.96	0.339
Seg.1/2	-0.0017	0.032	0.003	0.993	0.000	-0.53	0.594
Seg.1/3	-0.0061	0.060	0.006	0.986	0.000	-1.07	0.288
Seg.1/4	-0.0053	0.056	0.005	0.987	0.000	-0.99	0.324
Seg.1/5	-0.0075	0.063	0.006	0.984	0.000	-1.25	0.213
Seg.1/6	-0.0025	0.021	0.002	0.995	0.000	-1.28	0.202
Seg.2/3	-0.0044	0.029	0.003	0.997	0.000	-1.62	0.109
Seg.2/4	-0.0037	0.025	0.002	0.998	0.000	-1.52	0.131
Seg.2/5	-0.0059	0.031	0.003	0.998	0.000	-1.98	0.050
Seg.2/6	-0.0009	0.052	0.005	0.980	0.000	-0.17	0.863
Seg.3/4	0.0008	0.004	0.000	1.000	0.000	2.19	0.031
Seg.3/5	-0.0014	0.006	0.001	0.999	0.000	-2.28	0.025
Seg.3/6	0.0036	0.080	0.008	0.967	0.000	0.47	0.640
Seg.4/5	-0.0022	0.008	0.001	0.999	0.000	-2.72	0.008
Seg.4/6	0.0028	0.076	0.007	0.969	0.000	0.38	0.702
Seg.5/6	0.0050	0.083	0.008	0.965	0.000	0.63	0.529

MAPE/FORECAST

RW/Abs.Ch.	0.0456	0.068	0.007	0.855	0.000	6.99	0.000
RW/Per.Ch.	0.0283	0.080	0.008	0.835	0.000	3.70	0.000
RW/Mov.Av.	-0.0474	0.068	0.007	0.885	0.000	-7.28	0.000
RW/Exp.Sm.	-0.0044	0.008	0.001	0.998	0.000	-6.13	0.000
RW/Reg.	-0.0392	0.074	0.007	0.832	0.000	-5.51	0.000
RW/Seg.1	-0.1116	0.310	0.030	0.357	0.000	-3.76	0.000
RW/Seg.2	-0.0941	0.321	0.031	0.287	0.002	-3.06	0.003
RW/Seg.3	-0.0921	0.328	0.031	0.225	0.019	-2.93	0.004
RW/Seg.4	-0.0914	0.327	0.031	0.233	0.015	-2.92	0.004
RW/Seg.5	-0.0959	0.327	0.031	0.220	0.022	-3.06	0.003
RW/Seg.6	-0.1379	0.301	0.029	0.394	0.000	-4.79	0.000
Abs/Per.Ch.	-0.0172	0.060	0.006	0.911	0.000	-2.99	0.003
Abs/Mov.Av.	-0.0929	0.101	0.010	0.731	0.000	-9.64	0.000
Abs/Exp.Sm.	-0.0500	0.068	0.007	0.854	0.000	-7.63	0.000
Abs/Reg.	0.0063	0.042	0.004	0.943	0.000	1.57	0.119
Abs/Seg.1	-0.1572	0.312	0.030	0.345	0.000	-5.27	0.000
Abs/Seg.2	-0.1396	0.316	0.030	0.320	0.001	-4.61	0.000
Abs/Seg.3	-0.1377	0.319	0.031	0.288	0.002	-4.51	0.000
Abs/Seg.4	-0.1370	0.319	0.031	0.292	0.002	-4.49	0.000
Abs/Seg.5	-0.1414	0.318	0.030	0.285	0.003	-4.65	0.000
Abs/Seg.6	-0.1835	0.306	0.029	0.357	0.000	-6.26	0.000
Per/Mov.Av.	-0.0757	0.113	0.011	0.699	0.000	-7.02	0.000
Per/Exp.Sm.	-0.0328	0.080	0.008	0.832	0.000	-4.25	0.000
Per/Reg.	-0.0109	0.069	0.007	0.879	0.000	-1.66	0.101
Per/Seg.1	-0.1400	0.324	0.031	0.273	0.004	-4.51	0.000
Per/Seg.2	-0.1224	0.330	0.032	0.241	0.012	-3.87	0.000
Per/Seg.3	-0.1204	0.333	0.032	0.205	0.033	-3.77	0.000
Per/Seg.4	-0.1197	0.333	0.032	0.210	0.028	-3.75	0.000
Per/Seg.5	-0.1242	0.332	0.032	0.205	0.033	-3.90	0.000
Per/Seg.6	-0.1662	0.316	0.030	0.295	0.002	-5.49	0.000
Mov/Exp.Sm.	0.0429	0.061	0.006	0.910	0.000	7.38	0.000
Mov/Reg.	-0.0866	0.110	0.011	0.683	0.000	-8.23	0.000
Mov/Seg.1	-0.0643	0.321	0.031	0.296	0.002	-2.09	0.039
Mov/Seg.2	-0.0467	0.332	0.032	0.228	0.017	-1.47	0.145
Mov/Seg.3	-0.0448	0.340	0.033	0.159	0.098	-1.37	0.173

Mov/Seg.4	-0.0440	0.339	0.033	0.169	0.079	-1.35	0.178
Mov/Seg.5	-0.0485	0.340	0.033	0.154	0.109	-1.49	0.139
Mov/Seg.6	-0.0906	0.311	0.030	0.333	0.000	-3.04	0.003
Exp/Reg.	-0.0437	0.076	0.007	0.827	0.000	-6.04	0.000
Exp/Seg.1	-0.1072	0.311	0.030	0.354	0.000	-3.60	0.000
Exp/Seg.2	-0.0897	0.322	0.031	0.284	0.003	-2.91	0.004
Exp/Seg.3	-0.0877	0.329	0.031	0.220	0.022	-2.79	0.006
Exp/Seg.4	-0.0870	0.328	0.031	0.229	0.017	-2.77	0.007
Exp/Seg.5	-0.0915	0.328	0.031	0.215	0.025	-2.91	0.004
Exp/Seg.6	-0.1335	0.301	0.029	0.391	0.000	-4.63	0.000
Reg/Seg.1	-0.1509	0.314	0.030	0.326	0.001	-5.01	0.000
Reg/Seg.2	-0.1333	0.321	0.031	0.288	0.002	-4.34	0.000
Reg/Seg.3	-0.1314	0.324	0.031	0.251	0.009	-4.23	0.000
Reg/Seg.4	-0.1306	0.324	0.031	0.256	0.007	-4.21	0.000
Reg/Seg.5	-0.1351	0.323	0.031	0.250	0.009	-4.37	0.000
Reg/Seg.6	-0.1771	0.307	0.029	0.346	0.000	-6.02	0.000
Seg.1/2	0.0175	0.053	0.005	0.987	0.000	3.46	0.001
Seg.1/3	0.0195	0.082	0.008	0.969	0.000	2.48	0.015
Seg.1/4	0.0202	0.078	0.007	0.972	0.000	2.71	0.008
Seg.1/5	0.0157	0.086	0.008	0.966	0.000	1.91	0.059
Seg.1/6	-0.0263	0.036	0.003	0.994	0.000	-7.65	0.000
Seg.2/3	0.0020	0.042	0.004	0.992	0.000	0.49	0.625
Seg.2/4	0.0027	0.037	0.004	0.994	0.000	0.76	0.447
Seg.2/5	-0.0018	0.043	0.004	0.992	0.000	-0.44	0.658
Seg.2/6	-0.0438	0.077	0.007	0.973	0.000	-5.91	0.000
Seg.3/4	0.0007	0.006	0.001	1.000	0.000	1.16	0.249
Seg.3/5	-0.0038	0.017	0.002	0.999	0.000	-2.28	0.025
Seg.3/6	-0.0458	0.108	0.010	0.946	0.000	-4.42	0.000
Seg.4/5	-0.0045	0.018	0.002	0.999	0.000	-2.60	0.011
Seg.4/6	-0.0465	0.104	0.010	0.950	0.000	-4.66	0.000
Seg.5/6	-0.0420	0.111	0.011	0.943	0.000	-3.96	0.000

<u>MSE/FORECAST</u>

RW/Abs.Ch.	0.0120	0.035	0.003	0.972	0.000	3.60	0.000
RW/Per.Ch.	0.0027	0.027	0.003	0.970	0.000	1.05	0.298
RW/Mov.Av.	-0.0191	0.041	0.004	0.941	0.000	-4.81	0.000
RW/Exp.Sm.	-0.0012	0.003	0.000	1.000	0.000	-4.43	0.000
RW/Reg.	-0.0096	0.034	0.003	0.971	0.000	-2.95	0.004
RW/Seg.1	-0.1342	0.339	0.032	0.252	0.008	-4.13	0.000
RW/Seg.2	-0.1270	0.344	0.033	0.194	0.043	-3.86	0.000
RW/Seg.3	-0.1249	0.346	0.033	0.143	0.139	-3.77	0.000
RW/Seg.4	-0.1249	0.346	0.033	0.147	0.127	-3.77	0.000
RW/Seg.5	-0.1257	0.346	0.033	0.149	0.123	-3.79	0.000
RW/Seg.6	-0.1446	0.336	0.032	0.318	0.001	-4.50	0.000
Abs/Per.Ch.	-0.0093	0.036	0.003	0.981	0.000	-2.73	0.007
Abs/Mov.Av.	-0.0311	0.057	0.005	0.918	0.000	-5.68	0.000
Abs/Exp.Sm.	-0.0132	0.035	0.003	0.971	0.000	-3.89	0.000
Abs/Reg.	0.0024	0.011	0.001	0.990	0.000	2.22	0.028
Abs/Seg.1	-0.1462	0.338	0.032	0.260	0.006	-4.51	0.000
Abs/Seg.2	-0.1390	0.340	0.033	0.206	0.031	-4.26	0.000
Abs/Seg.3	-0.1369	0.342	0.033	0.160	0.097	-4.18	0.000
Abs/Seg.4	-0.1369	0.342	0.033	0.164	0.089	-4.18	0.000
Abs/Seg.5	-0.1377	0.341	0.033	0.166	0.085	-4.21	0.000
Abs/Seg.6	-0.1566	0.337	0.032	0.321	0.001	-4.85	0.000
Per/Mov.Av.	-0.0218	0.054	0.005	0.896	0.000	-4.24	0.000
Per/Exp.Sm.	-0.0039	0.028	0.003	0.967	0.000	-1.45	0.149
Per/Reg.	-0.0069	0.036	0.003	0.976	0.000	-2.01	0.047
Per/Seg.1	-0.1369	0.342	0.033	0.229	0.017	-4.18	0.000

Per/Seg.2	-0.1297	0.346	0.033	0.173	0.073	-3.91	0.000
Per/Seg.3	-0.1276	0.349	0.033	0.125	0.195	-3.82	0.000
Per/Seg.4	-0.1276	0.349	0.033	0.129	0.181	-3.82	0.000
Per/Seg.5	-0.1284	0.349	0.033	0.131	0.176	-3.85	0.000
Per/Seg.6	-0.1473	0.339	0.032	0.291	0.002	-4.54	0.000
Mov/Exp.Sm.	0.0179	0.039	0.004	0.949	0.000	4.83	0.000
Mov/Reg.	-0.0287	0.059	0.006	0.903	0.000	-5.08	0.000
Mov/Seg.1	-0.1151	0.343	0.033	0.227	0.018	-3.50	0.001
Mov/Seg.2	-0.1079	0.348	0.033	0.171	0.075	-3.24	0.002
Mov/Seg.3	-0.1058	0.352	0.034	0.120	0.214	-3.14	0.002
Mov/Seg.4	-0.1058	0.351	0.034	0.125	0.196	-3.14	0.002
Mov/Seg.5	-0.1066	0.351	0.034	0.126	0.193	-3.17	0.002
Mov/Seg.6	-0.1255	0.339	0.032	0.291	0.002	-3.86	0.000
Exp/Reg.	-0.0108	0.035	0.003	0.969	0.000	-3.23	0.002
Exp/Seg.1	-0.1330	0.339	0.033	0.251	0.008	-4.09	0.000
Exp/Seg.2	-0.1258	0.344	0.033	0.193	0.044	-3.82	0.000
Exp/Seg.3	-0.1237	0.347	0.033	0.142	0.142	-3.73	0.000
Exp/Seg.4	-0.1237	0.346	0.033	0.146	0.130	-3.73	0.000
Exp/Seg.5	-0.1245	0.346	0.033	0.148	0.125	-3.75	0.000
Exp/Seg.6	-0.1434	0.336	0.032	0.318	0.001	-4.46	0.000
Reg/Seg.1	-0.1438	0.338	0.032	0.261	0.006	-4.44	0.000
Reg/Seg.2	-0.1366	0.341	0.033	0.206	0.032	-4.19	0.000
Reg/Seg.3	-0.1345	0.342	0.033	0.159	0.098	-4.11	0.000
Reg/Seg.4	-0.1345	0.342	0.033	0.163	0.090	-4.11	0.000
Reg/Seg.5	-0.1353	0.342	0.033	0.165	0.086	-4.14	0.000
Reg/Seg.6	-0.1542	0.337	0.032	0.322	0.001	-4.78	0.000
Seg.1/2	0.0072	0.026	0.002	0.997	0.000	2.90	0.004
Seg.1/3	0.0093	0.043	0.004	0.992	0.000	2.26	0.026
Seg.1/4	0.0093	0.041	0.004	0.993	0.000	2.36	0.020
Seg.1/5	0.0085	0.042	0.004	0.993	0.000	2.11	0.037
Seg.1/6	-0.0104	0.028	0.003	0.997	0.000	-3.91	0.000
Seg.2/3	0.0021	0.021	0.002	0.998	0.000	1.03	0.305
Seg.2/4	0.0021	0.019	0.002	0.998	0.000	1.15	0.253
Seg.2/5	0.0013	0.018	0.002	0.999	0.000	0.76	0.449
Seg.2/6	-0.0176	0.050	0.005	0.990	0.000	-3.70	0.000
Seg.3/4	0.0000	0.002	0.000	1.000	0.000	0.12	0.908
Seg.3/5	-0.0008	0.007	0.001	1.000	0.000	-1.18	0.240
Seg.3/6	-0.0197	0.069	0.007	0.981	0.000	-2.97	0.004
Seg.4/5	-0.0008	0.006	0.001	1.000	0.000	-1.36	0.178
Seg.4/6	-0.0197	0.067	0.006	0.982	0.000	-3.05	0.003
Seg.5/6	-0.0189	0.067	0.006	0.982	0.000	-2.94	0.004

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<u>MAPE/ACTUAL</u>

RW/Abs.Ch.	0.0117	0.065	0.006	0.816	0.000	1.88	0.063
RW/Per.Ch.	-0.2617	0.330	0.032	0.041	0.671	-8.28	0.000
RW/Mov.Av.	-0.0388	0.054	0.005	0.893	0.000	-7.55	0.000
RW/Exp.Sm.	-0.0033	0.006	0.001	0.998	0.000	-5.51	0.000
RW/Reg.	-0.0244	0.122	0.012	0.529	0.000	-2.09	0.039
RW/Seg.1	0.0149	0.141	0.014	0.473	0.000	1.10	0.273
RW/Seg.2	0.0158	0.157	0.015	0.408	0.000	1.05	0.295
RW/Seg.3	0.0084	0.171	0.016	0.343	0.000	0.51	0.610
RW/Seg.4	0.0090	0.170	0.016	0.349	0.000	0.55	0.584
RW/Seg.5	0.0160	0.144	0.014	0.454	0.000	1.16	0.250
RW/Seg.6	-0.0394	0.137	0.013	0.375	0.000	-3.01	0.003
Abs/Per.Ch.	-0.2735	0.308	0.030	0.257	0.007	-9.26	0.000

Abs/Mov.Av.	-0.0505	0.099	0.009	0.630	0.000	-5.32	0.000
Abs/Exp.Sm.	-0.0151	0.068	0.006	0.803	0.000	-2.32	0.022
Abs/Reg.	-0.0361	0.096	0.009	0.727	0.000	-3.93	0.000
Abs/Seg.1	0.0032	0.142	0.014	0.477	0.000	0.23	0.817
Abs/Seg.2	0.0041	0.145	0.014	0.516	0.000	0.29	0.771
Abs/Seg.3	-0.0033	0.154	0.015	0.507	0.000	-0.23	0.821
Abs/Seg.4	-0.0028	0.153	0.015	0.506	0.000	-0.19	0.851
Abs/Seg.5	0.0043	0.140	0.013	0.501	0.000	0.32	0.751
Abs/Seg.6	-0.0511	0.156	0.015	0.215	0.024	-3.42	0.001
Per/Mov.Av.	0.2230	0.338	0.032	0.016	0.871	6.90	0.000
Per/Exp.Sm.	0.2584	0.330	0.032	0.042	0.665	8.17	0.000
Per/Reg.	0.2373	0.306	0.029	0.304	0.001	8.11	0.000
Per/Seg.1	0.2766	0.342	0.033	0.086	0.375	8.45	0.000
Per/Seg.2	0.2775	0.339	0.033	0.128	0.184	8.53	0.000
Per/Seg.3	0.2701	0.339	0.032	0.157	0.104	8.33	0.000
Per/Seg.4	0.2707	0.339	0.033	0.150	0.119	8.33	0.000
Per/Seg.5	0.2778	0.339	0.032	0.109	0.260	8.55	0.000
Per/Seg.6	0.2224	0.355	0.034	-0.073	0.453	6.55	0.000
Mov/Exp.Sm.	0.0355	0.049	0.005	0.913	0.000	7.60	0.000
Mov/Reg.	0.0144	0.143	0.014	0.395	0.000	1.05	0.296
Mov/Seg.1	0.0537	0.157	0.015	0.373	0.000	3.56	0.001
Mov/Seg.2	0.0546	0.174	0.017	0.296	0.002	3.27	0.001
Mov/Seg.3	0.0472	0.189	0.018	0.229	0.017	2.60	0.011
Mov/Seg.4	0.0477	0.188	0.018	0.235	0.014	2.65	0.009
Mov/Seg.5	0.0548	0.162	0.015	0.347	0.000	3.54	0.001
Mov/Seg.6	-0.0006	0.146	0.014	0.348	0.000	-0.04	0.966
Exp/Reg.	-0.0211	0.123	0.012	0.521	0.000	-1.79	0.076
Exp/Seg.1	0.0182	0.142	0.014	0.467	0.000	1.34	0.183
Exp/Seg.2	0.0191	0.158	0.015	0.401	0.000	1.27	0.208
Exp/Seg.3	0.0117	0.173	0.017	0.334	0.000	0.71	0.480
Exp/Seg.4	0.0123	0.171	0.016	0.340	0.000	0.75	0.456
Exp/Seg.5	0.0193	0.145	0.014	0.447	0.000	1.39	0.168
Exp/Seg.6	-0.0360	0.137	0.013	0.377	0.000	-2.75	0.007
Reg/Seg.1	0.0393	0.170	0.016	0.348	0.000	2.42	0.017
Reg/Seg.2	0.0402	0.169	0.016	0.404	0.000	2.48	0.015
Reg/Seg.3	0.0328	0.172	0.017	0.425	0.000	1.99	0.050
Reg/Seg.4	0.0333	0.172	0.016	0.423	0.000	2.02	0.040
Reg/Seg.5	0.0404	0.167	0.016	0.377	0.000	2.53	0.013
Reg/Seg.6	-0.0150	0.183	0.018	0.111	0.249	-0.85	0.396
Seg.1/2	0.0009	0.041	0.004	0.970	0.000	0.22	0.823
Seg.1/3	-0.0065	0.064	0.006	0.933	0.000	-1.05	0.294
Seg.1/4	-0.0059	0.062	0.006	0.937	0.000	-1.00	0.321
Seg.1/5	0.0011	0.019	0.002	0.993	0.000	0.60	0.547
Seg.1/6	-0.0543	0.087	0.008	0.832	0.000	-6.51	0.000
Seg.2/3	-0.0074	0.031	0.003	0.985	0.000	-2.46	0.015
Seg.2/4	-0.0068	0.029	0.003	0.987	0.000	-2.45	0.016
Seg.2/5	0.0002	0.027	0.003	0.988	0.000	0.09	0.929
Seg.2/6	-0.0552	0.115	0.011	0.728	0.000	-4.99	0.000
Seg.3/4	0.0006	0.003	0.000	1.000	0.000	1.70	0.092
Seg.3/5	0.0076	0.053	0.005	0.957	0.000	1.51	0.133
Seg.3/6	-0.0478	0.135	0.013	0.655	0.000	-3.69	0.000
Seg.4/5	0.0071	0.051	0.005	0.960	0.000	1.46	0.148
Seg.4/6	-0.0483	0.134	0.013	0.661	0.000	-3.78	0.000
Seg.5/6	-0.0554	0.096	0.009	0.800	0.000	-6.05	0.000

MSE/ACTUAL

RW/Abs.Ch.	0.0009	0.023	0.002	0.913	0.000	0.39	0.697
RW/Per.Ch.	-0.2161	0.657	0.063	0.039	0.691	-3.43	0.001
RW/Mov.Av.	-0.0136	0.038	0.004	0.852	0.000	-3.76	0.000
RW/Exp.Sm.	-0.0010	0.003	0.000	0.998	0.000	-3.15	0.002
RW/Reg.	-0.0146	0.060	0.006	0.679	0.000	-2.56	0.012
RW/Seg.1	-0.0107	0.163	0.016	0.243	0.011	-0.68	0.495
RW/Seg.2	-0.0138	0.187	0.018	0.219	0.022	-0.77	0.441
RW/Seg.3	-0.0186	0.210	0.020	0.199	0.038	-0.93	0.357
RW/Seg.4	-0.0183	0.209	0.020	0.200	0.037	-0.91	0.363
RW/Seg.5	-0.0109	0.167	0.016	0.243	0.011	-0.69	0.494
RW/Seg.6	-0.0181	0.101	0.010	0.348	0.000	-1.86	0.065
Abs/Per.Ch.	-0.2170	0.651	0.062	0.143	0.137	-3.48	0.001
Abs/Mov.Av.	-0.0145	0.052	0.005	0.689	0.000	-2.93	0.004
Abs/Exp.Sm.	-0.0018	0.025	0.002	0.899	0.000	-0.76	0.450
Abs/Reg.	-0.0155	0.048	0.005	0.808	0.000	-3.35	0.001
Abs/Seg.1	-0.0115	0.163	0.016	0.241	0.012	-0.74	0.462
Abs/Seg.2	-0.0147	0.186	0.018	0.240	0.012	-0.83	0.410
Abs/Seg.3	-0.0195	0.208	0.020	0.233	0.015	-0.98	0.331
Abs/Seg.4	-0.0191	0.207	0.020	0.232	0.015	-0.96	0.337
Abs/Seg.5	-0.0118	0.166	0.016	0.252	0.008	-0.74	0.460
Abs/Seg.6	-0.0189	0.108	0.010	0.256	0.007	-1.84	0.069
Per/Mov.Av.	0.2025	0.661	0.063	-0.010	0.922	3.20	0.002
Per/Exp.Sm.	0.2151	0.657	0.063	0.031	0.746	3.42	0.001
Per/Reg.	0.2015	0.650	0.062	0.150	0.119	3.24	0.002
Per/Seg.1	0.2054	0.675	0.065	0.017	0.858	3.18	0.002
Per/Seg.2	0.2023	0.679	0.065	0.027	0.781	3.11	0.002
Per/Seg.3	0.1975	0.684	0.066	0.033	0.734	3.01	0.003
Per/Seg.4	0.1978	0.684	0.066	0.032	0.744	3.02	0.003
Per/Seg.5	0.2052	0.675	0.065	0.023	0.809	3.17	0.002
Per/Seg.6	0.1980	0.667	0.064	-0.017	0.858	3.10	0.002
Mov/Exp.Sm.	0.0127	0.035	0.003	0.880	0.000	3.81	0.000
Mov/Reg.	-0.0010	0.080	0.008	0.454	0.000	-0.13	0.894
Mov/Seg.1	0.0030	0.171	0.016	0.160	0.097	0.18	0.857
Mov/Seg.2	-0.0002	0.195	0.019	0.132	0.172	-0.01	0.990
Mov/Seg.3	-0.0050	0.218	0.021	0.111	0.251	-0.24	0.811
Mov/Seg.4	-0.0046	0.216	0.021	0.112	0.246	-0.22	0.823
Mov/Seg.5	0.0027	0.175	0.017	0.155	0.108	0.16	0.874
Mov/Seg.6	-0.0045	0.111	0.011	0.273	0.004	-0.42	0.675
Exp/Reg.	-0.0137	0.061	0.006	0.662	0.000	-2.35	0.020
Exp/Seg.1	-0.0097	0.163	0.016	0.237	0.013	-0.62	0.535
Exp/Seg.2	-0.0129	0.187	0.018	0.212	0.027	-0.72	0.474
Exp/Seg.3	-0.0177	0.210	0.020	0.192	0.046	-0.88	0.383
Exp/Seg.4	-0.0173	0.209	0.020	0.192	0.045	-0.86	0.390
Exp/Seg.5	-0.0100	0.167	0.016	0.237	0.013	-0.63	0.533
Exp/Seg.6	-0.0171	0.102	0.010	0.346	0.000	-1.76	0.081
Reg/Seg.1	0.0040	0.171	0.016	0.196	0.042	0.24	0.809
Reg/Seg.2	0.0008	0.191	0.018	0.209	0.029	0.04	0.966
Reg/Seg.3	-0.0040	0.212	0.020	0.211	0.027	-0.20	0.845
Reg/Seg.4	-0.0036	0.211	0.020	0.209	0.029	-0.18	0.858
Reg/Seg.5	0.0037	0.173	0.017	0.211	0.028	0.22	0.825
Reg/Seg.6	-0.0034	0.124	0.012	0.155	0.107	-0.29	0.772
Seg.1/2	-0.0032	0.027	0.003	0.998	0.000	-1.24	0.219
Seg.1/3	-0.0080	0.051	0.005	0.994	0.000	-1.63	0.107
Seg.1/4	-0.0076	0.050	0.005	0.995	0.000	-1.60	0.113
Seg.1/5	-0.0003	0.008	0.001	0.999	0.000	-0.39	0.695
Seg.1/6	-0.0074	0.072	0.007	0.856	0.000	-1.07	0.285
Seg.2/3	-0.0048	0.025	0.002	0.999	0.000	-1.98	0.051

Seg.2/4	-0.0044	0.024	0.002	0.999	0.000	-1.92	0.057
Seg.2/5	0.0029	0.021	0.002	0.999	0.000	1.42	0.160
Seg.2/6	-0.0042	0.098	0.009	0.937	0.000	-0.45	0.655
Seg.3/4	0.0004	0.002	0.000	1.000	0.000	2.04	0.044
Seg.3/5	0.0077	0.046	0.004	0.996	0.000	1.73	0.086
Seg.3/6	0.0006	0.123	0.012	0.920	0.000	0.05	0.963
Seg.4/5	0.0073	0.045	0.004	0.996	0.000	1.70	0.092
Seg.4/6	0.0002	0.121	0.012	0.921	0.000	0.02	0.988
Seg.5/6	-0.0071	0.077	0.007	0.950	0.000	-0.96	0.338

MAPE/FORECAST

RW/Abs.Ch.	0.0257	0.182	0.017	0.908	0.000	3.48	0.001
RW/Per.Ch.	-0.1190	0.225	0.022	-0.040	0.683	-5.51	0.000
RW/Mov.Av.	-0.0537	0.072	0.007	0.952	0.000	-7.77	0.000
RW/Exp.Sm.	-0.0045	0.007	0.001	0.999	0.000	-6.45	0.000
RW/Reg.	0.0064	0.119	0.011	0.758	0.000	0.57	0.573
RW/Seg.1	-0.1118	0.311	0.030	0.479	0.000	-3.75	0.000
RW/Seg.2	-0.1031	0.319	0.031	0.435	0.000	-3.38	0.001
RW/Seg.3	-0.1042	0.323	0.031	0.379	0.000	-3.37	0.001
RW/Seg.4	-0.1041	0.322	0.031	0.400	0.000	-3.37	0.001
RW/Seg.5	-0.1080	0.314	0.030	0.465	0.000	-3.59	0.000
RW/Seg.6	-0.1997	0.283	0.027	0.571	0.000	-7.35	0.000
Abs/Per.Ch.	-0.1447	0.187	0.018	0.104	0.281	-8.09	0.000
Abs/Mov.Av.	-0.0794	0.130	0.012	0.813	0.000	-6.37	0.000
Abs/Exp.Sm.	-0.0302	0.081	0.008	0.902	0.000	-3.88	0.000
Abs/Reg.	-0.0193	0.078	0.007	0.862	0.000	-2.58	0.011
Abs/Seg.1	-0.1376	0.320	0.031	0.432	0.000	-4.49	0.000
Abs/Seg.2	-0.1288	0.320	0.031	0.419	0.000	-4.20	0.000
Abs/Seg.3	-0.1299	0.320	0.031	0.398	0.000	-4.24	0.000
Abs/Seg.4	-0.1299	0.320	0.031	0.399	0.000	-4.24	0.000
Abs/Seg.5	-0.1338	0.320	0.031	0.430	0.000	-4.37	0.000
Abs/Seg.6	-0.2254	0.306	0.029	0.462	0.000	-7.69	0.000
Per/Mov.Av.	0.0653	0.256	0.025	-0.035	0.721	2.66	0.009
Per/Exp.Sm.	0.1145	0.227	0.022	-0.037	0.699	5.26	0.000
Per/Reg.	0.1254	0.174	0.017	0.176	0.067	7.54	0.000
Per/Seg.1	0.0071	0.379	0.036	-0.020	0.833	0.20	0.844
Per/Seg.2	0.0159	0.374	0.036	0.001	0.990	0.44	0.658
Per/Seg.3	0.0148	0.369	0.035	0.017	0.860	0.42	0.677
Per/Seg.4	0.0148	0.369	0.035	0.014	0.884	0.42	0.676
Per/Seg.5	0.0109	0.377	0.036	-0.011	0.910	0.30	0.763
Per/Seg.6	-0.0807	0.380	0.036	-0.111	0.251	-2.22	0.029
Mov/Exp.Sm.	0.0492	0.066	0.006	0.961	0.000	7.78	0.000
Mov/Reg.	0.0601	0.162	0.016	0.673	0.000	3.88	0.000
Mov/Seg.1	-0.0581	0.318	0.030	0.466	0.000	-1.91	0.059
Mov/Seg.2	-0.0493	0.328	0.031	0.419	0.000	-1.57	0.119
Mov/Seg.3	-0.0505	0.334	0.032	0.377	0.000	-1.58	0.118
Mov/Seg.4	-0.0504	0.334	0.032	0.380	0.000	-1.58	0.118
Mov/Seg.5	-0.0543	0.321	0.031	0.451	0.000	-1.76	0.081
Mov/Seg.6	-0.1460	0.282	0.027	0.580	0.000	-5.41	0.000
Exp/Reg.	0.0109	0.121	0.012	0.753	0.000	0.94	0.351
Exp/Seg.1	-0.1074	0.311	0.030	0.479	0.000	-3.60	0.000
Exp/Seg.2	-0.0986	0.319	0.031	0.435	0.000	-3.23	0.002
Exp/Seg.3	-0.0997	0.323	0.031	0.396	0.000	-3.22	0.002
Exp/Seg.4	-0.0997	0.323	0.031	0.399	0.000	-3.22	0.002
Exp/Seg.5	-0.1035	0.314	0.030	0.465	0.000	-3.44	0.001
Exp/Seg.6	-0.1952	0.283	0.027	0.574	0.000	-7.21	0.000
Reg/Seg.1	-0.1183	0.330	0.032	0.367	0.000	-3.74	0.000
Reg/Seg.2	-0.1095	0.328	0.031	0.368	0.000	-3.48	0.001

Reg/Seg.3	-0.1106	0.325	0.031	0.362	0.000	-3.55	0.001
Reg/Seg.4	-0.1106	0.325	0.031	0.362	0.000	-3.55	0.001
Reg/Seg.5	-0.1144	0.329	0.031	0.372	0.000	-3.63	0.000
Reg/Seg.6	-0.2061	0.320	0.031	0.377	0.000	-6.73	0.000
Seg.1/2	0.0088	0.041	0.004	0.993	0.000	2.22	0.028
Seg.1/3	0.0076	0.064	0.006	0.984	0.000	1.24	0.217
Seg.1/4	0.0077	0.062	0.006	0.985	0.000	1.30	0.197
Seg.1/5	0.0038	0.019	0.002	0.999	0.000	2.08	0.040
Seg.1/6	-0.0878	0.094	0.009	0.964	0.000	-9.77	0.000
Seg.2/3	-0.0012	0.031	0.003	0.996	0.000	-0.40	0.693
Seg.2/4	-0.0011	0.028	0.003	0.997	0.000	-0.40	0.688
Seg.2/5	-0.0050	0.026	0.003	0.997	0.000	-1.96	0.052
Seg.2/6	-0.0966	0.123	0.012	0.938	0.000	-8.19	0.000
Seg.3/4	0.0001	0.003	0.000	1.000	0.000	0.25	0.806
Seg.3/5	-0.0038	0.051	0.005	0.990	0.000	-0.78	0.438
Seg.3/6	-0.0955	0.143	0.014	0.916	0.000	-6.99	0.000
Seg.4/5	-0.0039	0.049	0.005	0.990	0.000	-0.83	0.410
Seg.4/6	-0.0955	0.141	0.013	0.917	0.000	-7.08	0.000
Seg.5/6	-0.0916	0.103	0.010	0.957	0.000	-9.27	0.000

MSE/FORECAST

RW/Abs.Ch.	0.0159	0.099	0.009	0.994	0.000	1.69	0.095
RW/Per.Ch.	-0.0279	0.296	0.028	-0.033	0.737	-0.99	0.326
RW/Mov.Av.	-0.0315	0.100	0.010	0.978	0.000	-3.29	0.001
RW/Exp.Sm.	-0.0022	0.007	0.001	1.000	0.000	-3.11	0.002
RW/Reg.	0.0139	0.139	0.013	0.980	0.000	1.04	0.299
RW/Seg.1	-0.1331	0.339	0.032	0.606	0.000	-4.10	0.000
RW/Seg.2	-0.1277	0.345	0.033	0.550	0.000	-3.87	0.000
RW/Seg.3	-0.1253	0.350	0.034	0.506	0.000	-3.74	0.000
RW/Seg.4	-0.1254	0.350	0.034	0.507	0.000	-3.74	0.000
RW/Seg.5	-0.1310	0.340	0.033	0.594	0.000	-4.02	0.000
RW/Seg.6	-0.1765	0.344	0.033	0.770	0.000	-5.35	0.000
Abs/Per.Ch.	-0.0439	0.202	0.019	0.004	0.966	-2.27	0.025
Abs/Mov.Av.	-0.0474	0.184	0.018	0.963	0.000	-2.69	0.008
Abs/Exp.Sm.	-0.0182	0.105	0.010	0.994	0.000	-1.80	0.074
Abs/Reg.	-0.0021	0.044	0.004	0.989	0.000	-0.48	0.629
Abs/Seg.1	-0.1490	0.347	0.033	0.599	0.000	-4.49	0.000
Abs/Seg.2	-0.1436	0.343	0.033	0.545	0.000	-4.38	0.000
Abs/Seg.3	-0.1413	0.341	0.033	0.502	0.000	-4.33	0.000
Abs/Seg.4	-0.1413	0.341	0.033	0.503	0.000	-4.33	0.000
Abs/Seg.5	-0.1470	0.346	0.033	0.587	0.000	-4.44	0.000
Abs/Seg.6	-0.1924	0.389	0.037	0.758	0.000	-5.17	0.000
Per/Mov.Av.	-0.0036	0.368	0.035	-0.038	0.697	-0.10	0.919
Per/Exp.Sm.	0.0257	0.302	0.029	-0.034	0.728	0.89	0.376
Per/Reg.	0.0418	0.166	0.016	0.034	0.722	2.62	0.010
Per/Seg.1	-0.1051	0.435	0.042	-0.051	0.596	-2.52	0.013
Per/Seg.2	-0.0997	0.417	0.040	-0.044	0.652	-2.50	0.014
Per/Seg.3	-0.0974	0.404	0.039	-0.038	0.699	-2.52	0.013
Per/Seg.4	-0.0975	0.404	0.039	-0.038	0.692	-2.52	0.013
Per/Seg.5	-0.1031	0.431	0.041	-0.048	0.622	-2.50	0.014
Per/Seg.6	-0.1486	0.523	0.050	-0.074	0.446	-2.97	0.004
Mov/Exp.Sm.	0.0293	0.093	0.009	0.981	0.000	3.29	0.001
Mov/Reg.	0.0454	0.222	0.021	0.942	0.000	2.14	0.035
Mov/Seg.1	-0.1016	0.360	0.034	0.588	0.000	-2.95	0.004
Mov/Seg.2	-0.0962	0.372	0.036	0.532	0.000	-2.70	0.008
Mov/Seg.3	-0.0938	0.382	0.037	0.487	0.000	-2.56	0.012
Mov/Seg.4	-0.0939	0.382	0.037	0.488	0.000	-2.57	0.012
Mov/Seg.5	-0.0995	0.363	0.035	0.576	0.000	-2.86	0.005

Mov/Seg.6	-0.1450	0.336	0.032	0.757	0.000	-4.51	0.000
Exp/Reg.	0.0161	0.145	0.014	0.978	0.000	1.16	0.250
Exp/Seg.1	-0.1308	0.339	0.033	0.606	0.000	-4.02	0.000
Exp/Seg.2	-0.1254	0.346	0.033	0.550	0.000	-3.79	0.000
Exp/Seg.3	-0.1231	0.352	0.034	0.506	0.000	-3.65	0.000
Exp/Seg.4	-0.1232	0.351	0.034	0.507	0.000	-3.66	0.000
Exp/Seg.5	-0.1288	0.341	0.033	0.594	0.000	-3.94	0.000
Exp/Seg.6	-0.1743	0.342	0.033	0.771	0.000	-5.32	0.000
Reg/Seg.1	-0.1469	0.357	0.034	0.592	0.000	-4.30	0.000
Reg/Seg.2	-0.1415	0.349	0.033	0.540	0.000	-4.24	0.000
Reg/Seg.3	-0.1392	0.345	0.033	0.499	0.000	-4.22	0.000
Reg/Seg.4	-0.1393	0.345	0.033	0.500	0.000	-4.22	0.000
Reg/Seg.5	-0.1449	0.355	0.034	0.581	0.000	-4.26	0.000
Reg/Seg.6	-0.1904	0.412	0.039	0.745	0.000	-4.83	0.000
Seg.1/2	0.0054	0.035	0.003	0.997	0.000	1.60	0.112
Seg.1/3	0.0077	0.060	0.006	0.992	0.000	1.34	0.182
Seg.1/4	0.0077	0.059	0.006	0.992	0.000	1.35	0.180
Seg.1/5	0.0020	0.009	0.001	1.000	0.000	2.37	0.019
Seg.1/6	-0.0434	0.142	0.014	0.971	0.000	-3.20	0.002
Seg.2/3	0.0023	0.025	0.002	0.998	0.000	0.95	0.352
Seg.2/4	0.0023	0.025	0.002	0.999	0.000	0.96	0.337
Seg.2/5	-0.0034	0.027	0.003	0.998	0.000	-1.30	0.197
Seg.2/6	-0.0488	0.177	0.017	0.952	0.000	-2.89	0.005
Seg.3/4	-0.0001	0.001	0.000	1.000	0.000	-0.41	0.682
Seg.3/5	-0.0057	0.052	0.005	0.994	0.000	-1.14	0.256
Seg.3/6	-0.0511	0.202	0.019	0.933	0.000	-2.65	0.009
Seg.4/5	-0.0056	0.051	0.005	0.994	0.000	-1.15	0.254
Seg.4/6	-0.0511	0.201	0.019	0.934	0.000	-2.66	0.009
Seg.5/6	-0.0455	0.150	0.014	0.967	0.000	-3.17	0.002

Appendix 16.

ERRORS FOR THE MULTIPLE FORM MODELS FOR FORECASTING PROFIT (109 COMPANIES).

	NON-TRUNCATED					TRUNCATED (max. 1.0)		
	MEAN	STD. ERROR	STD. DEV.	RANGE	MINIMUM	MEAN	STD. ERROR	STD. DEV.
ABSOLUTE CHANGE								
1980								
MAPE/ACTUAL								
1y	2.721	1.625	16.966	176.838	0.007	0.525	0.037	0.388
2y	2.191	1.216	12.696	132.551	0.002	0.522	0.037	0.382
3y	2.072	1.083	11.302	117.824	0.011	0.513	0.037	0.389
4y	2.001	1.016	10.603	110.425	0.000	0.498	0.038	0.401
5y	1.936	0.976	10.186	106.016	0.001	0.494	0.038	0.398
MSE/ACTUAL								
1y	292.625	286.888	2995.203	31274.223	0.000	0.425	0.042	0.437
2y	164.520	161.172	1682.690	17570.410	0.000	0.418	0.041	0.433
3y	130.858	127.365	1329.729	13885.219	0.000	0.413	0.042	0.440
4y	115.391	111.847	1167.721	12193.766	0.000	0.407	0.043	0.446
5y	106.555	103.096	1076.356	11239.648	0.000	0.401	0.043	0.446
MAPE/FORECAST								
1y	1.178	0.378	3.945	36.457	0.007	0.446	0.033	0.343
2y	0.856	0.160	1.673	10.592	0.002	0.437	0.032	0.330
3y	0.734	0.130	1.356	10.894	0.011	0.430	0.032	0.335
4y	0.660	0.104	1.082	7.451	0.000	0.409	0.032	0.336
5y	0.726	0.128	1.338	8.575	0.001	0.408	0.032	0.334
MSE/FORECAST								
1y	16.809	12.506	130.564	1329.642	0.000	0.425	0.042	0.437
2y	3.505	1.442	15.059	112.244	0.000	0.298	0.034	0.360
3y	2.360	1.151	12.021	118.934	0.000	0.296	0.035	0.362
4y	1.596	0.588	6.140	55.527	0.000	0.280	0.034	0.355
5y	2.300	0.885	9.235	73.544	0.000	0.277	0.034	0.355
1981								
MAPE/ACTUAL								
1y	3.360	1.311	13.685	104.668	0.001	0.522	0.037	0.389
2y	1.906	0.715	7.469	72.139	0.003	0.478	0.037	0.390
3y	1.773	0.630	6.580	63.969	0.001	0.456	0.038	0.402
4y	1.654	0.565	5.904	58.185	0.002	0.460	0.038	0.394
5y	1.563	0.519	5.422	53.062	0.007	0.377	0.033	0.340

MSE/ACTUAL

1y	196.860	127.597	1332.156	10955.594	0.000	0.422	0.042	0.438
2y	58.912	48.240	503.642	5204.480	0.000	0.379	0.042	0.434
3y	46.046	37.785	394.489	4092.112	0.000	0.368	0.042	0.440
4y	37.272	31.167	325.395	3385.728	0.000	0.365	0.041	0.429
5y	31.567	25.925	270.660	2816.304	0.000	0.349	0.041	0.428

MAPE/FORECAST

1y	1.222	0.293	3.059	27.473	0.001	0.520	0.036	0.379
2y	73.377	72.648	758.467	7919.345	0.003	0.455	0.035	0.362
3y	3.287	2.261	23.608	245.565	0.001	0.429	0.036	0.378
4y	0.919	0.239	2.490	20.111	0.003	0.437	0.036	0.375
5y	0.629	0.105	1.098	9.192	0.007	0.418	0.035	0.368

MSE/FORECAST

1y	10.764	7.086	73.975	754.821	0.000	0.413	0.040	0.421
2y	575378.5	575376.8	>1000000	>1000000	0.000	0.337	0.037	0.390
3y	563.015	553.171	5775.271	60302.687	0.000	0.326	0.039	0.403
4y	6.988	4.246	44.329	404.536	0.000	0.331	0.038	0.400
5y	1.591	0.809	8.444	84.623	0.000	0.309	0.037	0.386

1982

MAPE/ACTUAL

1y	1.128	0.339	3.544	32.307	0.001	0.433	0.035	0.366
2y	1.290	0.502	5.238	50.355	0.003	0.423	0.035	0.368
3y	0.609	0.121	1.267	11.487	0.003	0.388	0.033	0.345
4y	0.571	0.106	1.107	9.159	0.002	0.377	0.033	0.340
5y	0.585	0.110	1.149	7.281	0.001	0.369	0.033	0.344

MSE/ACTUAL

1y	13.715	9.765	101.952	1043.793	0.000	0.321	0.037	0.375
2y	28.846	23.481	245.151	2535.970	0.000	0.313	0.038	0.396
3y	1.962	1.227	12.808	132.025	0.000	0.269	0.034	0.359
4y	1.541	0.810	8.455	83.938	0.000	0.256	0.033	0.350
5y	1.651	0.722	7.541	53.029	0.000	0.253	0.034	0.357

MAPE/FORECAST

1y	1.822	0.659	6.885	49.999	0.001	0.402	0.035	0.362
2y	2.659	1.541	16.090	165.990	0.003	0.429	0.036	0.379
3y	0.842	0.155	1.615	10.249	0.003	0.388	0.034	0.355
4y	3.735	2.609	27.234	282.929	0.002	0.385	0.035	0.365
5y	47.765	46.797	488.574	5101.733	0.001	0.374	0.035	0.365

MSE/FORECAST

1y	50.285	29.880	311.961	2499.954	0.000	0.292	0.038	0.395
2y	263.589	252.775	2639.051	27553.887	0.000	0.326	0.040	0.414
3y	3.294	1.208	12.607	105.120	0.000	0.275	0.036	0.377
4y	748.849	734.324	7666.563	80050.000	0.000	0.281	0.037	0.388
5y	238795.9	238786.0	>1000000	>1000000	0.000	0.272	0.037	0.389

1983

MAPE/ACTUAL

1y	0.826	0.154	1.604	9.673	0.006	0.402	0.033	0.339
2y	0.784	0.138	1.442	8.667	0.004	0.407	0.033	0.347
3y	1.039	0.240	2.505	22.153	0.014	0.442	0.035	0.366
4y	0.788	0.135	1.412	7.807	0.000	0.404	0.034	0.350
5y	0.732	0.124	1.298	7.294	0.003	0.393	0.033	0.347

MSE/ACTUAL

1y	3.231	1.242	12.967	93.688	0.000	0.276	0.036	0.375
2y	2.675	0.986	10.297	75.177	0.000	0.285	0.037	0.381
3y	7.299	4.582	47.838	491.380	0.000	0.328	0.039	0.402
4y	2.597	0.884	9.229	60.951	0.000	0.285	0.036	0.381
5y	2.206	0.758	7.918	53.245	0.000	0.274	0.036	0.375

MAPE/FORECAST

1y	36.987	30.641	319.906	3277.792	0.006	0.462	0.035	0.369
2y	1.303	0.383	3.994	35.236	0.004	0.458	0.035	0.368
3y	2.999	1.362	14.218	137.432	0.014	0.502	0.037	0.390
4y	2.171	1.072	11.195	236.619	0.000	0.461	0.036	0.374
5y	1.454	0.597	6.235	62.109	0.003	0.449	0.036	0.376

MSE/FORECAST

1y	102768.7	98619.0	>1000000	>1000000	0.000	0.348	0.039	0.404
2y	17.506	11.764	122.817	1241.836	0.000	0.344	0.039	0.406
3y	209.298	175.098	1828.075	18891.441	0.000	0.402	0.041	0.433
4y	128.894	113.651	1186.547	12321.156	0.000	0.351	0.040	0.415
5y	40.627	35.531	370.957	3857.830	0.000	0.342	0.040	0.414

PERCENTAGE CHANGE

1980

MAPE/ACTUAL

1y	109.36	107.90	1126.49	11762.240	0.005	0.574	0.036	0.380
2y	55.55	54.38	567.80	5929.03	0.006	0.582	0.037	0.388
3y	46.998	45.791	478.068	4992.333	0.015	0.289	0.026	0.267
4y	32.330	30.814	321.711	3360.202	0.001	0.651	0.035	0.367
5y	32.462	31.009	323.741	3381.289	0.029	0.422	0.031	0.328

MSE/ACTUAL

1y	1269292.6	>1000000	>1000000	>1000000	0.000	0.346	0.036	0.375
2y	322512.4	322508.3	>1000000	>1000000	0.000	0.488	0.042	0.437
3y	228660.5	328656.1	>1000000	>1000000	0.000	0.125	0.043	0.448
4y	103593.4	103586.7	>1000000	>1000000	0.000	0.558	0.041	0.429
5y	104900.7	104894.5	>1000000	>1000000	0.000	0.187	0.114	1.194

MAPE/FORECAST

1y	9.099	8.152	85.112	889.235	0.000	0.479	0.033	0.342
2y	1.182	0.457	4.776	49.235	0.000	0.461	0.032	0.336
3y	1.045	0.345	3.600	36.378	0.000	0.463	0.032	0.330
4y	0.992	0.305	3.183	32.364	0.000	0.498	0.031	0.321
5y	1.032	0.293	3.056	30.572	0.000	0.506	0.030	0.315

MSE/FORECAST

1y	7260.36	7254.43	75738.42	790738.187	0.000	0.472	0.041	0.433
2y	24.002	22.229	232.082	2424.051	0.000	0.324	0.035	0.365
3y	13.931	12.149	126.834	1323.330	0.000	0.323	0.034	0.359
4y	11.020	9.612	100.357	1047.436	0.000	0.350	0.034	0.356
5y	10.319	8.585	89.628	934.642	0.000	0.355	0.034	0.357

1981

MAPE/ACTUAL

1y	2.281	1.055	11.011	111.953	0.003	0.538	0.037	0.384
2y	1.230	0.447	4.666	48.117	0.001	0.496	0.036	0.378
3y	0.981	0.140	1.464	8.630	0.001	0.498	0.037	0.391
4y	0.960	0.130	1.352	9.273	0.000	0.525	0.036	0.374
5y	1.573	0.381	3.980	31.926	0.002	0.547	0.035	0.363

MSE/ACTUAL

1y	125.336	115.034	1200.991	12534.078	0.000	0.407	0.040	0.415
2y	23.082	21.234	221.685	2315.324	0.000	0.387	0.040	0.419
3y	3.086	0.913	9.535	74.494	0.000	0.399	0.041	0.432
4y	2.734	0.893	9.322	85.989	0.000	0.414	0.041	0.424
5y	18.174	10.650	111.191	1019.441	0.000	0.429	0.040	0.421

MAPE/FORECAST

1y	2.002	0.792	8.270	83.846	0.003	0.529	0.035	0.370
2y	1.224	0.246	2.572	16.033	0.001	0.472	0.034	0.357
3y	0.829	0.113	1.182	5.559	0.001	0.463	0.035	0.370
4y	1.119	0.336	3.511	35.104	0.000	0.474	0.034	0.354
5y	0.707	0.082	0.852	4.173	0.002	0.481	0.033	0.345

MSE/FORECAST

1y	71.777	64.515	673.554	7030.590	0.000	0.416	0.039	0.409
2y	8.055	3.422	35.722	257.068	0.000	0.350	0.038	0.393
3y	2.073	0.503	5.253	30.914	0.000	0.349	0.038	0.399
4y	13.467	11.316	118.140	1232.325	0.000	0.348	0.037	0.389
5y	1.219	0.275	2.868	17.438	0.000	0.349	0.037	0.384

1982

MAPE/ACTUAL

1y	0.708	0.114	1.192	11.060	0.003	0.490	0.036	0.377
2y	0.687	0.158	1.648	16.627	0.007	0.445	0.034	0.356
3y	0.605	0.083	0.868	6.585	0.005	0.446	0.034	0.358
4y	0.640	0.088	0.918	7.198	0.008	0.463	0.033	0.348
5y	0.664	0.093	0.969	7.883	0.010	0.485	0.032	0.334

MSE/ACTUAL

1y	1.910	1.126	11.761	122.392	0.000	0.381	0.039	0.411
2y	3.163	2.536	26.481	276.694	0.000	0.324	0.037	0.383
3y	1.112	0.465	4.858	47.099	0.000	0.326	0.037	0.386
4y	1.243	0.524	5.466	51.924	0.000	0.335	0.037	0.384
5y	1.371	0.620	6.477	62.299	0.000	0.345	0.036	0.373

MAPE/FORECAST

1y	5.389	2.006	20.947	179.067	0.003	0.453	0.036	0.371
2y	2.134	0.589	6.148	54.096	0.007	0.470	0.037	0.384
3y	1.541	0.396	4.139	35.293	0.005	0.446	0.035	0.370
4y	1.450	0.351	3.662	30.735	0.008	0.457	0.035	0.363
5y	1.476	0.360	3.763	28.844	0.010	0.459	0.033	0.344

MSE/FORECAST

1y	463.806	305.146	3185.815	32066.137	0.000	0.342	0.039	0.411
2y	42.002	27.279	284.800	2927.177	0.000	0.367	0.041	0.425
3y	19.349	11.742	122.586	1245.990	0.000	0.334	0.039	0.407
4y	15.390	8.941	93.350	945.091	0.000	0.340	0.039	0.403
5y	16.206	8.420	87.910	832.578	0.000	0.327	0.037	0.390

1983

MAPE/ACTUAL

1y	2.050	0.998	10.416	105.196	0.002	0.420	0.032	0.337
2y	0.829	0.214	2.231	21.178	0.004	0.434	0.034	0.355
3y	0.652	0.140	1.462	13.703	0.006	0.424	0.032	0.337
4y	0.509	0.058	0.610	3.173	0.008	0.394	0.032	0.338
5y	0.553	0.073	0.764	4.666	0.002	0.393	0.034	0.353

MSE/ACTUAL

1y	111.689	101.602	1060.755	11066.629	0.000	0.289	0.035	0.370
2y	5.621	4.169	43.524	488.681	0.000	0.314	0.038	0.392
3y	2.544	1.758	18.350	187.932	0.000	0.293	0.035	0.368
4y	0.628	0.142	1.480	10.116	0.000	0.268	0.035	0.367
5y	0.886	0.255	2.665	21.791	0.000	0.278	0.036	0.375

MAPE/FORECAST

1y	2.878	1.422	14.844	119.273	0.002	0.458	0.034	0.351
2y	1.762	0.433	4.516	30.804	0.004	0.481	0.036	0.375
3y	1.873	0.602	6.282	57.395	0.006	0.491	0.036	0.374
4y	1.226	0.287	2.993	22.394	0.008	0.450	0.035	0.368
5y	2.187	1.086	11.336	115.869	0.002	0.445	0.037	0.387

MSE/FORECAST

1y	226.599	158.188	1651.534	14226.437	0.000	0.332	0.037	0.383
2y	23.307	11.680	121.940	949.136	0.000	0.371	0.040	0.419
3y	42.615	30.865	322.239	3294.833	0.000	0.380	0.041	0.424
4y	10.382	5.708	59.594	501.805	0.000	0.337	0.039	0.410
5y	132.119	123.194	1286.187	13426.180	0.000	0.347	0.040	0.419

MOVING AVERAGE

1980

MAPE/ACTUAL

2y	1.291	0.415	4.333	43.968	0.001	0.472	0.037	0.384
3y	1.184	0.292	3.050	29.201	0.004	0.482	0.035	0.367
4y	1.121	0.231	2.414	21.780	0.009	0.500	0.034	0.351
5y	1.052	0.193	2.014	17.332	0.020	0.517	0.032	0.333
6y	1.012	0.167	1.745	14.357	0.027	0.539	0.030	0.318

MSE/ACTUAL

2y	20.272	17.728	185.082	1933.298	0.000	0.370	0.041	0.431
3y	10.618	7.845	81.904	852.940	0.000	0.365	0.040	0.418
4y	7.031	4.403	45.969	474.735	0.000	0.372	0.039	0.405
5y	5.125	2.832	29.565	301.079	0.000	0.377	0.038	0.392
6y	4.040	1.979	20.662	206.590	0.001	0.390	0.037	0.385

MAPE/FORECAST

2y	0.650	0.083	0.865	4.293	0.001	0.445	0.033	0.343
3y	0.675	0.079	0.821	5.187	0.004	0.480	0.033	0.344
4y	0.754	0.079	0.829	4.896	0.009	0.532	0.033	0.341
5y	0.926	0.122	1.278	10.546	0.020	0.584	0.032	0.338
6y	1.244	0.323	3.372	34.825	0.027	0.636	0.032	0.331

MSE/FORECAST

2y	1.163	0.305	3.166	18.439	0.000	0.315	0.035	0.369
3y	1.123	0.304	3.175	26.953	0.000	0.348	0.037	0.385
4y	1.249	0.294	3.068	24.061	0.000	0.398	0.037	0.390
5y	2.475	1.066	11.134	111.639	0.000	0.454	0.038	0.394
6y	12.812	11.134	116.241	1214.670	0.001	0.513	0.038	0.397

1981

MAPE/ACTUAL

2y	1.615	0.474	4.951	46.467	0.008	0.480	0.036	0.378
3y	1.521	0.361	3.770	30.880	0.008	0.488	0.036	0.373
4y	1.518	0.327	3.414	23.093	0.001	0.489	0.034	0.351
5y	1.508	0.303	3.165	18.383	0.005	0.506	0.032	0.344
6y	1.430	0.275	2.867	16.101	0.004	0.520	0.030	0.317

MSE/ACTUAL

2y	26.895	19.921	207.980	2159.970	0.000	0.372	0.041	0.427
3y	16.399	9.152	95.550	954.057	0.000	0.376	0.040	0.422
4y	13.851	5.897	61.568	533.326	0.000	0.361	0.038	0.401
5y	12.196	4.597	47.998	338.131	0.000	0.367	0.037	0.389
6y	10.188	3.722	38.860	259.376	0.000	0.370	0.036	0.378

MAPE/FORECAST

2y	1.001	0.355	3.708	38.110	0.008	0.451	0.032	0.334
3y	7.198	5.660	59.092	613.133	0.008	0.476	0.033	0.343
4y	0.737	0.121	1.262	11.249	0.001	0.507	0.033	0.339
5y	1.610	0.931	9.724	101.877	0.005	0.543	0.032	0.331
6y	0.921	0.178	1.861	18.436	0.004	0.591	0.031	0.328

MSE/FORECAST

2y	14.625	13.325	139.117	1453.001	0.000	0.314	0.035	0.365
3y	3511.6	3448.9	36007.1	375942.0	0.000	0.343	0.036	0.378
4y	2.121	1.201	12.538	126.562	0.000	0.371	0.036	0.380
5y	96.283	95.222	994.143	10380.110	0.000	0.404	0.037	0.381
6y	4.281	3.129	32.670	340.059	0.000	0.455	0.037	0.387

1982

MAPE/ACTUAL

2y	0.610	0.121	1.262	10.904	0.006	0.369	0.034	0.354
3y	1.067	0.337	3.514	33.732	0.002	0.434	0.035	0.362
4y	1.025	0.269	2.812	25.233	0.012	0.440	0.034	0.358
5y	1.083	0.240	2.506	20.149	0.001	0.459	0.034	0.359
6y	1.080	0.219	2.284	16.721	0.006	0.474	0.034	0.355

MSE/ACTUAL

2y	1.952	1.115	11.637	119.045	0.000	0.260	0.036	0.377
3y	13.376	10.541	110.047	1138.011	0.000	0.318	0.038	0.398
4y	8.885	6.034	62.994	637.272	0.000	0.321	0.038	0.401
5y	7.396	4.010	41.866	406.025	0.000	0.339	0.039	0.406
6y	6.335	2.945	30.748	279.810	0.000	0.350	0.039	0.406

MAPE/FORECAST

2y	1.430	0.367	3.828	25.244	0.007	0.386	0.035	0.364
3y	15.907	12.956	135.266	1405.476	0.002	0.438	0.034	0.358
4y	0.905	0.155	1.615	10.129	0.012	0.456	0.034	0.353
5y	0.848	0.129	1.342	9.399	0.001	0.483	0.033	0.347
6y	1.292	0.501	5.233	53.731	0.006	0.516	0.033	0.345

MSE/FORECAST

2y	16.560	7.370	76.950	637.565	0.000	0.280	0.038	0.392
3y	18382.0	18121.1	189190.0	>1000000	0.000	0.319	0.038	0.394
4y	3.405	1.284	13.403	102.829	0.000	0.332	0.038	0.392
5y	2.503	0.924	9.645	88.360	0.000	0.353	0.037	0.387
6y	28.804	26.500	276.672	2887.649	0.000	0.384	0.037	0.385

1983

MAPE/ACTUAL

2y	0.546	0.066	0.688	3.766	0.002	0.412	0.030	0.314
3y	0.544	0.065	0.675	3.831	0.005	0.415	0.029	0.301
4y	0.577	0.150	1.566	16.041	0.006	0.376	0.027	0.282
5y	0.499	0.119	1.240	12.725	0.013	0.362	0.026	0.274
6y	0.470	0.100	1.045	10.525	0.006	0.350	0.025	0.260

MSE/ACTUAL

2y	0.767	0.208	2.174	14.277	0.000	0.268	0.033	0.348
3y	0.748	0.209	2.187	14.713	0.000	0.261	0.032	0.330
4y	2.763	2.361	24.646	607.409	0.000	0.221	0.029	0.302
5y	1.773	1.488	15.531	162.245	0.000	0.206	0.028	0.291
6y	1.302	1.018	10.630	110.913	0.000	0.190	0.025	0.260

MAPE/FORECAST

2y	4.520	3.145	32.830	341.126	0.002	0.500	0.034	0.356
3y	1.050	0.153	1.597	7.604	0.005	0.516	0.034	0.354
4y	0.837	0.128	1.339	8.297	0.006	0.472	0.033	0.344
5y	1.287	0.430	4.487	44.380	0.013	0.458	0.032	0.333
6y	1.230	0.470	4.908	39.127	0.006	0.472	0.032	0.337

MSE/FORECAST

2y	1088.3	1067.5	11145.0	116368.4	0.000	0.376	0.039	0.409
3y	3.628	0.984	10.276	57.892	0.000	0.390	0.040	0.413
4y	2.476	0.883	9.219	68.929	0.000	0.340	0.037	0.390
5y	21.606	18.093	188.894	1970.653	0.000	0.320	0.036	0.376
6y	25.382	17.561	183.344	1531.405	0.000	0.335	0.035	0.367

EXPONENTIAL SMOOTHING.

1980

MAPE/ACTUAL

0.95	1.640	0.773	8.069	83.829	0.003	0.476	0.037	0.384
0.90	1.599	0.733	7.649	79.398	0.004	0.477	0.037	0.385
0.85	1.557	0.692	7.230	74.968	0.005	0.476	0.037	0.386
0.80	1.516	0.652	6.811	70.543	0.000	0.476	0.037	0.386
0.75	1.474	0.612	6.394	66.110	0.000	0.475	0.037	0.387
0.70	1.432	0.573	5.979	61.681	0.002	0.475	0.037	0.387
0.65	1.390	0.533	5.565	57.251	0.000	0.473	0.037	0.385
0.60	1.349	0.493	5.151	52.801	0.017	0.473	0.036	0.378
0.55	1.308	0.454	4.740	48.376	0.009	0.474	0.036	0.373
0.50	1.265	0.415	4.330	43.931	0.019	0.475	0.035	0.367
0.45	1.222	0.376	3.923	39.513	0.000	0.477	0.035	0.363
0.40	1.181	0.337	3.517	35.072	0.003	0.483	0.034	0.354
0.35	1.138	0.298	3.116	30.621	0.012	0.490	0.033	0.346
0.30	1.095	0.260	2.719	26.183	0.004	0.500	0.032	0.337
0.25	1.056	0.223	2.329	21.709	0.029	0.514	0.031	0.323
0.20	1.015	0.187	1.953	17.278	0.003	0.532	0.030	0.312
0.15	0.975	0.153	1.602	12.810	0.009	0.552	0.029	0.302
0.10	0.937	0.125	1.300	8.347	0.001	0.571	0.028	0.291
0.05	0.912	0.104	1.089	6.194	0.042	0.604	0.026	0.277

MSE/ACTUAL

0.95	67.208	64.461	672.989	7027.797	0.000	0.373	0.042	0.434
0.90	60.526	57.828	603.740	6304.777	0.000	0.374	0.041	0.433
0.85	54.213	51.555	538.249	5620.973	0.000	0.374	0.041	0.433
0.80	48.267	45.642	476.512	4976.363	0.000	0.374	0.041	0.432
0.75	42.686	40.088	418.531	4370.945	0.000	0.374	0.041	0.432
0.70	37.468	34.894	364.306	3804.721	0.000	0.375	0.041	0.433
0.65	32.611	30.060	313.835	3277.667	0.000	0.371	0.041	0.430
0.60	28.112	25.586	267.123	2789.820	0.000	0.366	0.041	0.427
0.55	23.968	21.471	224.167	2341.140	0.000	0.362	0.041	0.425
0.50	20.179	17.717	184.970	1931.645	0.000	0.359	0.040	0.421
0.45	16.741	14.323	149.535	1561.341	0.000	0.358	0.040	0.417
0.40	13.653	11.289	117.866	1230.242	0.000	0.358	0.039	0.409
0.35	10.915	8.618	89.970	938.376	0.000	0.359	0.038	0.400
0.30	8.526	6.308	65.861	685.778	0.000	0.362	0.037	0.391
0.25	6.489	4.364	45.565	472.507	0.001	0.368	0.037	0.381
0.20	4.808	2.791	29.136	298.652	0.000	0.349	0.036	0.374
0.15	3.492	1.602	16.724	164.327	0.000	0.394	0.035	0.361
0.10	2.552	0.841	8.775	69.691	0.000	0.410	0.033	0.339
0.05	2.007	0.567	5.925	38.896	0.000	0.441	0.032	0.234

MAPE/FORECAST

0.95	1.075	0.335	3.495	27.203	0.003	0.424	0.032	0.329
0.90	0.796	0.160	1.669	13.613	0.004	0.428	0.032	0.332
0.85	0.727	0.120	1.255	9.114	0.005	0.432	0.032	0.337
0.80	0.705	0.105	1.101	6.892	0.000	0.434	0.032	0.339
0.75	0.718	0.106	1.106	5.778	0.000	0.437	0.033	0.340
0.70	1.318	0.625	6.527	67.599	0.002	0.440	0.033	0.341
0.65	1.770	1.111	11.599	121.363	0.000	0.445	0.033	0.342
0.60	0.741	0.130	1.356	11.612	0.017	0.452	0.032	0.337
0.55	0.691	0.095	0.990	6.204	0.009	0.459	0.032	0.331
0.50	0.684	0.086	0.901	5.141	0.019	0.468	0.032	0.331
0.45	0.691	0.083	0.864	5.051	0.000	0.481	0.032	0.333
0.40	0.712	0.081	0.843	4.921	0.003	0.502	0.032	0.333
0.35	0.741	0.080	0.834	4.754	0.012	0.527	0.032	0.336
0.30	0.782	0.080	0.832	4.565	0.004	0.556	0.032	0.338
0.25	0.843	0.080	0.839	4.298	0.030	0.594	0.032	0.334
0.20	0.926	0.083	0.864	4.094	0.003	0.637	0.032	0.332
0.15	1.048	0.089	0.925	4.212	0.009	0.685	0.032	0.335
0.10	1.238	0.101	1.059	4.898	0.001	0.729	0.033	0.340
0.05	1.584	0.132	1.374	6.123	0.044	0.770	0.031	0.328

MSE/FORECAST

0.95	13.255	8.503	88.775	740.176	0.000	0.287	0.034	0.356
0.90	3.393	1.805	18.841	185.438	0.000	0.293	0.034	0.357
0.85	2.089	0.866	9.042	83.151	0.000	0.299	0.035	0.364
0.80	1.697	0.579	6.049	47.496	0.000	0.302	0.035	0.366
0.75	1.728	0.531	5.539	33.389	0.000	0.305	0.035	0.366
0.70	43.945	42.159	440.152	4596.539	0.000	0.309	0.035	0.366
0.65	136.434	35.117	1410.67	14729.051	0.000	0.314	0.035	0.366
0.60	2.373	1.276	13.321	135.243	0.000	0.314	0.035	0.366
0.55	1.449	0.472	4.932	38.603	0.000	0.319	0.035	0.361
0.50	1.272	0.359	3.751	26.623	0.000	0.327	0.035	0.366
0.45	1.218	0.325	3.391	25.515	0.000	0.341	0.035	0.370
0.40	1.211	0.308	3.214	24.243	0.000	0.362	0.036	0.375
0.35	1.238	0.297	3.102	22.715	0.000	0.390	0.037	0.383
0.30	1.299	0.290	3.031	20.875	0.000	0.422	0.037	0.387
0.25	1.408	0.289	3.019	18.725	0.001	0.463	0.037	0.391
0.20	1.598	0.299	3.117	16.787	0.000	0.515	0.038	0.396
0.15	1.945	0.330	3.445	17.824	0.000	0.580	0.039	0.406
0.10	2.644	0.414	4.319	24.004	0.000	0.646	0.039	0.407
0.05	4.379	0.686	7.166	38.037	0.002	0.700	0.039	0.407

1981

MAPE/ACTUAL

0.95	1.346	0.400	4.173	40.004	0.004	0.446	0.036	0.375
0.90	1.346	0.379	3.955	36.933	0.018	0.440	0.035	0.370
0.85	1.341	0.362	3.780	33.902	0.003	0.430	0.035	0.369
0.80	1.346	0.348	3.637	30.852	0.018	0.434	0.035	0.368
0.75	1.351	0.337	3.522	27.834	0.010	0.440	0.036	0.378
0.70	1.354	0.328	3.429	24.828	0.001	0.443	0.036	0.379
0.65	1.358	0.321	3.351	21.822	0.005	0.447	0.036	0.373
0.60	1.356	0.314	3.283	22.270	0.008	0.453	0.035	0.369
0.55	1.350	0.308	3.220	22.950	0.007	0.461	0.035	0.365
0.50	1.339	0.302	3.157	23.168	0.001	0.464	0.034	0.358
0.45	1.333	0.296	3.088	22.913	0.000	0.472	0.034	0.356
0.40	1.327	0.288	3.009	22.188	0.003	0.478	0.034	0.354
0.35	1.316	0.280	2.921	20.995	0.003	0.486	0.033	0.344
0.30	1.296	0.271	2.826	19.334	0.001	0.494	0.032	0.332
0.25	1.287	0.260	2.714	17.195	0.007	0.506	0.031	0.321
0.20	1.299	0.247	2.582	14.563	0.033	0.522	0.029	0.306
0.15	1.302	0.235	2.453	13.669	0.012	0.540	0.028	0.290
0.10	1.296	0.225	2.344	14.149	0.014	0.568	0.027	0.285
0.05	1.290	0.218	2.277	15.252	0.031	0.611	0.027	0.279

MSE/ACTUAL

0.95	19.066	14.747	153.962	1600.605	0.000	0.339	0.040	0.417
0.90	17.310	12.603	131.573	1365.329	0.000	0.330	0.040	0.413
0.85	15.957	10.689	111.596	1149.541	0.000	0.319	0.039	0.412
0.80	14.919	9.052	94.508	952.930	0.000	0.322	0.039	0.412
0.75	14.117	7.741	80.821	775.289	0.000	0.335	0.041	0.423
0.70	13.485	6.788	70.867	616.482	0.000	0.338	0.041	0.425
0.65	12.967	6.179	64.515	476.412	0.000	0.338	0.040	0.417
0.60	12.517	5.843	61.002	496.272	0.000	0.340	0.039	0.412
0.55	12.095	5.663	59.126	527.007	0.000	0.344	0.039	0.409
0.50	11.672	5.524	57.672	536.801	0.000	0.342	0.039	0.404
0.45	11.223	5.338	55.728	525.038	0.000	0.348	0.039	0.404
0.40	10.732	5.055	52.777	492.408	0.000	0.353	0.039	0.403
0.35	10.189	4.662	48.672	440.911	0.000	0.354	0.038	0.398
0.30	9.593	4.175	43.586	373.863	0.000	0.353	0.037	0.387
0.25	8.953	3.640	37.998	295.907	0.000	0.358	0.036	0.380
0.20	8.293	3.132	32.700	213.028	0.001	0.365	0.035	0.368
0.15	7.659	2.755	28.767	187.190	0.000	0.375	0.033	0.361
0.10	7.123	2.607	27.221	200.568	0.000	0.403	0.033	0.339
0.05	6.802	2.715	28.346	233.556	0.001	0.450	0.032	0.336

MAPE/FORECAST

0.95	0.606	0.075	0.787	4.983	0.004	0.434	0.033	0.348
0.90	0.774	0.209	2.185	22.121	0.017	0.428	0.033	0.344
0.85	0.616	0.082	0.856	5.183	0.003	0.421	0.033	0.345
0.80	0.706	0.131	1.366	11.860	0.018	0.431	0.033	0.349
0.75	1.616	0.813	8.490	87.475	0.010	0.425	0.033	0.347
0.70	2.819	1.847	19.286	198.473	0.001	0.427	0.033	0.346
0.65	0.709	0.107	1.113	6.138	0.005	0.434	0.033	0.341
0.60	0.654	0.084	0.874	5.070	0.008	0.445	0.033	0.341
0.55	0.669	0.090	0.943	6.654	0.007	0.456	0.032	0.338
0.50	0.767	0.132	1.378	9.561	0.001	0.462	0.031	0.328
0.45	1.488	0.662	6.907	70.116	0.000	0.480	0.031	0.329
0.40	1.260	0.498	5.196	53.185	0.003	0.498	0.032	0.336
0.35	2.563	1.258	13.132	124.929	0.003	0.521	0.032	0.335
0.30	1.559	0.636	6.640	65.328	0.001	0.543	0.032	0.332
0.25	1.957	0.931	9.721	99.569	0.007	0.577	0.031	0.328
0.20	0.921	0.121	1.266	8.754	0.034	0.618	0.031	0.327
0.15	0.937	0.087	0.904	6.825	0.012	0.668	0.031	0.326
0.10	1.075	0.085	0.890	5.956	0.013	0.722	0.032	0.331
0.05	1.395	0.112	1.168	5.863	0.030	0.771	0.030	0.315

MSE/FORECAST

0.95	0.981	0.279	2.916	24.872	0.000	0.308	0.036	0.380
0.90	5.328	4.493	46.906	490.091	0.000	0.300	0.036	0.379
0.85	1.106	0.320	3.337	26.899	0.000	0.295	0.036	0.379
0.80	2.349	1.325	13.837	141.079	0.000	0.307	0.037	0.384
0.75	74.034	70.205	732.963	7653.590	0.000	0.301	0.036	0.380
0.70	376.497	361.496	3774.13	39391.836	0.000	0.300	0.036	0.377
0.65	1.731	0.563	5.877	37.739	0.000	0.304	0.036	0.373
0.60	1.186	0.330	3.445	25.779	0.000	0.313	0.036	0.372
0.55	1.329	0.462	4.824	44.364	0.000	0.321	0.036	0.373
0.50	2.469	1.097	11.448	91.443	0.000	0.320	0.035	0.361
0.45	49.487	45.141	471.286	4916.293	0.000	0.337	0.035	0.365
0.40	28.334	25.954	270.963	2828.952	0.000	0.360	0.036	0.375
0.35	177.442	144.920	1513.01	15608.133	0.000	0.382	0.036	0.379
0.30	46.117	39.336	410.677	4267.883	0.000	0.405	0.037	0.384
0.25	97.453	90.978	949.839	9915.359	0.000	0.439	0.037	0.383
0.20	2.435	0.969	10.114	77.234	0.001	0.488	0.038	0.392
0.15	1.689	0.468	4.889	46.748	0.000	0.551	0.038	0.395
0.10	1.942	0.379	3.962	35.637	0.000	0.630	0.039	0.405
0.05	3.296	0.571	5.964	34.724	0.001	0.693	0.037	0.390

<u>1982</u>

MAPE/ACTUAL

0.95	0.531	0.100	1.041	7.425	0.000	0.340	0.032	0.331
0.90	0.529	0.095	0.993	6.535	0.004	0.344	0.032	0.337
0.85	0.534	0.093	0.973	7.082	0.005	0.346	0.032	0.338
0.80	0.543	0.095	0.990	7.627	0.000	0.349	0.033	0.341
0.75	0.556	0.100	1.047	8.152	0.000	0.352	0.033	0.345
0.70	0.570	0.109	1.139	8.651	0.005	0.353	0.033	0.346
0.65	0.588	0.120	1.256	9.124	0.006	0.352	0.032	0.339
0.60	0.609	0.133	1.387	9.757	0.006	0.350	0.033	0.340
0.55	0.649	0.145	1.514	11.304	0.001	0.366	0.033	0.344
0.50	0.693	0.156	1.634	12.666	0.001	0.380	0.033	0.345
0.45	0.737	0.167	1.740	13.769	0.004	0.394	0.033	0.349
0.40	0.780	0.175	1.825	14.545	0.000	0.406	0.034	0.355
0.35	0.821	0.180	1.884	14.906	0.002	0.416	0.034	0.357
0.30	0.868	0.183	1.909	14.780	0.005	0.435	0.034	0.352
0.25	0.913	0.182	1.905	14.096	0.001	0.458	0.033	0.348
0.20	0.957	0.180	1.879	12.762	0.005	0.485	0.032	0.337
0.15	0.999	0.177	1.852	10.846	0.000	0.518	0.030	0.318
0.10	1.042	0.179	1.872	14.059	0.010	0.561	0.028	0.294
0.05	1.091	0.193	2.018	18.230	0.011	0.619	0.025	0.266

MSE/ACTUAL

0.95	1.355	0.621	6.485	55.139	0.000	0.224	0.033	0.348
0.90	1.134	0.376	3.930	27.244	0.000	0.240	0.033	0.343
0.85	1.067	0.347	3.624	24.987	0.000	0.239	0.033	0.341
0.80	0.999	0.318	3.315	22.653	0.000	0.239	0.033	0.339
0.75	1.394	0.656	6.845	66.455	0.000	0.242	0.035	0.370
0.70	1.610	0.788	8.229	74.919	0.000	0.243	0.035	0.369
0.65	1.909	0.974	10.167	83.354	0.000	0.238	0.035	0.361
0.60	2.277	1.209	12.626	95.321	0.000	0.237	0.035	0.363
0.55	2.692	1.479	15.444	127.802	0.000	0.251	0.032	0.334
0.50	3.125	1.758	18.349	160.448	0.000	0.262	0.035	0.369
0.45	3.542	2.011	20.995	189.680	0.000	0.276	0.036	0.376
0.40	3.908	2.203	23.003	211.565	0.000	0.290	0.037	0.391
0.35	4.190	2.300	24.014	222.263	0.000	0.299	0.038	0.393
0.30	4.366	2.276	23.763	218.595	0.000	0.312	0.038	0.395
0.25	4.430	2.127	22.201	198.727	0.000	0.330	0.038	0.396
0.20	4.412	1.896	19.795	162.988	0.000	0.348	0.038	0.392
0.15	4.396	1.751	18.276	117.633	0.000	0.368	0.036	0.376
0.10	4.559	2.049	21.389	197.931	0.000	0.400	0.034	0.356
0.05	5.224	3.000	32.477	332.750	0.000	0.453	0.032	0.335

MAPE/FORECAST

0.95	0.939	0.243	2.535	20.975	0.000	0.368	0.034	0.353
0.90	0.996	0.271	2.830	20.720	0.004	0.370	0.034	0.355
0.85	1.810	0.964	0.063	102.658	0.005	0.370	0.034	0.353
0.80	1.189	0.358	3.740	25.248	0.000	0.369	0.034	0.352
0.75	1.344	0.428	4.471	33.434	0.000	0.369	0.033	0.350
0.70	2.729	1.512	15.790	153.172	0.005	0.368	0.033	0.348
0.65	6.491	5.523	57.659	602.181	0.006	0.371	0.033	0.347
0.60	1.477	0.548	5.726	43.045	0.006	0.368	0.033	0.345
0.55	1.758	0.822	8.583	86.527	0.001	0.387	0.034	0.353
0.50	1.122	0.273	2.851	18.050	0.001	0.401	0.034	0.354
0.45	1.257	0.382	3.990	37.519	0.004	0.414	0.034	0.351
0.40	5.604	3.656	38.168	371.707	0.000	0.427	0.034	0.352
0.35	0.930	0.156	1.624	9.251	0.002	0.443	0.034	0.351
0.30	1.196	0.376	3.922	39.692	0.005	0.477	0.034	0.350
0.25	1.045	0.185	1.929	15.852	0.001	0.514	0.033	0.348
0.20	1.126	0.223	2.328	19.554	0.005	0.568	0.033	0.346
0.15	3.681	2.640	27.563	288.268	0.000	0.638	0.033	0.343
0.10	1.247	0.170	1.770	16.629	0.010	0.718	0.032	0.329
0.05	1.498	0.123	1.228	8.738	0.011	0.794	0.028	0.296

MSE/FORECAST

0.95	7.246	4.216	44.017	439.959	0.000	0.259	0.035	0.369
0.90	8.931	4.834	50.465	429.490	0.000	0.261	0.036	0.372
0.85	103.618	96.734	1009.93	10539.621	0.000	0.260	0.036	0.371
0.80	15.274	8.346	87.133	637.455	0.000	0.259	0.036	0.372
0.75	21.612	12.505	130.559	1117.836	0.000	0.257	0.035	0.369
0.70	254.480	217.783	2273.721	23463.31	0.000	0.256	0.035	0.367
0.65	3336.23	3326.8	34732.80	362630.06	0.000	0.257	0.035	0.368
0.60	34.669	21.970	229.376	1853.401	0.000	0.254	0.035	0.367
0.55	76.088	68.750	717.772	7487.234	0.000	0.273	0.036	0.378
0.50	9.313	4.144	43.260	325.854	0.000	0.285	0.037	0.385
0.45	17.354	12.977	135.482	1407.976	0.000	0.294	0.037	0.382
0.40	1474.80	1281.99	13384.3	138166.06	0.000	0.305	0.037	0.383
0.35	3.477	1.085	11.330	85.327	0.000	0.318	0.037	0.383
0.30	16.669	14.449	150.847	1575.859	0.000	0.349	0.037	0.387
0.25	4.777	2.374	24.786	251.338	0.000	0.385	0.037	0.391
0.20	6.638	3.822	39.903	382.541	0.000	0.441	0.038	0.397
0.15	766.304	762.340	7959.06	83098.562	0.000	0.524	0.039	0.406
0.10	4.658	2.553	26.655	276.860	0.000	0.622	0.039	0.405
0.05	3.886	0.816	8.515	76.550	0.000	0.717	0.037	0.382

1983

MAPE/ACTUAL

0.95	0.584	0.089	0.931	5.424	0.000	0.378	0.030	0.314
0.90	0.575	0.086	0.901	5.217	0.002	0.377	0.030	0.314
0.85	0.565	0.083	0.869	4.991	0.008	0.377	0.030	0.314
0.80	0.558	0.080	0.833	4.749	0.011	0.379	0.030	0.310
0.75	0.554	0.076	0.794	4.487	0.014	0.386	0.029	0.305
0.70	0.548	0.072	0.754	4.204	0.016	0.394	0.029	0.307
0.65	0.542	0.069	0.715	3.910	0.010	0.397	0.029	0.307
0.60	0.535	0.065	0.681	3.600	0.018	0.398	0.029	0.304
0.55	0.525	0.063	0.655	3.337	0.001	0.397	0.029	0.301
0.50	0.514	0.061	0.640	3.740	0.013	0.395	0.028	0.297
0.45	0.500	0.061	0.638	4.557	0.001	0.392	0.028	0.292
0.40	0.484	0.062	0.647	5.300	0.005	0.385	0.027	0.283
0.35	0.470	0.063	0.660	5.921	0.008	0.381	0.026	0.276
0.30	0.470	0.064	0.664	6.339	0.017	0.391	0.025	0.261
0.25	0.471	0.063	0.662	6.495	0.006	0.401	0.025	0.257
0.20	0.483	0.062	0.644	6.242	0.025	0.411	0.022	0.225
0.15	0.506	0.059	0.612	5.532	0.019	0.431	0.020	0.209
0.10	0.551	0.055	0.576	4.335	0.002	0.475	0.021	0.218
0.05	0.622	0.055	0.577	5.435	0.019	0.545	0.022	0.233

MSE/ACTUAL

0.95	1.199	0.405	4.233	29.420	0.000	0.240	0.033	0.344
0.90	1.134	0.376	3.930	27.244	0.000	0.240	0.033	0.343
0.85	1.067	0.347	3.624	24.987	0.000	0.239	0.033	0.341
0.80	0.999	0.318	3.315	22.653	0.000	0.239	0.033	0.339
0.75	0.931	0.287	3.001	20.255	0.000	0.242	0.032	0.336
0.70	0.864	0.257	2.684	17.814	0.000	0.248	0.032	0.339
0.65	0.801	0.227	2.370	15.364	0.000	0.251	0.033	0.340
0.60	0.745	0.200	2.086	13.091	0.000	0.250	0.032	0.337
0.55	0.701	0.182	1.904	11.140	0.000	0.247	0.032	0.334
0.50	0.670	0.186	1.941	14.085	0.000	0.244	0.032	0.332
0.45	0.654	0.217	2.269	20.773	0.000	0.238	0.031	0.322
0.40	0.649	0.269	2.813	28.138	0.000	0.228	0.029	0.307
0.35	0.653	0.327	3.411	35.132	0.000	0.221	0.029	0.302
0.30	0.658	0.372	3.882	40.399	0.000	0.221	0.027	0.284
0.25	0.657	0.388	4.053	42.260	0.000	0.226	0.027	0.280
0.20	0.645	0.363	3.794	39.285	0.001	0.219	0.022	0.232
0.15	0.628	0.299	3.008	30.815	0.000	0.229	0.021	0.218
0.10	0.632	0.237	2.472	18.802	0.000	0.272	0.022	0.234
0.05	0.717	0.277	2.889	29.751	0.000	0.351	0.024	0.252

MAPE/FORECAST

0.95	1.020	0.267	2.788	26.177	0.000	0.451	0.033	0.348
0.90	1.169	0.412	4.298	43.744	0.002	0.453	0.034	0.350
0.85	1.454	0.691	7.209	74.986	0.008	0.455	0.035	0.353
0.80	1.804	1.022	10.671	111.443	0.011	0.461	0.034	0.352
0.75	1.894	1.070	11.168	116.477	0.014	0.472	0.033	0.349
0.70	1.844	0.887	9.265	94.536	0.016	0.480	0.034	0.351
0.65	2.442	1.014	10.589	76.410	0.010	0.485	0.034	0.350
0.60	1.677	0.679	7.093	71.001	0.018	0.489	0.033	0.350
0.55	1.692	0.809	8.447	87.880	0.001	0.492	0.033	0.349
0.50	5.016	3.640	38.002	393.957	0.013	0.496	0.033	0.347
0.45	1.485	0.604	6.303	64.874	0.001	0.496	0.033	0.345
0.40	1.284	0.390	4.067	36.388	0.005	0.499	0.033	0.346
0.35	4.857	3.816	39.841	416.073	0.008	0.506	0.033	0.344
0.30	1.835	0.879	9.182	95.303	0.016	0.528	0.032	0.331
0.25	3.301	1.570	16.391	140.169	0.006	0.553	0.032	0.330
0.20	1.095	0.236	2.469	23.889	0.026	0.607	0.031	0.328
0.15	0.885	0.076	0.793	4.982	0.019	0.662	0.030	0.318
0.10	1.121	0.125	1.302	11.682	0.002	0.719	0.030	0.315
0.05	1.469	0.125	1.300	8.399	0.019	0.791	0.030	0.313

0.95	8.743	6.370	66.509	685.219	0.000	0.323	0.037	0.389
0.90	19.666	17.555	183.281	1913.745	0.000	0.327	0.038	0.393
0.85	53.610	51.582	538.533	5624.016	0.000	0.331	0.038	0.397
0.80	116.089	113.945	1189.62	12421.922	0.000	0.336	0.038	0.398
0.75	127.167	124.477	1299.58	13570.187	0.000	0.343	0.038	0.398
0.70	88.462	82.068	856.811	8940.078	0.000	0.353	0.038	0.401
0.65	117.066	72.087	752.609	5840.058	0.000	0.357	0.038	0.401
0.60	223.093	221.935	2317.07	24192.094	0.000	0.264	0.036	0.374
0.55	73.559	70.847	739.659	7724.410	0.000	0.363	0.038	0.400
0.50	1456.02	1423.9	148366.3	155212.69	0.000	0.366	0.038	0.400
0.45	41.571	38.602	403.013	4208.812	0.000	0.364	0.038	0.399
0.40	18.035	12.821	133.853	1324.401	0.000	0.367	0.038	0.400
0.35	1596.36	1588.2	16581.46	173122.62	0.000	0.373	0.038	0.394
0.30	86.904	83.333	870.025	9085.746	0.000	0.387	0.037	0.384
0.25	277.090	200.944	2097.92	19648.918	0.000	0.414	0.037	0.382
0.20	7.237	5.276	55.083	571.908	0.001	0.475	0.038	0.392
0.15	1.408	0.314	3.279	25.016	0.000	0.529	0.037	0.387
0.10	2.938	1.270	13.256	136.211	0.000	0.616	0.037	0.391
0.05	3.832	0.852	8.894	70.857	0.000	0.723	0.036	0.380

Appendix 17.

COMPARISON OF THE NON-TRUNCATED ERRORS FOR FORECASTS OF PROFITS BY ABSOLUTE CHANGE MODELS, (109 COS.).

SPEARMAN CORRELATION COEFFICIENTS

MAPE/ACTUAL AND MSE/ACTUAL.

	2 yr.	3 yr.	4 yr.	5 yr.
1980				
1 yr.	0.8709	0.8163	0.7021	0.7011
2 yr.		0.9243	0.8459	0.8531
3 yr.			0.9502	0.9496
4 yr.				0.9885
1981				
	0.7359	0.7196	0.7481	0.7204
		0.8781	0.8616	0.8252
			0.9600	0.9287
				0.9830
1982				
	0.6575	0.6401	0.6466	0.5579
		0.7889	0.6988	0.5975
			0.9306	0.8608
				0.9346
1983				
	0.4900	0.6895	0.7167	0.6853
		0.4686	0.4849	0.4724
			0.9180	0.8931
				0.9742

MAPE/FORECAST AND MSE/FORECAST.

1980				
	0.7714	0.7797	0.6240	0.6230
		0.8944	0.7651	0.7754
			0.9257	0.9213
				0.9893
1981				
	0.5851	0.5533	0.5960	0.5678
		0.8630	0.8655	0.8095
			0.9576	0.9185
				0.9737
1982				
	0.6289	0.6306	0.6485	0.5580
		0.7987	0.6954	0.6092
			0.9239	0.8491
				0.9312
1983				
	0.3400	0.6709	0.6881	0.6590
		0.4496	0.4770	0.4737
			0.9101	0.8846
				0.9700

T - T E S T

	(DIFFERENCE) MEAN	STANDARD DEVIATION	STANDARD ERROR	CORR.	2-TAIL PROB.	T VALUE	2-TAIL PROB.
<u>1980</u>							
MAPE/ACTUAL							
1/2	0.5308	4.306	0.412	0.999	0.000	1.29	0.201
1/3	0.6490	5.709	0.547	0.999	0.000	1.19	0.238
1/4	0.7201	6.428	0.616	0.998	0.000	1.17	0.245
1/5	0.7851	6.844	0.656	0.997	0.000	1.20	0.234
2/3	0.1182	1.454	0.139	0.999	0.000	0.85	0.398
2/4	0.1893	2.170	0.208	0.999	0.000	0.91	0.364
2/5	0.2543	2.588	0.248	0.998	0.000	1.03	0.307
3/4	0.0711	0.744	0.071	1.000	0.000	1.00	0.321
3/5	0.1361	1.155	0.111	1.000	0.000	1.23	0.221
4/5	0.0650	0.438	0.042	1.000	0.000	1.55	0.124
MSE/ACTUAL							
1/2	128.1053	1312.539	125.718	1.000	0.000	1.02	0.310
1/3	161.7668	1665.479	159.524	1.000	0.000	1.01	0.313
1/4	177.2338	1827.492	175.042	1.000	0.000	1.01	0.314
1/5	186.0697	1918.861	183.794	1.000	0.000	1.01	0.314
2/3	33.6615	352.997	33.811	1.000	0.000	1.00	0.322
2/4	49.1285	515.014	49.329	1.000	0.000	1.00	0.322
2/5	57.9644	606.394	58.082	1.000	0.000	1.00	0.321
3/4	15.4669	162.022	15.519	1.000	0.000	1.00	0.321
3/5	24.3029	253.399	24.271	1.000	0.000	1.00	0.319
4/5	8.8360	91.384	8.753	1.000	0.000	1.01	0.315
MAPE/FORECAST							
1/2	0.3223	3.120	0.299	0.653	0.000	1.08	0.283
1/3	0.4442	3.507	0.336	0.477	0.000	1.32	0.189
1/4	0.5180	3.497	0.335	0.527	0.000	1.55	0.125
1/5	0.4521	3.646	0.349	0.385	0.000	1.29	0.198
2/3	0.1218	1.236	0.118	0.685	0.000	1.03	0.306
2/4	0.1956	1.302	0.125	0.628	0.000	1.57	0.120
2/5	0.1298	1.492	0.143	0.528	0.000	0.91	0.366
3/4	0.0738	0.507	0.049	0.938	0.000	1.52	0.132
3/5	0.0079	0.742	0.071	0.848	0.000	0.11	0.911
4/5	-0.0659	0.448	0.043	0.953	0.000	-1.53	0.128

MSE/FORECAST

1/2	13.3035	121.971	11.683	0.610	0.000	1.14	0.257
1/3	14.4492	128.889	12.345	0.184	0.055	1.17	0.244
1/4	15.2128	128.724	12.329	0.321	0.001	1.23	0.220
1/5	14.5083	129.562	12.410	0.143	0.137	1.17	0.245
2/3	1.1458	15.047	1.441	0.400	0.000	0.80	0.428
2/4	1.9094	13.433	1.287	0.454	0.000	1.48	0.141
2/5	1.2048	15.006	1.437	0.312	0.001	0.84	0.404
3/4	0.7636	6.356	0.609	0.961	0.000	1.25	0.212
3/5	0.0591	6.919	0.663	0.819	0.000	0.09	0.929
4/5	-0.7045	4.519	0.433	0.904	0.000	-1.63	0.106

<u>1981</u>

MAPE/ACTUAL

1/2	1.4545	9.424	0.903	0.755	0.000	1.61	0.110
1/3	1.5871	9.770	0.936	0.750	0.000	1.70	0.093
1/4	1.7062	10.069	0.964	0.747	0.000	1.77	0.080
1/5	1.7975	10.359	0.992	0.737	0.000	1.81	0.073
2/3	0.1326	1.109	0.106	0.996	0.000	1.25	0.215
2/4	0.2516	1.880	0.180	0.988	0.000	1.40	0.165
2/5	0.3430	2.468	0.236	0.977	0.000	1.45	0.150
3/4	0.1190	0.891	0.085	0.996	0.000	1.40	0.166
3/5	0.2104	1.463	0.140	0.989	0.000	1.50	0.136
4/5	0.0914	0.622	0.060	0.998	0.000	1.53	0.128

MSE/ACTUAL

1/2	137.9478	987.848	94.619	0.784	0.000	1.46	0.148
1/3	150.8131	1051.416	100.707	0.785	0.000	1.50	0.137
1/4	159.5880	1095.518	104.932	0.785	0.000	1.52	0.131
1/5	165.2921	1132.450	108.469	0.784	0.000	1.52	0.130
2/3	12.8653	110.027	10.539	1.000	0.000	1.22	0.225
2/4	21.6402	179.964	17.237	0.998	0.000	1.26	0.212
2/5	27.3443	234.533	22.464	0.997	0.000	1.22	0.226
3/4	8.7749	70.237	6.727	0.999	0.000	1.30	0.195
3/5	14.4791	124.836	11.957	0.999	0.000	1.21	0.229
4/5	5.7042	55.021	5.270	1.000	0.000	1.08	0.281

MAPE/FORECAST

1/2	-72.1554	758.074	72.610	0.130	0.177	-0.99	0.323
1/3	-2.0655	23.849	2.284	-0.014	0.882	-0.90	0.368
1/4	0.3028	3.890	0.373	0.028	0.775	0.81	0.418
1/5	0.5928	3.055	0.293	0.183	0.057	2.03	0.045
2/3	70.0898	757.778	72.582	0.045	0.644	0.97	0.336
2/4	72.4582	758.271	72.629	0.080	0.407	1.00	0.321
2/5	72.7482	758.295	72.631	0.157	0.102	1.00	0.319
3/4	2.3683	21.736	2.082	0.774	0.000	1.14	0.258
3/5	2.6584	23.310	2.233	0.293	0.002	1.19	0.236
4/5	0.2900	2.225	0.213	0.449	0.000	1.36	0.176

MSE/FORECAST

1/2	-575368.2	6007107.6	575376.55	0.023	0.811	-1.00	0.320
1/3	-552.2507	5776.768	553.314	-0.014	0.887	-1.00	0.320
1/4	3.7760	86.926	8.326	-0.018	0.852	0.45	0.651
1/5	9.1733	74.046	7.092	0.049	0.616	1.29	0.199
2/3	574815.5	6007147.4	575380.367	-0.006	0.950	1.00	0.320
2/4	575371.5	6007109.1	575376.701	0.004	0.968	1.00	0.320
2/5	575376.9	6007108.9	575376.678	0.048	0.618	1.00	0.320
3/4	556.0267	5736.868	549.492	0.867	0.000	1.01	0.314
3/5	561.4240	5774.621	553.108	0.078	0.422	1.02	0.312
4/5	5.3974	44.256	4.239	0.104	0.283	1.27	0.206

1982

MAPE/ACTUAL

1/2	-0.1620	5.150	0.493	0.363	0.000	-0.33	0.743
1/3	0.5189	3.024	0.290	0.559	0.000	1.79	0.076
1/4	0.5565	3.013	0.289	0.600	0.000	1.93	0.056
1/5	0.5433	2.728	0.261	0.790	0.000	2.08	0.040
2/3	0.6809	5.035	0.482	0.278	0.003	1.41	0.161
2/4	0.7185	5.045	0.483	0.277	0.004	1.49	0.140
2/5	0.7053	4.974	0.476	0.333	0.000	1.48	0.142
3/4	0.0375	0.317	0.030	0.973	0.000	1.24	0.219
3/5	0.0244	0.654	0.063	0.858	0.000	0.39	0.698
4/5	-0.0131	0.441	0.042	0.924	0.000	-0.31	0.756

MSE/ACTUAL

1/2	-15.1311	252.747	24.209	0.132	0.170	-0.63	0.533
1/3	11.7531	99.759	9.555	0.232	0.015	1.23	0.221
1/4	12.1743	99.863	9.565	0.286	0.003	1.27	0.206
1/5	12.0642	96.268	9.221	0.770	0.000	1.31	0.194
2/3	26.8842	244.806	23.448	0.053	0.584	1.15	0.254
2/4	27.3054	244.817	23.449	0.057	0.559	1.16	0.247
2/5	27.1953	244.428	23.412	0.111	0.250	1.16	0.248
3/4	0.4212	4.750	0.455	0.983	0.000	0.93	0.357
3/5	0.3111	8.930	0.855	0.731	0.000	0.36	0.717
4/5	-0.1101	5.089	0.487	0.803	0.000	-0.23	0.822

MAPE/FORECAST

1/2	-0.8373	17.535	1.680	-0.005	0.956	-0.50	0.619
1/3	0.9794	6.790	0.650	0.175	0.068	1.51	0.135
1/4	-1.9134	27.915	2.674	0.026	0.786	-0.72	0.476
1/5	-45.9437	488.740	46.813	-0.017	0.860	-0.98	0.329
2/3	1.8167	15.551	1.489	0.379	0.000	1.22	0.225
2/4	-1.0761	31.518	3.019	0.008	0.933	-0.36	0.722
2/5	-45.1064	489.048	46.842	-0.013	0.893	-0.96	0.338
3/4	-2.8928	26.654	2.553	0.385	0.000	-1.13	0.260
3/5	-46.9231	488.345	46.775	0.143	0.137	-1.00	0.318
4/5	-44.0303	489.298	46.866	0.001	0.990	-0.94	0.350

MSE/FORECAST

1/2	-213.3036	2662.321	255.004	-0.016	0.870	-0.84	0.405
1/3	46.9909	311.914	29.876	0.024	0.804	1.57	0.119
1/4	-698.5643	7676.987	735.322	-0.013	0.893	-0.95	0.346
1/5	-238745.6	2493003.5	238786.43	-0.015	0.873	-1.00	0.320
2/3	260.2944	2635.663	252.451	0.271	0.004	1.03	0.305
2/4	-485.2607	8131.556	778.862	-0.009	0.923	-0.62	0.535
2/5	-238532.3	2493025.5	238788.54	-0.010	0.921	-1.00	0.320
3/4	-745.5552	7662.886	733.971	0.292	0.002	-1.02	0.312
3/5	-238792.6	2492998.0	238785.90	0.052	0.588	-1.00	0.320
4/5	-238047.1	2493081.6	238793.91	-0.009	0.924	-1.00	0.321

1983

MAPE/ACTUAL

1/2	0.0425	0.537	0.051	0.943	0.000	0.83	0.411
1/3	-0.2127	2.150	0.206	0.526	0.000	-1.03	0.304
1/4	0.0378	0.561	0.054	0.939	0.000	0.70	0.484
1/5	0.0942	0.574	0.055	0.943	0.000	1.71	0.090
2/3	-0.2552	2.130	0.204	0.529	0.000	-1.25	0.214
2/4	-0.0047	0.492	0.047	0.941	0.000	-0.10	0.920
2/5	0.0517	0.500	0.048	0.939	0.000	1.08	0.283
3/4	0.2505	2.097	0.201	0.547	0.000	1.25	0.215
3/5	0.3068	2.097	0.201	0.548	0.000	1.53	0.130
4/5	0.0564	0.152	0.015	0.997	0.000	3.87	0.000

MSE/ACTUAL

1/2	0.5557	4.656	0.446	0.945	0.000	1.25	0.215
1/3	-4.0680	47.314	4.532	0.176	0.068	-0.90	0.371
1/4	0.6333	5.285	0.506	0.942	0.000	1.25	0.214
1/5	1.0248	5.862	0.561	0.957	0.000	1.83	0.071
2/3	-4.6237	47.103	4.512	0.178	0.063	-1.02	0.308
2/4	0.0776	2.811	0.269	0.964	0.000	0.29	0.774
2/5	0.4690	3.594	0.344	0.956	0.000	1.36	0.176
3/4	4.7013	47.064	4.508	0.180	0.062	1.04	0.299
3/5	5.0928	47.078	4.509	0.178	0.064	1.13	0.261
4/5	0.3915	1.603	0.154	0.994	0.000	2.55	0.012

MAPE/FORECAST

1/2	35.6839	319.230	30.577	0.175	0.068	1.17	0.246
1/3	33.9874	317.695	30.430	0.177	0.065	1.12	0.267
1/4	34.8159	320.170	30.667	-0.006	0.950	1.14	0.259
1/5	35.5332	319.934	30.644	0.005	0.957	1.16	0.249
2/3	-1.6965	10.909	1.045	0.873	0.000	-1.62	0.107
2/4	-0.8680	9.941	0.952	0.475	0.000	-0.91	0.364
2/5	-0.1507	5.569	0.533	0.478	0.000	-0.28	0.778
3/4	0.8285	16.395	1.570	0.184	0.055	0.53	0.599
3/5	1.5457	14.624	1.401	0.153	0.112	1.10	0.272
4/5	0.7173	5.740	0.550	0.940	0.000	1.30	0.195

MSE/FORECAST

1/2	102751.2	1029608.57	98618.616	0.029	0.762	1.04	0.300
1/3	102559.4	1029556.82	98613.659	0.031	0.748	1.04	0.301
1/4	102639.8	1029625.66	98620.252	-0.011	0.911	1.04	0.300
1/5	102728.1	1029616.10	98619.336	-0.010	0.915	1.04	0.300
2/3	-191.7920	1710.087	163.797	0.963	0.000	-1.17	0.244
2/4	-111.3882	1168.261	111.899	0.199	0.038	-1.00	0.322
2/5	-23.1209	366.456	35.100	0.202	0.035	-0.66	0.511
3/4	80.4038	2169.152	207.767	0.010	0.916	0.39	0.700
3/5	168.6711	1864.204	178.558	0.003	0.974	0.94	0.347
4/5	88.2673	821.269	78.663	0.989	0.000	1.12	0.264

Appendix 18.

T-TESTS OF TRUNCATED ERRORS FOR FORECASTS OF PROFITS BY ABSOLUTE CHANGE MODELS, (109 COS.).

	(DIFFERENCE) MEAN	STANDARD DEVIATION	STANDARD ERROR	CORR.	2-TAIL PROB.	T VALUE	2-TAIL PROB.
1980							
MAPE/ACTUAL							
1/2 yr.	0.0029	0.181	0.017	0.889	0.000	0.17	0.868
1/3 yr.	0.0123	0.226	0.022	0.831	0.000	0.57	0.571
1/4 yr.	0.0270	0.275	0.026	0.758	0.000	1.03	0.307
1/5 yr.	0.0317	0.276	0.026	0.753	0.000	1.20	0.234
2/3 yr.	0.0094	0.149	0.014	0.926	0.000	0.66	0.511
2/4 yr.	0.0241	0.201	0.019	0.869	0.000	1.25	0.214
2/5 yr.	0.0288	0.200	0.019	0.869	0.000	1.50	0.136
3/4 yr.	0.0147	0.106	0.010	0.965	0.000	1.46	0.148
3/5 yr.	0.0194	0.111	0.011	0.960	0.000	1.82	0.071
4/5 yr.	0.0046	0.037	0.004	0.996	0.000	1.32	0.188
MSE/ACTUAL							
1/2 yr.	0.0070	0.204	0.019	0.890	0.000	0.36	0.719
1/3 yr.	0.0117	0.257	0.025	0.828	0.000	0.47	0.636
1/4 yr.	0.0174	0.291	0.028	0.783	0.000	0.62	0.534
1/5 yr.	0.0243	0.297	0.028	0.774	0.000	0.86	0.394
2/3 yr.	0.0047	0.169	0.016	0.925	0.000	0.29	0.774
2/4 yr.	0.0104	0.202	0.019	0.894	0.000	0.54	0.593
2/5 yr.	0.0173	0.208	0.020	0.888	0.000	0.87	0.387
3/4 yr.	0.0057	0.108	0.010	0.970	0.000	0.55	0.582
3/5 yr.	0.0126	0.116	0.011	0.966	0.000	1.13	0.259
4/5 yr.	0.0069	0.040	0.004	0.996	0.000	1.83	0.070
MAPE/FORECAST							
1/2 yr.	0.0093	0.147	0.014	0.906	0.000	0.66	0.509
1/3 yr.	0.0164	0.226	0.022	0.778	0.000	0.76	0.452
1/4 yr.	0.0366	0.277	0.027	0.668	0.000	1.38	0.170
1/5 yr.	0.0381	0.278	0.027	0.664	0.000	1.43	0.155
2/3 yr.	0.0071	0.151	0.014	0.897	0.000	0.49	0.627
2/4 yr.	0.0273	0.207	0.020	0.808	0.000	1.38	0.170
2/5 yr.	0.0288	0.206	0.020	0.807	0.000	1.46	0.148
3/4 yr.	0.0203	0.107	0.010	0.949	0.000	1.97	0.051
3/5 yr.	0.0217	0.112	0.011	0.944	0.000	2.03	0.045
4/5 yr.	0.0015	0.028	0.003	0.997	0.000	0.55	0.580

MSE/FORECAST

1/2 yr.	0.0173	0.155	0.015	0.911	0.000	1.16	0.248
1/3 yr.	0.0202	0.255	0.024	0.761	0.000	0.83	0.409
1/4 yr.	0.0360	0.291	0.028	0.684	0.000	1.29	0.199
1/5 yr.	0.0390	0.293	0.028	0.678	0.000	1.39	0.168
2/3 yr.	0.0029	0.173	0.017	0.886	0.000	0.18	0.861
2/4 yr.	0.0187	0.219	0.021	0.812	0.000	0.89	0.376
2/5 yr.	0.0217	0.222	0.021	0.807	0.000	1.02	0.310
3/4 yr.	0.0158	0.113	0.011	0.951	0.000	1.46	0.146
3/5 yr.	0.0188	0.117	0.011	0.947	0.000	1.68	0.096
4/5 yr.	0.0030	0.017	0.002	0.999	0.000	1.84	0.069

<u>1981</u>

MAPE/ACTUAL

1/2 yr.	0.0444	0.290	0.028	0.722	0.000	1.60	0.113
1/3 yr.	0.0662	0.286	0.027	0.740	0.000	2.42	0.017
1/4 yr.	0.0624	0.277	0.027	0.750	0.000	2.35	0.020
1/5 yr.	0.0789	0.288	0.028	0.728	0.000	2.86	0.005
2/3 yr.	0.0218	0.173	0.017	0.905	0.000	1.31	0.192
2/4 yr.	0.0180	0.186	0.018	0.888	0.000	1.01	0.314
2/5 yr.	0.0345	0.212	0.020	0.853	0.000	1.69	0.093
3/4 yr.	-0.0038	0.076	0.007	0.982	0.000	-0.52	0.606
3/5 yr.	0.0127	0.111	0.011	0.961	0.000	1.19	0.237
4/5 yr.	0.0165	0.070	0.007	0.984	0.000	2.46	0.015

MSE/ACTUAL

1/2 yr.	0.0434	0.330	0.032	0.714	0.000	1.38	0.172
1/3 yr.	0.0546	0.318	0.030	0.737	0.000	1.79	0.076
1/4 yr.	0.0570	0.313	0.030	0.739	0.000	1.90	0.060
1/5 yr.	0.0729	0.324	0.031	0.720	0.000	2.35	0.021
2/3 yr.	0.0112	0.187	0.018	0.909	0.000	0.63	0.533
2/4 yr.	0.0136	0.212	0.020	0.879	0.000	0.67	0.506
2/5 yr.	0.0295	0.245	0.024	0.838	0.000	1.25	0.213
3/4 yr.	0.0024	0.094	0.009	0.977	0.000	0.27	0.791
3/5 yr.	0.0183	0.134	0.013	0.953	0.000	1.42	0.158
4/5 yr.	0.0159	0.085	0.008	0.980	0.000	1.95	0.054

MAPE/FORECAST

1/2 yr.	0.0653	0.314	0.030	0.643	0.000	2.18	0.032
1/3 yr.	0.0912	0.328	0.031	0.625	0.000	2.91	0.004
1/4 yr.	0.0833	0.322	0.031	0.636	0.000	2.70	0.008
1/5 yr.	0.1028	0.342	0.033	0.580	0.000	3.14	0.002
2/3 yr.	0.0259	0.149	0.014	0.920	0.000	1.82	0.072
2/4 yr.	0.0180	0.159	0.015	0.908	0.000	1.18	0.239
2/5 yr.	0.0375	0.200	0.019	0.850	0.000	1.96	0.052
3/4 yr.	-0.0079	0.062	0.006	0.986	0.000	-1.33	0.186
3/5 yr.	0.0116	0.134	0.013	0.936	0.000	0.90	0.369
4/5 yr.	0.0195	0.104	0.010	0.961	0.000	1.96	0.052

MSE/FORECAST

1/2 yr.	0.0763	0.353	0.034	0.624	0.000	2.26	0.026
1/3 yr.	0.0874	0.363	0.035	0.612	0.000	2.51	0.014
1/4 yr.	0.0826	0.366	0.035	0.604	0.000	2.36	0.020
1/5 yr.	0.1046	0.391	0.037	0.534	0.000	2.79	0.006
2/3 yr.	0.0111	0.134	0.013	0.943	0.000	0.86	0.391
2/4 yr.	0.0063	0.154	0.015	0.924	0.000	0.43	0.671
2/5 yr.	0.0283	0.211	0.020	0.853	0.000	1.40	0.164
3/4 yr.	-0.0048	0.055	0.005	0.991	0.000	-0.91	0.364
3/5 yr.	0.0172	0.150	0.014	0.928	0.000	1.20	0.234
4/5 yr.	0.0220	0.125	0.012	0.950	0.000	1.84	0.069

<u>1982</u>

MAPE/ACTUAL

1/2 yr.	0.0107	0.299	0.029	0.670	0.000	0.37	0.709
1/3 yr.	0.0450	0.298	0.029	0.650	0.000	1.57	0.119
1/4 yr.	0.0562	0.292	0.028	0.659	0.000	2.01	0.047
1/5 yr.	0.0645	0.317	0.030	0.603	0.000	2.12	0.036
2/3 yr.	0.0342	0.244	0.023	0.768	0.000	1.47	0.146
2/4 yr.	0.0455	0.274	0.026	0.704	0.000	1.73	0.086
2/5 yr.	0.0538	0.315	0.030	0.611	0.000	1.78	0.077
3/4 yr.	0.0113	0.111	0.011	0.947	0.000	1.06	0.293
3/5 yr.	0.0196	0.159	0.015	0.893	0.000	1.28	0.202
4/5 yr.	0.0083	0.109	0.010	0.949	0.000	0.80	0.426

MSE/ACTUAL

1/2 yr.	0.0076	0.334	0.032	0.641	0.000	0.24	0.812
1/3 yr.	0.0518	0.326	0.031	0.626	0.000	1.66	0.100
1/4 yr.	0.0643	0.326	0.031	0.618	0.000	2.06	0.042
1/5 yr.	0.0672	0.343	0.033	0.584	0.000	2.05	0.043
2/3 yr.	0.0442	0.284	0.027	0.720	0.000	1.62	0.108
2/4 yr.	0.0566	0.304	0.029	0.674	0.000	1.95	0.054
2/5 yr.	0.0595	0.346	0.033	0.582	0.000	1.80	0.075
3/4 yr.	0.0125	0.128	0.012	0.935	0.000	1.02	0.312
3/5 yr.	0.0154	0.166	0.016	0.892	0.000	0.97	0.337
4/5 yr.	0.0029	0.121	0.012	0.941	0.000	0.25	0.803

MAPE/FORECAST

1/2 yr.	-0.0263	0.306	0.029	0.659	0.000	-0.90	0.373
1/3 yr.	0.0149	0.298	0.029	0.655	0.000	0.52	0.603
1/4 yr.	0.0172	0.311	0.030	0.634	0.000	0.58	0.566
1/5 yr.	0.0280	0.332	0.032	0.582	0.000	0.88	0.380
2/3 yr.	0.0411	0.230	0.022	0.805	0.000	1.87	0.065
2/4 yr.	0.0435	0.276	0.026	0.725	0.000	1.64	0.104
2/5 yr.	0.0543	0.309	0.030	0.656	0.000	1.84	0.069
3/4 yr.	0.0023	0.115	0.011	0.950	0.000	0.21	0.834
3/5 yr.	0.0132	0.174	0.017	0.883	0.000	0.79	0.431
4/5 yr.	0.0109	0.114	0.011	0.951	0.000	0.99	0.322

MSE/FORECAST

1/2 yr.	-0.0343	0.353	0.034	0.619	0.000	-1.01	0.313
1/3 yr.	0.0169	0.343	0.033	0.606	0.000	0.51	0.609
1/4 yr.	0.0115	0.367	0.035	0.559	0.000	0.33	0.745
1/5 yr.	0.0200	0.376	0.036	0.541	0.000	0.56	0.580
2/3 yr.	0.0512	0.274	0.026	0.763	0.000	1.95	0.054
2/4 yr.	0.0458	0.310	0.030	0.702	0.000	1.54	0.127
2/5 yr.	0.0543	0.341	0.033	0.641	0.000	1.66	0.099
3/4 yr.	-0.0054	0.130	0.012	0.943	0.000	-0.43	0.665
3/5 yr.	0.0031	0.187	0.018	0.882	0.000	0.17	0.862
4/5 yr.	0.0085	0.120	0.011	0.952	0.000	0.74	0.459

1983

MAPE/ACTUAL

1/2 yr.	-0.0049	0.205	0.020	0.821	0.000	-0.25	0.803
1/3 yr.	-0.0400	0.245	0.023	0.762	0.000	-1.71	0.091
1/4 yr.	-0.0026	0.212	0.020	0.812	0.000	-0.13	0.899
1/5 yr.	0.0086	0.218	0.021	0.799	0.000	0.41	0.682
2/3 yr.	-0.0351	0.187	0.018	0.863	0.000	-1.96	0.053
2/4 yr.	0.0023	0.163	0.016	0.890	0.000	0.15	0.881
2/5 yr.	0.0135	0.176	0.017	0.871	0.000	0.80	0.426
3/4 yr.	0.0375	0.134	0.013	0.931	0.000	2.93	0.004
3/5 yr.	0.0486	0.138	0.013	0.926	0.000	3.67	0.000
4/5 yr.	0.0112	0.057	0.006	0.986	0.000	2.03	0.045

MSE/ACTUAL

1/2 yr.	-0.0091	0.218	0.021	0.833	0.000	-0.44	0.664
1/3 yr.	-0.0526	0.265	0.025	0.769	0.000	-2.07	0.041
1/4 yr.	-0.0095	0.213	0.020	0.841	0.000	-0.46	0.644
1/5 yr.	0.0018	0.217	0.021	0.832	0.000	0.09	0.930
2/3 yr.	-0.0435	0.194	0.019	0.879	0.000	-2.34	0.021
2/4 yr.	-0.0003	0.154	0.015	0.918	0.000	-0.02	0.982
2/5 yr.	0.0109	0.163	0.016	0.907	0.000	0.70	0.486
3/4 yr.	0.0432	0.164	0.016	0.914	0.000	2.75	0.007
3/5 yr.	0.0545	0.161	0.015	0.917	0.000	3.54	0.001
4/5 yr.	0.0113	0.057	0.005	0.989	0.000	2.08	0.040

MAPE/FORECAST

1/2 yr.	0.0039	0.234	0.022	0.799	0.000	0.17	0.863
1/3 yr.	-0.0400	0.282	0.027	0.725	0.000	-1.48	0.141
1/4 yr.	0.0012	0.275	0.026	0.725	0.000	0.05	0.963
1/5 yr.	0.0132	0.274	0.026	0.730	0.000	0.50	0.616
2/3 yr.	-0.0439	0.218	0.021	0.836	0.000	-2.10	0.038
2/4 yr.	-0.0026	0.217	0.021	0.830	0.000	-0.13	0.899
2/5 yr.	0.0093	0.230	0.022	0.810	0.000	0.42	0.672
3/4 yr.	0.0413	0.151	0.014	0.923	0.000	2.86	0.005
3/5 yr.	0.0532	0.181	0.017	0.889	0.000	3.08	0.003
4/5 yr.	0.0120	0.078	0.007	0.978	0.000	1.61	0.111

MSE/FORECAST

1/2 yr.	0.0042	0.241	0.023	0.822	0.000	0.18	0.856
1/3 yr.	-0.0542	0.309	0.030	0.729	0.000	-1.83	0.070
1/4 yr.	-0.0026	0.299	0.029	0.733	0.000	-0.09	0.929
1/5 yr.	0.0068	0.291	0.028	0.747	0.000	0.24	0.807
2/3 yr.	-0.0584	0.253	0.024	0.819	0.000	-2.40	0.018
2/4 yr.	-0.0068	0.236	0.023	0.834	0.000	-0.30	0.766
2/5 yr.	0.0026	0.241	0.023	0.828	0.000	0.11	0.910
3/4 yr.	0.0516	0.171	0.016	0.920	0.000	3.15	0.002
3/5 yr.	0.0610	0.198	0.019	0.891	0.000	3.21	0.002
4/5 yr.	0.0094	0.096	0.009	0.973	0.000	1.02	0.311

Appendix 19.

COMPARISON OF THE NON-TRUNCATED ERRORS FOR FORECASTS OF PROFIT BY THE PERCENTAGE CHANGE MODELS, (109 COS.).

SPEARMAN CORRELATION COEFFICIENTS

MAPE/ACTUAL AND MSE/ACTUAL.

	2 yr.	3 yr.	4 yr.	5 yr.
1980				
1 yr.	0.8922	0.8063	0.7482	0.7263
2 yr.		0.9192	0.8376	0.8429
3 yr.			0.9056	0.9061
4 yr.				0.9055
1981				
	0.6990	0.6945	0.6524	0.5594
		0.8555	0.7952	0.7068
			0.9187	0.8181
				0.8996
1982				
	0.6662	0.6075	0.5591	0.4547
		0.7391	0.6424	0.5538
			0.9368	0.8443
				0.9077
1983				
	0.5705	0.6477	0.5845	0.5289
		0.4498	0.4504	0.4532
			0.8444	0.8019
				0.8984

MAPE/FORECAST AND MSE/FORECAST

1980				
	0.8583	0.7346	0.6832	0.6679
		0.8968	0.8358	0.8186
			0.9255	0.8980
				0.9470
1981				
	0.7273	0.6485	0.6329	0.5283
		0.8378	0.7688	0.6943
			0.9254	0.8225
				0.8858
1982				
	0.7531	0.7340	0.7128	0.6151
		0.8231	0.7130	0.6320
			0.9433	0.8784
				0.9305
1983				
	0.4387	0.6824	0.6186	0.5695
		0.4541	0.4757	0.4802
			0.8732	0.8319
				0.9112

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	(DIFFERENCE) MEAN	STANDARD DEVIATION	STANDARD ERROR	CORR.	2-TAIL PROB.	T VALUE	2-TAIL PROB.
1980							
MAPE/ACTUAL							
1/2	53.8088	558.702	53.514	1.000	0.000	1.01	0.317
1/3	62.3623	648.422	62.108	1.000	0.000	1.00	0.318
1/4	77.0296	804.782	77.084	1.000	0.000	1.00	0.320
1/5	76.8981	802.750	76.890	1.000	0.000	1.00	0.319
2/3	8.5535	89.723	8.594	1.000	0.000	1.00	0.322
2/4	23.2208	246.085	23.571	1.000	0.000	0.99	0.327
2/5	23.0893	244.053	23.376	1.000	0.000	0.99	0.325
3/4	14.6673	156.364	14.977	1.000	0.000	0.98	0.330
3/5	14.5359	154.331	14.782	1.000	0.000	0.98	0.328
4/5	-0.1314	2.236	0.214	1.000	0.000	-0.61	0.541
MSE/ACTUAL							
1/2	936780.2	9884480.43	946761.517	1.000	0.000	1.00	0.320
1/3	1040632.1	>1000000	>1000000	1.000	0.000	1.00	0.320
1/4	1165699.2	>1000000	>1000000	1.000	0.000	1.00	0.320
1/5	1164391.9	>1000000	>1000000	1.000	0.000	1.00	0.320
2/3	93851.9	979845.59	93852.186	1.000	0.000	1.00	0.320
2/4	218919.0	2285608.43	218921.583	1.000	0.000	1.00	0.320
2/5	217611.8	2271955.04	217613.826	1.000	0.000	1.00	0.320
3/4	125067.1	1305762.84	125069.397	1.000	0.000	1.00	0.320
3/5	123759.9	1292109.45	123761.640	1.000	0.000	1.00	0.320
4/5	-1307.2151	13653.392	1307.758	1.000	0.000	-1.00	0.320
MAPE/FORECAST							
1/2	7.9166	80.450	7.706	0.977	0.000	1.03	0.307
1/3	8.0542	81.676	7.823	0.956	0.000	1.03	0.306
1/4	8.1072	82.062	7.860	0.960	0.000	1.03	0.305
1/5	8.0664	82.239	7.877	0.942	0.000	1.02	0.308
2/3	0.1376	1.274	0.122	0.993	0.000	1.13	0.262
2/4	0.1906	1.655	0.159	0.993	0.000	1.20	0.232
2/5	0.1497	1.889	0.181	0.979	0.000	0.83	0.410
3/4	0.0530	0.448	0.043	0.999	0.000	1.24	0.219
3/5	0.0121	0.759	0.073	0.987	0.000	0.17	0.868
4/5	-0.0409	0.488	0.047	0.989	0.000	-0.87	0.384
MSE/FORECAST							
1/2	7236.3584	75506.411	7232.202	1.000	0.000	1.00	0.319
1/3	7246.4299	75611.842	7242.301	0.998	0.000	1.00	0.319
1/4	7249.3410	75638.232	7244.829	0.998	0.000	1.00	0.319
1/5	7250.0413	75649.067	7245.867	0.997	0.000	1.00	0.319
2/3	10.0714	105.502	10.105	0.999	0.000	1.00	0.321
2/4	12.9826	131.843	12.628	0.999	0.000	1.03	0.306
2/5	13.6828	142.716	13.670	0.998	0.000	1.00	0.319
3/4	2.9112	26.493	2.538	1.000	0.000	1.15	0.254
3/5	3.6114	37.337	3.576	1.000	0.000	1.01	0.315
4/5	0.7002	11.163	1.069	0.999	0.000	0.65	0.514

1981

MAPE/ACTUAL

1/2	1.0508	6.731	0.645	0.951	0.000	1.63	0.106
1/3	1.3006	10.387	0.995	0.480	0.000	1.31	0.194
1/4	1.3207	10.848	1.039	0.181	0.059	1.27	0.206
1/5	0.7078	8.383	0.803	0.762	0.000	0.88	0.380
2/3	0.2498	4.046	0.388	0.552	0.000	0.64	0.521
2/4	0.2699	4.425	0.424	0.318	0.001	0.64	0.526
2/5	-0.3430	2.745	0.263	0.810	0.000	-1.30	0.195
3/4	0.0201	0.696	0.067	0.881	0.000	0.30	0.764
3/5	-0.5928	3.249	0.311	0.638	0.000	-1.91	0.059
4/5	-0.6129	3.454	0.331	0.534	0.000	-1.85	0.067

MSE/ACTUAL

1/2	102.2534	979.732	93.841	0.998	0.000	1.09	0.278
1/3	122.2495	1197.181	114.669	0.403	0.000	1.07	0.289
1/4	122.6013	1200.720	115.008	0.033	0.733	1.07	0.289
1/5	107.1618	1105.569	105.894	0.870	0.000	1.01	0.314
2/3	19.9961	217.903	20.871	0.415	0.000	0.96	0.340
2/4	20.3479	221.342	21.201	0.058	0.551	0.96	0.339
2/5	4.9084	135.827	13.010	0.873	0.000	0.38	0.707
3/4	0.3517	5.099	0.488	0.854	0.000	0.72	0.473
3/5	-15.0877	107.345	10.282	0.439	0.000	-1.47	0.145
4/5	-15.4395	110.015	10.537	0.167	0.082	-1.47	0.146

MAPE/FORECAST

1/2	0.7781	8.470	0.811	0.077	0.426	0.96	0.340
1/3	1.1728	8.226	0.788	0.109	0.260	1.49	0.140
1/4	0.8826	8.926	0.855	0.018	0.851	1.03	0.304
1/5	1.2955	8.217	0.787	0.114	0.239	1.65	0.103
2/3	0.3946	1.977	0.189	0.675	0.000	2.08	0.040
2/4	0.1045	4.007	0.384	0.160	0.096	0.27	0.786
2/5	0.5174	2.090	0.200	0.679	0.000	2.58	0.011
3/4	-0.2902	3.226	0.309	0.399	0.000	-0.94	0.350
3/5	0.1227	0.578	0.055	0.888	0.000	2.22	0.029
4/5	0.4129	3.319	0.318	0.340	0.000	1.30	0.197

MSE/FORECAST

1/2	63.7226	675.065	64.659	-0.016	0.870	0.99	0.327
1/3	69.7045	673.688	64.528	-0.022	0.824	1.08	0.282
1/4	58.3098	685.161	65.626	-0.011	0.906	0.89	0.376
1/5	70.5586	673.614	64.521	-0.019	0.846	1.09	0.277
2/3	5.9819	33.330	3.192	0.514	0.000	1.87	0.064
2/4	-5.4127	123.720	11.850	-0.009	0.928	-0.46	0.649
2/5	6.8360	34.442	3.299	0.479	0.000	2.07	0.041
3/4	-11.3947	117.639	11.268	0.117	0.224	-1.01	0.314
3/5	0.8541	3.185	0.305	0.852	0.000	2.80	0.006
4/5	12.2488	118.055	11.308	0.042	0.665	1.08	0.281

1982

MAPE/ACTUAL

1/2	0.0216	1.950	0.187	0.085	0.378	0.12	0.908
1/3	0.1033	1.183	0.113	0.374	0.000	0.91	0.364
1/4	0.0688	1.183	0.113	0.395	0.000	0.61	0.545
1/5	0.0441	1.223	0.117	0.374	0.000	0.38	0.708
2/3	0.0818	1.691	0.162	0.213	0.026	0.50	0.615
2/4	0.0472	1.717	0.164	0.202	0.035	0.29	0.775
2/5	0.0225	1.732	0.166	0.205	0.032	0.14	0.892
3/4	-0.0346	0.152	0.015	0.987	0.000	-2.38	0.019
3/5	-0.0593	0.275	0.026	0.961	0.000	-2.25	0.027
4/5	-0.0247	0.219	0.021	0.975	0.000	-1.18	0.241

MSE/ACTUAL

1/2	-1.2522	29.115	2.789	-0.013	0.893	-0.45	0.654
1/2	0.7983	12.211	1.170	0.112	0.246	0.68	0.496
1/4	0.6671	12.220	1.170	0.147	0.128	0.57	0.570
1/5	0.5393	12.667	1.213	0.130	0.178	0.44	0.658
2/3	2.0505	26.850	2.572	0.015	0.876	0.80	0.427
2/4	1.9193	26.953	2.582	0.016	0.869	0.74	0.459
2/5	1.7915	27.153	2.601	0.017	0.859	0.69	0.492
3/4	-0.1312	0.725	0.069	0.997	0.000	-1.89	0.061
3/5	-0.2591	1.721	0.165	0.995	0.000	-1.57	0.119
4/5	-0.1279	1.122	0.107	0.997	0.000	-1.19	0.237

MAPE/FORECAST

1/2	3.2551	18.419	1.764	0.533	0.000	1.85	0.068
1/3	3.8484	19.017	1.822	0.544	0.000	2.11	0.037
1/4	3.9396	19.251	1.844	0.532	0.000	2.14	0.035
1/5	3.9133	19.446	1.863	0.474	0.000	2.10	0.038
2/3	0.5934	2.288	0.219	0.976	0.000	2.71	0.008
2/4	0.6845	2.795	0.268	0.964	0.000	2.56	0.012
2/5	0.6583	3.481	0.333	0.861	0.000	1.97	0.051
3/4	0.0912	0.571	0.055	0.997	0.000	1.97	0.098
3/5	0.0649	1.906	0.183	0.888	0.000	0.36	0.723
4/5	-0.0262	1.605	0.154	0.907	0.000	-0.17	0.865

MSE/FORECAST

1/2	421.8045	3153.032	301.910	0.163	0.091	1.40	0.165
1/3	444.4566	3167.501	303.392	0.168	0.080	1.46	0.146
1/4	448.4156	3171.604	303.785	0.167	0.083	1.48	0.143
1/5	447.5996	3173.778	303.993	0.150	0.118	1.47	0.144
2/3	22.6522	162.782	15.592	0.997	0.000	1.45	0.149
2/4	26.6111	192.071	18.397	0.996	0.000	1.45	0.151
2/5	25.7951	206.199	19.750	0.925	0.000	1.31	0.194
3/4	3.9590	29.397	2.816	1.000	0.000	1.41	0.163
3/5	3.1429	52.534	5.032	0.928	0.000	0.62	0.534
4/5	-0.8160	34.464	3.301	0.929	0.000	-0.25	0.805

1983

MAPE/ACTUAL

1/2	1.2202	8.433	0.808	0.911	0.000	1.51	0.134
1/3	1.3978	10.370	0.993	0.101	0.295	1.41	0.162
1/4	1.5404	10.113	0.969	0.518	0.000	1.59	0.115
1/5	1.4953	10.031	0.961	0.531	0.000	1.56	0.123
2/3	0.1775	2.488	0.238	0.142	0.141	0.74	0.458
2/4	0.3201	1.940	0.186	0.582	0.000	1.72	0.088
2/5	0.2750	1.874	0.180	0.601	0.000	1.53	0.128
3/4	0.1426	1.450	0.139	0.229	0.017	1.03	0.307
3/5	0.0975	1.363	0.131	0.387	0.000	0.75	0.457
4/5	-0.0451	0.476	0.046	0.783	0.000	-0.99	0.325

MSE/ACTUAL

1/2	106.0673	1017.930	97.500	0.985	0.000	1.09	0.279
1/3	109.1448	1061.000	101.625	-0.005	0.961	1.07	0.285
1/4	111.0604	1059.992	101.529	0.516	0.000	1.09	0.276
1/5	110.8028	1059.448	101.477	0.491	0.000	1.09	0.277
2/3	3.0775	47.275	4.528	-0.002	0.980	0.68	0.498
2/4	4.9931	42.761	4.096	0.527	0.000	1.22	0.225
2/5	4.7355	42.223	4.044	0.511	0.000	1.17	0.244
3/4	1.9156	18.415	1.764	-0.004	0.970	1.09	0.280
3/5	1.6580	18.145	1.738	0.149	0.122	0.95	0.342
4/5	-0.2576	2.227	0.213	0.549	0.000	-1.21	0.230

MAPE/FORECAST

1/2	1.1160	11.098	1.063	0.877	0.000	1.05	0.296
1/3	1.0050	13.097	1.254	0.473	0.000	0.80	0.425
1/4	1.6516	12.106	1.160	0.931	0.000	1.42	0.157
1/5	0.6909	16.612	1.591	0.217	0.024	0.43	0.665
2/3	-0.1110	5.890	0.564	0.444	0.000	-0.20	0.844
2/4	0.5356	2.214	0.212	0.904	0.000	2.53	0.013
2/5	-0.4251	11.357	1.088	0.195	0.043	-0.39	0.697
3/4	0.6466	5.487	0.526	0.487	0.000	1.23	0.221
3/5	-0.3140	12.386	1.186	0.102	0.290	-0.26	0.792
4/5	-0.9607	11.096	1.063	0.211	0.027	-0.90	0.368

MSE/FORECAST

1/2	203.2923	1534.151	146.945	0.865	0.000	1.38	0.169
1/3	183.9840	1616.712	154.853	0.204	0.033	1.19	0.237
1/4	216.2173	1592.277	152.512	0.995	0.000	1.42	0.159
1/5	94.4804	2065.595	197.848	0.027	0.780	0.48	0.634
2/3	-19.3082	321.468	30.791	0.196	0.042	-0.63	0.532
2/4	12.9251	65.676	6.291	0.971	0.000	2.05	0.042
2/5	-108.8119	1289.402	123.502	0.021	0.828	-0.88	0.380
3/4	32.2333	315.610	30.230	0.203	0.035	1.07	0.289
3/5	-89.5036	1327.332	127.135	-0.004	0.963	-0.70	0.483
4/5	-121.7369	1286.153	123.191	0.024	0.807	-0.99	0.325

Appendix 20.

T-TESTS OF THE TRUNCATED ERRORS FOR FORECASTS OF PROFITS BY PERCENTAGE CHANGE MODELS, (109 COS.).

	(DIFFERENCE) MEAN	STANDARD DEVIATION	STANDARD ERROR	CORR.	2-TAIL PROB.	T VALUE	2-TAIL PROB.
1980							
MAPE/ACTUAL							
1/2 y	-0.0086	0.193	0.018	0.874	0.000	-0.47	0.641
1/3 y	-0.0168	0.241	0.023	0.799	0.000	-0.73	0.468
1/4 y	-0.0778	0.293	0.028	0.692	0.000	-2.77	0.007
1/5 y	-0.0891	0.310	0.030	0.649	0.000	-3.00	0.003
2/3 y	-0.0082	0.139	0.013	0.935	0.000	-0.62	0.540
2/4 y	-0.0691	0.229	0.022	0.817	0.000	-3.15	0.002
2/5 y	-0.0804	0.235	0.023	0.805	0.000	-3.57	0.001
3/4 y	-0.0609	0.173	0.017	0.893	0.000	-3.67	0.000
3/5 y	-0.0722	0.188	0.018	0.873	0.000	-4.02	0.000
4/5 y	-0.0113	0.169	0.016	0.892	0.000	-0.70	0.485
MSE/ACTUAL							
1/2 y	-0.0164	0.210	0.020	0.884	0.000	-0.82	0.416
1/3 y	-0.0206	0.255	0.024	0.829	0.000	-0.84	0.401
1/4 y	-0.0858	0.310	0.030	0.741	0.000	-2.89	0.005
1/5 y	-0.0956	0.345	0.033	0.679	0.000	-2.89	0.005
2/3 y	-0.0042	0.117	0.011	0.964	0.000	-0.38	0.707
2/4 y	-0.0694	0.232	0.022	0.857	0.000	-3.13	0.002
2/5 y	-0.0792	0.247	0.024	0.838	0.000	-3.35	0.001
3/4 y	-0.0652	0.198	0.019	0.896	0.000	-3.43	0.001
3/5 y	-0.0750	0.221	0.021	0.870	0.000	-3.54	0.001
4/5 y	-0.0098	0.221	0.021	0.867	0.000	-0.46	0.645
MAPE/FORECAST							
1/2 y	0.0184	0.176	0.017	0.865	0.000	1.09	0.278
1/3 y	0.0159	0.230	0.022	0.767	0.000	0.72	0.470
1/4 y	-0.0188	0.256	0.025	0.704	0.000	-0.77	0.445
1/5 y	-0.0267	0.253	0.024	0.706	0.000	-1.10	0.272
2/3 y	-0.0024	0.124	0.012	0.931	0.000	-0.21	0.837
2/4 y	-0.0372	0.163	0.016	0.877	0.000	-2.38	0.019
2/5 y	-0.0451	0.168	0.016	0.869	0.000	-2.81	0.006
3/4 y	-0.0347	0.109	0.010	0.944	0.000	-3.32	0.001
3/5 y	-0.0427	0.132	0.013	0.918	0.000	-3.38	0.001
4/5 y	-0.0079	0.092	0.009	0.958	0.000	-0.90	0.370

MSE/FORECAST

1/2 y	0.0214	0.188	0.018	0.871	0.000	1.19	0.237
1/3 y	0.0231	0.233	0.022	0.800	0.000	1.04	0.301
1/4 y	-0.0045	0.251	0.024	0.766	0.000	-0.19	0.851
1/5 y	-0.0088	0.251	0.024	0.767	0.000	-0.37	0.716
2/3 y	0.0017	0.104	0.010	0.959	0.000	0.17	0.865
2/4 y	-0.0260	0.135	0.013	0.930	0.000	-2.01	0.047
2/5 y	-0.0302	0.142	0.014	0.923	0.000	-2.23	0.028
3/4 y	-0.0277	0.096	0.009	0.964	0.000	-3.02	0.003
3/5 y	-0.0319	0.132	0.013	0.932	0.000	-2.51	0.013
4/5 y	-0.0042	0.095	0.009	0.964	0.000	-0.46	0.644

1981

MAPE/ACTUAL

1/2 y	0.0218	0.280	0.027	0.724	0.000	0.81	0.418
1/3 y	0.0193	0.280	0.027	0.732	0.000	0.72	0.475
1/4 y	-0.0073	0.300	0.029	0.679	0.000	-0.25	0.801
1/5 y	-0.0292	0.342	0.033	0.572	0.000	-0.89	0.374
2/3 y	-0.0025	0.179	0.017	0.892	0.000	-0.15	0.884
2/4 y	-0.0291	0.223	0.021	0.824	0.000	-1.36	0.177
2/5 y	-0.0510	0.272	0.026	0.732	0.000	-1.96	0.053
3/4 y	-0.0265	0.158	0.015	0.916	0.000	-1.76	0.081
3/5 y	-0.0485	0.237	0.023	0.805	0.000	-2.13	0.035
4/5 y	-0.0219	0.160	0.015	0.906	0.000	-1.43	0.156

MSE/ACTUAL

1/2 y	0.0192	0.323	0.031	0.700	0.000	0.62	0.536
1/3 y	0.0072	0.309	0.030	0.734	0.000	0.24	0.809
1/4 y	-0.0074	0.334	0.032	0.683	0.000	-0.23	0.818
1/5 y	-0.0228	0.370	0.035	0.610	0.000	-0.65	0.520
2/3 y	-0.0120	0.189	0.018	0.902	0.000	-0.67	0.507
2/4 y	-0.0266	0.229	0.022	0.853	0.000	-1.22	0.227
2/5 y	-0.0421	0.290	0.028	0.761	0.000	-1.51	0.133
3/4 y	-0.0146	0.178	0.017	0.914	0.000	-0.86	0.394
3/5 y	-0.0300	0.269	0.026	0.802	0.000	-1.17	0.246
4/5 y	-0.0154	0.173	0.017	0.917	0.000	-0.93	0.352

MAPE/FORECAST

1/2 y	0.0566	0.258	0.025	0.750	0.000	2.29	0.024
1/3 y	0.0663	0.279	0.027	0.716	0.000	2.48	0.015
1/4 y	0.0551	0.289	0.028	0.682	0.000	1.99	0.049
1/5 y	0.0479	0.318	0.030	0.606	0.000	1.57	0.119
2/3 y	0.0097	0.169	0.016	0.892	0.000	0.60	0.549
2/4 y	-0.0015	0.207	0.020	0.831	0.000	-0.08	0.939
2/5 y	-0.0087	0.234	0.022	0.778	0.000	-0.39	0.700
3/4 y	-0.0113	0.110	0.011	0.954	0.000	-1.07	0.289
3/5 y	-0.0184	0.175	0.017	0.882	0.000	-1.10	0.275
4/5 y	-0.0071	0.136	0.013	0.925	0.000	-0.55	0.584

MSE/FORECAST

1/2 y	0.0659	0.277	0.027	0.761	0.000	2.48	0.015
1/3 y	0.0663	0.293	0.028	0.738	0.000	2.37	0.020
1/4 y	0.0673	0.310	0.030	0.698	0.000	2.26	0.026
1/5 y	0.0667	0.325	0.031	0.665	0.000	2.14	0.034
2/3 y	0.0004	0.171	0.016	0.907	0.000	0.02	0.982
2/4 y	0.0013	0.210	0.020	0.856	0.000	0.07	0.947
2/5 y	0.0008	0.232	0.022	0.822	0.000	0.03	0.973
2/4 y	0.0010	0.098	0.009	0.970	0.000	0.10	0.919
2/5 y	0.0004	0.168	0.016	0.908	0.000	0.02	0.981
4/5 y	-0.0006	0.145	0.014	0.930	0.000	-0.04	0.967

<u>1982</u>

MAPE/ACTUAL

1/2 y	0.0448	0.287	0.028	0.694	0.000	1.63	0.106
1/3 y	0.0445	0.324	0.031	0.612	0.000	1.43	0.155
1/4 y	0.0271	0.340	0.033	0.563	0.000	0.83	0.407
1/5 y	0.0056	0.366	0.035	0.475	0.000	0.16	0.874
2/3 y	-0.0003	0.261	0.025	0.732	0.000	-0.01	0.989
2/4 y	-0.0177	0.285	0.027	0.672	0.000	-0.65	0.518
2/5 y	-0.0392	0.306	0.029	0.609	0.000	-1.34	0.183
3/4 y	-0.0174	0.095	0.009	0.964	0.000	-1.91	0.059
3/5 y	-0.0389	0.161	0.015	0.894	0.000	-2.53	0.013
4/5 y	-0.0215	0.130	0.012	0.928	0.000	-1.73	0.087

MSE/ACTUAL

1/2 y	0.0576	0.318	0.030	0.683	0.000	1.90	0.061
1/3 y	0.0556	0.370	0.035	0.571	0.000	1.57	0.120
1/4 y	0.0468	0.391	0.037	0.519	0.000	1.25	0.214
1/5 y	0.0359	0.401	0.038	0.480	0.000	0.93	0.353
2/3 y	-0.0021	0.310	0.030	0.676	0.000	-0.07	0.945
2/4 y	-0.0108	0.322	0.031	0.649	0.000	-0.35	0.726
2/5 y	-0.0218	0.327	0.031	0.627	0.000	-0.70	0.488
3/4 y	-0.0088	0.086	0.008	0.975	0.000	-1.06	0.290
3/5 y	-0.0197	0.148	0.014	0.924	0.000	-1.39	0.167
4/5 y	-0.0109	0.140	0.013	0.932	0.000	-0.82	0.415

MAPE/FORECAST

1/2 y	-0.0174	0.261	0.025	0.761	0.000	-0.69	0.489
1/3 y	0.0070	0.276	0.026	0.724	0.000	0.27	0.790
1/4 y	-0.0048	0.280	0.027	0.711	0.000	-0.18	0.858
1/5 y	-0.0060	0.299	0.029	0.653	0.000	-0.21	0.835
2/3 y	0.0244	0.224	0.022	0.824	0.000	1.14	0.258
2/4 y	0.0126	0.262	0.025	0.755	0.000	0.50	0.617
2/5 y	0.0114	0.281	0.027	0.708	0.000	0.42	0.672
3/4 y	-0.0118	0.085	0.008	0.973	0.000	-1.45	0.150
3/5 y	-0.0130	0.128	0.012	0.938	0.000	-1.06	0.292
4/5 y	-0.0012	0.098	0.009	0.963	0.000	-0.12	0.901

MSE/FORECAST

1/2 y	-0.0258	0.301	0.029	0.742	0.000	-0.89	0.373
1/3 y	0.0072	0.315	0.030	0.704	0.000	0.24	0.812
1/4 y	0.0016	0.312	0.030	0.706	0.000	0.05	0.957
1/5 y	0.0142	0.322	0.031	0.678	0.000	0.46	0.647
2/3 y	0.0330	0.249	0.024	0.822	0.000	1.38	0.170
2/4 y	0.0274	0.279	0.027	0.775	0.000	1.02	0.308
2/5 y	0.0400	0.292	0.028	0.747	0.000	1.43	0.156
3/4 y	-0.0056	0.086	0.008	0.977	0.000	-0.67	0.502
3/5 y	0.0070	0.119	0.011	0.956	0.000	0.61	0.541
4/5 y	0.0126	0.087	0.008	0.976	0.000	1.50	0.136

1983

MAPE/ACTUAL

1/2 y	-0.0141	0.252	0.024	0.737	0.000	-0.59	0.558
1/3 y	-0.0041	0.267	0.026	0.687	0.000	-0.16	0.873
1/4 y	0.0264	0.275	0.026	0.667	0.000	1.00	0.320
1/5 y	0.0270	0.296	0.028	0.633	0.000	0.95	0.343
2/3 y	0.0100	0.265	0.025	0.707	0.000	0.40	0.694
2/4 y	0.0405	0.279	0.027	0.676	0.000	1.51	0.133
2/5 y	0.0411	0.297	0.028	0.649	0.000	1.45	0.150
3/4 y	0.0305	0.182	0.017	0.854	0.000	1.74	0.084
3/5 y	0.0311	0.198	0.019	0.836	0.000	1.64	0.104
4/5 y	0.0006	0.134	0.013	0.926	0.000	0.05	0.961

MSE/ACTUAL

1/2 y	-0.0245	0.279	0.027	0.734	0.000	-0.92	0.362
1/3 y	-0.0034	0.297	0.028	0.676	0.000	-0.12	0.905
1/4 y	0.0210	0.292	0.028	0.688	0.000	0.75	0.454
1/5 y	0.0111	0.306	0.029	0.663	0.000	0.38	0.706
2/3 y	0.0210	0.306	0.029	0.678	0.000	0.72	0.474
2/4 y	0.0455	0.305	0.029	0.679	0.000	1.55	0.123
2/5 y	0.0356	0.319	0.031	0.655	0.000	1.17	0.247
3/4 y	0.0244	0.215	0.021	0.829	0.000	1.18	0.239
3/5 y	0.0145	0.224	0.021	0.818	0.000	0.68	0.500
4/5 y	-0.0099	0.153	0.015	0.915	0.000	-0.68	0.501

MAPE/FORECAST

1/2 y	-0.0229	0.269	0.026	0.727	0.000	-0.89	0.375
1/3 y	-0.0327	0.294	0.028	0.674	0.000	-1.16	0.247
1/4 y	0.0079	0.303	0.029	0.646	0.000	0.27	0.785
1/5 y	0.0131	0.317	0.030	0.634	0.000	0.43	0.666
2/3 y	-0.0098	0.276	0.026	0.729	0.000	-0.37	0.712
2/4 y	0.0309	0.270	0.026	0.737	0.000	1.19	0.235
2/5 y	0.0361	0.285	0.027	0.721	0.000	1.32	0.188
3/4 y	0.0406	0.197	0.019	0.860	0.000	2.16	0.033
3/5 y	0.0459	0.208	0.020	0.851	0.000	2.30	0.023
4/5 y	0.0052	0.134	0.013	0.939	0.000	0.41	0.684

MSE/FORECAST

1/2 y	-0.0390	0.308	0.029	0.709	0.000	-1.32	0.188
1/3 y	-0.0481	0.347	0.033	0.634	0.000	-1.45	0.151
1/4 y	-0.0054	0.334	0.032	0.647	0.000	-0.17	0.865
1/5 y	-0.0148	0.334	0.032	0.656	0.000	-0.46	0.646
2/3 y	-0.0091	0.326	0.031	0.700	0.000	-0.29	0.772
2/4 y	0.0336	0.294	0.028	0.749	0.000	1.19	0.235
2/5 y	0.0243	0.295	0.028	0.752	0.000	0.86	0.392
3/4 y	0.0426	0.243	0.023	0.831	0.000	1.83	0.069
3/5 y	0.0333	0.240	0.023	0.838	0.000	1.45	0.150
4/5 y	-0.0093	0.150	0.014	0.935	0.000	-0.65	0.519

Appendix 21.

COMPARISON OF THE NON-TRUNCATED ERRORS FOR FORECASTS OF PROFIT BY MOVING AVERAGE MODELS, (109 COS.).

SPEARMAN CORRELATION COEFFICIENTS

MAPE/ACTUAL AND MSE/ACTUAL.

	3 yr.	4 yr.	5 yr.	6 yr.
1980				
2 yr.	0.9266	0.8227	0.7451	0.6694
3 yr.		0.9465	0.8832	0.8120
4 yr.			0.9720	0.9078
5 yr.				0.9680
1981				
	0.8691	0.7752	0.7221	0.6338
		0.9181	0.8532	0.7811
			0.9426	0.8751
				0.9619
1982				
	0.7570	0.6742	0.6468	0.5635
		0.9089	0.8410	0.7516
			0.9434	0.8505
				0.9596
1983				
	0.8734	0.6455	0.5712	0.3709
		0.8392	0.7025	0.4833
			0.8568	0.6685
				0.8554

MAPE/FORECAST AND MSE/FORECAST.

	3 yr.	4 yr.	5 yr.	6 yr.
1980				
	0.9022	0.7868	0.6636	0.5573
		0.9446	0.8546	0.7661
			0.9690	0.9050
				0.9719
1981				
	0.8301	0.6873	0.5511	0.4235
		0.8781	0.7711	0.6605
			0.9438	0.8617
				0.9656
1982				
	0.7534	0.6737	0.6262	0.5180
		0.9117	0.8207	0.7030
			0.9322	0.8295
				0.9554

1983

0.8618	0.6473	0.5631	0.4094
	0.8575	0.7183	0.5430
		0.8660	0.6934
			0.8872

-------------------- T - T E S T --------------------

1980

	(DIFFERENCE) MEAN	STANDARD DEVIATION	STANDARD ERROR	CORR.	2-TAIL PROB.	T VALUE	2-TAIL PROB.
MAPE/ACTUAL							
2/3 y	0.1071	1.438	0.138	0.984	0.000	0.78	0.439
2/4 y	0.1694	2.154	0.206	0.954	0.000	0.82	0.413
2/5 y	0.2384	2.581	0.247	0.927	0.000	0.96	0.337
2/6 y	0.2786	2.873	0.275	0.897	0.000	1.01	0.314
3/4 y	0.0623	0.734	0.070	0.991	0.000	0.89	0.377
3/5 y	0.1313	1.170	0.112	0.976	0.000	1.17	0.244
3/6 y	0.1716	1.472	0.141	0.956	0.000	1.22	0.226
4/5 y	0.0690	0.449	0.043	0.996	0.000	1.61	0.111
4/6 y	0.1093	0.755	0.072	0.985	0.000	1.51	0.134
5/6 y	0.0402	0.316	0.030	0.996	0.000	1.33	0.186
MSE/ACTUAL							
2/3 y	9.6537	103.528	9.916	0.998	0.000	0.97	0.332
2/4 y	13.2403	139.736	13.384	0.990	0.000	0.99	0.325
2/5 y	15.1466	156.337	14.974	0.977	0.000	1.01	0.314
2/6 y	16.2315	165.370	15.840	0.959	0.000	1.02	0.308
3/4 y	3.5866	36.229	3.470	0.997	0.000	1.03	0.304
3/5 y	5.4929	52.851	5.062	0.989	0.000	1.09	0.280
3/6 y	6.5778	61.908	5.930	0.976	0.000	1.11	0.270
4/5 y	1.9063	16.637	1.594	0.997	0.000	1.20	0.234
4/6 y	2.9911	25.706	2.462	0.989	0.000	1.21	0.227
5/6 y	1.0848	9.089	0.871	0.997	0.000	1.25	0.215
MAPE/FORECAST							
2/3 y	-0.0244	0.292	0.028	0.941	0.000	-0.87	0.385
2/4 y	-0.1037	0.408	0.039	0.885	0.000	-2.65	0.009
2/5 y	-0.2758	1.074	0.103	0.555	0.000	-2.68	0.008
2/6 y	-0.5939	3.340	0.320	0.165	0.086	-1.86	0.066
3/4 y	-0.0792	0.180	0.017	0.976	0.000	-4.59	0.000
3/5 y	-0.2514	0.937	0.090	0.681	0.000	-2.80	0.006
3/6 y	-0.5695	3.241	0.310	0.278	0.003	-1.83	0.069
4/5 y	-0.1722	0.796	0.076	0.796	0.000	-2.26	0.026
4/6 y	-0.4903	3.111	0.298	0.425	0.000	-1.65	0.103
5/6 y	-0.3181	2.320	0.222	0.884	0.000	-1.43	0.155

MSE/FORECAST

2/3	y	0.0407	1.564	0.150	0.878	0.000	0.27	0.786
2/4	y	-0.0857	1.691	0.162	0.853	0.000	-0.53	0.598
2/5	y	-1.3115	10.823	1.037	0.239	0.012	-1.27	0.209
2/6	y	-11.6486	116.311	11.141	-0.009	0.929	-1.05	0.298
3/4	y	-0.1264	0.615	0.059	0.981	0.000	-2.15	0.034
3/5	y	-1.3523	10.601	1.015	0.306	0.001	-1.33	0.186
3/6	y	-11.6893	116.210	11.131	0.023	0.810	-1.05	0.296
4/5	y	-1.2258	10.191	0.976	0.432	0.000	-1.26	0.212
4/6	y	-11.5628	115.808	11.092	0.154	0.110	-1.04	0.300
5/6	y	-10.3370	105.631	10.118	0.957	0.000	-1.02	0.309

1981

MAPE/ACTUAL

2/3	y	0.0940	1.877	0.180	0.943	0.000	0.52	0.602
2/4	y	0.0971	2.736	0.262	0.848	0.000	0.37	0.712
2/5	y	0.1076	3.080	0.295	0.799	0.000	0.36	0.716
2/6	y	0.1851	3.318	0.318	0.765	0.000	0.58	0.562
3/4	y	0.0030	0.950	0.091	0.970	0.000	0.03	0.974
3/5	y	0.0136	1.406	0.135	0.933	0.000	0.10	0.920
3/6	y	0.0910	1.682	0.161	0.907	0.000	0.57	0.573
4/5	y	0.0106	0.569	0.055	0.988	0.000	0.19	0.846
4/6	y	0.0880	0.884	0.085	0.975	0.000	1.04	0.301
5/6	y	0.0774	0.372	0.036	0.997	0.000	2.17	0.032

MSE/ACTUAL

2/3	y	10.4959	116.710	11.179	0.975	0.000	0.94	0.350
2/4	y	13.0435	157.717	15.107	0.866	0.000	0.86	0.390
2/5	y	14.6984	176.284	16.885	0.725	0.000	0.87	0.386
2/6	y	16.7063	185.935	17.809	0.631	0.000	0.94	0.350
3/4	y	2.5476	41.853	4.009	0.949	0.000	0.64	0.526
3/5	y	4.2025	60.613	5.806	0.846	0.000	0.72	0.471
3/6	y	6.2105	70.285	6.732	0.768	0.000	0.92	0.358
4/5	y	1.6549	19.089	1.828	0.970	0.000	0.91	0.367
4/6	y	3.6629	29.323	2.809	0.928	0.000	1.30	0.195
5/6	y	2.0079	10.872	1.041	0.991	0.000	1.93	0.056

MAPE/FORECAST

2/3	y	-6.1968	58.947	5.646	0.071	0.466	-1.10	0.275
2/4	y	0.2641	3.721	0.356	0.160	0.097	0.74	0.460
2/5	y	-0.6090	10.447	1.001	-0.012	0.904	-0.61	0.544
2/6	y	0.0800	4.121	0.395	0.017	0.864	0.20	0.840
3/4	y	6.4609	58.874	5.639	0.183	0.057	1.15	0.254
3/5	y	5.5878	59.792	5.727	0.010	0.919	0.98	0.331
3/6	y	6.2768	58.974	5.649	0.079	0.413	1.11	0.269
4/5	y	-0.8732	9.207	0.882	0.464	0.000	-0.99	0.324
4/6	y	-0.1842	1.365	0.131	0.680	0.000	-1.41	0.162
5/6	y	0.6890	8.004	0.767	0.938	0.000	0.90	0.371

MSE/FORECAST

2/3		-3496.999	36007.885	3448.930	-0.004	0.968	-1.01	0.313
2/4	y	12.5044	139.629	13.374	0.004	0.966	0.93	0.352
2/5	y	13.6655	139.586	13.370	-0.013	0.896	1.02	0.309
2/6	y	10.3442	143.268	13.723	-0.012	0.905	0.75	0.453
3/4	y	3509.503	36006.743	3448.820	0.027	0.780	1.02	0.311
3/5	y	3510.664	36007.361	3448.880	-0.029	0.768	1.02	0.311
3/6	y	3507.343	36007.105	3448.855	-0.000	0.997	1.02	0.311
4/5	y	1.1611	13.272	1.271	0.314	0.001	0.91	0.363
4/6	y	-2.1602	30.652	2.936	0.348	0.000	-0.74	0.463
5/6	y	-3.3213	22.948	2.198	0.994	0.000	-1.51	0.134

1982

MAPE/ACTUAL

2/3	y	-0.4570	3.268	0.313	0.368	0.000	-1.46	0.147
2/4	y	-0.4145	2.550	0.244	0.422	0.000	-1.70	0.093
2/5	y	-0.4724	2.148	0.206	0.515	0.000	-2.30	0.024
2/6	y	-0.4703	1.893	0.181	0.560	0.000	-2.59	0.011
3/4	y	0.0424	1.000	0.096	0.974	0.000	0.44	0.658
3/5	y	-0.0155	1.423	0.136	0.943	0.000	-0.11	0.910
3/6	y	-0.0133	1.764	0.169	0.900	0.000	-0.08	0.938
4/5	y	-0.0579	0.758	0.073	0.966	0.000	-0.80	0.427
4/6	y	-0.0557	1.105	0.106	0.927	0.000	-0.53	0.599
5/6	y	0.0022	0.379	0.036	0.992	0.000	0.06	0.952

MSE/ACTUAL

2/3	y	-11.4245	109.084	10.448	0.135	0.161	-1.09	0.277
2/4	y	-6.9334	61.302	5.872	0.236	0.014	-1.18	0.240
2/5	y	-5.4443	39.576	3.791	0.330	0.000	-1.44	0.154
2/6	y	-4.3832	28.123	2.694	0.405	0.000	-1.63	0.107
3/4	y	4.4911	48.189	4.616	0.992	0.000	0.97	0.333
3/5	y	5.9802	70.414	6.744	0.966	0.000	0.89	0.377
3/6	y	7.0413	82.621	7.914	0.921	0.000	0.89	0.376
4/5	y	1.4891	22.870	2.191	0.985	0.000	0.68	0.498
4/6	y	2.5502	35.226	3.374	0.948	0.000	0.76	0.451
5/6	y	1.0610	12.408	1.188	0.988	0.000	0.89	0.374

MAPE/FORECAST

2/3	y	-14.4778	134.903	12.921	0.109	0.260	-1.12	0.265
2/4	y	0.5246	3.592	0.344	0.352	0.000	1.52	0.130
2/5	y	0.5814	3.718	0.356	0.256	0.007	1.63	0.106
2/6	y	0.1372	6.365	0.610	0.038	0.696	0.23	0.822
3/4	y	15.0024	134.700	12.902	0.356	0.000	1.16	0.247
3/5	y	15.0592	135.021	12.933	0.187	0.052	1.16	0.242
3/6	y	14.6150	135.188	12.949	0.034	0.725	1.13	0.262
4/5	y	0.0568	1.144	0.110	0.715	0.000	0.52	0.605
4/6	y	-0.3874	4.981	0.477	0.307	0.001	-0.81	0.419
5/6	y	-0.4442	4.300	0.412	0.762	0.000	-1.08	0.283

MSE/FORECAST

2/3		-18365.44	189189.51	18121.069	0.007	0.945	-1.01	0.313
2/4	y	13.1551	76.709	7.347	0.105	0.277	1.79	0.076
2/5	y	16.4560	76.833	7.359	0.084	0.385	2.24	0.027
2/6	y	-12.2439	288.564	27.639	-0.019	0.846	-0.44	0.659
3/4		18378.60	189187.08	18120.836	0.218	0.023	1.01	0.313
3/5		18381.90	189190.28	18121.143	-0.174	0.070	1.01	0.313
3/6		18353.20	189192.30	18121.336	-0.008	0.938	1.01	0.313
4/5	y	3.3009	12.973	1.243	0.326	0.001	2.66	0.009
4/6	y	-25.3990	275.930	26.429	0.079	0.411	-0.96	0.339
5/6	y	-28.6999	277.610	26.590	-0.590	0.000	-1.08	0.283

<u>1983</u>

MAPE/ACTUAL

2/3	y	0.0012	0.406	0.039	0.823	0.000	0.03	0.976
2/4	y	-0.0309	1.609	0.154	0.157	0.102	-0.20	0.841
2/5	y	0.0124	1.321	0.127	0.147	0.128	0.10	0.922
2/6	y	0.0757	1.201	0.115	0.086	0.376	0.66	0.512
3/4	y	-0.0321	1.551	0.149	0.238	0.013	-0.22	0.830
3/5	y	0.0112	1.290	0.124	0.188	0.050	0.09	0.928
3/6	y	0.0746	1.177	0.113	0.115	0.235	0.66	0.510
4/5	y	0.0433	0.405	0.039	0.986	0.000	1.11	0.267
4/6	y	0.1066	0.663	0.064	0.949	0.000	1.68	0.096
5/6	y	0.0633	0.286	0.027	0.982	0.000	2.31	0.023

MSE/ACTUAL

2/3	y	0.0194	1.846	0.177	0.642	0.000	0.11	0.913
2/4	y	-1.9960	24.762	2.372	-0.010	0.920	-0.84	0.402
2/5	y	-1.0245	15.650	1.499	-0.011	0.913	-0.68	0.496
2/6	y	-0.5348	10.877	1.042	-0.013	0.894	-0.51	0.609
3/4	y	-2.0154	24.724	2.368	0.008	0.931	-0.85	0.397
3/5	y	-1.0439	15.636	1.498	-0.003	0.973	-0.70	0.487
3/6	y	-0.5543	10.874	1.042	-0.010	0.917	-0.53	0.596
4/5	y	0.9715	9.187	0.880	1.000	0.000	1.10	0.272
4/6	y	1.4612	14.061	1.347	0.998	0.000	1.08	0.280
5/6	y	0.4896	4.880	0.467	0.999	0.000	1.05	0.297

MAPE/FORECAST

2/3	y	3.4710	32.695	3.132	0.109	0.261	1.11	0.270
2/4	y	3.6839	32.749	3.137	0.081	0.403	1.17	0.243
2/5	y	1.7540	36.997	3.544	0.002	0.987	0.49	0.622
2/6	y	3.2907	33.121	3.172	0.015	0.875	1.04	0.302
3/4	y	0.2130	1.216	0.116	0.670	0.000	1.83	0.070
3/5	y	-1.7169	16.844	1.613	0.147	0.126	-1.06	0.290
3/6	y	-0.1803	4.873	0.467	0.185	0.055	-0.39	0.700
4/5	y	-1.9299	16.632	1.593	0.315	0.001	-1.21	0.228
4/6	y	-0.3932	4.666	0.447	0.313	0.001	-0.88	0.381
5/6	y	1.5366	17.057	1.634	0.134	0.166	0.94	0.349

MSE/FORECAST

2/3	y1084.7262	11144.921	1067.490	0.004	0.964	1.02	0.312
2/4	y1085.8781	11144.911	1067.489	0.006	0.952	1.02	0.311
2/5	y 794.1640	11556.717	1106.933	-0.010	0.920	0.72	0.475
2/6	y1062.9722	11148.704	1067.852	-0.012	0.900	1.00	0.322
3/4	y 1.1519	10.299	0.986	0.446	0.000	1.17	0.246
3/5	y-290.5622	2951.231	282.677	0.021	0.824	-1.03	0.306
3/6	y -21.7539	183.141	17.542	0.048	0.622	-1.24	0.218
4/5	y-291.7141	2950.154	282.573	0.140	0.145	-1.03	0.304
4/6	y -22.9059	182.112	17.443	0.158	0.100	-1.31	0.192
5/6	y 268.8083	2955.093	283.047	0.011	0.909	0.95	0.344

Appendix 22.

T-TESTS OF THE TRUNCATED ERRORS FOR FORCASTS OF PROFIT BY MOVING AVERAGE MODELS, (109 COS).

	(DIFFERENCE) MEAN	STANDARD DEVIATION	STANDARD ERROR	CORR.	2-TAIL PROB.	T VALUE	2-TAIL PROB.
1980							
MAPE/ACTUAL							
2/3 y	-0.0092	0.100	0.010	0.966	0.000	-0.96	0.338
2/4 y	-0.0279	0.177	0.017	0.888	0.000	-1.65	0.102
2/5 y	-0.0444	0.237	0.023	0.790	0.000	-1.95	0.053
2/6 y	-0.0661	0.275	0.026	0.709	0.000	-2.51	0.013
3/4 y	-0.0187	0.094	0.009	0.966	0.000	-2.07	0.041
3/5 y	-0.0352	0.163	0.016	0.896	0.000	-2.25	0.026
3/6 y	-0.0569	0.208	0.020	0.824	0.000	-2.85	0.005
4/5 y	-0.0165	0.085	0.008	0.971	0.000	-2.03	0.044
4/6 y	-0.0382	0.140	0.013	0.917	0.000	-2.84	0.005
5/6 y	-0.0217	0.067	0.006	0.980	0.000	-3.40	0.001
MSE/ACTUAL							
2/3 y	0.0044	0.088	0.008	0.979	0.000	0.52	0.606
2/4 y	-0.0029	0.169	0.016	0.921	0.000	-0.18	0.859
2/5 y	-0.0074	0.235	0.022	0.842	0.000	-0.33	0.743
2/6 y	-0.0206	0.275	0.026	0.779	0.000	-0.78	0.436
3/4 y	-0.0073	0.100	0.010	0.971	0.000	-0.75	0.452
3/5 y	-0.0118	0.174	0.017	0.910	0.000	-0.71	0.481
3/6 y	-0.0250	0.218	0.021	0.856	0.000	-1.20	0.234
4/5 y	-0.0045	0.094	0.009	0.973	0.000	-0.50	0.616
4/6 y	-0.0177	0.142	0.014	0.936	0.000	-1.30	0.197
5/6 y	-0.0132	0.054	0.005	0.991	0.000	-2.55	0.012
MAPE/FORECAST							
2/3 y	-0.0347	0.144	0.014	0.913	0.000	-2.52	0.013
2/4 y	-0.0866	0.207	0.020	0.816	0.000	-4.36	0.000
2/5 y	-0.1393	0.274	0.026	0.677	0.000	-5.31	0.000
2/6 y	-0.1911	0.328	0.031	0.528	0.000	-6.09	0.000
3/4 y	-0.0519	0.104	0.010	0.954	0.000	-5.21	0.000
3/5 y	-0.1046	0.190	0.018	0.845	0.000	-5.76	0.000
3/6 y	-0.1565	0.254	0.024	0.718	0.000	-6.43	0.000
4/5 y	-0.0527	0.098	0.009	0.958	0.000	-5.61	0.000
4/6 y	-0.1046	0.174	0.017	0.867	0.000	-6.28	0.000
5/6 y	-0.0519	0.091	0.009	0.963	0.000	-5.95	0.000

MSE/FORECAST

2/3	y	-0.0328	0.160	0.015	0.911	0.000	-2.14	0.035
2/4	y	-0.0831	0.218	0.021	0.836	0.000	-3.97	0.000
2/5	y	-0.1397	0.287	0.027	0.719	0.000	-5.09	0.000
2/6	y	-0.1986	0.349	0.033	0.586	0.000	-5.93	0.000
3/4	y	-0.0503	0.105	0.010	0.963	0.000	-5.00	0.000
3/5	y	-0.1069	0.204	0.020	0.863	0.000	-5.48	0.000
3/6	y	-0.1658	0.282	0.027	0.740	0.000	-6.14	0.000
4/5	y	-0.0566	0.117	0.011	0.955	0.000	-5.03	0.000
4/6	y	-0.1155	0.208	0.020	0.860	0.000	-5.79	0.000
5/6	y	-0.0589	0.111	0.011	0.961	0.000	-5.54	0.000

<u>1981</u>

MAPE/ACTUAL

2/3	y	-0.0089	0.141	0.014	0.930	0.000	-0.66	0.511
2/4	y	-0.0095	0.223	0.021	0.816	0.000	-0.44	0.657
2/5	y	-0.0263	0.255	0.024	0.751	0.000	-1.08	0.284
2/6	y	-0.0404	0.284	0.027	0.680	0.000	-1.49	0.140
3/4	y	-0.0006	0.137	0.013	0.930	0.000	-0.05	0.964
3/5	y	-0.0174	0.183	0.018	0.871	0.000	-0.99	0.323
3/6	y	-0.0315	0.220	0.021	0.809	0.000	-1.50	0.137
4/5	y	-0.0168	0.095	0.009	0.963	0.000	-1.84	0.068
4/6	y	-0.0309	0.149	0.014	0.906	0.000	-2.17	0.032
5/6	y	-0.0141	0.074	0.007	0.976	0.000	-2.01	0.047

MSE/ACTUAL

2/3	y	-0.0044	0.142	0.014	0.944	0.000	-0.32	0.746
2/4	y	0.0104	0.240	0.023	0.833	0.000	0.45	0.653
2/5	y	0.0053	0.270	0.026	0.784	0.000	0.20	0.838
2/6	y	0.0017	0.297	0.028	0.735	0.000	0.06	0.951
3/4	y	0.0148	0.145	0.014	0.939	0.000	1.07	0.288
3/5	y	0.0097	0.181	0.017	0.904	0.000	0.56	0.576
3/6	y	0.0062	0.218	0.021	0.857	0.000	0.30	0.768
4/5	y	-0.0051	0.080	0.008	0.980	0.000	-0.67	0.506
4/6	y	-0.0086	0.138	0.013	0.939	0.000	-0.65	0.515
5/6	y	-0.0035	0.070	0.007	0.984	0.000	-0.53	0.598

MAPE/FORECAST

2/3	y	-0.0249	0.180	0.017	0.858	0.000	-1.44	0.152
2/4	y	-0.0559	0.257	0.025	0.710	0.000	-2.27	0.025
2/5	y	-0.0927	0.304	0.029	0.581	0.000	-3.18	0.002
2/6	y	-0.1399	0.344	0.033	0.460	0.000	-4.24	0.000
3/4	y	-0.0310	0.159	0.015	0.892	0.000	-2.04	0.044
3/5	y	-0.0678	0.222	0.021	0.784	0.000	-3.19	0.002
3/6	y	-0.1150	0.272	0.026	0.672	0.000	-4.42	0.000
4/5	y	-0.0368	0.114	0.011	0.943	0.000	-3.38	0.001
4/6	y	-0.0840	0.181	0.017	0.853	0.000	-4.83	0.000
5/6	y	-0.0472	0.089	0.008	0.964	0.000	-5.56	0.000

MSE/FORECAST

2/3	y	-0.0289	0.188	0.018	0.872	0.000	-1.61	0.111
2/4	y	-0.0571	0.281	0.027	0.717	0.000	-2.12	0.036
2/5	y	-0.0901	0.338	0.032	0.591	0.000	-2.79	0.006
2/6	y	-0.1418	0.383	0.037	0.483	0.000	-3.87	0.000
3/4	y	-0.0282	0.179	0.017	0.888	0.000	-1.65	0.103
3/5	y	-0.0612	0.251	0.024	0.782	0.000	-2.55	0.012
3/6	y	-0.1129	0.308	0.030	0.675	0.000	-3.82	0.000
4/5	y	-0.0330	0.121	0.012	0.950	0.000	-2.86	0.005
4/6	y	-0.0846	0.199	0.019	0.866	0.000	-4.44	0.000
5/6	y	-0.0516	0.101	0.010	0.966	0.000	-5.34	0.000

1982

MAPE/ACTUAL

2/3	y	-0.0652	0.235	0.023	0.784	0.000	-2.89	0.005
2/4	y	-0.0715	0.289	0.028	0.671	0.000	-2.58	0.011
2/5	y	-0.0908	0.291	0.028	0.666	0.000	-3.25	0.002
2/6	y	-0.1056	0.312	0.030	0.613	0.000	-3.54	0.001
3/4	y	-0.0063	0.150	0.014	0.914	0.000	-0.44	0.662
3/5	y	-0.0256	0.174	0.017	0.884	0.000	-1.54	0.127
3/6	y	-0.0404	0.210	0.020	0.829	0.000	-2.01	0.047
4/5	y	-0.0193	0.113	0.011	0.950	0.000	-1.78	0.078
4/6	y	-0.0342	0.152	0.015	0.910	0.000	-2.35	0.020
5/6	y	-0.0149	0.064	0.006	0.984	0.000	-2.41	0.017

MSE/ACTUAL

2/3	y	-0.0586	0.258	0.025	0.780	0.000	-2.37	0.019
2/4	y	-0.0613	0.326	0.031	0.649	0.000	-1.96	0.053
2/5	y	-0.0789	0.326	0.031	0.655	0.000	-2.52	0.013
2/6	y	-0.0903	0.338	0.032	0.628	0.000	-2.78	0.006
3/4	y	-0.0027	0.179	0.017	0.900	0.000	-0.16	0.876
3/5	y	-0.0203	0.192	0.018	0.887	0.000	-1.10	0.272
3/6	y	-0.0317	0.213	0.020	0.860	0.000	-1.56	0.123
4/5	y	-0.0176	0.119	0.011	0.957	0.000	-1.55	0.124
4/6	y	-0.0290	0.141	0.013	0.939	0.000	-2.15	0.034
5/6	y	-0.0114	0.046	0.004	0.994	0.000	-2.58	0.011

MAPE/FORECAST

2/3	y	-0.0522	0.262	0.025	0.738	0.000	-2.08	0.040
2/4	y	-0.0698	0.308	0.029	0.632	0.000	-2.37	0.020
2/5	y	-0.0969	0.325	0.031	0.583	0.000	-3.11	0.002
2/6	y	-0.1299	0.357	0.034	0.494	0.000	-3.80	0.000
3/4	y	-0.0175	0.135	0.013	0.928	0.000	-1.36	0.178
3/5	y	-0.0447	0.209	0.020	0.825	0.000	-2.24	0.027
3/6	y	-0.0777	0.268	0.026	0.710	0.000	-3.03	0.003
4/5	y	-0.0272	0.134	0.013	0.927	0.000	-2.12	0.037
4/6	y	-0.0601	0.201	0.019	0.835	0.000	-3.13	0.002
5/6	y	-0.0330	0.092	0.009	0.965	0.000	-3.75	0.000

MSE/FORECAST

2/3	y	-0.0390	0.294	0.028	0.720	0.000	-1.39	0.169
2/4	y	-0.0511	0.350	0.034	0.600	0.000	-1.52	0.131
2/5	y	-0.0722	0.370	0.035	0.548	0.000	-2.04	0.044
2/6	y	-0.1036	0.396	0.038	0.480	0.000	-2.73	0.007
3/4	y	-0.0121	0.159	0.015	0.918	0.000	-0.80	0.428
3/5	y	-0.0332	0.246	0.024	0.801	0.000	-1.41	0.162
3/6	y	-0.0646	0.292	0.028	0.719	0.000	-2.31	0.023
4/5	y	-0.0211	0.161	0.015	0.914	0.000	-1.36	0.175
4/6	y	-0.0525	0.212	0.020	0.852	0.000	-2.59	0.011
5/6	y	-0.0314	0.080	0.008	0.979	0.000	-4.10	0.000

<u>1983</u>

MAPE/ACTUAL

2/3	y	-0.0026	0.158	0.015	0.869	0.000	-0.17	0.866
2/4	y	0.0359	0.247	0.024	0.661	0.000	1.51	0.133
2/5	y	0.0497	0.284	0.027	0.542	0.000	1.83	0.070
2/6	y	0.0618	0.322	0.031	0.382	0.000	2.00	0.048
3/4	y	0.0384	0.164	0.016	0.844	0.000	2.45	0.016
3/5	y	0.0523	0.230	0.022	0.683	0.000	2.37	0.019
3/6	y	0.0643	0.283	0.027	0.498	0.000	2.37	0.019
4/5	y	0.0138	0.160	0.015	0.836	0.000	0.90	0.368
4/6	y	0.0259	0.229	0.022	0.646	0.000	1.18	0.241
5/6	y	0.0120	0.125	0.012	0.892	0.000	1.01	0.316

MSE/ACTUAL

2/3	y	0.0063	0.192	0.018	0.842	0.000	0.34	0.732
2/4	y	0.0472	0.280	0.027	0.637	0.000	1.76	0.081
2/5	y	0.0620	0.312	0.030	0.535	0.000	2.07	0.041
2/6	y	0.0783	0.344	0.033	0.389	0.000	2.38	0.019
3/4	y	0.0409	0.190	0.018	0.823	0.000	2.25	0.027
3/5	y	0.0557	0.257	0.025	0.664	0.000	2.26	0.026
3/6	y	0.0720	0.306	0.029	0.480	0.000	2.45	0.016
4/5	y	0.0148	0.181	0.017	0.815	0.000	0.85	0.396
4/6	y	0.0311	0.253	0.024	0.605	0.000	1.29	0.201
5/6	y	0.0163	0.145	0.014	0.868	0.000	1.18	0.241

MAPE/FORECAST

2/3	y	-0.0155	0.177	0.017	0.875	0.000	-0.91	0.363
2/4	y	0.0283	0.286	0.027	0.666	0.000	1.03	0.304
2/5	y	0.0421	0.336	0.032	0.525	0.000	1.31	0.194
2/6	y	0.0288	0.383	0.037	0.390	0.000	0.79	0.434
3/4	y	0.0438	0.182	0.017	0.864	0.000	2.51	0.014
3/5	y	0.0575	0.274	0.026	0.682	0.000	2.19	0.031
3/6	y	0.0443	0.336	0.032	0.527	0.000	1.37	0.172
4/5	y	0.0137	0.196	0.019	0.833	0.000	0.73	0.466
4/6	y	0.0005	0.265	0.025	0.698	0.000	0.02	0.985
5/6	y	-0.0133	0.125	0.012	0.930	0.000	-1.10	0.272

MSE/FORECAST

2/3	y	-0.0143	0.220	0.021	0.857	0.000	-0.68	0.499
2/4	y	0.0356	0.328	0.031	0.663	0.000	1.13	0.260
2/5	y	0.0558	0.389	0.037	0.511	0.000	1.50	0.137
2/6	y	0.0407	0.429	0.041	0.393	0.000	0.99	0.325
3/4	y	0.0499	0.217	0.021	0.856	0.000	2.40	0.018
3/5	y	0.0701	0.326	0.031	0.663	0.000	2.25	0.027
3/6	y	0.0550	0.379	0.036	0.532	0.000	1.51	0.133
4/5	y	0.0202	0.224	0.021	0.829	0.000	0.94	0.349
4/6	y	0.0051	0.292	0.028	0.704	0.000	0.18	0.857
5/6	y	-0.0152	0.152	0.015	0.917	0.000	-1.04	0.299

Appendix 23.

COMPARISON OF THE NON-TRUNCATED ERRORS FOR FORECASTS OF PROFITS BY EXPONENTIAL SMOOTHING MODELS, (109 COS.).

SPEARMAN RANK CORRELATIONS

MAPE/ACTUAL AND MSE/ACTUAL.

1980

	0.90	0.85	0.80	0.75	0.70	0.65	0.60	0.55	0.50
0.95	.9962	.9903	.9815	.9645	.9469	.9193	.9043	.8835	.8335
0.90		.9976	.9918	.9785	.9627	.9380	.9239	.9039	.8561
0.85			.9970	.9869	.9731	.9516	.9379	.9191	.8731
0.80				.9953	.9852	.9673	.9545	.9362	.8919
0.75					.9960	.9850	.9748	.9583	.9184
0.70						.9948	.9885	.9740	.9377
0.65							.9961	.9836	.9529
0.60								.9939	.9704
0.55									.9890

	0.45	0.40	0.35	0.30	0.25	0.20	0.15	0.10	0.05
0.95	.7754	.7481	.7074	.6685	.6233	.5270	.4239	.3482	.2154*
0.90	.7993	.7722	.7315	.6923	.6472	.5526	.4503	.3735	.2335
0.85	.8171	.7889	.7470	.7067	.6613	.5672	.4656	.3899	.2470
0.80	.8365	.8076	.7644	.7234	.6795	.5876	.4866	.4113	.2646
0.75	.8653	.8360	.7915	.7496	.7059	.6160	.5154	.4390	.2887
0.70	.8867	.8572	.8119	.7693	.7260	.6385	.5404	.4647	.3130
0.65	.9060	.8772	.8324	.7895	.7474	.6642	.5704	.4964	.3440
0.60	.9298	.9045	.8614	.8189	.7774	.6966	.6018	.5249	.3731
0.55	.9568	.9376	.8956	.8518	.8099	.7290	.6309	.5493	.3639
0.50	.9894	.9686	.9291	.8843	.8434	.7653	.6667	.5809	.4289
0.45		.9864	.9552	.9146	.8757	.7992	.7004	.6110	.4594
0.40			.9892	.9637	.9319	.8581	.7596	.6661	.5090
0.35				.9902	.9668	.8981	.8017	.7055	.5479
0.30					.9887	.9330	.8448	.7504	.5932
0.25						.9711	.9011	.8170	.6675
0.20							.9729	.9134	.7776
0.15								.9743	.8607
0.10									.9330

1981

	0.90	0.85	0.80	0.75	0.70	0.65	0.60	0.55	0.50
0.95	.9876	.9413	.9272	.8848	.8600	.8628	.8369	.8331	.8240
0.90		.9774	.9637	.9268	.9003	.8999	.8720	.8647	.8543
0.85			.9733	.9373	.9041	.8972	.8655	.8529	.8403
0.80				.9837	.9543	.9380	.9049	.8912	.8751
0.75					.9848	.9553	.9189	.9011	.8804
0.70						.9753	.9421	.9243	.9023
0.65							.9900	.9784	.9570
0.60								.9920	.9709
0.55									.9903

0.95	.7938	.7536	.7369	.6963	.6328	.5376	.4896	.4530	.3839
0.90	.8218	.7791	.7614	.7192	.6531	.5538	.4997	.4469	.3685
0.85	.8047	.7588	.7398	.6968	.6320	.5326	.4758	.4172	.3386
0.80	.8367	.7902	.7690	.7270	.6610	.5617	.5039	.4472	.3774
0.75	.8365	.7893	.7635	.7223	.6561	.5595	.5038	.4460	.3732
0.70	.8579	.8121	.7848	.7443	.6775	.5808	.5260	.4601	.3768
0.65	.9161	.8672	.8403	.7973	.7283	.6278	.5725	.4984	.4052
0.60	.9316	.8829	.8572	.8155	.7466	.6442	.5867	.5054	.4058
0.55	.9637	.9225	.8994	.8587	.7919	.6874	.6245	.5344	.4254
0.50	.9872	.9525	.9328	.8921	.8251	.7175	.6485	.5484	.4282
0.45		.9857	.9709	.9295	.8620	.7535	.6803	.5738	.4457
0.40			.9911	.9520	.8863	.7820	.7067	.5946	.4628
0.35				.9802	.9276	.8309	.7522	.6395	.5093
0.30					.9758	.8883	.8053	.6906	.5590
0.25						.9574	.8852	.7635	.6255
0.20							.9663	.8474	.7101
0.15								.9344	.8066
0.10									.9508

<u>1982</u>

0.95	.9877	.9490	.9304	.8940	.8241	.8098	.7374	.7456	.7355
0.90		.9767	.9611	.9316	.8670	.8493	.7749	.7811	.7702
0.85			.9871	.9607	.8993	.8797	.8030	.8069	.7944
0.80				.9876	.9395	.9197	.8440	.8450	.8273
0.75					.9782	.9593	.8841	.8814	.8595
0.70						.9777	.9040	.8950	.8663
0.65							.9606	.9514	.9216
0.60								.9641	.9199
0.55									.9812

0.95	.7128	.6688	.6165	.5807	.5250	.4886	.4578	.4436	.3538
0.90	.7482	.7063	.6584	.6139	.5543	.5134	.4811	.4686	.3782
0.85	.7705	.7217	.6585	.6327	.5767	.5374	.5097	.5034	.4214
0.80	.8011	.7488	.6804	.6579	.5995	.5600	.5305	.5196	.4300
0.75	.8314	.7778	.7090	.6831	.6189	.5742	.5392	.5216	.4229
0.70	.8351	.7803	.7102	.6833	.6146	.5642	.5231	.4935	.3807
0.65	.8848	.8276	.7538	.7282	.6576	.6065	.5677	.5364	.4200
0.60	.8741	.8169	.7417	.7135	.6402	.5852	.5431	.5064	.3857
0.55	.9478	.8998	.8299	.8044	.7328	.6788	.6288	.5841	.4558
0.50	.9852	.9528	.8929	.8704	.8030	.7509	.6984	.6486	.5154
0.45		.9872	.9454	.9273	.8674	.8157	.7628	.7110	.5726
0.40			.9799	.9605	.9076	.8580	.8052	.7515	.6142
0.35				.9729	.9308	.8826	.8248	.7634	.6225
0.30					.9830	.9501	.8965	.8265	.6830
0.25						.9854	.9429	.8697	.7288
0.20							.9788	.9168	.7852
0.15								.9710	.8612
0.10									.9393

1983

0.95	.9903	.9717	.9663	.9730	.9574	.9327	.9015	.8675	.8283
0.90		.9919	.9780	.9721	.9508	.9222	.8888	.8557	.8151
0.85			.9898	.9632	.9352	.9051	.8706	.8388	.7983
0.80				.9736	.9493	.9250	.8929	.8638	.8261
0.75					.9946	.9815	.9601	.9366	.9044
0.70						.9942	.9789	.9597	.9318
0.65							.9939	.9813	.9606
0.60								.9951	.9813
0.55									.9938

0.95	.7648	.6750	.5726	.5774	.4822	.3917	.2373	.0868*	.0012*
0.90	.7499	.6607	.5566	.5597	.4638	.3742	.2250	.0793*	-.0069*
0.85	.7346	.6477	.5432	.5450	.4475	.3577	.2113	.0650*	-.0240*
0.80	.7666	.6810	.5781	.5813	.4825	.3895	.2408	.0855*	-.0104*
0.75	.8483	.7638	.6615	.6662	.5644	.4668	.3104	.1401*	.0341*
0.70	.8807	.7989	.6994	.7073	.6062	.5081	.3487	.1706*	.0593*
0.65	.9169	.8411	.7460	.7539	.6520	.5514	.3874	.1970*	.0773*
0.60	.9445	.8750	.7835	.7905	.6882	.5849	.4135	.2142*	.0878*
0.55	.9666	.9065	.8210	.8284	.7250	.6204	.4498	.2450	.1110*
0.50	.9868	.9417	.8644	.8712	.7659	.6585	.4857	.2711	.1282*
0.45		.9810	.9171	.9135	.8031	.6932	.5221	.3033	.1562*
0.40			.9516	.9294	.8134	.7032	.5294	.3071	.1537*
0.35				.9258	.8225	.7196	.5431	.3118	.1533*
0.30					.9561	.8741	.6999	.4582	.2992
0.25						.9689	.7835	.5456	.3953
0.20							.8459	.6348	.4913
0.15								.8757	.7245
0.10									.9323

MAPE/FORECAST AND MSE/FORECAST.

1980

0.95	.9942	.9871	.9759	.9603	.9425	.9172	.8966	.8663	.8019
0.90		.9974	.9904	.9784	.9635	.9405	.9214	.8915	.8282
0.85			.9964	.9870	.9744	.9541	.9358	.9065	.8438
0.80				.9961	.9876	.9720	.9560	.9276	.8663
0.75					.9965	.9862	.9745	.9485	.8901
0.70						.9948	.9862	.9620	.9061
0.65							.9947	.9740	.9246
0.60								.9894	.9516
0.55									.9841

0.95	.7343	.6798	.6149	.5295	.4402	.3424	.2320	.1214*	-.0020*
0.90	.7612	.7073	.6434	.5591	.4707	.3728	.2619	.1491*	.0179*
0.85	.7770	.7240	.6606	.5766	.4875	.3884	.2770	.1627*	.0273*
0.80	.8001	.7495	.6876	.6051	.5171	.4188	.3086	.1941*	.0544*
0.75	.5252	.7774	.7173	.6366	.5487	.4513	.3410	.2243	.0807*
0.70	.8424	.7968	.7379	.6598	.5737	.4784	.3703	.2531	.1063*
0.65	.8643	.8222	.7664	.6915	.6101	.5200	.4164	.3012	.1531*
0.60	.9003	.8644	.8133	.7433	.6655	.5773	.4715	.3519	.2017*
0.55	.9502	.9206	.8744	.8087	.7328	.6451	.5333	.4058	.2517
0.50	.9890	.9670	.9293	.8714	.8020	.7203	.6078	.4786	.3256
0.45		.9881	.9615	.9150	.8543	.7787	.6684	.5388	.3866
0.40			.9901	.9606	.9130	.8448	.7387	.6091	.4558
0.35				.9870	.9539	.8979	.8021	.6769	.5281
0.30					.9857	.9454	.8682	.7561	.6164
0.25						.9822	.9291	.8393	.7166
0.20							.9778	.9162	.8167
0.15								.9765	.9065
0.10									.6055

<u>1981</u>

0.95	.9894	.9480	.9143	.8511	.8161	.8207	.7982	.7904	.7685
0.90		.9801	.9437	.8857	.8516	.8556	.8305	.8194	.7959
0.85			.9457	.8917	.8609	.8609	.8337	.8217	.7967
0.80				.9806	.9492	.9366	.9048	.8859	.8577
0.75					.9854	.9589	.9216	.8963	.8636
0.70						.9811	.9503	.9261	.8921
0.65							.9897	.9735	.9429
0.60								.9912	.9631
0.55									.9853

0.95	.7353	.6617	.6077	.5187	.4372	.3133	.1858*	.0436*	-.1196*
0.90	.7589	.6808	.6250	.5333	.4483	.3204	.1909*	.0483*	-.1096*
0.85	.7570	.6770	.6222	.5337	.4521	.3275	.2038*	.0683*	-.0776*
0.80	.8123	.7305	.6767	.5873	.5038	.3769	.2501	.1069*	-.0524
0.75	.8139	.7340	.6809	.5937	.5130	.3893	.2634	.1213*	-.0335*
0.70	.8399	.7603	.7081	.6233	.5437	.4249	.2995	.1568*	.0003*
0.65	.8902	.8079	.7561	.6713	.5878	.4662	.3377	.1880*	.0216*
0.60	.9104	.8296	.7776	.6936	.6104	.4913	.3638	.2116*	.0396*
0.55	.9457	.8764	.8301	.7508	.6686	.5481	.4220	.2269	.0821*
0.50	.9677	.9164	.8790	.8039	.7247	.6042	.4764	.3161	.1237*
0.45		.9819	.9533	.8837	.8038	.6838	.5583	.3933	.1823*
0.40			.9860	.9293	.8554	.7435	.6281	.4688	.2568
0.35				.9741	.9153	.8163	.7155	.5654	.3579
0.30					.9666	.8858	.8043	.6661	.4688
0.25						.9617	.9003	.7785	.5920
0.20							.9706	.8811	.7214
0.15								.9644	.8442
0.10									.9468

1982

0.95	.9872	.9612	.9419	.9024	.8325	.8113	.7489	.7348	.7060
0.90		.9823	.9680	.9352	.8695	.8475	.7824	.7674	.7410
0.85			.9874	.9576	.8948	.8710	.8031	.7839	.7563
0.80				.9865	.9384	.9167	.8512	.8273	.7975
0.75					.9783	.9591	.8943	.8686	.8385
0.70						.9788	.9143	.8786	.8454
0.65							.9662	.9376	.9053
0.60								.9532	.9177
0.55									.9829

0.95	.6675	.6121	.5573	.5097	.4406	.3772	.3073	.2098*	.0631*
0.90	.7060	.6568	.6086	.5431	.4638	.3989	.3263	.2273	.0844*
0.85	.7180	.6641	.6098	.5608	.4887	.4228	.3487	.2536	.1110*
0.80	.7567	.7005	.6533	.5970	.5243	.4559	.3768	.2783	.1318*
0.75	.7976	.7407	.6842	.6395	.5636	.4929	.4106	.3075	.1536*
0.70	.8016	.7433	.6873	.6455	.5666	.4950	.4109	.3038	.1498*
0.65	.8606	.8020	.7445	.7012	.6224	.5488	.4609	.3494	.1830*
0.60	.8724	.8172	.7589	.7105	.6331	.5623	.4788	.3745	.2135*
0.55	.9476	.8988	.8450	.8008	.7225	.6531	.5658	.4441	.2603
0.50	.9857	.9515	.9071	.8679	.7920	.7245	.6361	.5079	.3133
0.45		.9870	.9572	.9230	.8509	.7885	.7063	.5794	.3799
0.40			.9866	.9519	.8864	.8315	.7584	.6375	.4416
0.35				.9639	.9035	.8589	.7882	.6699	.4790
0.30					.9791	.9449	.8794	.7639	.5622
0.25						.9835	.9335	.8357	.6461
0.20							.9767	.9054	.7246
0.15								.9695	.8473
0.10									.9455

1983

0.95	.9945	.9790	.9638	.9627	.9457	.9249	.8993	.8659	.8378
0.90		.9918	.9739	.9671	.9472	.9242	.8990	.8669	.8394
0.85			.9885	.9697	.9434	.9198	.9849	.9638	.8367
0.80				.9860	.9641	.9471	.9254	.8974	.8714
0.75					.9938	.9841	.9683	.9448	.9218
0.70						.9862	.9683	.9483	.9365
0.65							.9955	.9823	.9652
0.60								.9940	.9815
0.55									.9951

0.95	.7955	.7157	.6540	.6171	.5249	.4354	.2585	.0170*	-.1638*
0.90	.7987	.7201	.6595	.6231	.5320	.4423	.2651	.0245*	-.1592*
0.85	.7973	.7189	.6589	.6244	.5329	.4457	.2717	.0346*	-.1446*
0.80	.8318	.7550	.6953	.6585	.5651	.4766	.2983	.0560*	-.1240*
0.75	.8829	.8071	.7464	.7104	.6125	.5197	.3341	.0789*	-.1155*
0.70	.9115	.8386	.7807	.7438	.6461	.5507	.3634	.1013*	-.1011*
0.65	.9312	.8614	.8057	.7688	.6711	.5763	.3913	.1309*	-.0733*
0.60	.9527	.8890	.8362	.8008	.7020	.6066	.4217	.1582*	-.0494*
0.55	.9759	.9238	.8747	.8404	.7398	.6449	.4595	.1913*	-.0212*
0.50	.9904	.9506	.9055	.8714	.7681	.6716	.4809	.2087*	-.0062*
0.45		.9819	.9447	.9100	.8083	.7159	.5300	.2586	.0435*
0.40			.9761	.9363	.8419	.7559	.5694	.3046	.0967*
0.35				.9340	.8600	.7851	.5941	.3335	.1398*
0.30					.9690	.9101	.7166	.4435	.2320
0.25						.9754	.7829	.5301	.3415
0.20							.8491	.6224	.4565
0.15								.8970	.7483
0.10									.9354

* Not significant at the 10% level.

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	(DIFFERENCE) MEAN	STANDARD DEVIATION	STANDARD ERROR	CORR.	2-TAIL PROB.	T VALUE	2-TAIL PROB.

MAPE/ACTUAL.

<u>1980</u>

0.95/.90	0.0414	0.428	0.041	1.000	0.000	1.01	0.315
0.95/.85	0.0829	0.857	0.082	1.000	0.000	1.01	0.314
0.95/.80	0.1245	1.285	0.123	0.999	0.000	1.01	0.314
0.95/.75	0.1662	1.713	0.164	0.999	0.000	1.01	0.313
0.95/.70	0.2082	2.140	0.205	0.998	0.000	1.02	0.312
0.95/.65	0.2506	2.568	0.246	0.996	0.000	1.02	0.311
0.95/.60	0.2910	2.995	0.287	0.995	0.000	1.01	0.313
0.95/.55	0.3324	3.423	0.328	0.992	0.000	1.01	0.313
0.95/.50	0.3748	3.850	0.369	0.988	0.000	1.02	0.312
0.95/.45	0.4182	4.277	0.410	0.983	0.000	1.02	0.310
0.95/.40	0.4594	4.703	0.451	0.975	0.000	1.02	0.310
0.95/.35	0.5019	5.131	0.491	0.964	0.000	1.02	0.309
0.95/.30	0.5448	5.559	0.532	0.948	0.000	1.02	0.309
0.95/.25	0.5845	5.988	0.574	0.923	0.000	1.02	0.310
0.95/.20	0.6251	6.420	0.615	0.880	0.000	1.02	0.312
0.95/.15	0.6654	6.853	0.656	0.801	0.000	1.01	0.313
0.95/.10	0.7033	7.290	0.698	0.651	0.000	1.01	0.316
0.95/.05	0.7279	7.729	0.740	0.373	0.000	0.98	0.328
0.90/.85	0.0415	0.428	0.041	1.000	0.000	1.01	0.314
0.90/.80	0.0830	0.856	0.082	1.000	0.000	1.01	0.314
0.90/.75	0.1247	1.284	0.123	0.999	0.000	1.01	0.313
0.90/.70	0.1668	1.712	0.164	0.998	0.000	1.02	0.311
0.90/.65	0.2091	2.140	0.205	0.997	0.000	1.02	0.310
0.90/.60	0.2496	2.567	0.246	0.996	0.000	1.02	0.312
0.90/.55	0.2910	2.995	0.287	0.993	0.000	1.01	0.313
0.90/.50	0.3334	3.422	0.328	0.990	0.000	1.02	0.311
0.90/.45	0.3768	3.849	0.369	0.984	0.000	1.02	0.309

0.90/.40	0.4180	4.276	0.410	0.977	0.000	1.02	0.310
0.90/.35	0.4604	4.703	0.450	0.967	0.000	1.02	0.309
0.90/.30	0.5033	5.132	0.492	0.951	0.000	1.02	0.308
0.90/.25	0.5431	5.561	0.533	0.926	0.000	1.02	0.310
0.90/.20	0.5837	5.993	0.574	0.884	0.000	1.02	0.311
0.90/.15	0.6240	6.427	0.616	0.807	0.000	1.01	0.313
0.90/.10	0.6619	6.864	0.657	0.658	0.000	1.01	0.316
0.90/.05	0.6865	7.304	0.700	0.381	0.000	0.98	0.329
0.85/.80	0.0415	0.428	0.041	1.000	0.000	1.01	0.314
0.85/.75	0.0832	0.856	0.082	1.000	0.000	1.01	0.312
0.85/.70	0.1252	1.284	0.123	0.999	0.000	1.02	0.311
0.85/.65	0.1676	1.712	0.164	0.998	0.000	1.02	0.309
0.85/.60	0.2081	2.139	0.205	0.997	0.000	1.02	0.312
0.85/.55	0.2495	2.567	0.246	0.994	0.000	1.01	0.312
0.85/.50	0.2919	2.994	0.287	0.991	0.000	1.02	0.311
0.85/.45	0.3353	3.421	0.328	0.986	0.000	1.02	0.309
0.85/.40	0.3765	3.848	0.369	0.980	0.000	1.02	0.309
0.85/.35	0.4189	4.276	0.410	0.970	0.000	1.02	0.309
0.85/.30	0.4618	4.705	0.451	0.954	0.000	1.02	0.308
0.85/.25	0.5016	5.135	0.492	0.930	0.000	1.02	0.310
0.85/.20	0.5422	5.567	0.533	0.889	0.000	1.02	0.311
0.85/.15	0.5825	6.001	0.575	0.883	0.000	1.01	0.313
0.85/.10	0.6204	6.439	0.617	0.665	0.000	1.01	0.317
0.85/.05	0.6450	6.880	0.659	0.389	0.000	0.98	0.330
0.80/.75	0.0417	0.428	0.041	1.000	0.000	1.02	0.311
0.80/.70	0.0837	0.856	0.082	1.000	0.000	1.02	0.309
0.80/.65	0.1261	1.283	0.123	0.999	0.000	1.03	0.307
0.80/.60	0.1666	1.711	0.164	0.998	0.000	1.02	0.312
0.80/.55	0.2079	2.139	0.205	0.996	0.000	1.02	0.312
0.80/.50	0.2504	2.566	0.246	0.993	0.000	1.02	0.311
0.80/.45	0.2938	2.994	0.287	0.988	0.000	1.02	0.308
0.80/.40	0.3350	3.421	0.328	0.982	0.000	1.02	0.309
0.80/.35	0.3774	3.849	0.369	0.973	0.000	1.02	0.308
0.80/.30	0.4203	4.278	0.410	0.958	0.000	1.03	0.307
0.80/.25	0.4601	4.708	0.451	0.935	0.000	1.02	0.310
0.80/.20	0.5007	5.140	0.492	0.894	0.000	1.02	0.312
0.80/.15	0.5409	5.575	0.534	0.819	0.000	1.01	0.313
0.80/.10	0.5789	6.014	0.576	0.673	0.000	1.01	0.317
0.80/.05	0.6035	6.455	0.618	0.399	0.000	0.98	0.331
0.75/.70	0.0420	0.428	0.041	1.000	0.000	1.03	0.308
0.75/.65	0.0844	0.856	0.082	0.999	0.000	1.03	0.305
0.75/.60	0.1249	1.283	0.123	0.998	0.000	1.02	0.312
0.75/.55	0.1662	1.711	0.164	0.997	0.000	1.01	0.313
0.75/.50	0.2087	2.139	0.205	0.994	0.000	1.02	0.311
0.75/.45	0.2521	2.566	0.246	0.990	0.000	1.03	0.307
0.75/.40	0.2933	2.994	0.287	0.985	0.000	1.02	0.309
0.75/.35	0.3357	3.422	0.328	0.976	0.000	1.02	0.308
0.75/.30	0.3786	3.851	0.369	0.962	0.000	1.03	0.307
0.75/.25	0.4184	4.282	0.410	0.939	0.000	1.02	0.310
0.75/.20	0.4590	4.715	0.452	0.900	0.000	1.02	0.312
0.75/.15	0.4992	5.150	0.493	0.827	0.000	1.01	0.314
0.75/.10	0.5372	5.589	0.535	0.682	0.000	1.00	0.318
0.75/.05	0.5618	6.031	0.578	0.409	0.000	0.97	0.333
0.70/.65	0.0424	0.428	0.041	1.000	0.000	1.03	0.303
0.70/.60	0.0828	0.856	0.082	0.999	0.000	1.01	0.314
0.70/.55	0.1242	1.283	0.123	0.998	0.000	1.01	0.314
0.70/.50	0.1667	1.711	0.164	0.996	0.000	1.02	0.312
0.70/.45	0.2101	2.139	0.205	0.993	0.000	1.03	0.307
0.70/.40	0.2513	2.566	0.246	0.987	0.000	1.02	0.309

0.70/.35	0.2937	2.995	0.287	0.979	0.000	1.02	0.308
0.70/.30	0.3366	3.425	0.328	0.966	0.000	1.03	0.307
0.70/.25	0.3764	3.856	0.369	0.944	0.000	1.02	0.310
0.70/.20	0.4169	4.289	0.411	0.906	0.000	1.01	0.312
0.70/.15	0.4572	4.725	0.453	0.835	0.000	1.01	0.315
0.70/.10	0.4952	5.164	0.495	0.693	0.000	1.00	0.319
0.70/.05	0.5198	5.607	0.537	0.422	0.000	0.97	0.335
0.65/.60	0.0405	0.428	0.041	1.000	0.000	0.99	0.326
0.65/.55	0.0819	0.856	0.082	0.999	0.000	1.00	0.320
0.65/.50	0.1243	1.284	0.123	0.997	0.000	1.01	0.315
0.65/.45	0.1677	1.712	0.164	0.995	0.000	1.02	0.309
0.65/.40	0.2089	2.139	0.205	0.990	0.000	1.02	0.310
0.65/.35	0.2513	2.568	0.246	0.983	0.000	1.02	0.309
0.65/.30	0.2942	2.998	0.287	0.970	0.000	1.02	0.308
0.65/.25	0.3340	3.430	0.329	0.950	0.000	1.02	0.312
0.65/.20	0.3746	3.863	0.370	0.913	0.000	1.01	0.314
0.65/.15	0.4148	4.300	0.412	0.844	0.000	1.01	0.316
0.65/.10	0.4528	4.740	0.454	0.704	0.000	1.00	0.321
0.65/.05	0.4774	5.184	0.497	0.436	0.000	0.96	0.338
0.60/.55	0.0414	0.428	0.041	1.000	0.000	1.01	0.315
0.60/.50	0.0838	0.856	0.082	0.999	0.000	1.02	0.309
0.60/.45	0.1272	1.284	0.123	0.997	0.000	1.03	0.303
0.60/.40	0.1684	1.712	0.164	0.993	0.000	1.03	0.307
0.60/.35	0.2108	2.141	0.205	0.986	0.000	1.03	0.306
0.60/.30	0.2537	2.572	0.246	0.975	0.000	1.03	0.305
0.60/.25	0.2935	3.003	0.288	0.956	0.000	1.02	0.310
0.60/.20	0.3341	3.438	0.329	0.921	0.000	1.01	0.313
0.60/.15	0.3744	3.875	0.371	0.854	0.000	1.01	0.315
0.60/.10	0.4123	4.315	0.413	0.717	0.000	1.00	0.321
0.60/.05	0.4369	4.760	0.456	0.451	0.000	0.96	0.340
0.55/.50	0.0424	0.428	0.041	1.000	0.000	1.03	0.303
0.55/.45	0.0858	0.856	0.082	0.998	0.000	1.05	0.298
0.55/.40	0.1270	1.284	0.123	0.995	0.000	1.03	0.304
0.55/.35	0.1695	1.714	0.164	0.990	0.000	1.03	0.304
0.55/.30	0.2124	2.145	0.205	0.980	0.000	1.03	0.304
0.55/.25	0.2521	2.577	0.247	0.962	0.000	1.02	0.309
0.55/.20	0.2927	3.012	0.288	0.930	0.000	1.01	0.313
0.55/.15	0.3330	3.449	0.330	0.865	0.000	1.01	0.316
0.55/.10	0.3709	3.891	0.373	0.732	0.000	1.00	0.322
0.55/.05	0.3955	4.336	0.415	0.469	0.000	0.95	0.343
0.50/.45	0.0434	0.428	0.041	0.999	0.000	1.06	0.292
0.50/.40	0.0846	0.857	0.082	0.998	0.000	1.03	0.305
0.50/.35	0.1270	1.287	0.123	0.993	0.000	1.03	0.305
0.50/.30	0.1699	1.718	0.165	0.985	0.000	1.03	0.304
0.50/.25	0.2097	2.151	0.206	0.969	0.000	1.02	0.311
0.50/.20	0.2503	2.586	0.248	0.939	0.000	1.01	0.314
0.50/.15	0.2906	3.024	0.290	0.877	0.000	1.00	0.318
0.50/.10	0.3285	3.467	0.332	0.748	0.000	0.99	0.325
0.50/.05	0.3531	3.913	0.375	0.491	0.000	0.94	0.348
0.45/.40	0.0412	0.429	0.041	0.999	0.000	1.00	0.319
0.45/.35	0.0836	0.860	0.082	0.996	0.000	1.02	0.312
0.45/.30	0.1265	1.291	0.124	0.990	0.000	1.02	0.309
0.45/.25	0.1663	1.724	0.165	0.976	0.000	1.01	0.316
0.45/.20	0.2069	2.160	0.207	0.949	0.000	1.00	0.320
0.45/.15	0.2472	2.599	0.249	0.891	0.000	0.99	0.323
0.45/.10	0.2851	3.042	0.291	0.767	0.000	0.98	0.330
0.45/.05	0.3097	3.489	0.334	0.515	0.000	0.93	0.356
0.40/.35	0.0424	0.430	0.041	0.999	0.000	1.03	0.306
0.40/.30	0.0853	0.862	0.083	0.994	0.000	1.03	0.304

0.40/.25	0.1251	1.295	0.124	0.984	0.000	1.01	0.316
0.40/.20	0.1657	1.731	0.166	0.960	0.000	1.00	0.320
0.40/.15	0.2060	2.171	0.208	0.907	0.000	0.99	0.324
0.40/.10	0.2439	2.615	0.250	0.790	0.000	0.97	0.332
0.40/.05	0.2685	3.063	0.293	0.545	0.000	0.92	0.362
0.35/.30	0.0429	0.432	0.041	0.998	0.000	1.04	0.302
0.35/.25	0.0827	0.866	0.083	0.991	0.000	1.00	0.321
0.35/.20	0.1233	1.302	0.125	0.972	0.000	0.99	0.325
0.35/.15	0.1635	1.743	0.167	0.925	0.000	0.98	0.329
0.35/.10	0.2015	2.188	0.210	0.816	0.000	0.96	0.338
0.35/.05	0.2261	2.637	0.253	0.581	0.000	0.90	0.373
0.30/.25	0.0398	0.434	0.042	0.997	0.000	0.96	0.341
0.30/.20	0.0804	0.872	0.083	0.984	0.000	0.96	0.338
0.30/.15	0.1206	1.313	0.126	0.946	0.000	0.96	0.339
0.30/.10	0.1586	1.758	0.168	0.848	0.000	0.94	0.349
0.30/.05	0.1832	2.209	0.212	0.625	0.000	0.87	0.388
0.25/.20	0.0406	0.438	0.042	0.995	0.000	0.97	0.335
0.25/.15	0.0809	0.879	0.084	0.967	0.000	0.96	0.339
0.25/.10	0.1188	1.326	0.127	0.885	0.000	0.94	0.352
0.25/.05	0.1434	1.777	0.170	0.681	0.000	0.84	0.401
0.20/.15	0.0403	0.442	0.042	0.989	0.000	0.95	0.343
0.20/.10	0.0782	0.889	0.085	0.928	0.000	0.92	0.360
0.20/.05	0.1028	1.341	0.128	0.752	0.000	0.80	0.425
0.15/.10	0.0379	0.448	0.043	0.974	0.000	0.88	0.379
0.15/.05	0.0625	0.901	0.086	0.842	0.000	0.72	0.471
0.10/.05	0.0246	0.456	0.044	0.942	0.000	0.56	0.575

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0.95/.90	0.0005	0.509	0.049	0.994	0.000	0.01	0.992
0.95/.85	0.0049	0.983	0.094	0.974	0.000	0.05	0.959
0.95/.80	0.0003	1.415	0.136	0.943	0.000	0.00	0.998
0.95/.75	-0.0044	1.819	0.174	0.902	0.000	-0.03	0.980
0.95/.70	-0.0082	2.197	0.210	0.851	0.000	-0.04	0.969
0.95/.65	-0.0115	2.548	0.244	0.792	0.000	-0.05	0.963
0.95/.60	-0.0098	2.875	0.275	0.727	0.000	-0.04	0.972
0.95/.55	-0.0042	3.180	0.305	0.658	0.000	-0.01	0.989
0.95/.50	0.0070	3.462	0.332	0.584	0.000	0.02	0.983
0.95/.45	0.0131	3.686	0.353	0.519	0.000	0.04	0.970
0.95/.40	0.0190	3.871	0.371	0.457	0.000	0.05	0.959
0.95/.35	0.0300	4.049	0.388	0.392	0.000	0.08	0.939
0.95/.30	0.0498	4.223	0.404	0.321	0.001	0.12	0.902
0.95/.25	0.0590	4.220	0.404	0.308	0.001	0.15	0.884
0.95/.20	0.0468	3.945	0.378	0.395	0.000	0.12	0.902
0.95/.15	0.0445	3.685	0.353	0.481	0.000	0.13	0.900
0.95/.10	0.0502	3.461	0.332	0.559	0.000	0.15	0.880
0.95/.05	0.0563	3.304	0.316	0.615	0.000	0.18	0.859
0.90/.85	0.0044	0.475	0.046	0.993	0.000	0.10	0.924
0.90/.80	-0.0002	0.911	0.087	0.975	0.000	-0.00	0.998
0.90/.75	-0.0049	1.321	0.126	0.944	0.000	-0.04	0.969
0.90/.70	-0.0087	1.704	0.163	0.903	0.000	-0.05	0.957
0.90/.65	-0.0120	2.062	0.198	0.853	0.000	-0.06	0.952
0.90/.60	-0.0103	2.398	0.230	0.796	0.000	-0.04	0.964
0.90/.55	-0.0047	2.711	0.260	0.733	0.000	-0.02	0.986
0.90/.50	0.0065	3.004	0.288	0.664	0.000	0.02	0.982
0.90/.45	0.0126	3.238	0.310	0.601	0.000	0.04	0.968
0.90/.40	0.0185	3.436	0.329	0.541	0.000	0.06	0.955
0.90/.35	0.0295	3.631	0.348	0.476	0.000	0.08	0.933

0.90/.30	0.0493	3.824	0.366	0.403	0.000	0.13	0.893
0.90/.25	0.0585	3.842	0.368	0.384	0.000	0.16	0.874
0.90/.20	0.0463	3.589	0.344	0.462	0.000	0.13	0.893
0.90/.15	0.0439	3.361	0.322	0.534	0.000	0.14	0.892
0.90/.10	0.0497	3.183	0.305	0.594	0.000	0.16	0.871
0.90/.05	0.0558	3.087	0.296	0.627	0.000	0.19	0.851
0.85/.80	-0.0046	0.443	0.042	0.994	0.000	-0.11	0.914
0.85/.75	-0.0092	0.860	0.082	0.975	0.000	-0.11	0.911
0.85/.70	-0.0131	1.250	0.120	0.945	0.000	-0.11	0.913
0.85/.65	-0.0163	1.614	0.155	0.904	0.000	-0.11	0.916
0.85/.60	-0.0147	1.957	0.187	0.856	0.000	-0.08	0.938
0.85/.55	-0.0091	2.279	0.218	0.800	0.000	-0.04	0.967
0.85/.50	0.0021	2.581	0.247	0.737	0.000	0.01	0.993
0.85/.45	0.0083	2.827	0.271	0.678	0.000	0.03	0.976
0.85/.40	0.0141	3.039	0.291	0.620	0.000	0.05	0.961
0.85/.35	0.0251	3.250	0.311	0.555	0.000	0.08	0.936
0.85/.30	0.0449	3.463	0.332	0.481	0.000	0.14	0.892
0.85/.25	0.0542	3.502	0.335	0.458	0.000	0.16	0.872
0.85/.20	0.0419	3.277	0.314	0.523	0.000	0.13	0.894
0.85/.15	0.0396	3.087	0.296	0.581	0.000	0.13	0.894
0.85/.10	0.0453	2.960	0.284	0.622	0.000	0.16	0.873
0.85/.05	0.0514	2.930	0.281	0.633	0.000	0.18	0.855
0.80/.75	-0.0047	0.419	0.040	0.994	0.000	-0.12	0.908
0.80/.70	-0.0085	0.812	0.078	0.975	0.000	-0.11	0.913
0.80/.65	-0.0117	1.180	0.113	0.946	0.000	-0.10	0.917
0.80/.60	-0.0101	1.528	0.146	0.907	0.000	-0.07	0.945
0.80/.55	-0.0045	1.856	0.178	0.860	0.000	-0.03	0.980
0.80/.50	0.0067	2.166	0.208	0.806	0.000	0.03	0.974
0.80/.45	0.0128	2.421	0.232	0.753	0.000	0.06	0.956
0.80/.40	0.0187	2.645	0.253	0.698	0.000	0.07	0.941
0.80/.35	0.0297	2.872	0.275	0.636	0.000	0.11	0.914
0.80/.30	0.0495	3.104	0.297	0.563	0.000	0.17	0.868
0.80/.25	0.0587	3.163	0.303	0.536	0.000	0.19	0.847
0.80/.20	0.0465	2.964	0.284	0.591	0.000	0.16	0.870
0.80/.15	0.0442	2.812	0.269	0.635	0.000	0.16	0.870
0.80/.10	0.0499	2.737	0.262	0.659	0.000	0.19	0.849
0.80/.05	0.0560	2.771	0.265	0.648	0.000	0.21	0.833
0.75/.70	-0.0039	0.394	0.038	0.994	0.000	-0.10	0.918
0.75/.65	-0.0071	0.765	0.073	0.976	0.000	-0.10	0.923
0.75/.60	-0.0054	1.117	0.107	0.949	0.000	-0.05	0.960
0.75/.55	0.0001	1.450	0.139	0.911	0.000	0.00	0.999
0.75/.50	0.0114	1.767	0.169	0.866	0.000	0.07	0.947
0.75/.45	0.0175	2.030	0.194	0.819	0.000	0.09	0.928
0.75/.40	0.0234	2.266	0.217	0.770	0.000	0.11	0.914
0.75/.35	0.0343	2.508	0.240	0.712	0.000	0.14	0.887
0.75/.30	0.0542	2.758	0.264	0.642	0.000	0.21	0.838
0.75/.25	0.0634	2.838	0.272	0.613	0.000	0.23	0.816
0.75/.20	0.0511	2.666	0.255	0.658	0.000	0.20	0.842
0.75/.15	0.0488	2.554	0.245	0.689	0.000	0.20	0.842
0.75/.10	0.0546	2.533	0.243	0.695	0.000	0.22	0.823
0.75/.05	0.0606	2.633	0.252	0.665	0.000	0.24	0.810
0.70/.65	-0.0032	0.373	0.036	0.994	0.000	-0.09	0.929
0.70/.60	-0.0016	0.728	0.070	0.977	0.000	-0.02	0.982
0.70/.55	0.0040	1.065	0.102	0.951	0.000	0.04	0.969
0.70/.50	0.0152	1.387	0.133	0.915	0.000	0.11	0.909
0.70/.45	0.0214	1.657	0.159	0.876	0.000	0.13	0.893
0.70/.40	0.0272	1.906	0.183	0.833	0.000	0.15	0.882
0.70/.35	0.0382	2.164	0.207	0.779	0.000	0.18	0.854
0.70/.30	0.0581	2.432	0.233	0.714	0.000	0.25	0.804

0.70/.25	0.0673	2.532	0.243	0.683	0.000	0.28	0.782
0.70/.20	0.0550	2.391	0.229	0.718	0.000	0.24	0.811
0.70/.15	0.0527	2.323	0.223	0.736	0.000	0.24	0.813
0.70/.10	0.0584	2.359	0.226	0.727	0.000	0.26	0.796
0.70/.05	0.0645	2.524	0.242	0.677	0.000	0.27	0.790
0.65/.60	0.0016	0.356	0.034	0.994	0.000	0.05	0.962
0.65/.55	0.0072	0.695	0.067	0.978	0.000	0.11	0.914
0.65/.50	0.0184	1.022	0.098	0.952	0.000	0.19	0.851
0.65/.45	0.0246	1.299	0.124	0.922	0.000	0.20	0.844
0.65/.40	0.0304	1.561	0.150	0.885	0.000	0.20	0.839
0.65/.35	0.0414	1.835	0.176	0.837	0.000	0.24	0.814
0.65/.30	0.0613	2.121	0.203	0.777	0.000	0.30	0.763
0.65/.25	0.0705	2.242	0.215	0.746	0.000	0.33	0.743
0.65/.20	0.0582	2.135	0.204	0.771	0.000	0.28	0.776
0.65/.15	0.0559	2.115	0.203	0.777	0.000	0.28	0.783
0.65/.10	0.0616	2.210	0.212	0.754	0.000	0.29	0.771
0.65/.05	0.0677	2.436	0.233	0.687	0.000	0.29	0.772
0.60/.55	0.0056	0.341	0.033	0.995	0.000	0.17	0.865
0.60/.50	0.0168	0.671	0.064	0.979	0.000	0.26	0.794
0.60/.45	0.0229	0.955	0.092	0.957	0.000	0.25	0.803
0.60/.40	0.0288	1.232	0.118	0.927	0.000	0.24	0.808
0.60/.35	0.0398	1.523	0.146	0.886	0.000	0.27	0.786
0.60/.30	0.0596	1.825	0.175	0.832	0.000	0.34	0.734
0.60/.25	0.0688	1.968	0.188	0.801	0.000	0.37	0.716
0.60/.20	0.0566	1.898	0.182	0.817	0.000	0.31	0.756
0.60/.15	0.0543	1.929	0.185	0.812	0.000	0.29	0.770
0.60/.10	0.0600	2.083	0.200	0.775	0.000	0.30	0.764
0.60/.05	0.0661	2.367	0.227	0.693	0.000	0.29	0.771
0.55/.50	0.0112	0.332	0.032	0.995	0.000	0.35	0.725
0.55/.45	0.0174	0.623	0.060	0.981	0.000	0.29	0.772
0.55/.40	0.0232	0.918	0.088	0.959	0.000	0.26	0.792
0.55/.35	0.0342	1.226	0.117	0.925	0.000	0.29	0.771
0.55/.30	0.0540	1.544	0.148	0.878	0.000	0.37	0.715
0.55/.25	0.0632	1.707	0.163	0.848	0.000	0.39	0.700
0.55/.20	0.0510	1.677	0.161	0.855	0.000	0.32	0.752
0.55/.15	0.0487	1.762	0.169	0.841	0.000	0.29	0.774
0.55/.10	0.0544	1.974	0.189	0.793	0.000	0.29	0.774
0.55/.05	0.0605	2.309	0.221	0.697	0.000	0.27	0.785
0.50/.45	0.0061	0.307	0.029	0.995	0.000	0.21	0.835
0.50/.40	0.0120	0.625	0.060	0.981	0.000	0.20	0.841
0.50/.35	0.0230	0.948	0.091	0.954	0.000	0.25	0.801
0.50/.30	0.0428	1.278	0.122	0.915	0.000	0.35	0.727
0.50/.25	0.0520	1.460	0.140	0.887	0.000	0.37	0.710
0.50/.20	0.0398	1.475	0.141	0.887	0.000	0.28	0.779
0.50/.15	0.0375	1.615	0.155	0.864	0.000	0.24	0.809
0.50/.10	0.0432	1.881	0.180	0.806	0.000	0.24	0.811
0.50/.05	0.0493	2.258	0.216	0.699	0.000	0.23	0.820
0.45/.40	0.0059	0.326	0.031	0.995	0.000	0.19	0.852
0.45/.35	0.0168	0.654	0.063	0.978	0.000	0.27	0.789
0.45/.30	0.0367	0.990	0.095	0.948	0.000	0.39	0.699
0.45/.25	0.0459	1.187	0.114	0.924	0.000	0.40	0.687
0.45/.20	0.0336	1.249	0.120	0.918	0.000	0.28	0.779
0.45/.15	0.0313	1.448	0.139	0.888	0.000	0.23	0.822
0.45/.10	0.0371	1.768	0.169	0.822	0.000	0.22	0.827
0.45/.05	0.0431	2.187	0.210	0.706	0.000	0.21	0.837
0.40/.35	0.0110	0.331	0.032	0.994	0.000	0.35	0.730
0.40/.30	0.0308	0.671	0.064	0.976	0.000	0.48	0.632
0.40/.25	0.0400	0.883	0.085	0.958	0.000	0.47	0.637
0.40/.20	0.0278	1.000	0.096	0.947	0.000	0.29	0.772

0.40/.15	0.0255	1.266	0.121	0.912	0.000	0.21	0.834
0.40/.10	0.0312	1.642	0.157	0.840	0.000	0.20	0.843
0.40/.05	0.0373	2.100	0.201	0.717	0.000	0.19	0.853
0.35/.30	0.0199	0.342	0.033	0.993	0.000	0.61	0.546
0.35/.25	0.0291	0.571	0.055	0.982	0.000	0.53	0.596
0.35/.20	0.0168	0.764	0.073	0.969	0.000	0.23	0.819
0.35/.15	0.0145	1.104	0.106	0.930	0.000	0.14	0.891
0.35/.10	0.0202	1.526	0.146	0.854	0.000	0.14	0.890
0.35/.05	0.0263	2.013	0.193	0.726	0.000	0.14	0.892
0.30/.25	0.0092	0.261	0.025	0.996	0.000	0.37	0.713
0.30/.20	-0.0030	0.579	0.055	0.981	0.000	-0.05	0.956
0.30/.15	-0.0054	0.982	0.094	0.941	0.000	-0.06	0.955
0.30/.10	0.0004	1.433	0.137	0.863	0.000	0.00	0.998
0.30/.05	0.0064	1.933	0.185	0.733	0.000	0.03	0.972
0.25/.20	-0.0123	0.386	0.037	0.991	0.000	-0.33	0.741
0.25/.15	-0.0146	0.801	0.077	0.957	0.000	-0.19	0.850
0.25/.10	-0.0088	1.256	0.120	0.887	0.000	-0.07	0.942
0.25/.05	-0.0028	1.757	0.168	0.766	0.000	-0.02	0.987
0.20/.15	-0.0023	0.420	0.040	0.987	0.000	-0.06	0.954
0.20/.10	0.0034	0.880	0.084	0.941	0.000	0.04	0.968
0.20/.05	0.0095	1.388	0.133	0.844	0.000	0.07	0.943
0.15/.10	0.0057	0.464	0.044	0.982	0.000	0.13	0.897
0.15/.05	0.0118	0.977	0.094	0.917	0.000	0.13	0.900
0.10/.05	0.0061	0.518	0.050	0.975	0.000	0.12	0.903

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0.95/.90	0.0020	0.152	0.015	0.990	0.000	0.14	0.892
0.95/.85	-0.0034	0.317	0.030	0.953	0.000	-0.11	0.911
0.95/.80	-0.0126	0.493	0.047	0.883	0.000	-0.27	0.789
0.95/.75	-0.0249	0.677	0.065	0.789	0.000	-0.38	0.702
0.95/.70	-0.0391	0.865	0.083	0.689	0.000	-0.47	0.638
0.95/.65	-0.0573	1.048	0.100	0.597	0.000	-0.57	0.569
0.95/.60	-0.0785	1.220	0.117	0.526	0.000	-0.67	0.503
0.95/.55	-0.1177	1.333	0.128	0.507	0.000	-0.92	0.359
0.95/.50	-0.1619	1.429	0.137	0.503	0.000	-1.18	0.239
0.95/.45	-0.2065	1.504	0.144	0.510	0.000	-1.43	0.155
0.95/.40	-0.2488	1.552	0.149	0.528	0.000	-1.67	0.097
0.95/.35	-0.2904	1.565	0.150	0.557	0.000	-1.94	0.055
0.95/.30	-0.3373	1.534	0.147	0.598	0.000	-2.30	0.024
0.95/.25	-0.3821	1.459	0.140	0.652	0.000	-2.73	0.007
0.95/.20	-0.4258	1.343	0.129	0.719	0.000	-3.31	0.001
0.95/.15	-0.4682	1.207	0.116	0.793	0.000	-4.05	0.000
0.95/.10	-0.5113	1.121	0.107	0.855	0.000	-4.76	0.000
0.95/.05	-0.5597	1.231	0.118	0.867	0.000	-4.75	0.000
0.90/.85	-0.0054	0.169	0.016	0.985	0.000	-0.33	0.741
0.90/.80	-0.0146	0.348	0.033	0.938	0.000	-0.44	0.662
0.90/.75	-0.0269	0.535	0.051	0.863	0.000	-0.52	0.601
0.90/.70	-0.0411	0.725	0.069	0.777	0.000	-0.59	0.556
0.90/.65	-0.0593	0.912	0.087	0.694	0.000	-0.68	0.499
0.90/.60	-0.0804	1.087	0.104	0.628	0.000	-0.77	0.441
0.90/.55	-0.1197	1.204	0.115	0.608	0.000	-1.04	0.302
0.90/.50	-0.1639	1.305	0.125	0.602	0.000	-1.31	0.193
0.90/.45	-0.2085	1.386	0.133	0.606	0.000	-1.57	0.119
0.90/.40	-0.2508	1.440	0.138	0.619	0.000	-1.82	0.072
0.90/.35	-0.2924	1.461	0.140	0.642	0.000	-2.09	0.039
0.90/.30	-0.3392	1.440	0.138	0.674	0.000	-2.46	0.016
0.90/.25	-0.3841	1.379	0.132	0.718	0.000	-2.91	0.004

0.90/.20	-0.4277	1.282	0.123	0.770	0.000	-3.48	0.001
0.90/.15	-0.4702	1.178	0.113	0.823	0.000	-4.17	0.000
0.90/.10	-0.5133	1.141	0.109	0.857	0.000	-4.70	0.000
0.90/.05	-0.5616	1.307	0.125	0.836	0.000	-4.49	0.000
0.85/.80	-0.0093	0.181	0.017	0.983	0.000	-0.53	0.594
0.85/.75	-0.0215	0.370	0.035	0.935	0.000	-0.61	0.545
0.85/.70	-0.0357	0.562	0.054	0.870	0.000	-0.66	0.509
0.85/.65	-0.0539	0.751	0.072	0.802	0.000	-0.75	0.455
0.85/.60	-0.0751	0.929	0.089	0.744	0.000	-0.84	0.401
0.85/.55	-0.1143	1.050	0.101	0.725	0.000	-1.14	0.258
0.85/.50	-0.1585	1.157	0.111	0.717	0.000	-1.43	0.155
0.85/.45	-0.2031	1.245	0.119	0.716	0.000	-1.70	0.091
0.85/.40	-0.2454	1.307	0.125	0.723	0.000	-1.96	0.053
0.85/.35	-0.2870	1.337	0.128	0.738	0.000	-2.24	0.027
0.85/.30	-0.3339	1.327	0.127	0.762	0.000	-2.63	0.010
0.85/.25	-0.3787	1.280	0.123	0.793	0.000	-3.09	0.003
0.85/.20	-0.4224	1.205	0.115	0.827	0.000	-3.66	0.000
0.85/.15	-0.4648	1.137	0.109	0.856	0.000	-4.27	0.000
0.85/.10	-0.5079	1.155	0.111	0.856	0.000	-4.59	0.000
0.85/.05	-0.5563	1.379	0.132	0.794	0.000	-4.21	0.000
0.80/.75	-0.0123	0.190	0.018	0.984	0.000	-0.67	0.501
0.80/.70	-0.0264	0.383	0.037	0.945	0.000	-0.72	0.473
0.80/.65	-0.0447	0.574	0.055	0.896	0.000	-0.81	0.419
0.80/.60	-0.0658	0.754	0.072	0.850	0.000	-0.91	0.364
0.80/.55	-0.1051	0.880	0.084	0.833	0.000	-1.25	0.215
0.80/.50	-0.1492	0.992	0.095	0.824	0.000	-1.57	0.119
0.80/.45	-0.1938	1.088	0.104	0.820	0.000	-1.86	0.065
0.80/.40	-0.2362	1.159	0.111	0.821	0.000	-2.13	0.036
0.80/.35	-0.2778	1.200	0.115	0.828	0.000	-2.42	0.017
0.80/.30	-0.3246	1.202	0.115	0.841	0.000	-2.82	0.006
0.80/.25	-0.3694	1.172	0.112	0.858	0.000	-3.29	0.001
0.80/.20	-0.4131	1.125	0.108	0.872	0.000	-3.83	0.000
0.80/.15	-0.4555	1.100	0.105	0.873	0.000	-4.32	0.000
0.80/.10	-0.4987	1.178	0.113	0.835	0.000	-4.42	0.000
0.80/.05	-0.5470	1.459	0.140	0.731	0.000	-3.91	0.000
0.75/.70	-0.0142	0.194	0.019	0.988	0.000	-0.76	0.448
0.75/.65	-0.0324	0.387	0.037	0.960	0.000	-0.87	0.384
0.75/.60	-0.0535	0.569	0.054	0.928	0.000	-0.98	0.328
0.75/.55	-0.0928	0.698	0.067	0.915	0.000	-1.39	0.168
0.75/.50	-0.1370	0.818	0.078	0.905	0.000	-1.75	0.083
0.75/.45	-0.1816	0.922	0.088	0.898	0.000	-2.06	0.042
0.75/.40	-0.2239	1.005	0.096	0.894	0.000	-2.33	0.022
0.75/.35	-0.2655	1.059	0.101	0.894	0.000	-2.62	0.010
0.75/.30	-0.3123	1.075	0.103	0.897	0.000	-3.03	0.003
0.75/.25	-0.3571	1.067	0.102	0.899	0.000	-3.49	0.001
0.75/.20	-0.4008	1.053	0.101	0.894	0.000	-3.98	0.000
0.75/.15	-0.4433	1.077	0.103	0.868	0.000	-4.30	0.000
0.75/.10	-0.4864	1.216	0.116	0.796	0.000	-4.18	0.000
0.75/.05	-0.5347	1.549	0.148	0.655	0.000	-3.60	0.000
0.70/.65	-0.0182	0.194	0.019	0.992	0.000	-0.98	0.329
0.70/.60	-0.0394	0.378	0.036	0.974	0.000	-1.09	0.279
0.70/.55	-0.0786	0.513	0.049	0.964	0.000	-1.60	0.113
0.70/.50	-0.1228	0.642	0.062	0.955	0.000	-2.00	0.049
0.70/.45	-0.1674	0.758	0.073	0.946	0.000	-2.30	0.023
0.70/.40	-0.2097	0.854	0.082	0.938	0.000	-2.57	0.012
0.70/.35	-0.2513	0.922	0.088	0.931	0.000	-2.85	0.005
0.70/.30	-0.2982	0.957	0.092	0.926	0.000	-3.25	0.002
0.70/.25	-0.3430	0.975	0.093	0.916	0.000	-3.67	0.000
0.70/.20	-0.3867	0.998	0.096	0.895	0.000	-4.04	0.000

0.70/.15	-0.4291	1.074	0.103	0.847	0.000	-4.17	0.000
0.70/.10	-0.4722	1.270	0.122	0.748	0.000	-3.88	0.000
0.70/.05	-0.5206	1.646	0.158	0.578	0.000	-3.30	0.001
0.65/.60	-0.0212	0.184	0.018	0.995	0.000	-1.20	0.233
0.65/.55	-0.0604	0.331	0.032	0.989	0.000	-1.90	0.059
0.65/.50	-0.1046	0.475	0.045	0.980	0.000	-2.30	0.023
0.65/.45	-0.1492	0.605	0.058	0.970	0.000	-2.58	0.011
0.65/.40	-0.1915	0.714	0.068	0.959	0.000	-2.80	0.006
0.65/.35	-0.2331	0.800	0.077	0.948	0.000	-3.04	0.003
0.65/.30	-0.2799	0.855	0.082	0.936	0.000	-3.42	0.001
0.65/.25	-0.3248	0.902	0.086	0.918	0.000	-3.76	0.000
0.65/.20	-0.3684	0.966	0.093	0.884	0.000	-3.98	0.000
0.65/.15	-0.4109	1.091	0.105	0.820	0.000	-3.93	0.000
0.65/.10	-0.4540	1.334	0.128	0.702	0.000	-3.55	0.001
0.65/.05	-0.5024	1.745	0.167	0.514	0.000	-3.01	0.003
0.60/.55	-0.0393	0.174	0.017	0.997	0.000	-2.36	0.020
0.60/.50	-0.0834	0.333	0.032	0.989	0.000	-2.61	0.010
0.60/.45	-0.1280	0.476	0.046	0.979	0.000	-2.81	0.006
0.60/.40	-0.1703	0.599	0.057	0.967	0.000	-2.97	0.004
0.60/.35	-0.2119	0.701	0.067	0.953	0.000	-3.16	0.002
0.60/.30	-0.2588	0.777	0.074	0.938	0.000	-3.48	0.001
0.60/.25	-0.3036	0.853	0.082	0.913	0.000	-3.72	0.000
0.60/.20	-0.3473	0.954	0.091	0.872	0.000	-3.80	0.000
0.60/.15	-0.3897	1.121	0.107	0.797	0.000	-3.63	0.000
0.60/.10	-0.4329	1.402	0.134	0.667	0.000	-3.22	0.002
0.60/.05	-0.4812	1.839	0.176	0.467	0.000	-2.73	0.007
0.55/.50	-0.0442	0.163	0.016	0.998	0.000	-2.83	0.006
0.55/.45	-0.0888	0.309	0.030	0.992	0.000	-3.00	0.003
0.55/.40	-0.1311	0.438	0.042	0.983	0.000	-3.12	0.002
0.55/.35	-0.1727	0.550	0.053	0.971	0.000	-3.28	0.001
0.55/.30	-0.2195	0.641	0.061	0.956	0.000	-3.58	0.001
0.55/.25	-0.2644	0.741	0.071	0.931	0.000	-3.72	0.000
0.55/.20	-0.3080	0.878	0.084	0.888	0.000	-3.66	0.000
0.55/.15	-0.3505	1.089	0.104	0.809	0.000	-3.36	0.001
0.55/.10	-0.3936	1.411	0.135	0.671	0.000	-2.91	0.004
0.55/.05	-0.4420	1.882	0.180	0.462	0.000	-2.45	0.016
0.50/.45	-0.0446	0.148	0.014	0.998	0.000	-3.14	0.002
0.50/.40	-0.0869	0.282	0.027	0.993	0.000	-3.22	0.002
0.50/.35	-0.1285	0.402	0.039	0.984	0.000	-3.34	0.001
0.50/.30	-0.1754	0.508	0.049	0.971	0.000	-3.60	0.000
0.50/.25	-0.2202	0.634	0.061	0.947	0.000	-3.63	0.000
0.50/.20	-0.2639	0.805	0.077	0.904	0.000	-3.42	0.001
0.50/.15	-0.3063	1.053	0.101	0.824	0.000	-3.04	0.003
0.50/.10	-0.3495	1.411	0.135	0.684	0.000	-2.59	0.011
0.50/.05	-0.3978	1.910	0.183	0.469	0.000	-2.17	0.032
0.45/.40	-0.0423	0.137	0.013	0.998	0.000	-3.23	0.002
0.45/.35	-0.0839	0.264	0.025	0.993	0.000	-3.32	0.001
0.45/.30	-0.1308	0.385	0.037	0.982	0.000	-3.54	0.001
0.45/.25	-0.1756	0.535	0.051	0.961	0.000	-3.43	0.001
0.45/.20	-0.2193	0.736	0.070	0.920	0.000	-3.11	0.002
0.45/.15	-0.2617	1.014	0.097	0.842	0.000	-2.69	0.008
0.45/.10	-0.3048	1.399	0.134	0.702	0.000	-2.28	0.025
0.45/.05	-0.3532	1.920	0.184	0.486	0.000	-1.92	0.057
0.40/.35	-0.0416	0.132	0.013	0.998	0.000	-3.29	0.001
0.40/.30	-0.0884	0.268	0.026	0.991	0.000	-3.45	0.001
0.40/.25	-0.1333	0.438	0.042	0.973	0.000	-3.18	0.002
0.40/.20	-0.1770	0.662	0.063	0.937	0.000	-2.79	0.006
0.40/.15	-0.2194	0.962	0.092	0.863	0.000	-2.38	0.019
0.40/.10	-0.2625	1.366	0.131	0.727	0.000	-2.01	0.047

0.40/.05	-0.3109	1.902	0.182	0.514	0.000	-1.71	0.091
0.35/.30	-0.0468	0.149	0.014	0.997	0.000	-3.29	0.001
0.35/.25	-0.0917	0.332	0.032	0.985	0.000	-2.88	0.005
0.35/.20	-0.1353	0.570	0.055	0.954	0.000	-2.48	0.015
0.35/.15	-0.1778	0.885	0.085	0.888	0.000	-2.10	0.038
0.35/.10	-0.2209	1.302	0.125	0.760	0.000	-1.77	0.079
0.35/.05	-0.2693	1.849	0.177	0.553	0.000	-1.52	0.131
0.30/.25	-0.0448	0.188	0.018	0.995	0.000	-2.48	0.015
0.30/.20	-0.0885	0.434	0.042	0.974	0.000	-2.13	0.035
0.30/.15	-0.1309	0.758	0.073	0.919	0.000	-1.80	0.074
0.30/.10	-0.1741	1.184	0.113	0.804	0.000	-1.53	0.128
0.30/.05	-0.2224	1.740	0.167	0.609	0.000	-1.33	0.185
0.25/.20	-0.0437	0.249	0.024	0.991	0.000	-1.83	0.070
0.25/.15	-0.0861	0.579	0.055	0.953	0.000	-1.55	0.124
0.25/.10	-0.1293	1.012	0.097	0.857	0.000	-1.33	0.185
0.25/.05	-0.1776	1.573	0.151	0.680	0.000	-1.18	0.241
0.20/.15	-0.0424	0.332	0.032	0.984	0.000	-1.33	0.186
0.20/.10	-0.0856	0.768	0.074	0.916	0.000	-1.16	0.247
0.20/.05	-0.1339	1.334	0.128	0.768	0.000	-1.05	0.297
0.15/.10	-0.0432	0.438	0.042	0.972	0.000	-1.03	0.306
0.15/.05	-0.0915	1.007	0.096	0.868	0.000	-0.95	0.345
0.10/.05	-0.0483	0.571	0.055	0.960	0.000	-0.88	0.379

1983

0.95/.90	0.0094	0.042	0.004	1.000	0.000	2.35	0.021
0.95/.85	0.0189	0.084	0.008	0.998	0.000	2.36	0.020
0.95/.80	0.0260	0.124	0.012	0.996	0.000	2.18	0.031
0.95/.75	0.0304	0.169	0.016	0.993	0.000	1.88	0.063
0.95/.70	0.0356	0.227	0.022	0.985	0.000	1.64	0.105
0.95/.65	0.0419	0.299	0.029	0.968	0.000	1.46	0.147
0.95/.60	0.0494	0.383	0.037	0.933	0.000	1.35	0.181
0.95/.55	0.0590	0.478	0.046	0.875	0.000	1.29	0.201
0.95/.50	0.0700	0.582	0.056	0.787	0.000	1.26	0.212
0.95/.45	0.0837	0.692	0.066	0.669	0.000	1.26	0.209
0.95/.40	0.0998	0.804	0.077	0.530	0.000	1.30	0.198
0.95/.35	0.1139	0.910	0.087	0.386	0.000	1.31	0.194
0.95/.30	0.1138	0.961	0.092	0.310	0.001	1.24	0.219
0.95/.25	0.1130	1.007	0.096	0.235	0.014	1.17	0.244
0.95/.20	0.1009	1.036	0.099	0.174	0.070	1.02	0.311
0.95/.15	0.0776	1.043	0.100	0.135	0.160	0.78	0.439
0.95/.10	0.0332	0.994	0.095	0.196	0.041	0.35	0.728
0.95/.05	-0.0380	0.931	0.089	0.309	0.001	-0.43	0.671
0.90/.85	0.0095	0.043	0.004	0.999	0.000	2.30	0.023
0.90/.80	0.0166	0.087	0.008	0.998	0.000	1.99	0.049
0.90/.75	0.0210	0.135	0.013	0.995	0.000	1.63	0.107
0.90/.70	0.0262	0.197	0.019	0.987	0.000	1.39	0.167
0.90/.65	0.0325	0.272	0.026	0.969	0.000	1.25	0.215
0.90/.60	0.0400	0.358	0.034	0.935	0.000	1.17	0.246
0.90/.55	0.0496	0.455	0.044	0.875	0.000	1.14	0.258
0.90/.50	0.0606	0.561	0.054	0.786	0.000	1.13	0.262
0.90/.45	0.0743	0.671	0.064	0.668	0.000	1.16	0.250
0.90/.40	0.0904	0.784	0.075	0.527	0.000	1.20	0.232
0.90/.35	0.1045	0.891	0.085	0.382	0.000	1.22	0.223
0.90/.30	0.1044	0.942	0.090	0.304	0.001	1.16	0.250
0.90/.25	0.1036	0.988	0.095	0.229	0.017	1.09	0.276
0.90/.20	0.0915	1.016	0.097	0.167	0.083	0.94	0.349
0.90/.15	0.0682	1.022	0.098	0.128	0.185	0.70	0.487

0.90/.10	0.0238	0.973	0.093	0.188	0.050	0.26	0.799
0.90/.05	-0.0474	0.910	0.087	0.304	0.001	-0.54	0.588
0.85/.80	0.0071	0.047	0.005	0.999	0.000	1.57	0.119
0.85/.75	0.0115	0.101	0.010	0.997	0.000	1.19	0.237
0.85/.70	0.0167	0.168	0.016	0.989	0.000	1.04	0.301
0.85/.65	0.0230	0.247	0.024	0.970	0.000	0.97	0.333
0.85/.60	0.0305	0.336	0.032	0.934	0.000	0.95	0.345
0.85/.55	0.0401	0.435	0.042	0.874	0.000	0.96	0.338
0.85/.50	0.0511	0.541	0.052	0.783	0.000	0.98	0.327
0.85/.45	0.0648	0.653	0.063	0.663	0.000	1.04	0.302
0.85/.40	0.0809	0.767	0.073	0.521	0.000	1.10	0.273
0.85/.35	0.0950	0.873	0.084	0.374	0.000	1.14	0.258
0.85/.30	0.0949	0.925	0.089	0.294	0.002	1.07	0.286
0.85/.25	0.0942	0.972	0.093	0.217	0.023	1.01	0.314
0.85/.20	0.0821	0.999	0.096	0.154	0.109	0.86	0.393
0.85/.15	0.0588	1.004	0.096	0.115	0.234	0.61	0.542
0.85/.10	0.0143	0.954	0.091	0.175	0.068	0.16	0.876
0.85/.05	-0.0568	0.889	0.085	0.297	0.002	-0.67	0.506
0.80/.75	0.0044	0.061	0.006	0.998	0.000	0.75	0.454
0.80/.70	0.0096	0.132	0.013	0.991	0.000	0.76	0.448
0.80/.65	0.0159	0.213	0.020	0.974	0.000	0.78	0.439
0.80/.60	0.0234	0.305	0.029	0.939	0.000	0.80	0.424
0.80/.55	0.0330	0.405	0.039	0.879	0.000	0.85	0.398
0.80/.50	0.0440	0.513	0.049	0.788	0.000	0.89	0.373
0.80/.45	0.0577	0.625	0.060	0.668	0.000	0.96	0.337
0.80/.40	0.0738	0.739	0.071	0.526	0.000	1.04	0.300
0.80/.35	0.0879	0.845	0.081	0.378	0.000	1.09	0.280
0.80/.30	0.0878	0.898	0.086	0.296	0.002	1.02	0.310
0.80/.25	0.0870	0.945	0.091	0.217	0.023	0.96	0.338
0.80/.20	0.0749	0.972	0.093	0.153	0.113	0.80	0.423
0.80/.15	0.0516	0.977	0.094	0.112	0.248	0.55	0.582
0.80/.10	0.0072	0.928	0.089	0.171	0.076	0.08	0.935
0.80/.05	-0.0640	0.863	0.083	0.294	0.002	-0.77	0.441
0.75/.70	0.0052	0.071	0.007	0.997	0.000	0.77	0.445
0.75/.65	0.0115	0.153	0.015	0.985	0.000	0.78	0.435
0.75/.60	0.0190	0.245	0.023	0.956	0.000	0.81	0.419
0.75/.55	0.0286	0.346	0.033	0.904	0.000	0.86	0.390
0.75/.50	0.0396	0.454	0.043	0.820	0.000	0.91	0.365
0.75/.45	0.0533	0.567	0.054	0.707	0.000	0.98	0.328
0.75/.40	0.0694	0.681	0.065	0.570	0.000	1.06	0.290
0.75/.35	0.0835	0.788	0.075	0.425	0.000	1.11	0.271
0.75/.30	0.0834	0.842	0.081	0.344	0.000	1.03	0.303
0.75/.25	0.0827	0.890	0.085	0.263	0.006	0.97	0.334
0.75/.20	0.0706	0.919	0.088	0.196	0.041	0.80	0.425
0.75/.15	0.0473	0.928	0.089	0.149	0.122	0.53	0.596
0.75/.10	0.0028	0.884	0.085	0.196	0.041	0.03	0.973
0.75/.05	-0.0683	0.828	0.079	0.303	0.001	-0.86	0.391
0.70/.65	0.0062	0.082	0.008	0.995	0.000	0.80	0.428
0.70/.60	0.0138	0.174	0.017	0.976	0.000	0.83	0.410
0.70/.55	0.0233	0.276	0.026	0.933	0.000	0.88	0.378
0.70/.50	0.0343	0.384	0.037	0.861	0.000	0.93	0.353
0.70/.45	0.0481	0.497	0.048	0.757	0.000	1.01	0.315
0.70/.40	0.0642	0.612	0.059	0.628	0.000	1.09	0.276
0.70/.35	0.0782	0.719	0.069	0.489	0.000	1.14	0.259
0.70/.30	0.0782	0.774	0.074	0.410	0.000	1.05	0.294
0.70/.25	0.0774	0.824	0.079	0.328	0.001	0.98	0.329
0.70/.20	0.0653	0.857	0.082	0.257	0.007	0.80	0.428
0.70/.15	0.0420	0.870	0.083	0.201	0.036	0.50	0.615
0.70/.10	-0.0024	0.835	0.080	0.232	0.015	-0.03	0.976

0.70/.05	-0.0736	0.792	0.076	0.314	0.001	-0.97	0.334
0.65/.60	0.0076	0.092	0.009	0.992	0.000	0.85	0.395
0.65/.55	0.0171	0.194	0.019	0.964	0.000	0.92	0.359
0.65/.50	0.0281	0.303	0.029	0.906	0.000	0.97	0.335
0.65/.45	0.0419	0.416	0.040	0.817	0.000	1.05	0.296
0.65/.40	0.0579	0.532	0.051	0.700	0.000	1.14	0.258
0.65/.35	0.0720	0.640	0.061	0.570	0.000	1.17	0.243
0.65/.30	0.0719	0.695	0.067	0.494	0.000	1.08	0.282
0.65/.25	0.0712	0.749	0.072	0.411	0.000	0.99	0.323
0.65/.20	0.0591	0.786	0.075	0.336	0.000	0.79	0.434
0.65/.15	0.0358	0.806	0.077	0.270	0.005	0.46	0.644
0.65/.10	-0.0086	0.783	0.075	0.279	0.003	-0.12	0.909
0.65/.05	-0.0798	0.758	0.073	0.327	0.001	-1.10	0.274
0.60/.55	0.0095	0.102	0.010	0.989	0.000	0.98	0.330
0.60/.50	0.0205	0.211	0.020	0.951	0.000	1.02	0.311
0.60/.45	0.0343	0.325	0.031	0.881	0.000	1.10	0.273
0.60/.40	0.0504	0.440	0.042	0.781	0.000	1.19	0.235
0.60/.35	0.0644	0.550	0.053	0.665	0.000	1.22	0.224
0.60/.30	0.0644	0.606	0.058	0.594	0.000	1.11	0.270
0.60/.25	0.0636	0.664	0.064	0.512	0.000	1.00	0.319
0.60/.20	0.0515	0.707	0.068	0.432	0.000	0.76	0.448
0.60/.15	0.0282	0.738	0.071	0.353	0.000	0.40	0.690
0.60/.10	-0.0162	0.730	0.070	0.335	0.000	-0.23	0.817
0.60/.05	-0.0874	0.729	0.070	0.338	0.000	-1.25	0.213
0.55/.50	0.0110	0.109	0.010	0.986	0.000	1.05	0.296
0.55/.45	0.0248	0.224	0.021	0.941	0.000	1.16	0.250
0.55/.40	0.0408	0.340	0.033	0.864	0.000	1.25	0.212
0.55/.35	0.0549	0.450	0.043	0.766	0.000	1.27	0.206
0.55/.30	0.0548	0.509	0.049	0.702	0.000	1.12	0.263
0.55/.25	0.0541	0.572	0.055	0.623	0.000	0.99	0.326
0.55/.20	0.0420	0.624	0.060	0.539	0.000	0.70	0.484
0.55/.15	0.0187	0.668	0.064	0.446	0.000	0.29	0.771
0.55/.10	-0.0257	0.680	0.065	0.395	0.000	-0.40	0.694
0.55/.05	-0.0969	0.709	0.068	0.343	0.000	-1.43	0.157
0.50/.45	0.0138	0.114	0.011	0.984	0.000	1.25	0.212
0.50/.40	0.0298	0.231	0.022	0.936	0.000	1.35	0.181
0.50/.35	0.0439	0.343	0.033	0.861	0.000	1.34	0.184
0.50/.30	0.0438	0.405	0.039	0.808	0.000	1.13	0.261
0.50/.25	0.0431	0.477	0.046	0.732	0.000	0.94	0.348
0.50/.20	0.0310	0.541	0.052	0.646	0.000	0.60	0.551
0.50/.15	0.0077	0.602	0.058	0.539	0.000	0.13	0.894
0.50/.10	-0.0367	0.639	0.061	0.452	0.000	-0.60	0.550
0.50/.05	-0.1079	0.703	0.067	0.337	0.000	-1.60	0.112
0.45/.40	0.0161	0.117	0.011	0.983	0.000	1.43	0.155
0.45/.35	0.0302	0.231	0.022	0.937	0.000	1.36	0.175
0.45/.30	0.0301	0.299	0.029	0.896	0.000	1.05	0.295
0.45/.25	0.0293	0.383	0.037	0.827	0.000	0.80	0.426
0.45/.20	0.0172	0.464	0.044	0.739	0.000	0.39	0.699
0.45/.15	-0.0061	0.546	0.052	0.620	0.000	-0.12	0.908
0.45/.10	-0.0505	0.612	0.059	0.495	0.000	-0.86	0.391
0.45/.05	-0.1217	0.713	0.068	0.315	0.001	-1.78	0.077
0.40/.35	0.0141	0.117	0.011	0.984	0.000	1.26	0.211
0.40/.30	0.0140	0.198	0.019	0.955	0.000	0.74	0.462
0.40/.25	0.0133	0.302	0.029	0.894	0.000	0.46	0.648
0.40/.20	0.0012	0.402	0.038	0.806	0.000	0.03	0.976
0.40/.15	-0.0221	0.507	0.049	0.677	0.000	-0.46	0.649
0.40/.10	-0.0666	0.604	0.058	0.517	0.000	-1.15	0.253
0.40/.05	-0.1377	0.738	0.071	0.277	0.004	-1.95	0.054
0.35/.30	-0.0001	0.119	0.011	0.984	0.000	-0.00	0.996

0.35/.25	-0.0008	0.242	0.023	0.933	0.000	-0.03	0.972
0.35/.20	-0.0129	0.359	0.034	0.849	0.000	-0.38	0.708
0.35/.15	-0.0362	0.484	0.046	0.713	0.000	-0.78	0.437
0.35/.10	-0.0806	0.608	0.058	0.523	0.000	-1.38	0.169
0.35/.05	-0.1518	0.771	0.074	0.229	0.017	-2.06	0.042
0.30/.25	-0.0008	0.125	0.012	0.982	0.000	-0.06	0.950
0.30/.20	-0.0129	0.249	0.024	0.928	0.000	-0.54	0.590
0.30/.15	-0.0362	0.387	0.037	0.819	0.000	-0.97	0.332
0.30/.10	-0.0806	0.532	0.051	0.640	0.000	-1.58	0.117
0.30/.05	-0.1518	0.721	0.069	0.331	0.000	-2.20	0.030
0.25/.20	-0.0121	0.132	0.013	0.980	0.000	-0.96	0.340
0.25/.15	-0.0354	0.285	0.027	0.903	0.000	-1.30	0.197
0.25/.10	-0.0798	0.450	0.043	0.745	0.000	-1.85	0.067
0.25/.05	-0.1510	0.662	0.063	0.436	0.000	-2.38	0.019
0.20/.15	-0.0233	0.164	0.016	0.967	0.000	-1.48	0.140
0.20/.10	-0.0677	0.346	0.033	0.845	0.000	-2.04	0.043
0.20/.05	-0.1389	0.579	0.055	0.555	0.000	-2.50	0.014
0.15/.10	-0.0444	0.202	0.019	0.944	0.000	-2.30	0.023
0.15/.05	-0.1156	0.452	0.043	0.713	0.000	-2.67	0.009
0.10/.05	-0.0712	0.263	0.025	0.896	0.000	-2.83	0.006

Appendix 24.

T-TESTS OF THE TRUNCATED ERRORS FOR FORECASTS OF PROFIT BY EXPONENTIAL SMOOTHING MODELS, (109 COS.).

ERROR MEASURED BY MAPE/ACTUAL ONLY.

	(DIFFERENCE) MEAN	STANDARD DEVIATION	STANDARD ERROR	CORR.	2-TAIL PROB.	T VALUE	2-TAIL PROB.
1980							
0.95/.90	-0.0003	0.029	0.003	0.997	0.000	-0.12	0.908
0.95/.85	0.0001	0.053	0.005	0.990	0.000	0.01	0.991
0.95/.80	0.0006	0.075	0.007	0.981	0.000	0.09	0.928
0.95/.75	0.0009	0.097	0.009	0.968	0.000	0.10	0.920
0.95/.70	0.0011	0.120	0.011	0.952	0.000	0.09	0.926
0.95/.65	0.0031	0.140	0.013	0.934	0.000	0.23	0.815
0.95/.60	0.0032	0.154	0.015	0.919	0.000	0.21	0.831
0.95/.55	0.0027	0.172	0.016	0.897	0.000	0.16	0.872
0.95/.50	0.0017	0.194	0.019	0.868	0.000	0.09	0.929
0.95/.45	-0.0007	0.216	0.021	0.834	0.000	-0.03	0.973
0.95/.40	-0.0068	0.230	0.022	0.810	0.000	-0.31	0.757
0.95/.35	-0.0139	0.250	0.024	0.770	0.000	-0.58	0.563
0.95/.30	-0.0232	0.276	0.026	0.715	0.000	-0.88	0.382
0.95/.25	-0.0380	0.300	0.029	0.653	0.000	-1.32	0.188
0.95/.20	-0.0555	0.329	0.032	0.570	0.000	-1.76	0.081
0.95/.15	-0.0752	0.366	0.035	0.452	0.000	-2.15	0.034
0.95/.10	-0.0946	0.407	0.039	0.297	0.002	-2.43	0.017
0.95/.05	-0.1280	0.438	0.042	0.154	0.110	-3.05	0.003
0.90/.85	0.0004	0.025	0.002	0.998	0.000	0.16	0.875
0.90/.80	0.0010	0.048	0.005	0.992	0.000	0.21	0.833
0.90/.75	0.0013	0.071	0.007	0.983	0.000	0.18	0.854
0.90/.70	0.0014	0.095	0.009	0.970	0.000	0.15	0.879
0.90/.65	0.0035	0.116	0.011	0.955	0.000	0.31	0.755
0.90/.60	0.0035	0.132	0.013	0.941	0.000	0.28	0.783
0.95/.55	0.0030	0.152	0.015	0.920	0.000	0.20	0.838
0.90/.50	0.0020	0.176	0.017	0.892	0.000	0.12	0.906
0.90/.45	-0.0004	0.199	0.019	0.859	0.000	-0.02	0.984
0.90/.40	-0.0065	0.213	0.020	0.836	0.000	-0.32	0.751
0.90/.35	-0.0136	0.235	0.023	0.798	0.000	-0.60	0.547
0.90/.30	-0.0229	0.262	0.025	0.744	0.000	-0.91	0.364
0.90/.25	-0.0377	0.287	0.028	0.684	0.000	-1.37	0.173
0.90/.20	-0.0552	0.318	0.030	0.601	0.000	-1.81	0.073
0.90/.15	-0.0749	0.356	0.034	0.483	0.000	-2.20	0.030
0.90/.10	-0.0943	0.400	0.038	0.326	0.001	-2.46	0.015
0.90/.05	-0.1277	0.432	0.041	0.177	0.066	-3.08	0.003
0.85/.80	0.0006	0.024	0.002	0.998	0.000	0.26	0.797
0.85/.75	0.0009	0.048	0.005	0.992	0.000	0.19	0.847
0.85/.70	0.0010	0.072	0.007	0.983	0.000	0.15	0.884
0.85/.65	0.0031	0.094	0.009	0.970	0.000	0.34	0.732
0.85/.60	0.0031	0.112	0.011	0.957	0.000	0.29	0.773
0.85/.55	0.0026	0.134	0.013	0.938	0.000	0.20	0.840
0.85/.50	0.0016	0.160	0.015	0.911	0.000	0.11	0.916
0.85/.45	-0.0008	0.185	0.018	0.880	0.000	-0.04	0.966
0.85/.40	-0.0069	0.199	0.019	0.858	0.000	-0.36	0.719

0.85/.35	-0.0140	0.222	0.021	0.821	0.000	-0.66	0.512
0.85/.30	-0.0233	0.250	0.024	0.769	0.000	-0.97	0.334
0.82/.25	-0.0381	0.276	0.026	0.709	0.000	-1.44	0.153
0.85/.20	-0.0556	0.308	0.030	0.627	0.000	-1.88	0.062
0.85/.15	-0.0753	0.348	0.033	0.510	0.000	-2.26	0.026
0.85/.10	-0.0946	0.393	0.038	0.350	0.000	-2.51	0.014
0.85/.05	-0.1281	0.428	0.041	0.196	0.041	-3.12	0.002
0.80/.75	0.0003	0.024	0.002	0.998	0.000	0.13	0.900
0.80/.70	0.0004	0.048	0.005	0.992	0.000	0.09	0.930
0.80/.65	0.0025	0.072	0.007	0.983	0.000	0.36	0.718
0.80/.60	0.0025	0.092	0.009	0.971	0.000	0.28	0.776
0.80/.55	0.0020	0.116	0.011	0.954	0.000	0.18	0.858
0.80/.50	0.0010	0.145	0.014	0.928	0.000	0.07	0.942
0.80/.45	-0.0014	0.171	0.016	0.898	0.000	-0.08	0.934
0.80/.40	-0.0075	0.185	0.018	0.878	0.000	-0.42	0.675
0.80/.35	-0.0146	0.209	0.020	0.843	0.000	-0.73	0.468
0.80/.30	-0.0238	0.238	0.023	0.792	0.000	-1.05	0.298
0.80/.25	-0.0387	0.265	0.025	0.734	0.000	-1.52	0.131
0.80/.20	-0.0562	0.299	0.029	0.652	0.000	-1.96	0.052
0.80/.15	-0.0759	0.340	0.033	0.535	0.000	-2.33	0.022
0.80/.10	-0.0952	0.387	0.037	0.373	0.000	-2.57	0.012
0.80/.05	-0.1287	0.424	0.041	0.214	0.025	-3.17	0.002
0.75/.70	0.0001	0.025	0.002	0.998	0.000	0.05	0.960
0.75/.65	0.0022	0.050	0.005	0.992	0.000	0.46	0.647
0.75/.60	0.0022	0.073	0.007	0.982	0.000	0.32	0.752
0.75/.55	0.0017	0.100	0.010	0.966	0.000	0.18	0.859
0.75/.50	0.0007	0.130	0.012	0.942	0.000	0.06	0.954
0.75/.45	-0.0016	0.157	0.015	0.914	0.000	-0.11	0.913
0.75/.40	-0.0078	0.172	0.016	0.896	0.000	-0.47	0.638
0.75/.35	-0.0149	0.196	0.019	0.863	0.000	-0.79	0.431
0.75/.30	-0.0241	0.226	0.022	0.813	0.000	-1.11	0.268
0.75/.25	-0.0390	0.254	0.024	0.757	0.000	-1.60	0.113
0.75/.20	-0.0565	0.289	0.028	0.677	0.000	-2.04	0.044
0.75/.15	-0.0762	0.331	0.032	0.560	0.000	-2.40	0.018
0.75/.10	-0.0955	0.381	0.036	0.397	0.000	-2.62	0.010
0.75/.05	-0.1290	0.419	0.040	0.234	0.014	-3.21	0.002
0.70/.65	0.0021	0.030	0.003	0.997	0.000	0.73	0.465
0.70/.60	0.0021	0.056	0.005	0.989	0.000	0.39	0.699
0.70/.55	0.0016	0.086	0.008	0.975	0.000	0.19	0.847
0.70/.50	0.0006	0.118	0.011	0.953	0.000	0.05	0.957
0.70/.45	-0.0018	0.145	0.014	0.927	0.000	-0.13	0.899
0.75/.40	-0.0079	0.160	0.015	0.911	0.000	-0.52	0.607
0.75/.35	-0.0150	0.184	0.018	0.880	0.000	-0.85	0.397
0.70/.30	-0.0243	0.214	0.021	0.834	0.000	-1.18	0.240
0.70/.25	-0.0391	0.243	0.023	0.780	0.000	-1.68	0.097
0.70/.20	-0.0566	0.279	0.027	0.701	0.000	-2.12	0.036
0.70/.15	-0.0763	0.323	0.031	0.586	0.000	-2.47	0.015
0.70/.10	-0.0956	0.374	0.036	0.422	0.000	-2.67	0.009
0.70/.05	-0.1291	0.414	0.040	0.256	0.007	-3.25	0.002
0.65/.60	0.0000	0.030	0.003	0.997	0.000	0.00	0.998
0.65/.55	-0.0005	0.061	0.006	0.988	0.000	-0.08	0.933
0.65/.50	-0.0015	0.094	0.009	0.970	0.000	-0.16	0.869
0.65/.45	-0.0039	0.123	0.012	0.948	0.000	-0.33	0.743
0.65/.40	-0.0100	0.139	0.013	0.932	0.000	-0.75	0.456
0.65/.35	-0.0171	0.166	0.016	0.902	0.000	-1.07	0.286
0.65/.30	-0.0263	0.199	0.019	0.856	0.000	-1.38	0.170
0.65/.25	-0.0412	0.230	0.022	0.802	0.000	-1.87	0.064
0.65/.20	-0.0587	0.267	0.026	0.724	0.000	-2.29	0.024
0.65/.15	-0.0784	0.312	0.030	0.610	0.000	-2.62	0.010

0.65/.10	-0.0977	0.364	0.035	0.446	0.000	-2.80	0.006
0.65/.05	-0.1312	0.406	0.039	0.279	0.003	-3.37	0.001
0.60/.55	-0.0005	0.031	0.003	0.997	0.000	-0.17	0.868
0.60/.50	-0.0015	0.065	0.006	0.985	0.000	-0.24	0.811
0.60/.45	-0.0039	0.094	0.009	0.969	0.000	-0.43	0.670
0.60/.40	-0.0100	0.114	0.011	0.954	0.000	-0.92	0.362
0.60/.35	-0.0171	0.144	0.014	0.925	0.000	-1.24	0.219
0.60/.30	-0.0264	0.180	0.017	0.880	0.000	-1.53	0.129
0.60/.25	-0.0412	0.213	0.020	0.826	0.000	-2.02	0.046
0.60/.20	-0.0587	0.253	0.024	0.748	0.000	-2.42	0.017
0.60/.15	-0.0784	0.299	0.029	0.633	0.000	-2.73	0.007
0.60/.10	-0.0977	0.354	0.034	0.467	0.000	-2.89	0.005
0.60/.05	-0.1312	0.396	0.038	0.299	0.002	-3.46	0.001
0.55/.50	-0.0010	0.034	0.003	0.996	0.000	-0.30	0.761
0.55/.45	-0.0034	0.064	0.006	0.985	0.000	-0.55	0.586
0.55/.40	-0.0095	0.088	0.008	0.972	0.000	-1.13	0.261
0.55/.35	-0.0166	0.122	0.012	0.945	0.000	-1.42	0.158
0.55/.30	-0.0259	0.161	0.015	0.902	0.000	-1.68	0.096
0.55/.25	-0.0407	0.196	0.019	0.850	0.000	-2.16	0.033
0.55/.20	-0.0582	0.238	0.023	0.772	0.000	-2.55	0.012
0.55/.15	-0.0779	0.287	0.027	0.657	0.000	-2.84	0.005
0.55/.10	-0.0972	0.343	0.033	0.489	0.000	-2.96	0.004
0.55/.05	-0.1307	0.386	0.037	0.320	0.001	-3.53	0.001
0.50/.45	-0.0024	0.031	0.003	0.996	0.000	-0.80	0.427
0.50/.40	-0.0085	0.061	0.006	0.986	0.000	-1.46	0.148
0.50/.35	-0.0156	0.100	0.010	0.963	0.000	-1.63	0.106
0.50/.30	-0.0249	0.141	0.014	0.923	0.000	-1.84	0.069
0.50/.25	-0.0397	0.179	0.017	0.873	0.000	-2.31	0.023
0.50/.20	-0.0572	0.223	0.021	0.797	0.000	-2.68	0.008
0.50/.15	-0.0769	0.273	0.026	0.683	0.000	-2.94	0.004
0.50/.10	-0.0963	0.331	0.032	0.515	0.000	-3.04	0.003
0.50/.05	-0.1297	0.376	0.036	0.346	0.000	-3.60	0.000
0.45/.40	-0.0061	0.038	0.004	0.995	0.000	-1.70	0.093
0.45/.35	-0.0132	0.079	0.008	0.977	0.000	-1.75	0.083
0.45/.30	-0.0225	0.121	0.012	0.943	0.000	-1.93	0.056
0.45/.25	-0.0373	0.161	0.015	0.896	0.000	-2.42	0.017
0.45/.20	-0.0548	0.207	0.020	0.824	0.000	-2.77	0.007
0.45/.15	-0.0745	0.258	0.025	0.713	0.000	-3.01	0.003
0.45/.10	-0.0939	0.318	0.030	0.545	0.000	-3.08	0.003
0.45/.05	-0.1273	0.365	0.035	0.375	0.000	-3.64	0.000
0.40/.35	-0.0071	0.042	0.004	0.993	0.000	-1.77	0.080
0.40/.30	-0.0164	0.086	0.008	0.971	0.000	-2.00	0.048
0.40/.25	-0.0312	0.127	0.012	0.933	0.000	-2.56	0.012
0.40/.20	-0.0487	0.176	0.017	0.868	0.000	-2.89	0.005
0.40/.15	-0.0684	0.231	0.022	0.764	0.000	-3.10	0.002
0.40/.10	-0.0878	0.294	0.028	0.599	0.000	-3.11	0.002
0.40/.05	-0.1212	0.345	0.033	0.424	0.000	-3.67	0.000
0.35/.30	-0.0093	0.045	0.004	0.992	0.000	-2.16	0.033
0.35/.25	-0.0241	0.090	0.009	0.966	0.000	-2.81	0.006
0.35/.20	-0.0416	0.142	0.014	0.913	0.000	-3.07	0.003
0.35/.15	-0.0613	0.199	0.019	0.819	0.000	-3.21	0.002
0.35/.10	-0.0807	0.267	0.026	0.660	0.000	-3.15	0.002
0.35/.05	-0.1141	0.322	0.031	0.481	0.000	-3.69	0.000
0.30/.25	-0.0148	0.049	0.005	0.990	0.000	-3.18	0.002
0.30/.20	-0.0324	0.104	0.010	0.951	0.000	-3.24	0.002
0.30/.15	-0.0520	0.165	0.016	0.873	0.000	-3.29	0.001
0.30/.10	-0.0714	0.236	0.023	0.726	0.000	-3.15	0.002
0.30/.05	-0.1048	0.297	0.028	0.547	0.000	-3.68	0.000
0.25/.20	-0.0175	0.057	0.005	0.985	0.000	-3.24	0.002

0.25/.15	-0.0372	0.119	0.011	0.930	0.000	-3.28	0.001
0.25/.10	-0.0565	0.194	0.019	0.806	0.000	-3.05	0.003
0.25/.05	-0.0900	0.261	0.025	0.632	0.000	-3.61	0.000
0.20/.15	-0.0197	0.064	0.006	0.979	0.000	-3.20	0.002
0.20/.10	-0.0390	0.145	0.014	0.886	0.000	-2.81	0.006
0.20/.05	-0.0725	0.220	0.021	0.727	0.000	-3.44	0.001
0.15/.10	-0.0193	0.087	0.008	0.958	0.000	-2.33	0.022
0.15/.05	-0.0528	0.171	0.016	0.829	0.000	-3.23	0.002
0.10/.05	-0.0334	0.097	0.009	0.943	0.000	-3.61	0.000

1981

0.95/.90	0.0058	0.056	0.005	0.989	0.000	1.08	0.283
0.95/.85	0.0160	0.122	0.012	0.946	0.000	1.37	0.174
0.95/.80	0.0124	0.124	0.012	0.944	0.000	1.04	0.300
0.95/.75	0.0058	0.150	0.014	0.921	0.000	0.41	0.685
0.95/.70	0.0031	0.167	0.016	0.902	0.000	0.19	0.848
0.95/.65	-0.0016	0.168	0.016	0.899	0.000	-0.10	0.922
0.95/.60	-0.0072	0.176	0.017	0.888	0.000	-0.42	0.673
0.95/.55	-0.0147	0.182	0.017	0.879	0.000	-0.84	0.403
0.95/.50	-0.0182	0.198	0.019	0.855	0.000	-0.96	0.340
0.95/.45	-0.0261	0.212	0.020	0.833	0.000	-1.28	0.203
0.95/.40	-0.0323	0.233	0.022	0.798	0.000	-1.45	0.151
0.95/.35	-0.0403	0.246	0.024	0.771	0.000	-1.71	0.090
0.95/.30	-0.0481	0.264	0.025	0.729	0.000	-1.91	0.059
0.95/.25	-0.0602	0.283	0.027	0.680	0.000	-2.22	0.028
0.95/.20	-0.0758	0.306	0.029	0.614	0.000	-2.59	0.011
0.95/.15	-0.0938	0.330	0.032	0.535	0.000	-2.97	0.004
0.95/.10	-0.1223	0.353	0.034	0.455	0.000	-3.61	0.000
0.95/.05	-0.1648	0.376	0.036	0.371	0.000	-4.58	0.000
0.90/.85	0.0102	0.076	0.007	0.979	0.000	1.40	0.164
0.90/.80	0.0066	0.091	0.009	0.970	0.000	0.76	0.450
0.90/.75	0.0001	0.135	0.013	0.935	0.000	0.00	0.997
0.90/.70	-0.0027	0.154	0.015	0.916	0.000	-0.18	0.855
0.90/.65	-0.0074	0.155	0.015	0.913	0.000	-0.50	0.621
0.90/.60	-0.0129	0.164	0.016	0.901	0.000	-0.82	0.413
0.90/.55	-0.0204	0.173	0.017	0.889	0.000	-1.23	0.220
0.90/.50	-0.0240	0.192	0.018	0.861	0.000	-1.30	0.196
0.90/.45	-0.0319	0.209	0.020	0.834	0.000	-1.59	0.115
0.90/.40	-0.0380	0.231	0.022	0.797	0.000	-1.72	0.089
0.90/.35	-0.0460	0.245	0.023	0.767	0.000	-1.96	0.052
0.90/.30	-0.0539	0.264	0.025	0.722	0.000	-2.13	0.035
0.90/.25	-0.0660	0.285	0.027	0.669	0.000	-2.42	0.017
0.90/.20	-0.0816	0.308	0.029	0.600	0.000	-2.77	0.007
0.90/.15	-0.0995	0.333	0.032	0.515	0.000	-3.13	0.002
0.90/.10	-0.1281	0.357	0.034	0.432	0.000	-3.75	0.000
0.90/.05	-0.1706	0.379	0.036	0.344	0.000	-4.70	0.000
0.85/.80	-0.0036	0.065	0.006	0.985	0.000	-0.58	0.566
0.85/.75	-0.0101	0.135	0.013	0.935	0.000	-0.79	0.433
0.85/.70	-0.0129	0.151	0.014	0.919	0.000	-0.89	0.373
0.85/.65	-0.0176	0.155	0.015	0.913	0.000	-1.18	0.239
0.85/.60	-0.0231	0.167	0.016	0.897	0.000	-1.44	0.152
0.85/.55	-0.0306	0.180	0.017	0.880	0.000	-1.78	0.078
0.85/.50	-0.0341	0.203	0.019	0.844	0.000	-1.76	0.082
0.85/.45	-0.0421	0.223	0.021	0.811	0.000	-1.97	0.051
0.85/.40	-0.0482	0.244	0.023	0.773	0.000	-2.06	0.042
0.85/.35	-0.0562	0.258	0.025	0.740	0.000	-2.27	0.025
0.85/.30	-0.0641	0.277	0.027	0.692	0.000	-2.41	0.017
0.85/.25	-0.0762	0.298	0.029	0.635	0.000	-2.67	0.009

0.85/.20	-0.0918	0.320	0.031	0.563	0.000	-2.99	0.003
0.85/.15	-0.1097	0.345	0.033	0.474	0.000	-3.32	0.001
0.85/.10	-0.1383	0.368	0.035	0.388	0.000	-3.92	0.000
0.85/.05	-0.1808	0.390	0.037	0.299	0.002	-4.84	0.000
0.80/.75	-0.0066	0.071	0.007	0.982	0.000	-0.96	0.339
0.80/.70	-0.0093	0.090	0.009	0.972	0.000	-1.09	0.279
0.80/.65	-0.0140	0.101	0.010	0.963	0.000	-1.44	0.153
0.80/.60	-0.0196	0.124	0.012	0.943	0.000	-1.64	0.103
0.80/.55	-0.0271	0.147	0.014	0.920	0.000	-1.93	0.056
0.80/.50	-0.0306	0.179	0.017	0.879	0.000	-1.78	0.078
0.80/.45	-0.0385	0.205	0.020	0.840	0.000	-1.96	0.053
0.80/.40	-0.0446	0.229	0.022	0.799	0.000	-2.03	0.044
0.80/.35	-0.0527	0.245	0.023	0.765	0.000	-2.24	0.027
0.80/.30	-0.0605	0.267	0.026	0.715	0.000	-2.37	0.020
0.80/.25	-0.0726	0.289	0.028	0.656	0.000	-2.62	0.010
0.80/.20	-0.0882	0.313	0.030	0.582	0.000	-2.94	0.004
0.80/.15	-0.1062	0.339	0.032	0.492	0.000	-3.27	0.001
0.80/.10	-0.1347	0.364	0.035	0.403	0.000	-3.86	0.000
0.80/.05	-0.1772	0.386	0.037	0.312	0.001	-4.79	0.000
0.75/.70	-0.0028	0.030	0.003	0.997	0.000	-0.96	0.339
0.75/.65	-0.0074	0.061	0.006	0.987	0.000	-1.27	0.206
0.75/.60	-0.0130	0.098	0.009	0.966	0.000	-1.39	0.168
0.75/.55	-0.0205	0.130	0.012	0.939	0.000	-1.65	0.103
0.75/.50	-0.0240	0.170	0.016	0.894	0.000	-1.47	0.144
0.75/.45	-0.0319	0.201	0.019	0.852	0.000	-1.66	0.100
0.75/.40	-0.0381	0.226	0.022	0.812	0.000	-1.76	0.081
0.75/.35	-0.0461	0.243	0.023	0.777	0.000	-1.98	0.050
0.75/.30	-0.0539	0.266	0.025	0.728	0.000	-2.12	0.036
0.75/.25	-0.0660	0.290	0.028	0.668	0.000	-2.38	0.019
0.75/.20	-0.0817	0.315	0.030	0.594	0.000	-2.71	0.008
0.75/.15	-0.0996	0.342	0.033	0.504	0.000	-3.04	0.003
0.75/.10	-0.1281	0.368	0.035	0.412	0.000	-3.64	0.000
0.75/.05	-0.1706	0.392	0.038	0.317	0.001	-4.54	0.000
0.70/.65	-0.0047	0.042	0.004	0.994	0.000	-1.16	0.247
0.70/.60	-0.0102	0.082	0.008	0.976	0.000	-1.30	0.195
0.70/.55	-0.0177	0.117	0.011	0.951	0.000	-1.58	0.118
0.70/.50	-0.0212	0.161	0.015	0.906	0.000	-1.38	0.171
0.70/.45	-0.0292	0.193	0.018	0.864	0.000	-1.58	0.117
0.70/.40	-0.0353	0.219	0.021	0.824	0.000	-1.69	0.095
0.70/.35	-0.0433	0.237	0.023	0.790	0.000	-1.91	0.059
0.70/.30	-0.0512	0.261	0.025	0.739	0.000	-2.05	0.043
0.70/.25	-0.0633	0.286	0.027	0.677	0.000	-2.31	0.023
0.70/.20	-0.0789	0.313	0.030	0.601	0.000	-2.63	0.010
0.70/.15	-0.0968	0.341	0.033	0.507	0.000	-2.97	0.004
0.70/.10	-0.1254	0.369	0.035	0.411	0.000	-3.55	0.001
0.70/.05	-0.1679	0.395	0.038	0.309	0.001	-4.44	0.000
0.65/.60	-0.0056	0.041	0.004	0.994	0.000	-1.42	0.157
0.65/.55	-0.0131	0.078	0.007	0.978	0.000	-1.75	0.083
0.65/.50	-0.0166	0.126	0.012	0.942	0.000	-1.38	0.171
0.65/.45	-0.0245	0.158	0.015	0.907	0.000	-1.61	0.109
0.65/.40	-0.0307	0.186	0.018	0.870	0.000	-1.72	0.089
0.65/.35	-0.0387	0.208	0.020	0.835	0.000	-1.94	0.055
0.65/.30	-0.0465	0.236	0.023	0.782	0.000	-2.06	0.042
0.65/.25	-0.0586	0.267	0.026	0.714	0.000	-2.29	0.024
0.65/.20	-0.0743	0.297	0.028	0.632	0.000	-2.61	0.010
0.65/.15	-0.0922	0.328	0.031	0.535	0.000	-2.93	0.004
0.65/.10	-0.1207	0.358	0.034	0.432	0.000	-3.52	0.001
0.65/.05	-0.1632	0.387	0.037	0.321	0.001	-4.40	0.000
0.60/.55	-0.0075	0.040	0.004	0.994	0.000	-1.97	0.051

0.60/.50	-0.0110	0.093	0.009	0.967	0.000	-1.23	0.221
0.60/.45	-0.0189	0.126	0.012	0.940	0.000	-1.57	0.119
0.60/.40	-0.0251	0.156	0.015	0.908	0.000	-1.68	0.095
0.60/.35	-0.0331	0.181	0.017	0.874	0.000	-1.91	0.059
0.60/.30	-0.0410	0.214	0.020	0.819	0.000	-2.00	0.048
0.60/.25	-0.0531	0.250	0.024	0.746	0.000	-2.22	0.029
0.60/.20	-0.0687	0.284	0.027	0.659	0.000	-2.52	0.013
0.60/.15	-0.0866	0.317	0.030	0.560	0.000	-2.85	0.005
0.60/.10	-0.1151	0.350	0.033	0.452	0.000	-3.44	0.001
0.60/.05	-0.1577	0.381	0.036	0.333	0.000	-4.32	0.000
0.55/.50	-0.0035	0.063	0.006	0.985	0.000	-0.58	0.561
0.55/.45	-0.0114	0.090	0.009	0.969	0.000	-1.32	0.188
0.55/.40	-0.0176	0.121	0.012	0.944	0.000	-1.52	0.132
0.55/.35	-0.0256	0.150	0.014	0.912	0.000	-1.78	0.077
0.55/.30	-0.0335	0.188	0.018	0.859	0.000	-1.86	0.065
0.55/.25	-0.0456	0.229	0.022	0.785	0.000	-2.08	0.040
0.55/.20	-0.0612	0.267	0.026	0.695	0.000	-2.39	0.019
0.55/.15	-0.0791	0.302	0.029	0.595	0.000	-2.73	0.007
0.55/.10	-0.1076	0.338	0.032	0.483	0.000	-3.33	0.001
0.55/.05	-0.1501	0.372	0.036	0.355	0.000	-4.21	0.000
0.50/.45	-0.0079	0.044	0.004	0.992	0.000	-1.87	0.064
0.50/.40	-0.0141	0.095	0.009	0.964	0.000	-1.54	0.126
0.50/.35	-0.0221	0.125	0.012	0.938	0.000	-1.85	0.068
0.50/.30	-0.0299	0.166	0.016	0.887	0.000	-1.88	0.062
0.50/.25	-0.0420	0.211	0.020	0.812	0.000	-2.08	0.040
0.50/.20	-0.0577	0.253	0.024	0.721	0.000	-2.38	0.019
0.50/.15	-0.0756	0.289	0.028	0.621	0.000	-2.73	0.007
0.50/.10	-0.1041	0.327	0.031	0.503	0.000	-3.33	0.001
0.50/.05	-0.1466	0.365	0.035	0.365	0.000	-4.20	0.000
0.45/.40	-0.0062	0.056	0.005	0.988	0.000	-1.15	0.251
0.45/.35	-0.0142	0.088	0.008	0.969	0.000	-1.68	0.097
0.45/.30	-0.0220	0.135	0.013	0.925	0.000	-1.70	0.092
0.45/.25	-0.0341	0.186	0.018	0.853	0.000	-1.91	0.058
0.45/.20	-0.0498	0.234	0.022	0.761	0.000	-2.22	0.028
0.45/.15	-0.0677	0.271	0.026	0.664	0.000	-2.60	0.011
0.45/.10	-0.0962	0.313	0.030	0.541	0.000	-3.21	0.002
0.45/.05	-0.1387	0.356	0.034	0.392	0.000	-4.07	0.000
0.40/.35	-0.0080	0.045	0.004	0.992	0.000	-1.87	0.064
0.40/.30	-0.0159	0.101	0.010	0.959	0.000	-1.64	0.103
0.40/.25	-0.0280	0.159	0.015	0.894	0.000	-1.84	0.069
0.40/.20	-0.0436	0.214	0.021	0.799	0.000	-2.13	0.036
0.40/.15	-0.0615	0.254	0.024	0.705	0.000	-2.52	0.013
0.40/.10	-0.0900	0.301	0.029	0.575	0.000	-3.13	0.002
0.40/.05	-0.1326	0.347	0.033	0.416	0.000	-3.98	0.000
0.35/.30	-0.0079	0.060	0.006	0.985	0.000	-1.36	0.175
0.35/.25	-0.0200	0.122	0.012	0.936	0.000	-1.71	0.089
0.35/.20	-0.0356	0.183	0.018	0.848	0.000	-2.03	0.045
0.35/.15	-0.0535	0.226	0.022	0.759	0.000	-2.47	0.015
0.35/.10	-0.0820	0.278	0.027	0.625	0.000	-3.08	0.003
0.35/.05	-0.1246	0.330	0.032	0.456	0.000	-3.94	0.000
0.30/.25	-0.0121	0.064	0.006	0.981	0.000	-1.96	0.052
0.30/.20	-0.0277	0.132	0.013	0.917	0.000	-2.19	0.031
0.30/.15	-0.0456	0.185	0.018	0.831	0.000	-2.57	0.012
0.30/.10	-0.0742	0.249	0.024	0.685	0.000	-3.11	0.002
0.30/.05	-0.1167	0.308	0.030	0.502	0.000	-3.95	0.000
0.25/.20	-0.0156	0.076	0.007	0.972	0.000	-2.15	0.034
0.25/.15	-0.0335	0.141	0.013	0.899	0.000	-2.49	0.014
0.25/.10	-0.0621	0.217	0.021	0.749	0.000	-2.98	0.004
0.25/.05	-0.1046	0.285	0.027	0.556	0.000	-3.83	0.000

0.20/.15	-0.0179	0.082	0.008	0.963	0.000	-2.27	0.025
0.20/.10	-0.0464	0.171	0.016	0.834	0.000	-2.83	0.006
0.20/.05	-0.0890	0.246	0.024	0.649	0.000	-3.77	0.000
0.15/.10	-0.0285	0.097	0.009	0.943	0.000	-3.06	0.003
0.15/.05	-0.0710	0.183	0.018	0.794	0.000	-4.06	0.000
0.10/.05	-0.0425	0.101	0.010	0.936	0.000	-4.38	0.000

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0.95/.90	-0.0045	0.071	0.007	0.978	0.000	-0.66	0.509
0.95/.85	-0.0066	0.087	0.008	0.966	0.000	-0.80	0.427
0.95/.80	-0.0093	0.109	0.010	0.948	0.000	-0.89	0.377
0.95/.75	-0.0123	0.133	0.013	0.923	0.000	-0.96	0.338
0.95/.70	-0.0131	0.153	0.015	0.899	0.000	-0.90	0.373
0.95/.65	-0.0120	0.169	0.016	0.873	0.000	-0.74	0.461
0.95/.60	-0.0098	0.206	0.020	0.812	0.000	-0.50	0.620
0.95/.55	-0.0258	0.195	0.019	0.833	0.000	-1.38	0.171
0.95/.50	-0.0401	0.190	0.018	0.843	0.000	-2.20	0.030
0.95/.45	-0.0544	0.195	0.019	0.837	0.000	-2.91	0.004
0.95/.40	-0.0661	0.213	0.020	0.809	0.000	-3.24	0.002
0.95/.35	-0.0758	0.232	0.022	0.775	0.000	-3.41	0.001
0.95/.30	-0.0954	0.247	0.024	0.741	0.000	-4.04	0.000
0.95/.25	-0.1186	0.265	0.025	0.697	0.000	-4.68	0.000
0.95/.20	-0.1451	0.277	0.026	0.657	0.000	-5.48	0.000
0.95/.15	-0.1779	0.286	0.027	0.614	0.000	-6.51	0.000
0.95/.10	-0.2215	0.295	0.028	0.559	0.000	-7.84	0.000
0.95/.05	-0.2792	0.323	0.031	0.430	0.000	-9.01	0.000
0.90/.85	-0.0022	0.043	0.004	0.992	0.000	-0.53	0.598
0.90/.80	-0.0048	0.076	0.007	0.975	0.000	-0.65	0.516
0.90/.75	-0.0078	0.106	0.010	0.951	0.000	-0.76	0.447
0.90/.70	-0.0086	0.128	0.012	0.930	0.000	-0.70	0.486
0.90/.65	-0.0075	0.148	0.014	0.904	0.000	-0.53	0.598
0.90/.60	-0.0053	0.190	0.018	0.843	0.000	-0.29	0.771
0.90/.55	-0.0213	0.180	0.017	0.860	0.000	-1.24	0.219
0.90/.50	-0.0356	0.175	0.017	0.869	0.000	-2.13	0.036
0.90/.45	-0.0499	0.180	0.017	0.862	0.000	-2.89	0.005
0.90/.40	-0.0616	0.200	0.019	0.835	0.000	-3.22	0.002
0.90/.35	-0.0714	0.219	0.021	0.802	0.000	-3.40	0.001
0.90/.30	-0.0909	0.236	0.023	0.765	0.000	-4.02	0.000
0.90/.25	-0.1141	0.258	0.025	0.717	0.000	-4.62	0.000
0.90/.20	-0.1406	0.271	0.026	0.676	0.000	-5.42	0.000
0.90/.15	-0.1734	0.281	0.027	0.633	0.000	-6.45	0.000
0.90/.10	-0.2170	0.291	0.028	0.580	0.000	-7.78	0.000
0.90/.05	-0.2747	0.321	0.031	0.454	0.000	-8.94	0.000
0.85/.80	-0.0026	0.037	0.004	0.994	0.000	-0.74	0.459
0.85/.75	-0.0056	0.069	0.007	0.980	0.000	-0.85	0.397
0.85/.70	-0.0064	0.094	0.009	0.962	0.000	-0.71	0.476
0.85/.65	-0.0053	0.120	0.011	0.938	0.000	-0.47	0.643
0.85/.60	-0.0031	0.170	0.016	0.875	0.000	-0.19	0.847
0.85/.55	-0.0191	0.160	0.015	0.890	0.000	-1.25	0.214
0.85/.50	-0.0334	0.159	0.015	0.892	0.000	-2.19	0.030
0.85/.45	-0.0477	0.171	0.016	0.876	0.000	-2.91	0.004
0.85/.40	-0.0595	0.198	0.019	0.838	0.000	-3.14	0.002
0.85/.35	-0.0692	0.221	0.021	0.799	0.000	-3.27	0.001
0.85/.30	-0.0888	0.233	0.022	0.773	0.000	-3.98	0.000
0.85/.25	-0.1120	0.249	0.024	0.736	0.000	-4.68	0.000
0.85/.20	-0.1384	0.263	0.025	0.697	0.000	-5.50	0.000
0.85/.15	-0.1713	0.274	0.026	0.653	0.000	-6.53	0.000
0.85/.10	-0.2148	0.285	0.027	0.600	0.000	-7.87	0.000

0.85/.05	-0.2725	0.315	0.030	0.476	0.000	-9.02	0.000
0.80/.75	-0.0030	0.034	0.003	0.995	0.000	-0.94	0.351
0.80/.70	-0.0038	0.061	0.006	0.984	0.000	-0.65	0.517
0.80/.65	-0.0027	0.094	0.009	0.961	0.000	-0.30	0.765
0.80/.60	-0.0005	0.153	0.015	0.899	0.000	-0.04	0.971
0.80/.55	-0.0165	0.143	0.014	0.912	0.000	-1.20	0.232
0.80/.50	-0.0308	0.147	0.014	0.909	0.000	-2.19	0.030
0.80/.45	-0.0451	0.165	0.016	0.886	0.000	-2.85	0.005
0.80/.40	-0.0569	0.198	0.019	0.839	0.000	-3.00	0.003
0.80/.35	-0.0666	0.224	0.021	0.795	0.000	-3.10	0.002
0.80/.30	-0.0862	0.232	0.022	0.776	0.000	-3.88	0.000
0.80/.25	-0.1093	0.245	0.023	0.748	0.000	-4.67	0.000
0.80/.20	-0.1358	0.258	0.025	0.710	0.000	-5.49	0.000
0.80/.15	-0.1687	0.270	0.026	0.666	0.000	-6.52	0.000
0.80/.10	-0.2122	0.282	0.027	0.613	0.000	-7.85	0.000
0.80/.05	-0.2699	0.313	0.030	0.489	0.000	-8.99	0.000
0.75/.70	-0.0008	0.032	0.003	0.996	0.000	-0.26	0.792
0.75/.65	0.0003	0.075	0.007	0.976	0.000	0.04	0.967
0.75/.60	0.0025	0.141	0.014	0.915	0.000	0.18	0.855
0.75/.55	-0.0135	0.131	0.013	0.927	0.000	-1.07	0.285
0.75/.50	-0.0278	0.138	0.013	0.920	0.000	-2.10	0.038
0.75/.45	-0.0421	0.162	0.016	0.891	0.000	-2.71	0.008
0.75/.40	-0.0539	0.200	0.019	0.837	0.000	-2.81	0.006
0.75/.35	-0.0636	0.228	0.022	0.789	0.000	-2.91	0.004
0.75/.30	-0.0831	0.233	0.022	0.776	0.000	-3.72	0.000
0.75/.25	-0.1063	0.243	0.023	0.754	0.000	-4.57	0.000
0.75/.20	-0.1328	0.257	0.025	0.716	0.000	-5.40	0.000
0.75/.15	-0.1657	0.270	0.026	0.672	0.000	-6.41	0.000
0.75/.10	-0.2092	0.283	0.027	0.617	0.000	-7.71	0.000
0.75/.05	-0.2669	0.315	0.030	0.492	0.000	-8.84	0.000
0.70/.65	0.0011	0.053	0.005	0.988	0.000	0.22	0.829
0.70/.60	0.0033	0.125	0.012	0.934	0.000	0.27	0.784
0.70/.55	-0.0127	0.113	0.011	0.946	0.000	-1.18	0.242
0.70/.50	-0.0270	0.126	0.012	0.933	0.000	-2.24	0.027
0.70/.45	-0.0413	0.157	0.015	0.898	0.000	-2.75	0.007
0.70/.40	-0.0530	0.199	0.019	0.839	0.000	-2.78	0.006
0.70/.35	-0.0628	0.228	0.022	0.790	0.000	-2.88	0.005
0.70/.30	-0.0823	0.232	0.022	0.779	0.000	-3.70	0.000
0.70/.25	-0.1055	0.241	0.023	0.758	0.000	-4.57	0.000
0.70/.20	-0.1320	0.256	0.024	0.720	0.000	-5.39	0.000
0.70/.15	-0.1648	0.269	0.026	0.674	0.000	-6.40	0.000
0.70/.10	-0.2084	0.283	0.027	0.617	0.000	-7.68	0.000
0.70/.05	-0.2661	0.316	0.030	0.491	0.000	-8.79	0.000
0.65/.60	0.0022	0.073	0.007	0.977	0.000	0.31	0.756
0.65/.55	-0.0138	0.075	0.007	0.976	0.000	-1.93	0.057
0.65/.50	-0.0281	0.102	0.010	0.955	0.000	-2.87	0.005
0.65/.45	-0.0424	0.142	0.014	0.915	0.000	-3.11	0.002
0.65/.40	-0.0542	0.187	0.018	0.855	0.000	-3.02	0.003
0.65/.35	-0.0639	0.217	0.021	0.806	0.000	-3.07	0.003
0.65/.30	-0.0834	0.222	0.021	0.794	0.000	-3.92	0.000
0.65/.25	-0.1066	0.232	0.022	0.773	0.000	-4.81	0.000
0.65/.20	-0.1331	0.247	0.024	0.734	0.000	-5.64	0.000
0.65/.15	-0.1660	0.261	0.025	0.686	0.000	-6.64	0.000
0.65/.10	-0.2095	0.276	0.026	0.627	0.000	-7.91	0.000
0.65/.05	-0.2672	0.310	0.030	0.496	0.000	-8.99	0.000
0.60/.55	-0.0160	0.081	0.008	0.972	0.000	-2.06	0.042
0.60/.50	-0.0303	0.116	0.011	0.943	0.000	-2.73	0.007
0.60/.45	-0.0446	0.155	0.015	0.900	0.000	-3.01	0.003
0.60/.40	-0.0563	0.196	0.019	0.843	0.000	-3.01	0.003

0.60/.35	-0.0661	0.224	0.021	0.795	0.000	-3.08	0.003
0.60/.30	-0.0856	0.228	0.022	0.783	0.000	-3.91	0.000
0.60/.25	-0.1088	0.237	0.023	0.763	0.000	-4.79	0.000
0.60/.20	-0.1353	0.251	0.024	0.724	0.000	-5.62	0.000
0.60/.15	-0.1681	0.266	0.025	0.676	0.000	-6.61	0.000
0.60/.10	-0.2117	0.282	0.027	0.613	0.000	-7.84	0.000
0.60/.05	-0.2694	0.316	0.030	0.478	0.000	-8.90	0.000
0.55/.50	-0.0143	0.053	0.005	0.988	0.000	-2.79	0.006
0.55/.45	-0.0286	0.108	0.010	0.952	0.000	-2.77	0.007
0.55/.40	-0.0403	0.155	0.015	0.902	0.000	-2.71	0.008
0.55/.35	-0.0501	0.187	0.018	0.858	0.000	-2.80	0.006
0.55/.30	-0.0696	0.192	0.018	0.847	0.000	-3.78	0.000
0.55/.25	-0.0928	0.204	0.019	0.827	0.000	-4.76	0.000
0.55/.20	-0.1193	0.222	0.021	0.788	0.000	-5.62	0.000
0.55/.15	-0.1521	0.241	0.023	0.738	0.000	-6.60	0.000
0.55/.10	-0.1957	0.262	0.025	0.671	0.000	-7.79	0.000
0.55/.05	-0.2534	0.304	0.029	0.529	0.000	-8.71	0.000
0.50/.45	-0.0143	0.056	0.005	0.987	0.000	-2.66	0.009
0.50/.40	-0.0261	0.106	0.010	0.955	0.000	-2.57	0.012
0.50/.35	-0.0358	0.141	0.013	0.920	0.000	-2.65	0.009
0.50/.30	-0.0553	0.150	0.014	0.908	0.000	-3.86	0.000
0.50/.25	-0.0785	0.168	0.016	0.883	0.000	-4.89	0.000
0.50/.20	-0.1050	0.190	0.018	0.845	0.000	-5.76	0.000
0.50/.15	-0.1379	0.214	0.020	0.795	0.000	-6.73	0.000
0.50/.10	-0.1814	0.242	0.023	0.724	0.000	-7.84	0.000
0.50/.05	-0.2391	0.291	0.028	0.574	0.000	-8.59	0.000
0.45/.40	-0.0118	0.052	0.005	0.989	0.000	-2.35	0.021
0.45/.35	-0.0215	0.091	0.009	0.967	0.000	-2.46	0.015
0.45/.30	-0.0410	0.106	0.010	0.954	0.000	-4.05	0.000
0.45/.25	-0.0642	0.135	0.013	0.925	0.000	-4.97	0.000
0.45/.20	-0.0907	0.162	0.016	0.889	0.000	-5.84	0.000
0.45/.15	-0.1235	0.191	0.018	0.840	0.000	-6.77	0.000
0.45/.10	-0.1671	0.225	0.022	0.769	0.000	-7.77	0.000
0.45/.05	-0.2248	0.281	0.027	0.612	0.000	-8.36	0.000
0.40/.35	-0.0097	0.043	0.004	0.993	0.000	-2.34	0.021
0.40/.30	-0.0293	0.072	0.007	0.979	0.000	-4.22	0.000
0.40/.25	-0.0525	0.117	0.011	0.945	0.000	-4.67	0.000
0.40/.20	-0.0789	0.146	0.014	0.912	0.000	-5.63	0.000
0.40/.15	-0.1118	0.177	0.017	0.867	0.000	-6.58	0.000
0.40/.10	-0.1554	0.216	0.021	0.795	0.000	-7.51	0.000
0.40/.05	-0.2130	0.278	0.027	0.634	0.000	-8.01	0.000
0.35/.30	-0.0196	0.053	0.005	0.989	0.000	-3.83	0.000
0.35/.25	-0.0428	0.108	0.010	0.953	0.000	-4.11	0.000
0.35/.20	-0.0692	0.136	0.013	0.925	0.000	-5.32	0.000
0.35/.15	-0.1021	0.167	0.016	0.883	0.000	-6.37	0.000
0.35/.10	-0.1456	0.209	0.020	0.810	0.000	-7.27	0.000
0.35/.05	-0.2033	0.275	0.026	0.646	0.000	-7.73	0.000
0.30/.25	-0.0232	0.058	0.006	0.986	0.000	-4.20	0.000
0.30/.20	-0.0497	0.090	0.009	0.967	0.000	-5.79	0.000
0.30/.15	-0.0825	0.130	0.012	0.930	0.000	-6.63	0.000
0.30/.10	-0.1261	0.183	0.018	0.855	0.000	-7.20	0.000
0.30/.05	-0.1838	0.257	0.025	0.686	0.000	-7.46	0.000
0.25/.20	-0.0265	0.043	0.004	0.993	0.000	-6.39	0.000
0.25/.15	-0.0593	0.096	0.009	0.962	0.000	-6.44	0.000
0.25/.10	-0.1029		0.015	0.889	0.000	-6.70	0.000
0.25/.05	-0.1606	0.242	0.023	0.719	0.000	-6.92	0.000
0.20/.15	-0.0329	0.058	0.006	0.986	0.000	-5.88	0.000
0.20/.10	-0.0764	0.130	0.012	0.925	0.000	-6.15	0.000
0.20/.05	-0.1341	0.217	0.021	0.764	0.000	-6.44	0.000

0.15/.10	-0.0436	0.078	0.007	0.971	0.000	-5.86	0.000
0.15/.05	-0.1012	0.172	0.016	0.842	0.000	-6.16	0.000
0.10/.05	-0.0577	0.105	0.010	0.934	0.000	-5.73	0.000

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0.95/.90	0.0008	0.021	0.002	0.998	0.000	0.38	0.706
0.95/.85	0.0010	0.038	0.004	0.993	0.000	0.29	0.775
0.95/.80	-0.0019	0.045	0.004	0.990	0.000	-0.44	0.662
0.95/.75	-0.0087	0.050	0.005	0.987	0.000	-1.81	0.073
0.95/.70	-0.0161	0.086	0.008	0.962	0.000	-1.94	0.055
0.95/.65	-0.0195	0.110	0.011	0.938	0.000	-1.85	0.067
0.95/.60	-0.0201	0.131	0.013	0.910	0.000	-1.60	0.113
0.95/.55	-0.0189	0.150	0.014	0.881	0.000	-1.31	0.192
0.95/.50	-0.0179	0.170	0.016	0.846	0.000	-1.10	0.276
0.95/.45	-0.0144	0.195	0.019	0.796	0.000	-0.77	0.442
0.95/.40	-0.0076	0.227	0.022	0.716	0.000	-0.35	0.726
0.95/.35	-0.0038	0.259	0.025	0.621	0.000	-0.15	0.880
0.95/.30	-0.0138	0.257	0.025	0.614	0.000	-0.56	0.577
0.95/.25	-0.0231	0.282	0.027	0.529	0.000	-0.86	0.394
0.95/.20	-0.0331	0.304	0.029	0.401	0.000	-1.13	0.259
0.95/.15	-0.0535	0.341	0.033	0.201	0.036	-1.64	0.104
0.95/.10	-0.0972	0.375	0.036	0.041	0.669	-2.71	0.008
0.95/.05	-0.1679	0.400	0.038	-0.047	0.626	-4.38	0.000
0.90/.85	0.0003	0.020	0.002	0.998	0.000	0.16	0.877
0.90/.80	-0.0026	0.034	0.003	0.994	0.000	-0.81	0.420
0.90/.75	-0.0094	0.049	0.005	0.988	0.000	-2.02	0.046
0.90/.70	-0.0169	0.091	0.009	0.958	0.000	-1.94	0.055
0.90/.65	-0.0202	0.115	0.011	0.931	0.000	-1.83	0.070
0.90/.60	-0.0209	0.138	0.013	0.901	0.000	-1.58	0.117
0.90/.55	-0.0197	0.156	0.015	0.872	0.000	-1.32	0.191
0.90/.50	-0.0186	0.175	0.017	0.838	0.000	-1.11	0.269
0.90/.45	-0.0152	0.199	0.019	0.788	0.000	-0.80	0.427
0.90/.40	-0.0084	0.230	0.022	0.707	0.000	-0.38	0.704
0.90/.35	-0.0045	0.262	0.025	0.613	0.000	-0.18	0.857
0.90/.30	-0.0145	0.260	0.025	0.605	0.000	-0.58	0.561
0.90/.25	-0.0238	0.285	0.027	0.519	0.000	-0.87	0.384
0.90/.20	-0.0338	0.307	0.029	0.390	0.000	-1.15	0.253
0.90/.15	-0.0542	0.343	0.033	0.189	0.049	-1.65	0.102
0.90/.10	-0.0979	0.376	0.036	0.032	0.741	-2.72	0.008
0.90/.05	-0.1686	0.401	0.038	-0.053	0.581	-4.39	0.000
0.85/.80	-0.0029	0.022	0.002	0.998	0.000	-1.36	0.176
0.85/.75	-0.0097	0.050	0.005	0.987	0.000	-2.01	0.047
0.85/.70	-0.0171	0.097	0.009	0.951	0.000	-1.84	0.069
0.85/.65	-0.0205	0.122	0.012	0.923	0.000	-1.76	0.081
0.85/.60	-0.0211	0.143	0.014	0.893	0.000	-1.54	0.126
0.85/.55	-0.0200	0.160	0.015	0.865	0.000	-1.30	0.196
0.85/.50	-0.0189	0.178	0.017	0.831	0.000	-1.11	0.270
0.85/.45	-0.0155	0.201	0.019	0.782	0.000	-0.80	0.423
0.85/.40	-0.0087	0.231	0.022	0.703	0.000	-0.39	0.696
0.85/.35	-0.0048	0.263	0.025	0.609	0.000	-0.19	0.849
0.85/.30	-0.0148	0.261	0.025	0.601	0.000	-0.59	0.555
0.85/.25	-0.0241	0.286	0.027	0.514	0.000	-0.88	0.380
0.85/.20	-0.0341	0.308	0.029	0.383	0.000	-1.16	0.250
0.85/.15	-0.0545	0.344	0.033	0.181	0.059	-1.65	0.101
0.85/.10	-0.0982	0.377	0.036	0.026	0.791	-2.72	0.008
0.85/.05	-0.1689	0.401	0.038	-0.059	0.543	-4.39	0.000
0.80/.75	-0.0068	0.040	0.004	0.992	0.000	-1.76	0.081
0.80/.70	-0.0142	0.091	0.009	0.957	0.000	-1.63	0.106

0.80/.65	-0.0176	0.113	0.011	0.933	0.000	-1.63	0.107
0.80/.60	-0.0182	0.132	0.013	0.908	0.000	-1.44	0.152
0.80/.55	-0.0171	0.148	0.014	0.882	0.000	-1.20	0.233
0.80/.50	-0.0160	0.166	0.016	0.851	0.000	-1.00	0.317
0.80/.45	-0.0125	0.189	0.018	0.804	0.000	-0.69	0.491
0.80/.40	-0.0058	0.221	0.021	0.727	0.000	-0.27	0.785
0.80/.35	-0.0019	0.253	0.024	0.634	0.000	-0.08	0.937
0.80/.30	-0.0119	0.251	0.024	0.626	0.000	-0.50	0.621
0.80/.25	-0.0212	0.277	0.026	0.538	0.000	-0.80	0.425
0.80/.20	-0.0312	0.300	0.029	0.407	0.000	-1.09	0.280
0.80/.15	-0.0516	0.338	0.032	0.201	0.036	-1.60	0.113
0.80/.10	-0.0953	0.372	0.036	0.040	0.682	-2.68	0.009
0.80/.05	-0.1660	0.397	0.038	-0.051	0.600	-4.36	0.000
0.75/.70	-0.0074	0.051	0.005	0.986	0.000	-1.52	0.130
0.75/.65	-0.0108	0.073	0.007	0.972	0.000	-1.55	0.125
0.75/.60	-0.0114	0.094	0.009	0.952	0.000	-1.27	0.207
0.75/.55	-0.0103	0.113	0.011	0.931	0.000	-0.95	0.346
0.75/.50	-0.0092	0.134	0.013	0.902	0.000	-0.72	0.473
0.75/.45	-0.0057	0.160	0.015	0.858	0.000	-0.38	0.708
0.75/.40	0.0010	0.194	0.019	0.784	0.000	0.05	0.956
0.75/.35	0.0049	0.229	0.022	0.694	0.000	0.22	0.824
0.75/.30	-0.0051	0.227	0.022	0.688	0.000	-0.23	0.815
0.75/.25	-0.0144	0.256	0.024	0.599	0.000	-0.59	0.557
0.75/.20	-0.0244	0.281	0.027	0.470	0.000	-0.90	0.368
0.75/.15	-0.0448	0.322	0.031	0.261	0.006	-1.45	0.149
0.75/.10	-0.0885	0.359	0.034	0.087	0.369	-2.57	0.011
0.75/.05	-0.1592	0.387	0.037	-0.017	0.861	-4.29	0.000
0.70/.65	-0.0034	0.027	0.003	0.996	0.000	-1.31	0.192
0.70/.60	-0.0040	0.055	0.005	0.984	0.000	-0.76	0.449
0.70/.55	-0.0028	0.079	0.008	0.967	0.000	-0.37	0.709
0.70/.50	-0.0018	0.103	0.010	0.942	0.000	-0.18	0.858
0.70/.45	0.0017	0.133	0.013	0.903	0.000	0.13	0.894
0.70/.40	0.0085	0.171	0.016	0.835	0.000	0.52	0.606
0.70/.35	0.0123	0.209	0.020	0.749	0.000	0.62	0.539
0.70/.30	0.0023	0.207	0.020	0.747	0.000	0.12	0.906
0.70/.25	-0.0070	0.238	0.023	0.658	0.000	0.31	0.760
0.70/.20	-0.0170	0.266	0.025	0.537	0.000	-0.67	0.507
0.70/.15	-0.0374	0.310	0.030	0.328	0.000	-1.26	0.211
0.70/.10	-0.0811	0.350	0.034	0.145	0.133	-2.42	0.017
0.70/.05	-0.1518	0.380	0.036	0.028	0.776	-4.17	0.000
0.65/.60	-0.0006	0.031	0.003	0.995	0.000	-0.22	0.827
0.65/.55	0.0005	0.056	0.005	0.983	0.000	0.10	0.920
0.65/.50	0.0016	0.083	0.008	0.963	0.000	0.20	0.842
0.65/.45	0.0051	0.114	0.011	0.929	0.000	0.46	0.644
0.65/.40	0.0118	0.154	0.015	0.867	0.000	0.80	0.425
0.65/.35	0.0157	0.194	0.019	0.784	0.000	0.84	0.400
0.65/.30	0.0057	0.192	0.018	0.784	0.000	0.31	0.757
0.65/.25	-0.0036	0.225	0.022	0.695	0.000	0.17	0.867
0.65/.20	-0.0136	0.256	0.024	0.577	0.000	-0.56	0.580
0.65/.15	-0.0340	0.302	0.029	0.368	0.000	-1.18	0.242
0.65/.10	-0.0777	0.344	0.033	0.177	0.065	-2.36	0.020
0.65/.05	-0.1484	0.376	0.036	0.052	0.591	-4.13	0.000
0.60/.55	0.0012	0.027	0.003	0.996	0.000	0.46	0.649
0.60/.50	0.0022	0.056	0.005	0.983	0.000	0.42	0.676
0.60/.45	0.0057	0.088	0.008	0.957	0.000	0.67	0.502
0.60/.40	0.0125	0.131	0.013	0.903	0.000	1.00	0.322
0.60/.35	0.0163	0.175	0.017	0.823	0.000	0.97	0.332
0.60/.30	0.0063	0.174	0.017	0.822	0.000	0.38	0.704
0.60/.25	-0.0030	0.211	0.020	0.729	0.000	0.15	0.883

0.60/.20	-0.0129	0.244	0.023	0.609	0.000	-0.55	0.582
0.60/.15	-0.0334	0.293	0.028	0.397	0.000	-1.19	0.237
0.60/.10	-0.0771	0.337	0.032	0.201	0.036	-2.39	0.019
0.60/.05	-0.1478	0.370	0.035	0.070	0.469	-4.17	0.000
0.55/.50	0.0010	0.029	0.003	0.995	0.000	0.37	0.710
0.55/.45	0.0045	0.063	0.006	0.978	0.000	0.75	0.456
0.55/.40	0.0113	0.108	0.010	0.934	0.000	1.09	0.278
0.55/.35	0.0151	0.157	0.015	0.855	0.000	1.00	0.318
0.55/.30	0.0052	0.157	0.015	0.853	0.000	0.34	0.733
0.55/.25	-0.0042	0.199	0.019	0.756	0.000	-0.22	0.827
0.55/.20	-0.0141	0.235	0.023	0.634	0.000	-0.63	0.532
0.55/.15	-0.0345	0.286	0.027	0.417	0.000	-1.26	0.210
0.55/.10	-0.0783	0.331	0.032	0.216	0.024	-2.47	0.015
0.55/.05	-0.1489	0.365	0.035	0.081	0.400	-4.26	0.000
0.50/.45	0.0035	0.036	0.003	0.993	0.000	1.02	0.312
0.50/.40	0.0102	0.084	0.008	0.959	0.000	1.27	0.205
0.50/.35	0.0141	0.140	0.013	0.883	0.000	1.05	0.296
0.50/.30	0.0041	0.141	0.013	0.881	0.000	0.30	0.761
0.50/.25	-0.0052	0.187	0.018	0.781	0.000	-0.29	0.772
0.50/.20	-0.0152	0.227	0.022	0.655	0.000	-0.70	0.486
0.50/.15	-0.0356	0.280	0.027	0.433	0.000	-1.33	0.187
0.50/.10	-0.0793	0.326	0.031	0.227	0.018	-2.54	0.013
0.50/.05	-0.1500	0.361	0.035	0.088	0.362	-4.34	0.000
0.45/.40	0.0068	0.054	0.005	0.983	0.000	1.31	0.194
0.45/.35	0.0106	0.119	0.011	0.914	0.000	0.94	0.352
0.45/.30	0.0006	0.117	0.011	0.916	0.000	0.06	0.954
0.45/.25	-0.0087	0.169	0.016	0.818	0.000	-0.54	0.593
0.45/.20	-0.0186	0.213	0.020	0.688	0.000	-0.91	0.363
0.45/.15	-0.0391	0.270	0.026	0.459	0.000	-1.51	0.134
0.45/.10	-0.0828	0.318	0.030	0.245	0.010	-2.72	0.008
0.45/.05	-0.1535	0.354	0.034	0.103	0.285	-4.53	0.000
0.40/.35	0.0039	0.071	0.007	0.968	0.000	0.57	0.570
0.40/.30	-0.0061	0.090	0.009	0.948	0.000	-0.71	0.479
0.40/.25	-0.0154	0.155	0.015	0.840	0.000	-1.04	0.300
0.40/.20	-0.0254	0.204	0.020	0.699	0.000	-1.30	0.196
0.40/.15	-0.0458	0.264	0.025	0.458	0.000	-1.81	0.072
0.40/.10	-0.0895	0.313	0.030	0.238	0.013	-2.99	0.003
0.40/.05	-0.1602	0.348	0.033	0.098	0.309	-4.81	0.000
0.35/.30	-0.0100	0.086	0.008	0.950	0.000	-1.21	0.229
0.35/.25	-0.0193	0.154	0.015	0.837	0.000	-1.31	0.192
0.35/.20	-0.0293	0.200	0.019	0.699	0.000	-1.53	0.130
0.35/.15	-0.0497	0.260	0.025	0.455	0.000	-2.00	0.048
0.35/.10	-0.0934	0.310	0.030	0.232	0.015	-3.15	0.002
0.35/.05	-0.1641	0.344	0.033	0.097	0.317	-4.98	0.000
0.30/.25	-0.0093	0.072	0.007	0.962	0.000	-1.36	0.176
0.30/.20	-0.0193	0.133	0.013	0.860	0.000	-1.51	0.133
0.30/.15	-0.0397	0.215	0.021	0.602	0.000	-1.93	0.056
0.30/.10	-0.0834	0.275	0.026	0.351	0.000	-3.17	0.002
0.30/.05	-0.1541	0.312	0.030	0.204	0.034	-5.16	0.000
0.25/.20	-0.0100	0.086	0.008	0.945	0.000	-1.21	0.230
0.25/.15	-0.0304	0.189	0.018	0.690	0.000	-1.68	0.097
0.25/.10	-0.0741	0.255	0.024	0.434	0.000	-3.03	0.003
0.25/.05	-0.1448	0.291	0.028	0.298	0.002	-5.19	0.000
0.20/.15	-0.0204	0.116	0.011	0.859	0.000	-1.83	0.069
0.20/.10	-0.0641	0.194	0.019	0.614	0.000	-3.44	0.001
0.20/.05	-0.1348	0.239	0.023	0.456	0.000	-5.90	0.000
0.15/.10	-0.0437	0.107	0.010	0.875	0.000	-4.26	0.000
0.15/.05	-0.1144	0.178	0.017	0.680	0.000	-6.71	0.000
0.10/.05	-0.0707	0.099	0.009	0.906	0.000	-7.48	0.000

Appendix 25.

ERRORS FROM THE OPTIMAL OVERALL MODELS FOR FORECASTING PROFIT, (109 COMPANIES).

BEST MODELS;

	NON-TRUNCATED;	TRUNCATED
Absolute change	5 yr.	5 yr.
Percentage change	4 yr.	3 yr.
Moving average	4 and 6 yr.	2 yr.
Exponential smoothing	0.20	0.85

In cases of ties, the simplest model is employed, in this case 4 year moving average.

	NON-TRUNCATED			TRUNCATED (Max. 1.0)				
	MEAN	STD. ERROR	STD. DEV.	RANGE	MINIMUM	MEAN	STD. ERROR	STD. DEV.
1981								
MAPE/ACTUAL								
RW.	1.342	0.425	4.440	43.068	0.011	0.440	0.036	0.379
AC.	1.563	0.519	5.422	53.062	0.007	0.377	0.033	0.340
PC.	0.960	0.130	1.352	9.273	0.000	0.498	0.037	0.391
MA.	1.518	0.327	3.414	23.093	0.001	0.480	0.036	0.378
ES.	1.299	0.247	2.582	14.563	0.033	0.430	0.035	0.369
Re.	1.407	0.345	3.604	29.625	0.000	0.423	0.037	0.389
S1	2.425	0.468	4.888	31.837	0.012	0.738	0.033	0.343
S2	2.563	0.497	5.190	34.225	0.003	0.737	0.034	0.350
S3	2.650	0.520	5.426	35.363	0.001	0.742	0.033	0.349
S4	2.645	0.518	5.411	35.324	0.004	0.741	0.033	0.349
S5	2.915	0.576	6.014	39.565	0.020	0.751	0.033	0.346
S6	2.568	0.500	5.216	34.302	0.007	0.737	0.034	0.350
MSE/ACTUAL								
RW.	21.330	17.091	178.431	1855.797	0.000	0.336	0.040	0.421
AC.	31.567	25.925	270.660	2816.304	0.000	0.349	0.041	0.428
PC.	2.734	0.893	9.322	85.989	0.000	0.399	0.041	0.432
MA.	13.851	5.897	61.568	533.326	0.000	0.372	0.041	0.427
ES.	8.293	3.132	32.700	213.028	0.001	0.319	0.039	0.412
Re.	14.850	8.549	89.249	877.624	0.000	0.329	0.041	0.427
S1	29.552	12.652	132.093	1014.371	0.000	0.662	0.040	0.413
S2	33.258	14.194	148.193	1171.593	0.000	0.665	0.040	0.414
S3	36.191	15.559	162.445	1250.619	0.000	0.671	0.040	0.414
S4	36.010	15.479	161.604	1248.084	0.000	0.681	0.040	0.414
S5	44.333	19.018	198.556	1566.954	0.000	0.682	0.040	0.418
S6	33.550	14.327	149.581	1177.153	0.000	0.664	0.040	0.414

MAPE/FORECAST

RW.	0.578	0.065	0.683	3.676	0.011	0.431	0.034	0.353
AC.	0.629	0.105	1.098	9.192	0.007	0.418	0.035	0.368
PC.	1.119	0.336	3.511	35.104	0.000	0.463	0.035	0.370
MA.	0.737	0.121	1.262	11.249	0.001	0.451	0.032	0.334
ES.	0.921	0.121	1.266	8.754	0.034	0.421	0.033	0.345
Re.	0.782	0.195	2.034	15.125	0.000	0.376	0.033	0.343
S1	1.973	0.531	5.542	45.290	0.000	0.594	0.038	0.398
S2	1.873	0.503	5.252	43.011	0.000	0.587	0.038	0.399
S3	1.807	0.479	5.003	41.009	0.000	0.585	0.038	0.398
S4	1.810	0.481	5.018	41.157	0.000	0.585	0.038	0.398
S5	1.678	0.438	4.572	37.581	0.000	0.584	0.038	0.393
S6	1.878	0.504	5.263	43.037	0.000	0.587	0.038	0.399

MSE/FORECAST

RW.	0.797	0.179	1.864	13.589	0.000	0.309	0.037	0.383
AC.	1.591	0.809	8.444	84.623	0.000	0.309	0.037	0.386
PC.	13.467	11.316	118.140	1232.325	0.000	0.349	0.038	0.399
MA.	2.121	1.201	12.538	126.562	0.000	0.314	0.035	0.365
ES.	2.435	0.969	10.114	77.234	0.001	0.295	0.036	0.379
Re.	4.709	2.530	26.411	228.768	0.000	0.258	0.035	0.362
S1	34.328	20.366	212.631	2051.181	0.000	0.510	0.041	0.428
S2	30.838	18.372	191.810	1849.915	0.000	0.503	0.041	0.426
S3	28.066	16.666	174.002	1681.736	0.000	0.499	0.041	0.425
S4	28.226	16.783	175.220	1693.921	0.000	0.500	0.041	0.425
S5	23.528	13.990	146.055	1412.355	0.000	0.495	0.041	0.425
S6	30.968	18.400	192.098	1852.176	0.000	0.503	0.041	0.426

1982

MAPE/ACTUAL

RW.	0.541	0.106	1.106	8.597	0.002	0.343	0.032	0.336
AC.	0.585	0.110	1.149	7.281	0.001	0.369	0.033	0.344
PC.	0.640	0.088	0.918	7.198	0.008	0.446	0.034	0.358
MA.	1.025	0.269	2.812	25.233	0.012	0.369	0.034	0.354
ES.	0.957	0.180	1.879	12.762	0.005	0.346	0.032	0.338
Re.	0.597	0.137	1.435	11.933	0.000	0.351	0.034	0.352
S1	1.148	0.196	2.049	14.500	0.003	0.637	0.034	0.357
S2	1.205	0.215	2.242	16.032	0.003	0.641	0.034	0.357
S3	1.236	0.219	2.284	16.159	0.003	0.645	0.034	0.356
S4	1.231	0.218	2.277	16.131	0.005	0.644	0.034	0.356
S5	1.247	0.224	2.340	16.599	0.026	0.646	0.034	0.354
S6	1.125	0.192	2.000	14.205	0.015	0.638	0.034	0.352

MSE/ACTUAL

RW.	1.505	0.753	7.862	73.931	0.000	0.230	0.034	0.351
AC.	1.651	0.722	7.541	53.029	0.000	0.253	0.034	0.357
PC.	1.243	0.524	5.466	51.924	0.000	0.326	0.037	0.386
MA.	8.885	6.034	62.994	637.272	0.000	0.260	0.036	0.377
ES.	4.412	1.896	19.795	162.988	0.000	0.239	0.033	0.341
Re.	2.396	1.417	14.789	142.399	0.000	0.246	0.035	0.364
S1	5.477	2.467	25.759	210.341	0.000	0.532	0.039	0.411
S2	6.434	2.970	31.009	257.129	0.000	0.536	0.040	0.413
S3	6.694	3.045	31.792	261.209	0.000	0.541	0.040	0.416
S4	6.652	3.030	31.633	260.368	0.000	0.541	0.040	0.416
S5	6.983	3.213	33.549	276.410	0.001	0.541	0.040	0.416
S6	5.228	2.371	24.755	202.205	0.000	0.530	0.039	0.409

MAPE/FORECAST

RW.	0.997	0.256	2.674	22.498	0.002	0.369	0.034	0.357
AC.	47.765	46.797	488.574	5101.733	0.001	0.374	0.035	0.365
PC.	1.450	0.360	3.763	28.844	0.010	0.446	0.035	0.370
MA.	0.905	0.155	1.615	10.129	0.012	0.386	0.035	0.364
ES.	1.126	0.223	2.328	19.554	0.005	0.370	0.034	0.353
Re.	9.410	8.379	87.474	913.784	0.000	0.364	0.035	0.362
S1	2.982	0.887	9.260	70.819	0.000	0.545	0.039	0.410
S2	2.841	0.860	8.975	70.819	0.000	0.536	0.039	0.403
S3	2.695	0.800	8.353	63.877	0.000	0.533	0.038	0.397
S4	2.714	0.807	8.421	64.603	0.000	0.533	0.038	0.398
S5	2.709	0.819	8.550	67.243	0.000	0.532	0.038	0.396
S6	3.144	0.953	9.947	78.342	0.000	0.553	0.039	0.410

MSE/FORECAST

RW.	8.080	4.820	50.326	506.250	0.000	0.262	0.036	0.373
AC.	238795.9	238786	>1000000	>1000000	0.000	0.272	0.037	0.389
PC.	15.390	8.941	93.350	945.091	0.000	0.334	0.039	0.407
MA.	3.405	1.284	13.403	102.829	0.000	0.280	0.038	0.392
ES.	6.638	3.822	39.903	382.541	0.000	0.260	0.036	0.371
Re.	7670.12	7660.48	79977.8	835001.94	0.000	0.263	0.036	0.379
S1	93.853	51.785	540.651	5015.316	0.000	0.464	0.042	0.434
S2	87.885	50.347	525.635	5015.316	0.000	0.448	0.041	0.427
S3	76.386	42.126	439.805	4080.273	0.000	0.440	0.040	0.422
S4	77.630	42.949	448.403	4173.484	0.000	0.442	0.040	0.423
S5	79.770	45.530	475.347	4521.656	0.000	0.439	0.040	0.422
S6	107.909	61.744	644.623	6137.395	0.000	0.472	0.042	0.438

1983

MAPE/ACTUAL

RW.	0.592	0.092	0.960	5.610	0.004	0.378	0.030	0.315
AC.	0.732	0.124	1.298	7.294	0.003	0.393	0.033	0.347
PC.	0.509	0.058	0.610	3.173	0.008	0.424	0.032	0.337
MA.	0.577	0.150	1.566	16.041	0.006	0.412	0.030	0.314
ES.	0.483	0.062	0.644	6.242	0.025	0.377	0.030	0.314
Re.	0.626	0.083	0.869	6.935	0.001	0.442	0.035	0.367
S1	1.996	0.821	8.575	88.905	0.002	0.685	0.034	0.355
S2	2.072	0.857	8.949	92.737	0.007	0.685	0.035	0.361
S3	2.127	0.885	9.236	95.729	0.010	0.689	0.035	0.361
S4	2.121	0.882	9.206	95.417	0.007	0.688	0.035	0.361
S5	2.025	0.835	8.721	90.394	0.008	0.686	0.034	0.358
S6	1.804	0.723	7.544	78.258	0.008	0.681	0.032	0.331

MSE/ACTUAL

RW.	1.265	0.434	4.535	31.508	0.000	0.241	0.033	0.344
AC.	2.206	0.758	7.918	53.245	0.000	0.274	0.036	0.375
PC.	0.628	0.142	1.480	10.116	0.000	0.293	0.035	0.368
MA.	2.763	2.361	24.646	607.409	0.000	0.268	0.033	0.348
ES.	0.645	0.363	3.794	39.285	0.001	0.239	0.033	0.341
Re.	1.141	0.454	4.744	48.107	0.000	0.329	0.039	0.403
S1	76.833	72.498	756.904	7904.367	0.000	0.595	0.040	0.416
S2	83.648	78.891	823.642	8601.285	0.000	0.599	0.040	0.421
S3	89.053	84.070	877.717	9166.039	0.000	0.604	0.040	0.422
S4	88.474	83.517	871.943	9105.734	0.000	0.603	0.040	0.422
S5	79.465	74.958	782.585	8172.531	0.000	0.597	0.040	0.419
S6	59.647	56.184	586.573	6125.574	0.000	0.573	0.038	0.402

MAPE/FORECAST

RW.	0.959	0.213	2.227	16.825	0.004	0.449	0.033	0.346
AC.	1.454	0.597	6.235	62.109	0.003	0.449	0.036	0.376
PC.	1.226	0.287	2.993	22.394	0.008	0.491	0.036	0.374
MA.	0.837	0.128	1.339	8.297	0.006	0.500	0.034	0.356
ES.	1.095	0.236	2.469	23.889	0.026	0.455	0.035	0.353
Re.	0.583	0.180	1.882	19.258	0.001	0.346	0.026	0.274
S1	1.800	0.480	5.010	45.165	0.000	0.527	0.036	0.380
S2	1.733	0.465	4.850	43.958	0.000	0.520	0.037	0.382
S3	1.680	0.446	4.658	42.046	0.000	0.519	0.037	0.382
S4	1.684	0.447	4.672	42.201	0.000	0.520	0.037	0.382
S5	1.778	0.474	4.951	44.626	0.000	0.524	0.036	0.381
S6	2.049	0.547	5.707	51.342	0.000	0.553	0.036	0.378

MSE/FORECAST

RW.	5.837	3.238	33.803	283.218	0.000	0.320	0.037	0.387
AC.	40.627	35.531	370.957	3857.830	0.000	0.342	0.040	0.414
PC.	10.382	5.708	59.594	501.805	0.000	0.380	0.041	0.424
MA.	2.476	0.883	9.219	68.929	0.000	0.376	0.039	0.409
ES.	7.237	5.276	55.083	571.908	0.001	0.331	0.038	0.397
Re.	3.848	3.402	35.516	370.913	0.000	0.194	0.026	0.270
S1	28.109	18.991	198.271	2039.889	0.000	0.421	0.039	0.407
S2	26.309	17.966	187.575	1932.296	0.000	0.415	0.039	0.409
S3	24.318	16.459	171.841	1767.840	0.000	0.414	0.039	0.409
S4	24.462	16.579	173.090	1780.892	0.000	0.414	0.039	0.409
S5	27.452	18.542	193.581	1991.480	0.000	0.418	0.039	0.407
S6	36.474	24.539	256.190	2635.986	0.000	0.447	0.040	0.413

Appendix 26.

T-TESTS OF NON-TRUNCATED ERRORS FOR THE OPTIMAL OVERALL MODELS FOR FORECASTING PROFITS (109 COS.).

	(DIFFERENCE) MEAN	STANDARD DEVIATION	STANDARD ERROR	CORR.	2-TAIL PROB.	T VALUE	2-TAIL PROB.
1981							
MAPE/ACTUAL							
RW/AC	-0.2209	1.050	0.101	0.997	0.000	-2.20	0.030
RW/PC	0.3813	4.071	0.390	0.414	0.000	0.98	0.330
RW/MA	-0.1765	4.817	0.461	0.269	0.005	-0.38	0.703
RW/ES	0.0423	4.347	0.416	0.326	0.001	0.10	0.919
RW/Re	-0.3133	2.558	0.245	0.818	0.000	-1.28	0.204
RW/S1	-1.0833	5.012	0.480	0.426	0.000	-2.26	0.026
RW/S2	-1.2211	5.147	0.493	0.437	0.000	-2.48	0.015
RW/S3	-1.3083	5.360	0.513	0.424	0.000	-2.55	0.012
RW/S4	-1.3033	5.347	0.512	0.424	0.000	-2.54	0.012
RW/S5	-1.5721	5.714	0.547	0.434	0.000	-2.87	0.005
RW/S6	-1.2260	5.166	0.495	0.437	0.000	-2.48	0.015
AC/PC	0.6022	5.072	0.486	0.375	0.000	1.24	0.218
AC/MA	0.0444	5.634	0.540	0.251	0.008	0.08	0.935
AC/ES	0.2632	5.237	0.502	0.309	0.001	0.52	0.601
AC/Re	-0.0925	3.308	0.317	0.798	0.000	-0.29	0.771
AC/S1	-0.8625	5.517	0.528	0.431	0.000	-1.63	0.106
AC/S2	-1.0002	5.603	0.537	0.443	0.000	-1.86	0.065
AC/S3	-1.0874	5.794	0.555	0.429	0.000	-1.96	0.053
AC/S4	-1.0824	5.783	0.554	0.430	0.000	-1.95	0.053
AC/S5	-1.3512	6.068	0.581	0.440	0.000	-2.32	0.022
AC/S6	-1.0051	5.619	0.538	0.442	0.000	-1.87	0.065
PC/MA	-0.5578	2.853	0.273	0.579	0.000	-2.04	0.044
PC/ES	-0.3390	2.050	0.196	0.615	0.000	-1.73	0.087
PC/Re	-0.6947	3.023	0.290	0.704	0.000	-2.40	0.018
PC/S1	-1.4647	4.862	0.466	0.157	0.102	-3.15	0.002
PC/S2	-1.6024	5.157	0.494	0.155	0.108	-3.24	0.002
PC/S3	-1.6896	5.382	0.516	0.156	0.104	-3.28	0.001
PC/S4	-1.6846	5.369	0.514	0.156	0.105	-3.28	0.001
PC/S5	-1.9534	5.954	0.570	0.153	0.111	-3.43	0.001
PC/S6	-1.6073	5.181	0.496	0.155	0.107	-3.24	0.002
MA/ES	0.2188	1.006	0.096	0.982	0.000	2.27	0.025
MA/Re	-0.1369	3.104	0.297	0.637	0.000	-0.46	0.646
MA/S1	-0.9069	5.941	0.569	0.007	0.939	-1.59	0.114
MA/S2	-1.0446	6.195	0.593	0.006	0.951	-1.76	0.081
MA/S3	-1.1318	6.396	0.613	0.005	0.959	-1.85	0.067
MA/S4	-1.1268	6.384	0.611	0.005	0.959	-1.84	0.068
MA/S5	-1.3956	6.902	0.661	0.003	0.975	-2.11	0.037
MA/S6	-1.0495	6.215	0.595	0.006	0.948	-1.76	0.081
ES/Re	-0.3557	2.681	0.257	0.713	0.000	-1.39	0.169
ES/S1	-1.1257	5.406	0.518	0.053	0.586	-2.17	0.032
ES/S2	-1.2634	5.674	0.543	0.053	0.588	-2.32	0.022
ES/S3	-1.3506	5.891	0.564	0.050	0.604	-2.39	0.018
ES/S4	-1.3456	5.877	0.563	0.050	0.604	-2.39	0.019
ES/S5	-1.6144	6.423	0.615	0.049	0.612	-2.62	0.010
ES/S6	-1.2683	5.696	0.546	0.053	0.585	-2.32	0.022

Re/S1	-0.7700	5.716	0.496	0.313	0.001	-1.55	0.123
Re/S2	-0.9077	5.372	0.515	0.319	0.001	-1.76	0.081
Re/S3	-0.9949	5.584	0.535	0.310	0.001	-1.86	0.066
Re/S4	-0.9899	5.571	0.534	0.310	0.001	-1.86	0.066
Re/S5	-1.2588	6.019	0.577	0.315	0.001	-2.18	0.031
Re/S6	-0.9126	5.392	0.516	0.319	0.001	-1.77	0.080
S1/2	-0.1377	0.360	0.034	0.999	0.000	-4.00	0.000
S1/3	-0.2250	0.546	0.052	1.000	0.000	-4.30	0.000
S1/4	-0.2199	0.532	0.051	1.000	0.000	-4.32	0.000
S1/5	-0.4888	1.150	0.110	0.999	0.000	-4.44	0.000
S1/6	-0.1426	0.375	0.036	0.999	0.000	-3.97	0.000
S2/3	-0.0872	0.315	0.030	0.999	0.000	-2.89	0.005
S2/4	-0.0822	0.295	0.028	0.999	0.000	-2.91	0.004
S2/5	-0.3510	0.831	0.080	1.000	0.000	-4.41	0.000
S2/6	-0.0049	0.041	0.004	1.000	0.000	-1.23	0.221
S3/4	0.0050	0.020	0.002	1.000	0.000	2.57	0.012
S3/5	-0.2638	0.621	0.060	0.999	0.000	-4.43	0.000
S3/6	0.0823	0.286	0.027	0.999	0.000	3.00	0.003
S4/5	-0.2688	0.631	0.060	0.999	0.000	-4.45	0.000
S4/6	0.0773	0.267	0.026	0.999	0.000	3.03	0.003
S5/6	0.3461	0.804	0.077	1.000	0.000	4.49	0.000

MSE/ACTUAL

RW/AC	-10.2376	92.373	8.848	1.000	0.000	-1.16	0.250
RW/PC	18.5956	177.794	17.030	0.094	0.329	1.09	0.277
RW/MA	7.4787	187.280	17.938	0.025	0.795	0.42	0.678
RW/ES	13.0364	179.525	17.195	0.058	0.549	0.76	0.450
RW/Re	4.1477	116.917	11.199	0.834	0.000	0.37	0.712
RW/S1	-8.2226	173.495	16.618	0.407	0.000	-0.49	0.622
RW/S2	-11.9283	175.992	16.857	0.432	0.000	-0.71	0.481
RW/S3	-14.8612	186.838	17.896	0.402	0.000	-0.83	0.408
RW/S4	-14.6798	186.244	17.839	0.403	0.000	-0.82	0.412
RW/S5	-22.9413	202.883	19.433	0.424	0.000	-1.18	0.240
RW/S6	-12.2199	176.823	16.937	0.430	0.000	-0.72	0.472
AC/PC	28.8332	270.136	25.874	0.073	0.448	1.11	0.268
AC/MA	17.7163	276.608	26.494	0.016	0.868	0.67	0.505
AC/ES	23.2740	271.128	25.969	0.046	0.634	0.90	0.372
AC/Re	14.3853	206.020	19.733	0.822	0.000	0.73	0.468
AC/S1	2.0150	248.111	23.765	0.408	0.000	0.08	0.933
AC/S2	-1.6907	246.056	23.568	0.432	0.000	-0.07	0.943
AC/S3	-4.6236	253.420	24.273	0.403	0.000	-0.19	0.849
AC/S4	-4.4422	253.035	24.236	0.404	0.000	-0.18	0.855
AC/S5	-12.7037	258.874	24.796	0.424	0.000	-0.51	0.609
AC/S6	-1.9823	246.524	23.613	0.430	0.000	-0.08	0.933
PC/MA	-11.1169	57.773	5.534	0.470	0.000	-2.01	0.047
PC/ES	-5.5591	27.810	2.664	0.628	0.000	-2.09	0.039
PC/Re	-14.4479	80.611	7.721	0.588	0.000	-1.87	0.064
PC/S1	-26.8181	132.103	12.653	0.034	0.724	-2.12	0.036
PC/S2	-30.5239	148.180	14.193	0.033	0.735	-2.15	0.034
PC/S3	-33.4568	162.392	15.554	0.034	0.723	-2.15	0.034
PC/S4	-33.2754	161.553	15.474	0.034	0.724	-2.15	0.034
PC/S5	-41.5369	198.169	18.981	0.033	0.730	-2.19	0.031
PC/S6	-30.8155	149.562	14.325	0.033	0.732	-2.15	0.034
MA/ES	5.5578	32.251	3.089	0.949	0.000	1.80	0.075
MA/Re	-3.3310	88.298	8.457	0.317	0.001	0.39	0.694
MA/S1	-15.7012	147.547	14.132	-0.033	0.736	-1.11	0.269
MA/S2	-19.4069	162.316	15.547	-0.033	0.736	-1.25	0.215

MA/S3	-22.3399	175.589	16.818	-0.033	0.736	-1.33	0.187
MA/S4	-22.1584	174.801	16.743	-0.033	0.736	-1.32	0.188
MA/S5	-30.4200	209.501	20.067	-0.032	0.738	-1.52	0.132
MA/S6	-19.6985	163.595	15.670	-0.032	0.737	-1.26	0.211
ES/Re	-8.8888	76.878	7.364	0.488	0.000	1.21	0.230
ES/S1	-21.2590	136.745	13.098	-0.021	0.828	-1.62	0.107
ES/S2	-24.9647	152.399	14.597	-0.020	0.835	-1.71	0.090
ES/S3	-27.8977	166.378	15.936	-0.021	0.828	-1.75	0.083
ES/S4	-27.7162	165.551	15.857	-0.021	0.828	-1.75	0.083
ES/S5	-35.9777	201.589	19.309	-0.020	0.835	-1.86	0.065
ES/S6	-25.2563	153.753	14.727	-0.020	0.836	-1.71	0.089
Re/S1	-12.3702	132.475	12.689	0.320	0.001	-0.97	0.332
Re/S2	-16.0759	143.777	13.771	0.340	0.000	-1.17	0.246
Re/S3	-19.0089	157.893	15.123	0.316	0.001	-1.26	0.211
Re/S4	-18.8275	157.087	15.046	0.317	0.001	-1.25	0.214
Re/S5	-27.0890	187.909	17.998	0.334	0.000	-1.51	0.135
Re/S6	-16.3676	145.046	13.893	0.339	0.000	-1.18	0.241
S1/2	-3.7057	18.629	1.784	0.998	0.000	-2.08	0.040
S1/3	-6.6387	30.370	2.909	1.000	0.000	-2.28	0.024
S1/4	-6.4572	29.530	2.828	1.000	0.000	-2.28	0.024
S1/5	-14.7187	66.780	6.396	0.998	0.000	-2.30	0.023
S1/6	-3.9973	19.374	1.856	0.998	0.000	-2.15	0.033
S2/3	-2.9329	17.956	1.720	0.998	0.000	-1.71	0.091
S2/4	-2.7515	16.800	1.609	0.998	0.000	-1.71	0.090
S2/5	-11.0130	50.126	4.801	1.000	0.000	-2.29	0.024
S2/6	-0.2916	1.864	0.179	1.000	0.000	-1.63	0.105
S3/4	0.1814	1.191	0.114	1.000	0.000	1.59	0.115
S3/5	-8.0801	37.318	3.574	0.998	0.000	-2.26	0.026
S3/6	2.6413	16.171	1.549	0.998	0.000	1.71	0.091
S4/5	-8.2615	37.881	3.628	0.999	0.000	-2.28	0.025
S4/6	2.4599	15.022	1.439	0.998	0.000	1.71	0.090
S5/6	10.7214	48.706	4.665	1.000	0.000	2.30	0.023

MAPE/FORECAST

RW/AC	-0.0508	0.623	0.060	0.856	0.000	-0.85	0.396
RW/PC	-0.5414	3.441	0.330	0.198	0.039	-1.64	0.103
RW/MA	-0.1593	1.216	0.116	0.336	0.000	-1.37	0.174
RW/ES	-0.3431	1.267	0.121	0.269	0.005	-2.83	0.006
RW/Re	-0.2256	2.328	0.223	0.364	0.000	-1.01	0.314
RW/S1	-1.3949	5.641	0.540	-0.085	0.382	-2.58	0.011
RW/S2	-1.2954	5.353	0.513	-0.085	0.381	-2.53	0.013
RW/S3	-1.2290	5.106	0.489	-0.084	0.387	-2.51	0.013
RW/S4	-1.2323	5.121	0.490	-0.084	0.387	-2.51	0.013
RW/S5	-1.1003	4.681	0.448	-0.085	0.380	-2.45	0.016
RW/S6	-1.3000	5.364	0.514	-0.085	0.379	-2.53	0.013
AC/PC	-0.4905	3.506	0.336	0.161	0.094	-1.46	0.147
AC/MA	-0.1084	1.498	0.144	0.200	0.038	-0.76	0.452
AC/ES	-0.2923	1.550	0.148	0.146	0.129	-1.97	0.052
AC/Re	-0.1748	2.545	0.244	0.168	0.080	-0.72	0.475
AC/S1	-1.3441	5.727	0.549	-0.072	0.460	-2.45	0.016
AC/S2	-1.2446	5.442	0.521	-0.071	0.460	-2.39	0.019
AC/S3	-1.1781	5.198	0.498	-0.071	0.464	-2.37	0.020
AC/S4	-1.1815	5.212	0.499	-0.071	0.464	-2.37	0.020
AC/S5	-1.0494	4.780	0.458	-0.072	0.459	-2.29	0.024
AC/S6	-1.2492	5.453	0.522	-0.072	0.457	-2.39	0.018
PC/MA	0.3821	3.451	0.331	0.227	0.018	1.16	0.250
PC/ES	0.1983	3.455	0.331	0.224	0.019	0.60	0.550

PC/Re	0.3158	4.039	0.387	0.126	0.191	0.82	0.416
PC/S1	-0.8535	5.162	0.494	0.421	0.000	-1.73	0.087
PC/S2	-0.7540	4.925	0.472	0.424	0.000	-1.60	0.113
PC/S3	-0.6876	4.755	0.455	0.420	0.000	-1.51	0.134
PC/S4	-0.6909	4.765	0.456	0.420	0.000	-1.51	0.133
PC/S5	-0.5589	4.443	0.426	0.421	0.000	-1.31	0.192
PC/S6	-0.7587	4.937	0.473	0.423	0.000	-1.60	0.112
MA/ES	-0.1838	0.520	0.050	0.915	0.000	-3.69	0.000
MA/Re	-0.0663	1.657	0.159	0.802	0.000	-0.42	0.677
MA/S1	-1.2356	5.645	0.541	0.032	0.744	-2.29	0.024
MA/S2	-1.1361	5.362	0.514	0.032	0.743	-2.21	0.029
MA/S3	-1.0697	5.123	0.491	0.030	0.759	-2.18	0.031
MA/S4	-1.0730	5.137	0.492	0.030	0.758	-2.18	0.031
MA/S5	-0.9410	4.710	0.451	0.028	0.769	-2.09	0.039
MA/S6	-1.1408	5.373	0.515	0.031	0.746	-2.22	0.029
ES/Re	0.1175	2.055	0.197	0.567	0.000	0.60	0.552
ES/S1	-1.0518	5.668	0.543	0.014	0.886	-1.94	0.055
ES/S2	-0.9523	5.384	0.516	0.015	0.878	-1.85	0.068
ES/S3	-0.8859	5.144	0.493	0.013	0.890	-1.80	0.075
ES/S4	-0.8892	5.159	0.494	0.013	0.889	-1.80	0.075
ES/S5	-0.7572	4.729	0.453	0.014	0.889	-1.67	0.097
ES/S6	-0.9569	5.395	0.517	0.015	0.880	-1.85	0.067
Re/S1	-1.1693	6.061	0.581	0.006	0.951	-2.01	0.046
Re/S2	-1.0698	5.798	0.555	0.006	0.950	-1.93	0.057
Re/S3	-1.0034	5.578	0.534	0.004	0.965	-1.88	0.063
Re/S4	-1.0067	5.591	0.536	0.004	0.965	-1.88	0.063
Re/S5	-0.8747	5.200	0.498	0.003	0.975	-1.76	0.082
Re/S6	-1.0744	5.808	0.556	0.006	0.951	-1.93	0.056
S1/2	0.0995	0.306	0.029	1.000	0.000	3.40	0.001
S1/3	0.1659	0.547	0.052	1.000	0.000	3.17	0.002
S1/4	0.1626	0.532	0.051	1.000	0.000	3.19	0.002
S1/5	0.2946	0.989	0.095	0.999	0.000	3.11	0.002
S1/6	0.0949	0.304	0.029	1.000	0.000	3.25	0.002
S2/3	0.0664	0.260	0.025	1.000	0.000	2.67	0.009
S2/4	0.0631	0.245	0.023	1.000	0.000	2.69	0.008
S2/5	0.1951	0.690	0.066	1.000	0.000	2.95	0.004
S2/6	-0.0047	0.048	0.005	1.000	0.000	-1.01	0.314
S3/4	-0.0033	0.017	0.002	1.000	0.000	-2.06	0.042
S3/5	0.1287	0.448	0.043	1.000	0.000	3.00	0.003
S3/6	-0.0711	0.278	0.027	1.000	0.000	-2.67	0.009
S4/5	0.1320	0.463	0.044	1.000	0.000	2.98	0.004
S4/6	-0.0677	0.264	0.025	1.000	0.000	-2.68	0.009
S5/6	-0.1998	0.699	0.067	1.000	0.000	-2.98	0.004

MSE/FORECAST

RW/AC	-0.7938	7.038	0.674	0.802	0.000	-1.18	0.242
RW/PC	-12.6705	118.183	11.320	-0.015	0.878	-1.12	0.265
RW/MA	-1.3241	12.408	1.188	0.144	0.136	-1.11	0.268
RW/ES	-1.6385	10.065	0.964	0.118	0.220	-1.70	0.092
RW/Re	-5.9814	58.546	5.608	0.139	0.149	-1.07	0.289
RW/S1	-33.5309	212.748	20.378	-0.058	0.546	-1.65	0.103
RW/S2	-30.0411	191.928	18.383	-0.059	0.546	-1.63	0.105
RW/S3	-27.2694	174.120	16.678	-0.058	0.547	-1.64	0.105
RW/S4	-27.4290	175.338	16.794	-0.058	0.547	-1.63	0.105
RW/S5	-22.7463	146.250	14.008	-0.059	0.545	-1.62	0.107
RW/S6	-30.1709	192.216	18.411	-0.059	0.544	-1.64	0.104
AC/PC	-11.8767	118.449	11.345	-0.001	0.993	-1.05	0.298
AC/MA	-0.5303	14.994	1.436	0.018	0.857	-0.37	0.713

AC/ES	-0.8447	13.088	1.254	0.014	0.888	-0.67	0.502
AC/Re	-5.1876	59.395	5.689	-0.002	0.984	-0.91	0.364
AC/S1	-32.7371	213.036	20.405	-0.028	0.771	-1.60	0.112
AC/S2	-29.2473	192.233	18.413	-0.028	0.771	-1.59	0.115
AC/S3	-26.4755	174.444	16.709	-0.028	0.772	-1.58	0.116
AC/S4	-26.6352	175.660	16.825	-0.028	0.772	-1.58	0.116
AC/S5	-21.9525	146.610	14.043	-0.028	0.772	-1.56	0.121
AC/S6	-29.3771	192.522	18.440	-0.028	0.771	-1.59	0.114
PC/MA	11.3464	118.562	11.356	0.019	0.841	1.00	0.320
PC/ES	11.0320	118.165	11.318	0.040	0.677	0.97	0.332
PC/Re	6.6891	131.905	12.634	0.001	0.992	-0.53	0.598
PC/S1	-20.8604	203.450	19.487	0.354	0.000	-1.07	0.287
PC/S2	-17.3706	186.010	17.817	0.356	0.000	-0.97	0.332
PC/S3	-14.5988	172.748	16.546	0.350	0.000	-0.88	0.380
PC/S4	-14.7585	173.710	16.638	0.350	0.000	-0.89	0.377
PC/S5	-10.0758	152.377	14.595	0.350	0.000	-0.69	0.491
PC/S6	-17.5004	186.304	17.845	0.356	0.000	-0.98	0.329
MA/ES	-0.3144	7.113	0.681	0.824	0.000	-0.46	0.645
MA/Re	-4.6573	46.908	4.493	0.958	0.000	-1.04	0.302
MA/S1	-32.2068	213.192	20.420	-0.015	0.874	-1.58	0.118
MA/S2	-28.7170	192.409	18.429	-0.015	0.875	-1.56	0.122
MA/S3	-25.9452	174.645	16.728	-0.015	0.874	-1.55	0.124
MA/S4	-26.1049	175.860	16.844	-0.015	0.874	-1.55	0.124
MA/S5	-21.4222	146.859	14.067	-0.015	0.873	-1.52	0.131
MA/S6	-28.8468	192.698	18.457	-0.015	0.875	-1.56	0.121
ES/Re	-4.3429	52.929	5.070	0.635	0.000	-0.86	0.394
ES/S1	-31.8924	213.113	20.413	-0.024	0.805	-1.56	0.121
ES/S2	-28.4026	192.315	18.420	-0.024	0.807	-1.54	0.126
ES/S3	-25.6308	174.536	16.718	-0.024	0.806	-1.53	0.128
ES/S4	-25.7905	175.752	16.834	-0.024	0.806	-1.53	0.128
ES/S5	-21.1078	146.717	14.053	-0.024	0.807	-1.50	0.136
ES/S6	-28.5324	192.604	18.448	-0.024	0.806	-1.55	0.125
Re/S1	-27.5495	221.428	21.209	-0.015	0.881	-1.30	0.197
Re/S2	-24.0598	201.427	19.293	-0.015	0.881	-1.25	0.215
Re/S3	-21.2880	184.477	17.670	-0.015	0.879	-1.20	0.231
Re/S4	-21.4476	185.631	17.780	-0.015	0.880	-1.21	0.230
Re/S5	-16.7649	158.310	15.163	-0.015	0.879	-1.11	0.271
Re/S6	-24.1895	201.706	19.320	-0.015	0.881	-1.25	0.213
S1/2	3.4898	20.916	2.003	1.000	0.000	1.74	0.084
S1/3	6.2616	38.642	3.701	1.000	0.000	1.69	0.094
S1/4	6.1019	37.427	3.585	1.000	0.000	1.70	0.092
S1/5	10.7846	66.572	6.376	1.000	0.000	1.69	0.094
S1/6	3.3600	20.712	1.984	1.000	0.000	1.69	0.093
S2/3	2.7718	17.899	1.714	1.000	0.000	1.62	0.109
S2/4	2.6121	16.687	1.598	1.000	0.000	1.63	0.105
S2/5	7.2949	45.719	4.379	1.000	0.000	1.67	0.099
S2/6	-0.1297	1.238	0.119	1.000	0.000	-1.09	0.277
S3/4	-0.1597	1.234	0.118	1.000	0.000	-1.35	0.180
S3/5	4.5231	27.966	2.679	1.000	0.000	1.69	0.094
S3/6	-2.9015	18.246	1.748	1.000	0.000	-1.66	0.100
S4/5	4.6828	29.182	2.795	1.000	0.000	1.68	0.097
S4/6	-2.7419	17.048	1.633	1.000	0.000	-1.68	0.096
S5/6	-7.4246	45.986	4.405	1.000	0.000	-1.69	0.095

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MAPE/ACTUAL

RW/AC	-0.0433	0.380	0.036	0.944	0.000	-1.19	0.236
RW/PC	-0.0984	0.410	0.039	0.935	0.000	-2.51	0.014
RW/MA	-0.4836	2.647	0.254	0.341	0.000	-1.91	0.059
RW/ES	-0.4154	1.381	0.132	0.685	0.000	-3.14	0.002
RW/Re	-0.2327	1.447	0.139	0.732	0.000	-1.68	0.096
RW/S1	-0.6068	2.332	0.223	-0.003	0.973	-2.72	0.008
RW/S2	-0.6638	2.509	0.240	-0.008	0.930	-2.76	0.007
RW/S3	-0.6944	2.549	0.244	-0.011	0.908	-2.84	0.005
RW/S4	-0.6903	2.542	0.243	-0.011	0.911	-2.84	0.005
RW/S5	-0.7054	2.601	0.249	-0.012	0.898	-2.83	0.006
RW/S6	-0.5844	2.287	0.219	-0.001	0.988	-2.67	0.009
AC/PC	-0.0551	0.603	0.058	0.853	0.000	-0.95	0.343
AC/MA	-0.4402	2.660	0.255	0.333	0.000	-1.73	0.087
AC/ES	-0.3721	1.469	0.141	0.623	0.000	-2.64	0.009
AC/Re	-0.1894	1.635	0.157	0.601	0.000	-1.21	0.229
AC/S1	-0.5635	2.344	0.224	0.005	0.956	-2.51	0.014
AC/S2	-0.6205	2.519	0.241	0.001	0.995	-2.57	0.011
AC/S3	-0.6510	2.558	0.245	-0.002	0.986	-2.66	0.009
AC/S4	-0.6470	2.552	0.244	-0.001	0.989	-2.65	0.009
AC/S5	-0.6621	2.610	0.250	-0.003	0.976	-2.65	0.009
AC/S6	-0.5411	2.300	0.220	0.007	0.945	-2.46	0.016
PC/MA	-0.3852	2.682	0.257	0.301	0.001	-1.50	0.137
PC/ES	-0.3170	1.483	0.142	0.630	0.000	-2.23	0.028
PC/Re	-0.1343	1.516	0.145	0.725	0.000	-0.92	0.357
PC/S1	-0.5084	2.262	0.217	-0.020	0.836	-2.35	0.021
PC/S2	-0.5654	2.444	0.234	-0.025	0.797	-2.42	0.017
PC/S3	-0.5960	2.483	0.238	-0.026	0.791	-2.51	0.014
PC/S4	-0.5919	2.476	0.237	-0.025	0.794	-2.50	0.014
PC/S5	-0.6070	2.537	0.243	-0.028	0.776	-2.50	0.014
PC/S6	-0.4860	2.217	0.212	-0.020	0.837	-2.29	0.024
MA/ES	0.0681	1.410	0.135	0.894	0.000	0.50	0.615
MA/Re	0.2508	2.147	0.206	0.650	0.000	1.22	0.225
MA/S1	-0.1232	3.460	0.331	0.011	0.906	-0.37	0.711
MA/S2	-0.1802	3.582	0.343	0.009	0.929	-0.53	0.600
MA/S3	-0.2108	3.600	0.345	0.013	0.345	-0.61	0.542
MA/S4	-0.2067	3.596	0.344	0.012	0.899	-0.60	0.550
MA/S5	-0.2219	3.640	0.349	0.010	0.915	-0.64	0.526
MA/S6	-0.1008	3.437	0.329	0.008	0.931	-0.31	0.760
ES/Re	0.1827	1.173	0.112	0.825	0.000	1.63	0.107
ES/S1	-0.1914	2.804	0.269	-0.018	0.855	-0.71	0.478
ES/S2	-0.2484	2.958	0.283	-0.022	0.817	-0.88	0.383
ES/S3	-0.2790	2.986	0.286	-0.020	0.835	-0.98	0.332
ES/S4	-0.2749	2.981	0.286	-0.020	0.834	-0.96	0.338
ES/S5	-0.2900	3.034	0.291	-0.022	0.817	-1.00	0.320
ES/S6	-0.1690	2.771	0.265	-0.019	0.842	-0.64	0.526
Re/S1	-0.3741	2.933	0.281	-0.027	0.778	-1.33	0.186
Re/S2	-0.4311	3.081	0.295	-0.031	0.295	-1.46	0.147
Re/S3	-0.4616	3.110	0.298	-0.029	0.761	-1.55	0.124
Re/S4	-0.4576	3.104	0.297	-0.029	0.761	-1.54	0.127
Re/S5	-0.4727	3.155	0.302	-0.031	0.747	-1.56	0.121
Re/S6	-0.3517	2.901	0.278	-0.028	0.769	-1.27	0.208
S1/2	-0.0570	0.209	0.020	0.999	0.000	-2.85	0.005
S1/3	-0.0876	0.253	0.024	0.999	0.000	-3.62	0.000
S1/4	-0.0835	0.245	0.023	0.999	0.000	-3.56	0.000

S1/5	-0.0986	0.309	0.030	0.999	0.000	-3.33	0.001
S1/6	0.0224	0.069	0.007	1.000	0.000	3.39	0.001
S2/3	-0.0306	0.079	0.008	1.000	0.000	-4.04	0.000
S2/4	-0.0265	0.069	0.007	1.000	0.000	-4.02	0.000
S2/5	-0.0416	0.110	0.010	1.000	0.000	-3.97	0.000
S2/6	0.0794	0.260	0.025	0.999	0.000	3.19	0.002
S3/4	0.0041	0.011	0.001	1.000	0.000	3.72	0.000
S3/5	-0.0111	0.067	0.006	1.000	0.000	-1.71	0.090
S3/6	0.1100	0.312	0.030	0.998	0.000	3.68	0.000
S4/5	-0.0151	0.072	0.007	1.000	0.000	-2.20	0.030
S4/6	0.1059	0.304	0.029	0.998	0.000	3.64	0.000
S5/6	0.1210	0.364	0.035	0.998	0.000	3.47	0.001

MSE/ACTUAL

RW/AC	-0.1454	3.645	0.349	0.889	0.000	-0.42	0.678
RW/PC	0.2620	2.690	0.258	0.983	0.000	1.02	0.312
RW/MA	-7.3797	62.776	6.013	0.090	0.351	-1.23	0.222
RW/ES	-2.9065	17.236	1.651	0.503	0.000	-1.76	0.081
RW/Re	-3.2343	22.553	2.160	0.843	0.000	-1.50	0.137
RW/S1	-3.9712	27.157	2.601	-0.030	0.757	-1.53	0.130
RW/S2	-4.9290	32.217	3.086	-0.030	0.758	-1.60	0.113
RW/S3	-5.1889	32.982	3.159	-0.030	0.753	-1.64	0.103
RW/S4	-5.1464	32.826	3.144	-0.030	0.754	-1.64	0.105
RW/S5	-5.4751	34.687	3.322	-0.030	0.755	-1.65	0.102
RW/S6	-3.7266	26.220	2.511	-0.030	0.760	-1.48	0.141
AC/PC	0.4074	4.493	0.430	0.807	0.000	0.95	0.346
AC/MA	-7.2342	62.689	6.005	0.100	0.300	-1.20	0.231
AC/ES	-2.7610	17.531	1.679	0.474	0.000	-1.64	0.103
AC/Re	-3.0889	24.723	2.368	0.631	0.000	-1.30	0.195
AC/S1	-3.8258	27.064	2.592	-0.031	0.749	-1.48	0.143
AC/S2	-4.7836	32.139	3.078	-0.031	0.749	-1.55	0.123
AC/S3	-5.0434	32.906	3.152	-0.032	0.744	-1.60	0.112
AC/S4	-5.0010	32.750	3.137	-0.032	0.744	-1.59	0.114
AC/S5	-5.3297	34.615	3.316	-0.031	0.746	-1.61	0.111
AC/S6	-3.5812	26.124	2.502	-0.031	0.752	-1.43	0.155
PC/MA	-7.6417	62.735	6.009	0.091	0.348	-1.27	0.206
PC/ES	-3.1685	17.712	1.697	0.499	0.000	-1.87	0.065
PC/Re	-3.4963	24.257	2.323	0.858	0.000	-1.50	0.135
PC/S1	-4.2333	26.503	2.538	-0.032	0.742	-1.67	0.098
PC/S2	-5.1910	31.657	3.032	-0.032	0.744	-1.71	0.090
PC/S3	-5.4509	32.432	3.106	-0.032	0.740	-1.75	0.082
PC/S4	-5.4084	32.274	3.091	-0.032	0.740	-1.75	0.083
PC/S5	-5.7372	34.162	3.272	-0.032	0.741	-1.75	0.082
PC/S6	-3.9886	25.546	2.447	-0.032	0.745	-1.63	0.106
MA/ES	4.4732	46.307	4.435	0.888	0.000	1.01	0.315
MA/Re	4.1454	55.323	5.299	0.479	0.000	0.78	0.436
MA/S1	3.4084	68.453	6.557	-0.017	0.864	0.52	0.604
MA/S2	2.4507	70.682	6.770	-0.017	0.861	0.36	0.718
MA/S3	2.1908	71.001	6.801	-0.016	0.873	0.32	0.748
MA/S4	2.2333	70.931	6.794	-0.016	0.872	0.33	0.743
MA/S5	1.9045	71.845	6.882	-0.016	0.868	0.28	0.782
MA/S6	3.6531	68.100	6.523	-0.018	0.855	0.56	0.577
ES/Re	-0.3278	19.789	1.895	0.727	0.000	-0.17	0.863
ES/S1	-1.0648	32.981	3.159	-0.032	0.743	-0.34	0.737
ES/S2	-2.0226	37.319	3.575	-0.032	0.741	-0.52	0.573
ES/S3	-2.2824	37.971	3.637	-0.031	0.748	-0.63	0.532
ES/S4	-2.2399	37.836	3.624	-0.031	0.747	-0.62	0.538
ES/S5	-2.5687	39.486	3.782	-0.032	0.745	-0.68	0.498

ES/S6	-0.8202	32.214	3.086	-0.032	0.738	-0.27	0.791
Re/S1	-0.7369	39.153	3.750	-0.028	0.775	-0.20	0.845
Re/S2	-1.6947	42.886	4.108	-0.028	0.776	-0.41	0.681
Re/S3	-1.9546	43.463	4.163	-0.027	0.779	-0.47	0.640
Re/S4	-1.9121	43.344	4.152	-0.027	0.779	-0.46	0.646
Re/S5	-2.2408	44.796	4.291	-0.027	0.778	-0.52	0.603
Re/S6	-0.4923	38.502	3.688	-0.028	0.773	-0.13	0.894
S1/2	-0.9578	5.347	0.512	0.999	0.000	-1.87	0.064
S1/3	-1.2176	6.051	0.580	1.000	0.000	-2.10	0.038
S1/4	-1.1751	5.900	0.565	1.000	0.000	-2.08	0.040
S1/5	-1.5039	7.822	0.749	1.000	0.000	-2.01	0.047
S1/6	0.2446	0.999	0.096	1.000	0.000	2.56	0.012
S2/3	-0.2599	1.063	0.102	1.000	0.000	-2.55	0.012
S2/4	-0.2174	0.861	0.082	1.000	0.000	-2.64	0.010
S2/5	-0.5461	2.574	0.247	1.000	0.000	-2.22	0.029
S2/6	1.2024	6.293	0.603	0.999	0.000	1.99	0.049
S3/4	0.0425	0.206	0.020	1.000	0.000	2.15	0.034
S2/5	-0.2863	1.790	0.171	1.000	0.000	-1.67	0.098
S2/6	1.4623	7.027	0.673	1.000	0.000	2.17	0.032
S4/5	-0.3288	1.931	0.185	1.000	0.000	-1.78	0.078
S4/6	1.4198	6.873	0.658	1.000	0.000	2.16	0.033
S5/6	1.7485	8.789	0.842	1.000	0.000	2.08	0.040

MAPE/FORECAST

RW/AC	-46.7687	488.444	46.784	0.051	0.597	-1.00	0.320
RW/PC	-0.4530	1.162	0.111	0.981	0.000	-4.07	0.000
RW/MA	0.0916	2.408	0.231	0.458	0.000	0.40	0.692
RW/ES	-0.1290	3.123	0.299	0.227	0.018	-0.43	0.667
RW/Re	0.0311	0.962	0.092	0.937	0.000	0.34	0.736
RW/S1	-1.9850	9.525	0.912	0.044	0.650	-2.18	0.032
RW/S2	-1.8441	9.260	0.887	0.041	0.674	-2.08	0.040
RW/S3	-1.6979	8.658	0.829	0.044	0.650	-2.05	0.043
RW/S4	-1.7171	8.724	0.836	0.043	0.654	-2.05	0.042
RW/S5	-1.7164	8.874	0.850	0.041	0.670	-2.02	0.046
RW/S6	-2.1452	10.188	0.976	0.041	0.669	-2.20	0.030
AC/PC	46.3156	488.459	46.786	0.035	0.716	0.99	0.324
AC/MA	46.8603	488.537	46.793	0.025	0.800	1.00	0.319
AC/ES	46.6397	488.562	46.796	0.008	0.937	1.00	0.321
AC/Re	46.7998	488.131	46.754	0.164	0.088	1.00	0.319
AC/S1	44.7837	488.866	46.825	-0.022	0.820	0.96	0.341
AC/S2	44.9245	488.855	46.824	-0.022	0.819	0.96	0.339
AC/S3	45.0707	488.839	46.822	-0.023	0.811	0.96	0.338
AC/S4	45.0516	488.841	46.822	-0.023	0.812	0.96	0.338
AC/S5	45.0523	488.845	46.823	-0.023	0.813	0.96	0.338
AC/S6	44.6235	488.887	46.827	-0.021	0.826	0.95	0.343
PC/MA	0.5446	3.223	0.309	0.476	0.000	1.76	0.081
PC/ES	0.3240	3.533	0.338	0.372	0.001	0.96	0.340
PC/Re	0.4841	1.469	0.141	0.934	0.000	3.44	0.001
PC/S1	-1.5320	9.790	0.938	0.049	0.614	-1.63	0.105
PC/S2	-1.3911	9.539	0.914	0.045	0.640	-1.52	0.131
PC/S3	-1.2449	8.954	0.858	0.049	0.611	-1.45	0.149
PC/S4	-1.2641	9.018	0.864	0.049	0.616	-1.46	0.146
PC/S5	-1.2634	9.165	0.878	0.046	0.634	-1.44	0.153
PC/S6	-1.6922	10.437	1.000	0.046	0.638	-1.69	0.093
MA/ES	-0.2206	2.021	0.194	0.525	0.000	-1.14	0.257
MA/Re	-0.0605	2.502	0.240	0.439	0.000	-0.25	0.801
MA/S1	-2.0766	9.238	0.885	0.101	0.295	-2.35	0.021
MA/S2	-1.9357	8.959	0.858	0.100	0.302	-2.26	0.026

MA/S3	-1.7895	8.345	0.799	0.102	0.293	-2.24	0.027
MA/S4	-1.8087	8.412	0.806	0.102	0.293	-2.24	0.027
MA/S5	-1.8080	8.564	0.820	0.099	0.305	-2.20	0.030
MA/S6	-2.2368	9.914	0.950	0.099	0.308	-2.36	0.020
ES/Re	0.1601	3.187	0.305	0.220	0.022	0528	0.601
ES/S1	-1.8560	9.433	0.904	0.051	0.601	-2.05	0.042
ES/S2	-1.7151	9.159	0.877	0.050	0.605	-1.96	0.053
ES/S3	-1.5689	8.553	0.819	0.052	0.590	-1.92	0.058
ES/S4	-1.5881	8.620	0.826	0.052	0.591	-1.92	0.057
ES/S5	-1.5874	8.768	0.840	0.051	0.600	-1.89	0.061
ES/S6	-2.0162	10.100	0.967	0.049	0.615	-2.08	0.040
Re/S1	-2.0161	9.435	0.904	0.084	0.384	-2.23	0.028
Re/S2	-1.8752	9.175	0.879	0.080	0.410	-2.13	0.035
Re/S3	-1.7290	8.570	0.821	0.084	0.384	-2.11	0.037
Re/S4	-1.7482	8.637	0.827	0.084	0.388	-2.11	0.037
Re/S5	-1.7475	8.789	0.842	0.080	0.406	-2.08	0.040
Re/S6	-2.1763	10.100	0.967	0.080	0.406	-2.25	0.027
S1/2	0.1409	0.451	0.043	0.999	0.000	3.26	0.001
S1/3	0.2870	0.912	0.087	1.000	0.000	3.29	0.001
S1/4	0.2679	0.844	0.081	1.000	0.000	3.31	0.001
S1/5	0.2686	0.759	0.073	0.999	0.000	3.69	0.000
S1/6	-0.1602	0.758	0.073	0.999	0.000	-2.21	0.029
S2/3	0.1462	0.705	0.068	0.999	0.000	2.16	0.033
S2/4	0.1270	0.628	0.060	0.999	0.000	2.11	0.037
S2/5	0.1277	0.410	0.039	1.000	0.000	3.25	0.002
S2/6	-0.3011	0.973	0.093	1.000	0.000	-3.23	0.002
S3/4	-0.0191	0.079	0.008	1.000	0.000	-2.53	0.013
S3/5	-0.0185	0.363	0.035	0.999	0.000	-0.53	0.597
S3/6	-0.4472	1.624	0.156	0.999	0.000	-2.87	0.005
S4/5	0.0007	0.299	0.029	1.000	0.000	0.02	0.981
S4/6	-0.4281	1.551	0.149	0.999	0.000	-2.88	0.005
S5/6	-0.4288	1.376	0.132	1.000	0.000	-3.25	0.002

MSE/FORECAST

RW/AC	-238787.8	2492998.9	238786.0	-0.005	0.957	-1.00	0.320
RW/PC	-7.3108	43.263	4.144	0.998	0.000	-1.76	0.081
RW/MA	4.6749	48.824	4.677	0.244	0.011	1.00	0.320
RW/ES	1.4418	63.593	6.091	0.020	0.835	0.24	0.813
RW/Re	0.3323	13.740	1.316	0.973	0.000	0.25	0.801
RW/S1	-85.7736	543.504	52.058	-0.010	0.915	-1.65	0.102
RW/S2	-79.8058	528.605	50.631	-0.011	0.907	-1.58	0.118
RW/S3	-68.3060	443.182	42.449	-0.010	0.917	-1.61	0.111
RW/S4	-69.5502	451.737	43.269	-0.010	0.915	-1.61	0.111
RW/S5	-72.0894	481.827	46.151	-0.011	0.910	-1.56	0.121
RW/S6	-99.7331	646.744	61.947	-0.011	0.908	-1.61	0.110
AC/PC	238780.5	2492999.4	238786.0	-0.009	0.929	1.00	0.320
AC/MA	238792.5	2492998.8	238786.0	-0.013	0.896	1.00	0.320
AC/ES	238789.3	2492999.1	238786.0	-0.012	0.901	1.00	0.320
AC/Re	231125.8	2492996.5	238785.7	0.039	0.689	1.00	0.320
AC/S1	238702.1	2493007.7	238776.8	-0.017	0.864	1.00	0.320
AC/S2	238708.0	2493007.1	238786.8	-0.016	0.868	1.00	0.320
AC/S3	238319.5	2493006.0	238786.7	-0.017	0.863	1.00	0.320
AC/S4	238718.3	2493006.1	238786.7	-0.017	0.864	1.00	0.320
AC/S5	238716.1	2493006.4	238786.7	-0.016	0.868	1.00	0.320
AC/S6	238598.0	2493009.1	238787.0	-0.016	0.869	1.00	0.320
PC/MA	11.9858	91.084	8.724	0.239	0.012	1.37	0.172
PC/ES	8.7526	99.185	9.500	0.063	0.516	0.92	0.359
PC/Re	6.9786	39.794	3.812	0.980	0.010	1.83	0.070

PC/S1	-78.4627	549.512	52.634	-0.009	0.923	-1.49	0.139
PC/S2	-72.4950	534.838	51.228	-0.011	0.912	-1.42	0.160
PC/S3	-60.9952	450.442	43.145	-0.009	0.924	-1.41	0.160
PC/S4	-62.2394	458.881	43.953	-0.009	0.922	-1.42	0.160
PC/S5	-64.7786	488.597	46.799	-0.010	0.915	-1.38	0.169
PC/S6	-92.4223	651.916	62.442	-0.010	0.914	-1.48	0.142
MA/ES	-3.2332	40.146	3.845	0.150	0.120	-0.84	0.402
MA/Re	-5.0072	54.785	5.247	0.228	0.017	-0.95	0.342
MA/S1	-90.4485	540.837	51.803	-0.001	0.988	-1.75	0.084
MA/S2	-84.4808	525.834	50.366	-0.002	0.982	-1.68	0.096
MA/S3	-72.9810	440.029	42.147	-0.002	0.988	-1.73	0.086
MA/S4	-74.2251	448.624	42.970	-0.002	0.987	-1.73	0.087
MA/S5	-76.7643	478.859	45.866	-0.003	0.979	-1.67	0.097
MA/S6	-104.4081	644.394	61.722	-0.003	0.979	-1.69	0.094
ES/Re	-1.7740	68.315	6.543	0.020	0.835	-0.27	0.787
ES/S1	-87.2153	542.840	51.995	-0.018	0.852	-1.68	0.096
ES/S2	-81.2476	527.845	50.558	-0.018	0.856	-1.61	0.111
ES/S3	-69.7478	442.324	42.367	-0.018	0.853	-1.35	0.103
ES/S4	-70.9920	450.887	43.187	-0.018	0.853	-1.64	0.103
ES/S5	-73.5312	480.996	46.071	-0.018	0.856	-1.60	0.113
ES/S6	-101.1749	646.160	61.891	-0.018	0.855	-1.63	0.105
Re/S1	-85.4413	543.501	52.058	0.001	0.990	-1.64	0.104
Re/S2	-79.4736	528.694	50.640	-0.001	0.991	-1.57	0.119
Re/S3	-67.9738	443.305	42.461	0.001	0.988	-1.60	0.112
Re/S4	-69.2180	451.858	43.280	0.001	0.991	-1.60	0.113
Re/S5	-71.7571	481.960	46.163	-0.000	0.996	-1.55	0.123
Re/S6	-99.4009	646.717	61.944	-0.001	0.994	-1.60	0.111
S1/2	5.9677	35.601	3.410	0.998	0.000	1.75	0.083
S1/3	17.4675	100.852	9.660	1.000	0.000	1.81	0.073
S1/4	16.2233	92.319	8.843	1.000	0.000	1.83	0.069
S1/5	13.6841	68.055	6.518	0.998	0.000	2.10	0.038
S1/6	-13.9596	108.480	10.391	0.999	0.000	-1.34	0.182
S2/3	11.4998	90.609	8.679	0.998	0.000	1.33	0.188
S2/4	10.2556	81.507	7.807	0.999	0.000	1.31	0.192
S2/5	7.7164	47.129	4.514	1.000	0.000	1.71	0.090
S2/6	-19.9273	118.669	11.366	1.000	0.000	-1.75	0.082
S3/4	-1.2442	9.129	0.874	1.000	0.000	-1.42	0.158
S3/5	-3.7834	46.283	4.433	0.998	0.000	-0.85	0.395
S3/6	-31.4271	206.470	19.776	0.999	0.000	-1.59	0.115
S4/5	-2.5392	37.604	3.602	0.999	0.000	-0.70	0.482
S4/6	-30.1829	197.508	18.918	0.999	0.000	-1.60	0.114
S5/6	-27.6437	165.591	15.861	1.000	0.000	-1.74	0.084

<u>1983</u>

MAPE/ACTUAL

RW/AC	-0.1395	0.372	0.036	0.990	0.000	-3.92	0.000
RW/PC	0.0830	0.548	0.052	0.849	0.000	1.58	0.116
RW/MA	0.0159	1.726	0.165	0.131	0.174	0.10	0.924
RW/ES	0.1094	1.058	0.101	0.177	0.066	1.08	0.283
RW/Re	0.0219	0.732	0.070	0.680	0.000	0.31	0.755
RW/S1	-1.4031	8.621	0.826	0.007	0.941	-1.70	0.092
RW/S2	-1.4792	8.993	0.861	0.008	0.936	-1.72	0.089
RW/S3	-1.5344	9.279	0.889	0.008	0.937	-1.73	0.087
RW/S4	-1.5288	9.249	0.886	0.008	0.937	-1.73	0.087
RW/S5	-1.4326	8.767	0.840	0.007	0.940	-1.71	0.091
RW/S6	-1.2118	7.600	0.728	0.006	0.953	-1.66	0.099

AC/PC	0.2226	0.847	0.081	0.846	0.000	2.74	0.007
AC/MA	0.1554	1.900	0.182	0.130	0.178	0.85	0.395
AC/ES	0.2489	1.336	0.128	0.188	0.050	1.94	0.054
AC/Re	0.1176	0.899	0.086	0.724	0.000	1.37	0.175
AC/S1	-1.2636	8.666	0.830	0.005	0.962	-1.52	0.131
AC/S2	-1.3396	9.036	0.866	0.005	0.956	-1.55	0.125
AC/S3	-1.3949	9.321	0.893	0.005	0.957	-1.56	0.121
AC/S4	-1.3893	9.290	0.890	0.005	0.957	-1.56	0.121
AC/S5	-1.2931	8.811	0.844	0.005	0.960	-1.53	0.128
AC/S6	-1.0723	7.651	0.733	0.003	0.975	-1.46	0.146
PC/MA	-0.0671	1.617	0.155	0.110	0.254	-0.43	0.666
PC/ES	0.0264	0.830	0.080	0.125	0.194	0.33	0.741
PC/Re	-0.1050	0.724	0.069	0.552	0.000	-1.51	0.133
PC/S1	-1.4862	8.580	0.822	0.026	0.786	-1.81	0.073
PC/S2	-1.5622	8.954	0.858	0.027	0.781	-1.82	0.071
PC/S3	-1.6175	9.240	0.885	0.027	0.783	-1.83	0.070
PC/S4	-1.6119	9.210	0.882	0.027	0.783	-1.83	0.070
PC/S5	-1.5157	8.726	0.836	0.027	0.784	-1.81	0.073
PC/S6	-1.2948	7.554	0.724	0.025	0.797	-1.79	0.076
MA/ES	0.0935	1.015	0.097	0.910	0.000	0.96	0.339
MA/Re	-0.0378	1.734	0.166	0.064	0.506	-0.23	0.820
MA/S1	-1.4190	8.736	0.837	-0.013	0.895	-1.70	0.093
MA/S2	-1.4951	9.105	0.872	-0.013	0.897	-1.71	0.089
MA/S3	-1.5503	9.389	0.899	-0.013	0.891	-1.72	0.088
MA/S4	-1.5448	9.359	0.896	-0.013	0.892	-1.72	0.088
MA/S5	-1.4486	8.880	0.851	-0.013	0.896	-1.70	0.091
MA/S6	-1.2277	7.723	0.740	-0.012	0.901	-1.66	0.100
ES/Re	-0.1313	0.964	0.092	0.193	0.044	-1.42	0.158
ES/S1	-1.5125	8.621	0.826	-0.035	0.720	-1.83	0.070
ES/S2	-1.5886	8.995	0.862	-0.035	0.721	-1.84	0.068
ES/S3	-1.6438	9.281	0.889	-0.035	0.719	-1.85	0.067
ES/S4	-1.9383	9.251	0.886	-0.035	0.720	-1.85	0.067
ES/S5	-1.5421	8.767	0.840	-0.035	0.720	-1.84	0.069
ES/S6	-1.3212	7.594	0.727	-0.035	0.717	-1.82	0.072
Re/S1	-1.3812	8.570	0.821	0.056	0.566	-1.68	0.095
Re/S2	-1.4573	8.942	0.856	0.057	0.557	-1.70	0.092
Re/S3	-1.5125	9.227	0.884	0.057	0.556	-1.71	0.090
Re/S4	-1.5069	9.197	0.881	0.057	0.555	-1.71	0.090
Re/S5	-1.4107	8.715	0.835	0.056	0.563	-1.69	0.094
Re/S6	-1.1899	7.547	0.723	0.053	0.585	-1.65	0.103
S1/2	-0.0760	0.379	0.036	1.000	0.000	-2.09	0.039
S1/3	-0.1313	0.665	0.064	1.000	0.000	-2.06	0.042
S1/4	-0.1257	0.635	0.061	1.000	0.000	-2.07	0.041
S1/5	-0.0295	0.151	0.014	1.000	0.000	-2.05	0.043
S1/6	0.1913	1.037	0.099	1.000	0.000	1.93	0.057
S2/3	-0.0552	0.292	0.028	1.000	0.000	-1.98	0.051
S2/4	-0.0497	0.261	0.025	1.000	0.000	-1.99	0.049
S2/5	0.0465	0.230	0.022	1.000	0.000	2.11	0.037
S2/6	0.2674	1.414	0.135	1.000	0.000	1.97	0.051
S3/4	0.0056	0.031	0.003	1.000	0.000	1.86	0.065
S3/5	0.1018	0.519	0.050	1.000	0.000	2.05	0.043
S3/6	0.3226	1.702	0.163	1.000	0.000	1.98	0.050
S4/5	0.0962	0.488	0.047	1.000	0.000	2.06	0.042
S4/6	0.3171	1.672	0.160	1.000	0.000	1.98	0.050
S5/6	0.2209	1.184	0.113	1.000	0.000	1.95	0.054

MSE/ACTUAL

RW/AC	-0.9411	3.504	0.336	0.988	0.000	-2.80	0.006
RW/PC	0.6364	3.298	0.316	0.885	0.000	2.01	0.046
RW/MA	-1.4982	25.100	2.404	-0.009	0.924	0.62	0.534
RW/ES	0.6200	5.833	0.559	0.027	0.779	1.11	0.270
RW/Re	0.1679	4.495	0.431	0.504	0.000	0.39	0.697
RW/S1	-75.5684	757.020	72.509	-0.023	0.815	-1.04	0.300
RW/S2	-82.3834	823.757	78.902	-0.023	0.816	-1.04	0.299
RW/S3	-87.7877	877.832	84.081	-0.023	0.815	-1.04	0.299
RW/S4	-87.2094	872.057	83.528	-0.023	0.815	-1.04	0.299
RW/S5	-78.2000	782.701	74.969	-0.023	0.815	-1.04	0.299
RW/S6	-58.3823	586.693	56.195	-0.023	0.816	-1.04	0.301
AC/PC	1.5775	6.686	0.640	0.861	0.000	2.46	0.015
AC/MA	-0.5572	25.959	2.486	-0.010	0.921	-0.22	0.823
AC/ES	1.5611	8.637	0.827	0.041	0.670	1.89	0.062
AC/Re	1.1089	6.288	0.602	0.609	0.000	1.84	0.068
AC/S1	-74.6273	757.134	72.520	-0.024	0.806	-1.03	0.306
AC/S2	-81.4424	823.868	78.912	-0.024	0.806	-1.03	0.304
AC/S3	-86.8467	877.942	84.092	-0.024	0.806	-1.03	0.304
AC/S4	-86.2683	872.167	83.538	-0.024	0.806	-1.03	0.304
AC/S5	-77.2589	782.814	74.980	-0.024	0.806	-1.03	0.305
AC/S6	-57.4412	586.815	56.207	-0.024	0.807	-1.02	0.309
PC/MA	-2.1347	24.716	2.367	-0.017	0.858	-0.90	0.369
PC/ES	-0.0164	4.074	0.390	-0.001	0.988	-0.04	0.967
PC/Re	-0.4686	4.223	0.405	0.343	0.000	-1.16	0.249
PC/S1	-76.2049	756.942	72.502	-0.025	0.800	-1.05	0.296
PC/S2	-83.0199	823.680	78.894	-0.025	0.800	-1.05	0.295
PC/S3	-88.4242	877.755	84.074	-0.025	0.799	-1.05	0.295
PC/S4	-87.8458	871.980	83.521	-0.025	0.799	-1.05	0.295
PC/S5	-78.8365	782.623	74.962	-0.025	0.800	-1.05	0.295
PC/S6	-59.0187	586.612	56.187	-0.024	0.801	-1.05	0.296
MA/ES	2.1183	20.912	2.003	0.987	0.000	1.06	0.293
MA/Re	1.6661	25.121	2.406	-0.016	0.872	0.69	0.490
MA/S1	-74.0702	757.572	72.562	-0.011	0.911	-1.02	0.310
MA/S2	-80.8852	824.277	78.951	-0.011	0.911	-1.02	0.308
MA/S3	-86.2895	878.330	84.129	-0.011	0.911	-1.03	0.307
MA/S4	-85.7111	872.558	83.576	-0.011	0.911	-1.03	0.307
MA/S5	-76.7018	783.240	75.021	-0.011	0.911	-1.02	0.309
MA/S6	-56.8841	587.357	56.259	-0.011	0.911	-1.01	0.314
ES/Re	-0.4522	5.559	0.532	0.108	0.263	-0.85	0.398
ES/S1	-76.1884	756.972	72.505	-0.015	0.873	-1.05	0.296
ES/S2	-83.0035	823.709	78.897	-0.015	0.873	-1.05	0.295
ES/S3	-88.4077	877.784	84.076	-0.015	0.873	-1.05	0.295
ES/S4	-87.8294	872.010	83.523	-0.015	0.873	-1.05	0.295
ES/S5	-78.8200	782.653	74.965	-0.015	0.873	-1.05	0.295
ES/S6	-59.0023	586.644	56.190	-0.015	0.873	-1.05	0.296
Re/S1	-75.7363	756.950	72.503	-0.007	0.940	-1.04	0.299
Re/S2	-82.5513	823.687	78.895	-0.007	0.941	-1.05	0.298
Re/S3	-87.9556	877.761	84.074	-0.007	0.940	-1.05	0.298
Re/S4	-87.3772	871.987	83.521	-0.007	0.940	-1.05	0.298
Re/S5	-78.3679	782.631	74.962	-0.007	0.941	-1.05	0.298
Re/S6	-58.5502	586.623	56.188	-0.007	0.940	-1.04	0.300
S1/2	-6.8150	66.742	6.393	1.000	0.000	-1.07	0.289
S1/3	-12.2193	120.814	11.572	1.000	0.000	-1.06	0.293
S1/4	-11.6409	115.039	11.019	1.000	0.000	-1.06	0.293
S1/5	-2.6316	25.686	2.460	1.000	0.000	-1.07	0.287
S1/6	17.1861	170.332	16.315	1.000	0.000	1.05	0.295
S2/3	-5.4043	54.082	5.180	1.000	0.000	-1.04	0.299

S2/4	-4.8259	48.307	4.627	1.000	0.000	-1.04	0.299
S2/5	4.1834	41.058	3.933	1.000	0.000	1.06	0.290
S2/6	24.0011	237.070	22.707	1.000	0.000	1.06	0.293
S3/4	0.5784	5.776	0.553	1.000	0.000	1.05	0.298
S3/5	9.5877	95.134	9.112	1.000	0.000	1.05	0.295
S3/6	29.4054	291.146	27.887	1.000	0.000	1.05	0.294
S4/5	9.0093	89.359	8.559	1.000	0.000	1.05	0.295
S4/6	28.8271	285.371	27.334	1.000	0.000	1.05	0.294
S5/6	19.8177	196.013	18.775	1.000	0.000	1.06	0.294

MAPE/FORECAST

RW/AC	-0.4941	5.713	0.547	0.403	0.000	-0.90	0.369
RW/PC	-0.2667	0.830	0.080	0.992	0.000	-3.35	0.001
RW/MA	0.1229	2.299	0.220	0.246	0.010	0.56	0.578
RW/ES	-0.1352	3.141	0.301	0.108	0.262	-0.45	0.654
RW/Re	0.4022	2.695	0.258	0.054	0.579	-1.56	0.122
RW/S1	-0.8401	5.560	0.533	-0.038	0.693	-1.58	0.118
RW/S2	-0.7741	5.409	0.518	-0.036	0.710	-1.49	0.138
RW/S3	-0.7207	5.233	0.501	-0.035	0.717	-1.44	0.153
RW/S4	-0.7241	5.246	0.502	-0.035	0.716	-1.44	0.152
RW/S5	-0.8196	5.508	0.528	-0.038	0.698	-1.55	0.123
RW/S6	-1.0895	6.217	0.595	-0.044	0.652	-1.83	0.070
AC/PC	0.2274	5.744	0.550	0.398	0.000	0.41	0.680
AC/MA	0.6170	6.290	0.602	0.066	0.494	1.02	0.308
AC/ES	0.3589	6.669	0.639	0.016	0.869	0.56	0.575
AC/Re	0.8963	6.429	0.616	0.011	0.908	1.46	0.148
AC/S1	-0.3460	8.192	0.785	-0.050	0.604	-0.44	0.660
AC/S2	-0.2800	8.086	0.774	-0.049	0.610	-0.36	0.718
AC/S3	-0.2266	7.964	0.763	-0.049	0.611	-0.30	0.767
AC/S4	-0.2300	7.973	0.764	-0.049	0.611	-0.30	0.764
AC/S5	-0.3255	8.155	0.781	-0.050	0.606	-0.42	0.678
AC/S6	-0.5954	8.668	0.830	-0.052	0.592	-0.72	0.475
PC/MA	0.3896	2.929	0.281	0.271	0.004	1.39	0.168
PC/ES	0.1315	3.505	0.336	0.187	0.051	0.39	0.696
PC/Re	0.6689	3.311	0.317	0.070	0.468	2.11	0.037
PC/S1	-0.5735	5.865	0.562	-0.011	0.908	-1.02	0.310
PC/S2	-0.5074	5.721	0.548	-0.009	0.928	-0.93	0.357
PC/S3	-0.4541	5.557	0.532	-0.008	0.934	-0.85	0.395
PC/S4	-0.4574	5.569	0.533	-0.008	0.934	-0.86	0.393
PC/S5	-0.5529	5.816	0.557	-0.011	0.913	-0.99	0.323
PC/S6	-0.8228	6.489	0.622	-0.017	0.861	-1.32	0.188
MA/ES	-0.2581	2.132	0.204	0.506	0.000	-1.26	0.209
MA/Re	0.2793	1.896	0.182	0.203	0.034	1.54	0.127
MA/S1	-0.9630	4.614	0.442	0.417	0.000	-2.18	0.032
MA/S2	-0.8970	4.456	0.427	0.420	0.000	-2.10	0.038
MA/S3	-0.8436	4.272	0.409	0.420	0.000	-2.06	0.042
MA/S4	-0.8470	4.285	0.410	0.420	0.000	-2.06	0.041
MA/S5	-0.9425	4.562	0.437	0.417	0.000	-2.16	0.033
MA/S6	-1.2124	5.298	0.517	0.412	0.000	-2.39	0.019
ES/Re	0.5374	2.719	0.260	0.172	0.074	2.06	0.041
ES/S1	-0.7049	5.335	0.511	0.111	0.253	-1.38	0.171
ES/S2	-0.6389	5.189	0.497	0.112	0.246	-1.29	0.201
ES/S3	-0.5855	5.020	0.481	0.113	0.243	-1.22	0.226
ES/S4	-0.5889	5.032	0.482	0.113	0.244	-1.22	0.224
ES/S5	-0.6844	5.286	0.506	0.111	0.253	-1.35	0.179
ES/S6	-0.9543	5.973	0.572	0.106	0.272	-1.67	0.098
Re/S1	-1.2423	5.095	0.488	0.111	0.249	-2.55	0.012
Re/S2	-1.1763	4.940	0.473	0.113	0.240	-2.49	0.014

Re/S3	-1.1230	4.762	0.456	0.112	0.248	-2.46	0.015
Re/S4	-1.1263	4.776	0.457	0.111	0.248	-2.46	0.015
Re/S5	-1.2218	5.041	0.483	0.113	0.243	-2.53	0.013
Re/S6	-1.4917	5.759	0.552	0.112	0.246	-2.70	0.008
S1/2	0.0660	0.180	0.017	1.000	0.000	3.82	0.000
S1/3	0.1194	0.359	0.034	1.000	0.000	3.48	0.001
S1/4	0.1160	0.344	0.033	1.000	0.000	3.52	0.001
S1/5	0.0205	0.083	0.008	1.000	0.000	2.59	0.011
S1/6	-0.2494	0.710	0.068	1.000	0.000	-3.67	0.000
S2/3	0.0534	0.205	0.020	1.000	0.000	2.71	0.008
S2/4	0.0500	0.192	0.018	1.000	0.000	2.72	0.008
S2/5	-0.0455	0.120	0.011	1.000	0.000	-3.97	0.000
S2/6	-0.3154	0.874	0.084	1.000	0.000	-3.77	0.000
S3/4	-0.0034	0.017	0.002	1.000	0.000	-2.04	0.044
S3/5	-0.0989	0.307	0.029	1.000	0.000	-3.36	0.001
S3/6	-0.3688	1.067	0.102	0.999	0.000	-3.61	0.000
S4/5	-0.0955	0.294	0.028	1.000	0.000	-3.39	0.001
S4/6	-0.3654	1.053	0.101	0.999	0.000	-3.62	0.000
S5/6	-0.2699	0.764	0.073	1.000	0.000	-3.69	0.000

MSE/FORECAST

RW/AC	-34.7901	368.785	35.323	0.110	0.256	-0.98	0.327
RW/PC	-4.5449	25.844	2.475	0.999	0.000	-1.84	0.069
RW/MA	3.3609	34.200	3.276	0.093	0.336	-1.03	0.307
RW/ES	-1.4001	64.747	6.202	-0.004	0.966	-0.23	0.822
RW/Re	2.8592	43.108	4.129	-0.011	0.911	-0.69	0.490
RW/S1	-22.2718	201.870	19.336	-0.022	0.819	-1.15	0.252
RW/S2	-20.4721	191.323	18.325	-0.022	0.821	-1.12	0.266
RW/S3	-18.4817	175.864	16.845	-0.022	0.820	-1.10	0.275
RW/S4	-18.6249	177.089	16.962	-0.022	0.820	-1.10	0.275
RW/S5	-21.6544	197.512	18.918	-0.022	0.819	-1.14	0.255
RW/S6	-30.6367	259.161	24.823	-0.022	0.817	-1.23	0.220
AC/PC	30.2453	369.373	35.380	0.107	0.269	0.85	0.395
AC/MA	38.1510	371.121	35.547	-0.005	0.956	1.07	0.286
AC/ES	33.3900	375.663	35.982	-0.012	0.904	0.93	0.355
AC/Re	37.6493	372.178	35.648	-0.011	0.912	1.06	0.293
AC/S1	12.5184	423.335	40.548	-0.016	0.872	0.31	0.758
AC/S2	14.3180	418.257	40.062	-0.015	0.874	0.36	0.721
AC/S3	16.3084	411.243	39.390	-0.016	0.873	0.41	0.680
AC/S4	16.1652	411.780	39.441	-0.016	0.873	0.41	0.683
AC/S5	13.1357	421.223	40.346	-0.016	0.872	0.33	0.745
AC/S6	4.1534	454.113	43.496	-0.016	0.872	0.10	0.924
PC/MA	7.9057	59.368	5.686	0.102	0.292	1.39	0.167
PC/ES	3.1447	79.935	7.656	0.030	0.758	0.41	0.682
PC/Re	7.4041	65.402	6.264	-0.009	0.923	1.18	0.240
PC/S1	-17.7269	208.057	19.928	-0.018	0.853	-0.89	0.376
PC/S2	-15.9273	197.816	18.947	-0.018	0.855	-0.84	0.402
PC/S3	-13.9368	182.883	17.517	-0.018	0.854	-0.80	0.428
PC/S4	-14.0800	184.063	17.630	-0.018	0.854	-0.80	0.426
PC/S5	-17.1096	203.825	19.523	-0.018	0.853	-0.88	0.383
PC/S6	-26.0919	264.086	25.295	-0.018	0.851	-1.03	0.305
MA/ES	-4.7610	53.722	5.146	0.229	0.016	0.93	0.357
MA/Re	-0.5017	27.754	2.658	0.023	0.814	-0.19	0.851
MA/S1	-25.6327	192.909	18.477	0.597	0.000	-1.39	0.168
MA/S2	-23.8330	182.215	17.453	0.598	0.000	-1.37	0.175
MA/S3	-21.8426	166.501	15.948	0.597	0.000	-1.37	0.174
MA/S4	-21.9858	167.749	16.067	0.597	0.000	-1.37	0.174
AC/S5	-25.0153	188.495	18.055	0.597	0.000	-1.39	0.169

AC/S6	-33.9976	250.799	24.022	0.597	0.000	-1.42	0.160
ES/Re	4.2593	60.623	5.807	0.019	0.844	0.73	0.465
ES/S1	-20.8716	204.295	19.568	0.028	0.774	-1.07	0.289
ES/S2	-19.0720	194.004	18.582	0.028	0.772	-1.03	0.307
ES/S3	-17.0816	178.981	17.143	0.028	0.773	-1.00	0.321
ES/S4	-17.2248	180.169	17.257	0.028	0.773	-1.00	0.320
ES/S5	-20.2543	200.042	19.161	0.028	0.774	-1.06	0.293
ES/S6	-29.2366	260.546	24.956	0.028	0.775	-1.17	0.244
Re/S1	-25.1310	199.397	19.099	0.024	0.806	-1.32	0.191
Re/S2	-23.3313	188.794	18.083	0.024	0.804	-1.29	0.200
Re/S3	-21.3409	173.235	16.593	0.024	0.806	-1.29	0.201
Re/S4	-21.4841	174.469	16.711	0.024	0.806	-1.29	0.201
Re/S5	-24.5136	195.013	18.679	0.024	0.806	-1.31	0.192
Re/S6	-33.4960	256.919	24.608	0.024	0.806	-1.36	0.176
S1/2	1.7997	10.835	1.038	1.000	0.000	1.73	0.086
S1/3	3.7901	26.433	2.532	1.000	0.000	1.50	0.137
S1/4	3.6469	25.185	2.412	1.000	0.000	1.51	0.134
S1/5	0.6173	4.540	0.435	1.000	0.000	1.42	0.159
S1/6	-8.3650	57.934	5.549	1.000	0.000	-1.51	0.135
S2/3	1.9904	15.818	1.515	1.000	0.000	1.31	0.192
S2/4	1.8472	14.570	1.396	1.000	0.000	1.32	0.188
S2/5	-1.1823	6.452	0.618	1.000	0.000	-1.91	0.058
S2/6	-10.1646	68.640	6.575	1.000	0.000	-1.55	0.125
S3/4	-0.1432	1.262	0.121	1.000	0.000	-1.18	0.239
S3/5	-3.1727	22.029	2.110	1.000	0.000	-1.50	0.136
S3/6	-12.1550	84.362	8.080	1.000	0.000	-1.50	0.135
S4/5	-3.0295	20.786	1.991	1.000	0.000	-1.52	0.131
S4/6	-12.0119	83.115	7.961	1.000	0.000	-1.51	0.134
S5/6	-8.9823	62.346	5.972	1.000	0.000	-1.50	0.135

Appendix 27.

T-TESTS OF THE TRUNCATED ERRORS FOR THE OPTIMAL OVERALL MODELS FOR FORECASTING PROFITS, (109 COS.).

	(DIFFERENCE) MEAN	STANDARD DEVIATION	STANDARD ERROR	CORR.	2-TAIL PROB.	T VALUE	2-TAIL PROB.
1981							
MAPE/ACTUAL							
RW/AC	-0.0033	0.100	0.010	0.967	0.000	-0.34	0.731
RW/PC	-0.0584	0.248	0.024	0.794	0.000	-2.46	0.015
RW/MA	-0.0398	0.245	0.023	0.792	0.000	-1.70	0.092
RW/ES	0.0098	0.180	0.017	0.885	0.000	0.57	0.571
RW/Re	0.0172	0.249	0.024	0.791	0.000	0.72	0.473
RW/S1	-0.2986	0.471	0.045	0.154	0.110	-6.62	0.000
RW/S2	-0.2975	0.475	0.046	0.153	0.111	-6.54	0.000
RW/S3	-0.3019	0.477	0.046	0.146	0.129	-6.61	0.000
RW/S4	-0.3018	0.477	0.046	0.147	0.128	-6.61	0.000
RW/S5	-0.3109	0.475	0.046	0.145	0.134	-6.83	0.000
RW/S6	-0.2971	0.475	0.046	0.154	0.111	-6.53	0.000
AC/PC	-0.0551	0.243	0.023	0.808	0.000	-2.37	0.020
AC/MA	-0.0365	0.256	0.024	0.781	0.000	-1.49	0.139
AC/ES	0.0131	0.209	0.020	0.851	0.000	0.65	0.514
AC/Re	0.0205	0.262	0.025	0.776	0.000	0.82	0.416
AC/S1	-0.2953	0.496	0.047	0.098	0.309	-6.22	0.000
AC/S2	-0.2942	0.499	0.048	0.102	0.290	-6.16	0.000
AC/S3	-0.2986	0.500	0.048	0.098	0.313	-6.24	0.000
AC/S4	-0.2984	0.500	0.048	0.098	0.311	-6.24	0.000
AC/S5	-0.3076	0.496	0.047	0.105	0.276	-6.48	0.000
AC/S6	-0.2938	0.499	0.048	0.102	0.290	-6.15	0.000
PC/MA	0.0186	0.334	0.032	0.624	0.000	0.58	0.562
PC/ES	0.0682	0.262	0.025	0.763	0.000	2.72	0.008
PC/Re	0.0755	0.330	0.032	0.643	0.000	2.39	0.018
PC/S1	-0.2403	0.497	0.048	0.088	0.362	-5.05	0.000
PC/S2	-0.2391	0.499	0.048	0.096	0.321	-5.00	0.000
PC/S3	-0.2435	0.501	0.048	0.089	0.359	-5.08	0.000
PC/S4	-0.2434	0.500	0.048	0.089	0.357	-5.08	0.000
PC/S5	-0.2525	0.498	0.048	0.090	0.353	-5.29	0.000
PC/S6	-0.2387	0.499	0.048	0.097	0.318	-4.99	0.000
MA/ES	0.0496	0.209	0.020	0.844	0.000	2.48	0.015
MA/Re	0.0570	0.244	0.023	0.799	0.000	2.44	0.016
MA/S1	-0.2589	0.500	0.048	0.045	0.645	-5.41	0.000
MA/S2	-0.2577	0.503	0.048	0.049	0.613	-5.35	0.000
MA/S3	-0.2621	0.503	0.048	0.046	0.636	-5.44	0.000
MA/S4	-0.2620	0.503	0.048	0.046	0.633	-5.44	0.000
MA/S5	-0.2711	0.499	0.048	0.054	0.576	-5.67	0.000
MA/S6	-0.2573	0.503	0.048	0.049	0.613	-5.34	0.000
ES/Re	0.0074	0.229	0.022	0.819	0.000	0.34	0.737
ES/S1	-0.3084	0.465	0.045	0.148	0.125	-6.92	0.000
ES/S2	-0.3073	0.469	0.045	0.150	0.120	-6.85	0.000
ES/S3	-0.3117	0.470	0.045	0.146	0.131	-6.93	0.000
ES/S4	-0.3116	0.469	0.045	0.146	0.130	-6.93	0.000

ES/S5	-0.3207	0.466	0.045	0.149	0.122	-7.18	0.000
ES/S6	-0.3069	0.469	0.045	0.150	0.119	-6.83	0.000
Re/S1	-0.3158	0.473	0.045	0.170	0.077	-6.97	0.000
Re/S2	-0.3147	0.480	0.046	0.159	0.099	-6.84	0.000
Re/S3	-0.3191	0.484	0.046	0.143	0.138	-6.88	0.000
Re/S4	-0.3189	0.484	0.046	0.144	0.136	-6.88	0.000
Re/S5	-0.3280	0.488	0.047	0.121	0.209	-7.01	0.000
Re/S6	-0.3142	0.480	0.046	0.161	0.095	-6.84	0.000
S1/2	0.0012	0.039	0.004	0.994	0.000	0.31	0.756
S1/3	-0.0032	0.064	0.006	0.983	0.000	-0.53	0.600
S1/4	-0.0031	0.063	0.006	0.984	0.000	-0.51	0.608
S1/5	-0.0122	0.116	0.011	0.944	0.000	-1.10	0.273
S1/6	0.0016	0.038	0.004	0.994	0.000	0.43	0.667
S2/3	-0.0044	0.034	0.003	0.995	0.000	-1.34	0.183
S2/4	-0.0043	0.033	0.003	0.996	0.000	-1.37	0.175
S2/5	-0.0134	0.086	0.008	0.970	0.000	-1.63	0.105
S2/6	0.0004	0.006	0.001	1.000	0.000	0.75	0.452
S3/4	0.0001	0.002	0.000	1.000	0.000	0.66	0.513
S3/5	-0.0090	0.060	0.006	0.985	0.000	-1.56	0.123
S3/6	0.0048	0.037	0.004	0.994	0.000	1.36	0.176
S4/5	-0.0091	0.061	0.006	0.985	0.000	-1.55	0.123
S4/6	0.0047	0.035	0.003	0.995	0.000	1.38	0.169
S5/6	0.0138	0.087	0.008	0.969	0.000	1.66	0.100

MSE/ACTUAL

RW/AC	-0.0133	0.076	0.007	0.984	0.000	-1.84	0.069
RW/PC	-0.0634	0.262	0.025	0.811	0.000	-2.52	0.013
RW/MA	-0.0358	0.270	0.026	0.797	0.000	-1.38	0.169
RW/ES	0.0166	0.203	0.019	0.881	0.000	0.85	0.397
RW/Re	0.0073	0.250	0.024	0.826	0.000	0.31	0.760
RW/S1	-0.3261	0.539	0.052	0.164	0.088	-6.32	0.000
RW/S2	-0.3288	0.540	0.052	0.164	0.089	-6.36	0.000
RW/S3	-0.3349	0.541	0.052	0.159	0.099	-6.46	0.000
RW/S4	-0.3347	0.541	0.052	0.159	0.098	-6.46	0.000
RW/S5	-0.3460	0.545	0.052	0.155	0.106	-6.63	0.000
RW/S6	-0.3284	0.540	0.052	0.163	0.090	-6.35	0.000
AC/PC	-0.0501	0.260	0.025	0.817	0.000	-2.01	0.047
AC/MA	-0.0225	0.287	0.027	0.775	0.000	-0.82	0.414
AC/ES	0.0299	0.229	0.022	0.852	0.000	1.36	0.176
AC/Re	0.0206	0.268	0.026	0.803	0.000	0.80	0.424
AC/S1	-0.3128	0.555	0.053	0.128	0.183	-5.88	0.000
AC/S2	-0.3155	0.556	0.053	0.129	0.182	-5.92	0.000
AC/S3	-0.3216	0.557	0.053	0.124	0.198	-6.03	0.000
AC/S4	-0.3214	0.557	0.053	0.125	0.196	-6.02	0.000
AC/S5	-0.3327	0.559	0.054	0.127	0.189	-6.21	0.000
AC/S6	-0.3151	0.556	0.053	0.129	0.182	-5.92	0.000
PC/MA	0.0275	0.369	0.035	0.632	0.000	0.78	0.437
PC/ES	0.0799	0.279	0.027	0.783	0.000	2.99	0.003
PC/Re	0.0707	0.345	0.033	0.678	0.000	2.14	0.035
PC/S1	-0.2627	0.567	0.054	0.099	0.306	-4.84	0.000
PC/S2	-0.2654	0.567	0.054	0.103	0.287	-4.89	0.000
PC/S3	-0.2715	0.569	0.054	0.097	0.316	-4.99	0.000
PC/S4	-0.2713	0.569	0.054	0.097	0.314	-4.98	0.000
PC/S5	-0.2827	0.569	0.054	0.105	0.276	-5.19	0.000
PC/S6	-0.2650	0.567	0.054	0.103	0.285	-4.88	0.000
MA/ES	0.0524	0.246	0.024	0.828	0.000	2.22	0.028
MA/Re	0.0431	0.256	0.025	0.820	0.000	1.76	0.081

MA/S1	-0.2902	0.569	0.055	0.081	0.403	-5.32	0.000
MA/S2	-0.2930	0.569	0.054	0.086	0.373	-5.38	0.000
MA/S3	-0.2991	0.569	0.054	0.084	0.385	-5.49	0.000
MA/S4	-0.2988	0.569	0.054	0.085	0.382	-5.49	0.000
MA/S5	-0.3102	0.568	0.054	0.096	0.319	-5.70	0.000
MA/S6	-0.2926	0.569	0.054	0.085	0.377	-5.37	0.000
ES/Re	-0.0092	0.231	0.022	0.849	0.000	-0.42	0.677
ES/S1	-0.3426	0.532	0.051	0.168	0.081	-6.73	0.000
ES/S2	-0.3453	0.531	0.051	0.172	0.073	-6.79	0.000
ES/S3	-0.3515	0.532	0.051	0.169	0.080	-6.90	0.000
ES/S4	-0.3512	0.532	0.051	0.169	0.078	-6.89	0.000
ES/S5	-0.3626	0.533	0.051	0.176	0.067	-7.11	0.000
ES/S6	-0.3449	0.532	0.051	0.172	0.074	-6.78	0.000
Re/S1	-0.3334	0.537	0.051	0.181	0.059	-6.48	0.000
Re/S2	-0.3361	0.541	0.052	0.172	0.074	-6.48	0.000
Re/S3	-0.3422	0.546	0.052	0.156	0.105	-6.55	0.000
Re/S4	-0.3420	0.546	0.052	0.157	0.103	-6.54	0.000
Re/S5	-0.3533	0.556	0.053	0.133	0.169	-6.63	0.000
Re/S6	-0.3357	0.541	0.052	0.173	0.071	-6.48	0.000
S1/2	-0.0027	0.041	0.004	0.995	0.000	-0.70	0.488
S1/3	-0.0088	0.069	0.007	0.986	0.000	-1.34	0.183
S1/4	-0.0086	0.067	0.006	0.987	0.000	-1.33	0.186
S1/5	-0.0200	0.133	0.013	0.949	0.000	-1.56	0.121
S1/6	-0.0023	0.041	0.004	0.995	0.000	-0.60	0.552
S2/3	-0.0061	0.039	0.004	0.996	0.000	-1.65	0.103
S2/4	-0.0059	0.037	0.004	0.996	0.000	-1.66	0.099
S2/5	-0.0172	0.098	0.009	0.972	0.000	-1.84	0.069
S2/6	0.0004	0.007	0.001	1.000	0.000	0.63	0.531
S3/4	0.0002	0.003	0.000	1.000	0.000	0.97	0.334
S3/5	-0.0111	0.070	0.007	0.986	0.000	-1.65	0.102
S3/6	0.0065	0.042	0.004	0.995	0.000	1.61	0.109
S4/5	-0.0114	0.071	0.007	0.985	0.000	-1.66	0.099
S4/6	0.0063	0.040	0.004	0.995	0.000	1.62	0.108
S5/6	0.0176	0.099	0.010	0.971	0.000	1.85	0.067

MAPE/FORECAST

RW/AC	0.0136	0.113	0.011	0.952	0.000	1.25	0.213
RW/PC	-0.0315	0.184	0.018	0.871	0.000	-1.78	0.077
RW/MA	-0.0196	0.229	0.022	0.780	0.000	-0.89	0.374
RW/ES	0.0105	0.153	0.015	0.904	0.000	0.72	0.474
RW/Re	0.0551	0.277	0.027	0.682	0.000	2.07	0.041
RW/S1	-0.1634	0.507	0.049	0.090	0.353	-3.36	0.001
RW/S2	-0.1560	0.506	0.048	0.098	0.310	-3.22	0.002
RW/S3	-0.1542	0.505	0.048	0.098	0.309	-3.19	0.002
RW/S4	-0.1543	0.505	0.048	0.098	0.309	-3.19	0.002
RW/S5	-0.1533	0.501	0.048	0.101	0.294	-3.19	0.002
RW/S6	-0.1561	0.507	0.049	0.096	0.320	-3.21	0.002
AC/PC	-0.0451	0.176	0.017	0.886	0.000	-2.67	0.009
AC/MA	-0.0332	0.243	0.023	0.765	0.000	-1.42	0.157
AC/ES	-0.0031	0.195	0.019	0.852	0.000	-0.16	0.870
AC/Re	0.0415	0.288	0.028	0.673	0.000	1.50	0.136
AC/S1	-0.1769	0.533	0.051	0.033	0.731	-3.47	0.001
AC/S2	-0.1696	0.532	0.051	0.041	0.672	-3.33	0.001
AC/S3	-0.1678	0.531	0.051	0.041	0.674	-3.30	0.001
AC/S4	-0.1679	0.531	0.051	0.041	0.673	-3.30	0.001
AC/S5	-0.1669	0.526	0.050	0.045	0.639	-3.31	0.001
AC/S6	-0.1697	0.533	0.051	0.039	0.688	-3.33	0.001

PC/MA	0.0119	0.295	0.028	0.651	0.000	0.42	0.675
PC/ES	0.0420	0.232	0.022	0.792	0.000	1.89	0.061
PC/Re	0.0866	0.337	0.032	0.554	0.000	2.68	0.009
PC/S1	-0.1319	0.528	0.051	0.054	0.575	-2.61	0.010
PC/S2	-0.1245	0.528	0.051	0.060	0.538	-2.46	0.015
PC/S3	-0.1227	0.528	0.051	0.054	0.574	-2.43	0.017
PC/S4	-0.1228	0.528	0.051	0.055	0.572	-2.43	0.017
PC/S5	-0.1218	0.525	0.050	0.053	0.585	-2.42	0.017
PC/S6	-0.1246	0.528	0.051	0.058	0.550	-2.46	0.015
MA/ES	0.0301	0.188	0.018	0.846	0.000	1.67	0.099
MA/Re	0.0747	0.242	0.023	0.745	0.000	3.22	0.002
MA/S1	-0.1438	0.499	0.048	0.079	0.416	-3.01	0.003
MA/S2	-0.1364	0.498	0.048	0.084	0.383	-2.86	0.005
MA/S3	-0.1346	0.498	0.048	0.082	0.394	-2.82	0.006
MA/S4	-0.1347	0.498	0.048	0.083	0.393	-2.82	0.006
MA/S5	-0.1337	0.492	0.047	0.094	0.332	-2.84	0.005
MA/S6	-0.1365	0.498	0.048	0.085	0.379	-2.86	0.005
ES/Re	0.0446	0.260	0.025	0.714	0.000	1.79	0.076
ES/S1	-0.1739	0.489	0.047	0.138	0.152	-3.71	0.000
ES/S2	-0.1665	0.487	0.047	0.148	0.124	-3.57	0.001
ES/S3	-0.1647	0.485	0.046	0.152	0.114	-3.54	0.001
ES/S4	-0.1648	0.485	0.046	0.152	0.114	-3.55	0.001
ES/S5	-0.1638	0.479	0.046	0.162	0.093	-3.57	0.001
ES/S6	-0.1666	0.487	0.047	0.148	0.124	-3.57	0.001
Re/S1	-0.2185	0.481	0.046	0.162	0.092	-4.74	0.000
Re/S2	-0.2111	0.482	0.046	0.164	0.089	-4.58	0.000
Re/S3	-0.2093	0.482	0.046	0.159	0.099	-4.53	0.000
Re/S4	-0.2094	0.482	0.046	0.159	0.099	-4.54	0.000
Re/S5	-0.2084	0.479	0.046	0.158	0.100	-4.54	0.000
Re/S6	-0.2112	0.481	0.046	0.165	0.085	-4.58	0.000
S1/2	0.0074	0.043	0.004	0.994	0.000	1.78	0.077
S1/3	0.0092	0.067	0.006	0.986	0.000	1.44	0.152
S1/4	0.0091	0.065	0.006	0.986	0.000	1.45	0.151
S1/5	0.0101	0.120	0.012	0.954	0.000	0.87	0.385
S1/6	0.0073	0.043	0.004	0.994	0.000	1.76	0.082
S2/3	0.0018	0.029	0.003	0.997	0.000	0.67	0.505
S2/4	0.0017	0.027	0.003	0.998	0.000	0.66	0.513
S2/5	0.0027	0.084	0.008	0.978	0.000	0.34	0.738
S2/6	-0.0001	0.007	0.001	1.000	0.000	-0.14	0.891
S3/4	-0.0001	0.002	0.000	1.000	0.000	-0.79	0.433
S3/5	0.0009	0.061	0.006	0.988	0.000	0.15	0.884
S3/6	-0.0019	0.031	0.003	0.997	0.000	-0.64	0.524
S4/5	0.0010	0.062	0.006	0.988	0.000	0.16	0.871
S4/6	-0.0018	0.030	0.003	0.997	0.000	-0.63	0.533
S5/6	-0.0028	0.085	0.008	0.977	0.000	-0.34	0.733

MSE/FORECAST

RW/AC	0.0006	0.105	0.010	0.962	0.000	0.06	0.950
RW/PC	-0.0401	0.171	0.016	0.906	0.000	-2.45	0.016
RW/MA	-0.0044	0.253	0.024	0.772	0.000	-0.18	0.857
RW/ES	0.0146	0.155	0.015	0.917	0.000	0.99	0.327
RW/Re	0.0516	0.296	0.028	0.687	0.000	1.82	0.071
RW/S1	-0.2008	0.548	0.052	0.091	0.347	-3.83	0.000
RW/S2	-0.1933	0.543	0.052	0.102	0.293	-3.72	0.000
RW/S3	-0.1902	0.542	0.052	0.104	0.283	-3.66	0.000
RW/S4	-0.1903	0.542	0.052	0.104	0.283	-3.67	0.000
RW/S5	-0.1857	0.538	0.052	0.116	0.228	-3.60	0.000

RW/S6	-0.1936	0.544	0.052	0.100	0.301	-3.72	0.000
AC/PC	-0.0407	0.170	0.016	0.907	0.000	-2.51	0.014
AC/MA	-0.0050	0.261	0.025	0.760	0.000	-0.20	0.842
AC/ES	0.0140	0.195	0.019	0.871	0.000	0.75	0.454
AC/Re	0.0510	0.305	0.029	0.670	0.000	1.74	0.084
AC/S1	-0.2014	0.563	0.054	0.048	0.619	-3.74	0.000
AC/S2	-0.1940	0.559	0.053	0.057	0.554	-3.63	0.000
AC/S3	-0.1908	0.558	0.053	0.059	0.544	-3.57	0.001
AC/S4	-0.1909	0.558	0.053	0.059	0.543	-3.57	0.001
AC/S5	-0.1863	0.554	0.053	0.070	0.467	-3.51	0.001
AC/S6	-0.1943	0.559	0.054	0.056	0.565	-3.63	0.000
PC/MA	0.0357	0.311	0.030	0.672	0.000	1.20	0.234
PC/ES	0.0547	0.231	0.022	0.824	0.000	2.47	0.015
PC/Re	0.0917	0.358	0.034	0.563	0.000	2.68	0.009
PC/S1	-0.1607	0.560	0.054	0.084	0.387	-3.00	0.003
PC/S2	-0.1533	0.557	0.053	0.090	0.353	-2.87	0.005
PC/S3	-0.1501	0.557	0.053	0.089	0.355	-2.81	0.006
PC/S4	-0.1502	0.557	0.053	0.090	0.354	-2.82	0.006
PC/S5	-0.1456	0.554	0.053	0.098	0.313	-2.74	0.007
PC/S6	-0.1536	0.558	0.053	0.088	0.363	-2.87	0.005
MA/ES	0.0190	0.215	0.021	0.833	0.000	0.92	0.359
MA/Re	0.0560	0.239	0.023	0.783	0.000	2.44	0.016
MA/S1	-0.1964	0.534	0.051	0.100	0.300	-3.84	0.000
MA/S2	-0.1890	0.529	0.051	0.113	0.243	-3.73	0.000
MA/S3	-0.1858	0.527	0.050	0.116	0.229	-3.68	0.000
MA/S4	-0.1859	0.527	0.050	0.116	0.229	-3.68	0.000
MA/S5	-0.1813	0.522	0.050	0.132	0.172	-3.62	0.000
MA/S6	-0.1893	0.529	0.051	0.113	0.243	-3.74	0.000
ES/Re	0.0370	0.274	0.026	0.729	0.000	1.41	0.161
ES/S1	-0.2154	0.525	0.050	0.158	0.100	-4.29	0.000
ES/S2	-0.2080	0.519	0.050	0.171	0.075	-4.18	0.000
ES/S3	-0.2048	0.518	0.050	0.175	0.068	-4.13	0.000
ES/S4	-0.2049	0.518	0.050	0.175	0.068	-4.13	0.000
ES/S5	-0.2003	0.513	0.049	0.190	0.047	-4.08	0.000
ES/S6	-0.2083	0.520	0.050	0.171	0.076	-4.18	0.000
Re/S1	-0.2524	0.512	0.049	0.169	0.079	-5.15	0.000
Re/S2	-0.2449	0.509	0.049	0.176	0.068	-5.03	0.000
Re/S3	-0.2418	0.509	0.049	0.173	0.071	-4.96	0.000
Re/S4	-0.2419	0.509	0.049	0.174	0.071	-4.96	0.000
Re/S5	-0.2373	0.506	0.048	0.181	0.060	-4.89	0.000
Re/S6	-0.2452	0.508	0.049	0.176	0.067	-5.04	0.000
S1/2	0.0075	0.048	0.005	0.994	0.000	1.64	0.104
S1/3	0.0107	0.072	0.007	0.986	0.000	1.55	0.124
S1/4	0.0105	0.071	0.007	0.986	0.000	1.55	0.123
S1/5	0.0151	0.129	0.012	0.954	0.000	1.22	0.223
S1/6	0.0072	0.048	0.005	0.994	0.000	1.56	0.121
S2/3	0.0032	0.027	0.003	0.998	0.000	1.25	0.213
S2/4	0.0030	0.025	0.002	0.998	0.000	1.26	0.211
S2/5	0.0077	0.084	0.008	0.981	0.000	0.95	0.343
S2/6	-0.0003	0.007	0.001	1.000	0.000	-0.45	0.653
S3/4	-0.0001	0.002	0.000	1.000	0.000	-0.98	0.327
S3/5	0.0045	0.061	0.006	0.990	0.000	0.76	0.447
S3/6	-0.0035	0.029	0.003	0.998	0.000	-1.25	0.215
S4/5	0.0046	0.062	0.006	0.989	0.000	0.78	0.440
S4/6	-0.0033	0.028	0.003	0.998	0.000	-1.25	0.214
S5/6	-0.0080	0.085	0.008	0.980	0.000	-0.98	0.329

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MAPE/ACTUAL

RW/AC	-0.0252	0.180	0.017	0.861	0.000	-1.46	0.146
RW/PC	-0.1022	0.208	0.020	0.823	0.000	-5.14	0.000
RW/MA	-0.0251	0.226	0.022	0.786	0.000	-1.16	0.248
RW/ES	-0.0029	0.122	0.012	0.934	0.000	-0.25	0.804
RW/Re	-0.0421	0.246	0.024	0.757	0.000	-1.79	0.077
RW/S1	-0.2937	0.431	0.041	0.227	0.018	-7.11	0.000
RW/S2	-0.2970	0.436	0.042	0.210	0.028	-7.12	0.000
RW/S3	-0.3015	0.440	0.042	0.193	0.044	-7.16	0.000
RW/S4	-0.3008	0.439	0.042	0.196	0.041	-7.15	0.000
RW/S5	-0.3021	0.439	0.042	0.189	0.049	-7.18	0.000
RW/S6	-0.2944	0.425	0.041	0.237	0.013	-7.23	0.000
AC/PC	-0.0770	0.252	0.024	0.744	0.000	-3.20	0.002
AC/MA	0.0001	0.290	0.028	0.655	0.000	0.00	0.997
AC/ES	0.0223	0.218	0.021	0.797	0.000	1.07	0.287
AC/Re	-0.0169	0.289	0.028	0.671	0.000	-0.61	0.543
AC/S1	-0.2685	0.432	0.041	0.242	0.011	-6.49	0.000
AC/S2	-0.2718	0.435	0.042	0.230	0.016	-6.52	0.000
AC/S3	-0.2763	0.438	0.042	0.218	0.023	-6.59	0.000
AC/S4	-0.2756	0.437	0.042	0.220	0.021	-6.58	0.000
AC/S5	-0.2769	0.438	0.042	0.213	0.026	-6.60	0.000
AC/S6	-0.2691	0.427	0.041	0.248	0.009	-6.58	0.000
PC/MA	0.0771	0.289	0.028	0.671	0.000	2.79	0.006
PC/ES	0.0993	0.235	0.023	0.773	0.000	4.40	0.000
PC/Re	0.0602	0.303	0.029	0.649	0.000	2.07	0.041
PC/S1	-0.1914	0.452	0.043	0.202	0.035	-4.42	0.000
PC/S2	-0.1948	0.455	0.044	0.188	0.050	-4.47	0.000
PC/S3	-0.1993	0.457	0.044	0.182	0.059	-4.56	0.000
PC/S4	-0.1986	0.456	0.044	0.183	0.057	-4.54	0.000
PC/S5	-0.1999	0.456	0.044	0.180	0.061	-4.58	0.000
PC/S6	-0.1921	0.447	0.043	0.209	0.029	-4.49	0.000
MA/ES	0.0222	0.215	0.021	0.807	0.000	1.08	0.284
MA/Re	-0.0170	0.283	0.027	0.690	0.000	-0.63	0.533
MA/S1	-0.2686	0.436	0.042	0.248	0.009	-6.43	0.000
MA/S2	-0.2719	0.439	0.042	0.237	0.013	-6.47	0.000
MA/S3	-0.2764	0.439	0.042	0.236	0.014	-6.58	0.000
MA/S4	-0.2757	0.438	0.042	0.237	0.013	-6.57	0.000
MA/S5	-0.2770	0.439	0.042	0.230	0.016	-6.59	0.000
MA/S6	-0.2692	0.433	0.041	0.247	0.010	-6.49	0.000
ES/Re	-0.0392	0.248	0.024	0.755	0.000	-1.65	0.101
ES/S1	-0.2908	0.424	0.041	0.257	0.007	-7.16	0.000
ES/S2	-0.2941	0.427	0.041	0.243	0.011	-7.18	0.000
ES/S3	-0.2986	0.431	0.041	0.230	0.016	-7.24	0.000
ES/S4	-0.2979	0.430	0.041	0.233	0.015	-7.23	0.000
ES/S5	-0.2992	0.430	0.041	0.227	0.018	-7.26	0.000
ES/S6	-0.2914	0.419	0.040	0.265	0.005	-7.27	0.000
Re/S1	-0.2516	0.479	0.046	0.121	0.209	-5.48	0.000
Re/S2	-0.2549	0.482	0.046	0.111	0.249	-5.53	0.000
Re/S3	-0.2594	0.484	0.046	0.100	0.300	-5.60	0.000
Re/S4	-0.2588	0.483	0.046	0.103	0.288	-5.59	0.000
Re/S5	-0.2600	0.483	0.046	0.097	0.316	-5.62	0.000
Re/S6	-0.2523	0.474	0.045	0.129	0.181	-5.56	0.000
S1/2	-0.0033	0.046	0.004	0.992	0.000	-0.77	0.446
S1/3	-0.0078	0.072	0.007	0.980	0.000	-1.14	0.259
S1/4	-0.0072	0.068	0.006	0.982	0.000	-1.10	0.272

S1/5	-0.0084	0.076	0.007	0.977	0.000	-1.16	0.248
S1/6	-0.0007	0.031	0.003	0.996	0.000	-0.23	0.821
S2/3	-0.0045	0.035	0.003	0.995	0.000	-1.35	0.179
S2/4	-0.0038	0.030	0.003	0.997	0.000	-1.35	0.180
S2/5	-0.0051	0.035	0.003	0.995	0.000	-1.50	0.135
S2/6	0.0027	0.069	0.007	0.981	0.000	0.40	0.687
S3/4	0.0007	0.005	0.001	1.000	0.000	1.29	0.201
S3/5	-0.0006	0.013	0.001	0.999	0.000	-0.47	0.642
S3/6	0.0071	0.097	0.009	0.962	0.000	0.77	0.445
S4/5	-0.0013	0.014	0.001	0.999	0.000	-0.95	0.344
S4/6	0.0065	0.093	0.009	0.965	0.000	0.73	0.468
S5/6	0.0077	0.099	0.010	0.960	0.000	0.81	0.418

MSE/ACTUAL

RW/AC	-0.0236	0.189	0.018	0.858	0.000	-1.31	0.195
RW/PC	-0.0959	0.231	0.022	0.808	0.000	-4.33	0.000
RW/MA	-0.0298	0.246	0.024	0.773	0.000	-1.26	0.209
RW/ES	-0.0033	0.123	0.012	0.940	0.000	-0.28	0.781
RW/Re	-0.0513	0.263	0.025	0.757	0.000	-2.04	0.044
RW/S1	-0.3026	0.493	0.047	0.170	0.078	-6.41	0.000
RW/S2	-0.3064	0.501	0.048	0.150	0.119	-6.39	0.000
RW/S3	-0.3116	0.508	0.049	0.132	0.172	-6.40	0.000
RW/S4	-0.3108	0.507	0.049	0.135	0.162	-6.40	0.000
RW/S5	-0.3107	0.508	0.049	0.130	0.179	-6.38	0.000
RW/S6	-0.2999	0.489	0.047	0.181	0.060	-6.40	0.000
AC/PC	-0.0723	0.280	0.027	0.720	0.000	-2.70	0.008
AC/MA	-0.0062	0.304	0.029	0.658	0.000	-0.21	0.832
AC/ES	0.0203	0.230	0.022	0.794	0.000	0.92	0.359
AC/Re	-0.0277	0.307	0.029	0.669	0.000	-0.94	0.349
AC/S1	-0.2790	0.487	0.047	0.200	0.037	-5.98	0.000
AC/S2	-0.2828	0.494	0.047	0.183	0.057	-5.97	0.000
AC/S3	-0.2880	0.500	0.048	0.169	0.078	-6.01	0.000
AC/S4	-0.2872	0.499	0.048	0.172	0.074	-6.01	0.000
AC/S5	-0.2871	0.501	0.048	0.165	0.086	-5.98	0.000
AC/S6	-0.2763	0.484	0.046	0.208	0.030	-5.96	0.000
PC/MA	0.0661	0.325	0.031	0.638	0.000	2.12	0.036
PC/ES	0.0926	0.262	0.025	0.756	0.000	3.69	0.000
PC/Re	0.0446	0.340	0.033	0.622	0.000	1.37	0.174
PC/S1	-0.2067	0.504	0.048	0.202	0.036	-4.28	0.000
PC/S2	-0.2105	0.512	0.049	0.181	0.060	-4.29	0.000
PC/S3	-0.2157	0.519	0.050	0.164	0.088	-4.34	0.000
PC/S4	-0.2150	0.518	0.050	0.167	0.083	-4.33	0.000
PC/S5	-0.2148	0.519	0.050	0.163	0.091	-4.32	0.000
PC/S6	-0.2040	0.499	0.048	0.214	0.025	-4.27	0.000
MA/ES	0.0265	0.242	0.023	0.784	0.000	1.14	0.256
MA/Re	-0.0215	0.297	0.028	0.704	0.000	-0.76	0.452
MA/S1	-0.2728	0.489	0.047	0.232	0.015	-5.83	0.000
MA/S2	-0.2766	0.495	0.047	0.216	0.024	-5.83	0.000
MA/S3	-0.2818	0.499	0.048	0.210	0.028	-5.89	0.000
MA/S4	-0.2810	0.498	0.048	0.212	0.027	-5.89	0.000
MA/S5	-0.2809	0.500	0.048	0.204	0.033	-5.86	0.000
MA/S6	-0.2701	0.487	0.047	0.235	0.014	-5.79	0.000
ES/Re	-0.0480	0.258	0.025	0.769	0.000	-1.94	0.055
ES/S1	-0.2993	0.480	0.046	0.227	0.018	-6.50	0.000
ES/S2	-0.3031	0.488	0.047	0.209	0.029	-6.49	0.000
ES/S3	-0.3083	0.495	0.047	0.192	0.045	-6.50	0.000
ES/S4	-0.3075	0.494	0.047	0.195	0.042	-6.50	0.000

ES/S5	-0.3074	0.495	0.047	0.190	0.048	-6.48	0.000
ES/S6	-0.2966	0.476	0.046	0.237	0.013	-6.50	0.000
Re/S1	-0.2513	0.535	0.051	0.117	0.227	-4.90	0.000
Re/S2	-0.2551	0.542	0.052	0.102	0.293	-4.92	0.000
Re/S3	-0.2603	0.546	0.052	0.094	0.333	-4.98	0.000
Re/S4	-0.2595	0.545	0.052	0.096	0.323	-4.97	0.000
Re/S5	-0.2594	0.547	0.052	0.088	0.361	-4.95	0.000
Re/S6	-0.2486	0.533	0.051	0.122	0.205	-4.87	0.000
S1/2	-0.0038	0.044	0.004	0.994	0.000	-0.90	0.372
S1/3	-0.0090	0.076	0.007	0.983	0.000	-1.23	0.221
S1/4	-0.0082	0.071	0.007	0.985	0.000	-1.21	0.230
S1/5	-0.0081	0.077	0.007	0.983	0.000	-1.10	0.273
S1/6	0.0027	0.031	0.003	0.997	0.000	0.92	0.362
S2/3	-0.0052	0.039	0.004	0.996	0.000	-1.38	0.169
S2/4	-0.0044	0.033	0.003	0.997	0.000	-1.39	0.167
S2/5	-0.0043	0.036	0.003	0.996	0.000	-1.25	0.215
S2/6	0.0065	0.071	0.007	0.985	0.000	0.96	0.341
S3/4	0.0008	0.006	0.001	1.000	0.000	1.27	0.206
S3/5	0.0009	0.014	0.001	0.999	0.000	0.67	0.506
S3/6	0.0117	0.105	0.010	0.968	0.000	1.16	0.248
S4/5	0.0001	0.013	0.001	0.999	0.000	0.11	0.916
S4/6	0.0110	0.100	0.010	0.971	0.000	1.14	0.256
S5/6	0.0108	0.104	0.010	0.968	0.000	1.08	0.281

MAPE/FORECAST

RW/AC	-0.0055	0.187	0.018	0.866	0.000	-0.31	0.760
RW/PC	-0.0767	0.157	0.015	0.908	0.000	-5.11	0.000
RW/MA	-0.0172	0.263	0.025	0.735	0.000	-0.68	0.496
RW/ES	-0.0009	0.137	0.013	0.926	0.000	-0.07	0.944
RW/Re	0.0051	0.241	0.023	0.761	0.000	0.22	0.826
RW/S1	-0.1761	0.484	0.046	0.210	0.028	-3.80	0.000
RW/S2	-0.1674	0.480	0.046	0.204	0.033	-3.64	0.000
RW/S3	-0.1639	0.477	0.046	0.205	0.033	-3.59	0.001
RW/S4	-0.1644	0.477	0.046	0.205	0.033	-3.60	0.000
RW/S5	-0.1636	0.477	0.046	0.199	0.038	-3.58	0.001
RW/S6	-0.1838	0.484	0.046	0.208	0.030	-3.96	0.000
AC/PC	-0.0712	0.213	0.020	0.832	0.000	-3.49	0.001
AC/MA	-0.0117	0.304	0.029	0.653	0.000	-0.40	0.688
AC/ES	0.0045	0.207	0.020	0.834	0.000	0.23	0.819
AC/Re	0.0106	0.284	0.027	0.677	0.000	0.39	0.699
AC/S1	-0.1706	0.511	0.049	0.135	0.162	-3.49	0.001
AC/S2	-0.1619	0.506	0.048	0.134	0.164	-3.34	0.001
AC/S3	-0.1584	0.501	0.048	0.136	0.157	-3.30	0.001
AC/S4	-0.1589	0.502	0.048	0.137	0.156	-3.31	0.001
AC/S5	-0.1581	0.502	0.048	0.131	0.173	-3.29	0.001
AC/S6	-0.1783	0.512	0.049	0.130	0.177	-3.63	0.000
PC/MA	0.0595	0.266	0.026	0.737	0.000	2.33	0.022
PC/ES	0.0758	0.190	0.018	0.863	0.000	4.16	0.000
PC/Re	0.0818	0.265	0.025	0.724	0.000	3.22	0.002
PC/S1	-0.0994	0.498	0.048	0.188	0.050	-2.08	0.040
PC/S2	-0.0907	0.492	0.047	0.193	0.045	-1.93	0.057
PC/S3	-0.0872	0.485	0.046	0.202	0.035	-1.88	0.063
PC/S4	-0.0877	0.486	0.047	0.201	0.036	-1.88	0.062
PC/S5	-0.0869	0.485	0.046	0.198	0.039	-1.87	0.064
PC/S6	-0.1071	0.501	0.048	0.179	0.063	-2.23	0.028
MA/ES	0.0163	0.220	0.021	0.812	0.000	0.77	0.442
MA/Re	0.0223	0.291	0.028	0.660	0.000	0.80	0.426

MA/S1	-0.1589	0.489	0.047	0.206	0.032	-3.39	0.001
MA/S2	-0.1502	0.483	0.046	0.210	0.028	-3.25	0.002
MA/S3	-0.1467	0.477	0.046	0.217	0.024	-3.21	0.002
MA/S4	-0.1472	0.478	0.046	0.216	0.024	-3.21	0.002
MA/S5	-0.1464	0.477	0.046	0.214	0.026	-3.20	0.002
MA/S6	-0.1666	0.492	0.047	0.198	0.039	-3.54	0.001
ES/Re	0.0060	0.220	0.021	0.799	0.000	0.29	0.776
ES/S1	-0.1752	0.479	0.046	0.220	0.022	-3.82	0.000
ES/S2	-0.1664	0.473	0.045	0.220	0.021	-3.67	0.000
ES/S3	-0.1630	0.468	0.045	0.225	0.019	-3.63	0.000
ES/S4	-0.1635	0.469	0.045	0.225	0.019	-3.64	0.000
ES/S5	-0.1626	0.469	0.045	0.220	0.021	-3.62	0.000
ES/S6	-0.1828	0.480	0.046	0.215	0.025	-3.97	0.000
Re/S1	-0.1812	0.466	0.045	0.240	0.012	-4.06	0.000
Re/S2	-0.1725	0.461	0.044	0.240	0.012	-3.91	0.000
Re/S3	-0.1690	0.457	0.044	0.240	0.012	-3.86	0.000
Re/S4	-0.1695	0.457	0.044	0.240	0.012	-3.87	0.000
Re/S5	-0.1687	0.456	0.044	0.237	0.013	-3.86	0.000
Re/S6	-0.1888	0.466	0.045	0.238	0.013	-4.23	0.000
S1/2	0.0087	0.050	0.005	0.992	0.000	1.80	0.074
S1/3	0.0122	0.077	0.007	0.982	0.000	1.66	0.100
S1/4	0.0117	0.073	0.007	0.984	0.000	1.68	0.096
S1/5	0.0125	0.082	0.008	0.980	0.000	1.59	0.114
S1/6	-0.0077	0.032	0.003	0.997	0.000	-2.54	0.013
S2/3	0.0035	0.034	0.003	0.996	0.000	1.07	0.288
S2/4	0.0030	0.029	0.003	0.997	0.000	1.06	0.292
S2/5	0.0038	0.037	0.004	0.996	0.000	1.08	0.284
S2/6	-0.0164	0.075	0.007	0.983	0.000	-2.30	0.024
S3/4	-0.0005	0.005	0.000	1.000	0.000	-1.03	0.305
S3/5	0.0003	0.012	0.001	1.000	0.000	0.28	0.779
S3/6	-0.0199	0.102	0.010	0.969	0.000	-2.04	0.044
S4/5	0.0008	0.013	0.001	0.999	0.000	0.64	0.522
S4/6	-0.0194	0.098	0.009	0.971	0.000	-2.06	0.042
S5/6	-0.0202	0.106	0.010	0.966	0.000	-1.99	0.050

MSE/FORECAST

RW/AC	-0.0097	0.211	0.020	0.847	0.000	-0.48	0.633
RW/PC	-0.0722	0.173	0.017	0.906	0.000	-4.37	0.000
RW/MA	-0.0181	0.306	0.029	0.682	0.000	-0.62	0.537
RW/ES	0.0020	0.170	0.016	0.895	0.000	0.12	0.901
RW/R	0.0155	0.256	0.025	0.756	0.000	0.63	0.529
RW/S1	-0.2014	0.518	0.050	0.183	0.056	-4.06	0.000
RW/S2	-0.1862	0.514	0.049	0.179	0.062	-3.78	0.000
RW/S3	-0.1782	0.509	0.049	0.185	0.054	-3.65	0.000
RW/S4	-0.1793	0.510	0.049	0.185	0.055	-3.67	0.000
RW/S5	-0.1764	0.510	0.049	0.182	0.059	-3.61	0.000
RW/S6	-0.2100	0.521	0.050	0.183	0.057	-4.21	0.000
AC/PC	-0.0625	0.228	0.022	0.838	0.000	-2.87	0.005
AC/MA	-0.0084	0.312	0.030	0.681	0.000	-0.28	0.778
AC/ES	0.0117	0.226	0.022	0.824	0.000	0.54	0.589
AC/Re	0.0252	0.306	0.029	0.668	0.000	0.86	0.391
AC/S1	-0.1917	0.555	0.053	0.095	0.328	-3.61	0.000
AC/S2	-0.1765	0.550	0.053	0.094	0.332	-3.35	0.001
AC/S3	-0.1685	0.545	0.052	0.100	0.302	-3.23	0.002
AC/S4	-0.1696	0.545	0.052	0.099	0.305	-3.25	0.002
AC/S5	-0.1667	0.545	0.052	0.097	0.316	-3.19	0.002
AC/S6	-0.2003	0.558	0.053	0.093	0.334	-3.75	0.000

PC/MA	0.0541	0.290	0.028	0.738	0.000	1.95	0.054
PC/ES	0.0742	0.214	0.021	0.852	0.000	3.62	0.000
PC/Re	0.0877	0.287	0.028	0.725	0.000	3.19	0.002
PC/S1	-0.1293	0.540	0.052	0.178	0.064	-2.50	0.014
PC/S2	-0.1140	0.533	0.051	0.184	0.055	-2.23	0.028
PC/S3	-0.1060	0.526	0.050	0.196	0.041	-2.10	0.038
PC/S4	-0.1071	0.527	0.050	0.194	0.043	-2.12	0.036
PC/S5	-0.1042	0.527	0.050	0.193	0.044	-2.07	0.041
PC/S6	-0.1378	0.545	0.052	0.172	0.074	-2.64	0.009
MA/ES	0.0202	0.243	0.023	0.799	0.000	0.87	0.388
MA/Re	0.0336	0.317	0.030	0.646	0.000	1.11	0.270
MA/S1	-0.1833	0.517	0.050	0.219	0.022	-3.70	0.000
MA/S2	-0.1680	0.509	0.049	0.229	0.017	-3.45	0.001
MA/S3	-0.1600	0.503	0.048	0.238	0.013	-3.32	0.001
MA/S4	-0.1612	0.504	0.048	0.236	0.013	-3.34	0.001
MA/S5	-0.1583	0.503	0.048	0.236	0.013	-3.28	0.001
MA/S6	-0.1919	0.522	0.050	0.213	0.026	-3.84	0.000
ES/Re	0.0135	0.225	0.022	0.810	0.000	0.62	0.533
ES/S1	-0.2035	0.507	0.049	0.212	0.027	-4.19	0.000
ES/S2	-0.1882	0.502	0.048	0.214	0.026	-3.91	0.000
ES/S3	-0.1802	0.496	0.048	0.222	0.020	-3.79	0.000
ES/S4	-0.1814	0.497	0.048	0.221	0.021	-3.81	0.000
ES/S5	-0.1785	0.497	0.048	0.219	0.022	-3.75	0.000
ES/S6	-0.2120	0.512	0.049	0.208	0.030	-4.33	0.000
Re/S1	-0.2170	0.501	0.048	0.210	0.028	-4.52	0.000
Re/S2	-0.2017	0.497	0.048	0.207	0.031	-4.23	0.000
Re/S3	-0.1937	0.493	0.047	0.211	0.027	-4.10	0.000
Re/S4	-0.1948	0.493	0.047	0.211	0.028	-4.12	0.000
Re/S5	-0.1919	0.493	0.047	0.208	0.030	-4.06	0.000
Re/S6	-0.2255	0.505	0.048	0.209	0.029	-4.66	0.000
S1/2	0.0153	0.058	0.006	0.991	0.000	2.75	0.007
S1/3	0.0233	0.089	0.009	0.979	0.000	2.74	0.007
S1/4	0.0221	0.084	0.008	0.981	0.000	2.74	0.007
S1/5	0.0250	0.095	0.009	0.976	0.000	2.76	0.007
S1/6	-0.0086	0.035	0.003	0.997	0.000	-2.58	0.011
S2/3	0.0080	0.040	0.004	0.996	0.000	2.10	0.038
S2/4	0.0068	0.034	0.003	0.997	0.000	2.09	0.039
S2/5	0.0097	0.042	0.004	0.995	0.000	2.40	0.018
S2/6	-0.0238	0.088	0.008	0.980	0.000	-2.84	0.005
S3/4	-0.0012	0.006	0.001	1.000	0.000	-2.02	0.046
S3/5	0.0017	0.011	0.001	1.000	0.000	1.59	0.116
S3/6	-0.0318	0.119	0.011	0.962	0.000	-2.79	0.006
S4/5	0.0029	0.014	0.001	0.999	0.000	2.18	0.032
S4/6	-0.0307	0.115	0.011	0.965	0.000	-2.80	0.006
S5/6	-0.0336	0.124	0.012	0.959	0.000	-2.83	0.006

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MAPE/ACTUAL

RW/AC	-0.0156	0.115	0.011	0.944	0.000	-1.41	0.160
RW/PC	-0.0465	0.158	0.015	0.884	0.000	-3.07	0.003
RW/MA	-0.0344	0.124	0.012	0.922	0.000	-2.90	0.005
RW/ES	0.0011	0.056	0.005	0.984	0.000	0.21	0.831
RW/Re	-0.0594	0.361	0.035	0.447	0.000	-1.72	0.089
RW/S1	-0.3077	0.402	0.038	0.286	0.003	-7.99	0.000
RW/S2	-0.3076	0.401	0.038	0.302	0.001	-8.02	0.000

RW/S3	-0.3108	0.397	0.038	0.316	0.001	-8.17	0.000
RW/S4	-0.3105	0.397	0.038	0.316	0.001	-8.16	0.000
RW/S5	-0.3081	0.401	0.038	0.294	0.002	-8.02	0.000
RW/S6	-0.3036	0.404	0.039	0.219	0.022	-7.85	0.000
AC/PC	-0.0309	0.171	0.016	0.875	0.000	-1.88	0.063
AC/MA	-0.0188	0.150	0.014	0.902	0.000	-1.31	0.193
AC/ES	0.0167	0.150	0.014	0.902	0.000	1.17	0.245
AC/Re	-0.0438	0.368	0.035	0.469	0.000	-1.24	0.217
AC/S1	-0.2921	0.432	0.041	0.241	0.011	-7.05	0.000
AC/S2	-0.2920	0.431	0.041	0.256	0.007	-7.07	0.000
AC/S3	-0.2952	0.428	0.041	0.270	0.004	-7.20	0.000
AC/S4	-0.2949	0.428	0.041	0.270	0.005	-7.19	0.000
AC/S5	-0.2925	0.432	0.041	0.249	0.009	-7.07	0.000
AC/S6	-0.2880	0.435	0.042	0.178	0.063	-6.92	0.000
PC/MA	0.0120	0.191	0.018	0.830	0.000	0.66	0.513
PC/ES	0.0476	0.169	0.016	0.868	0.000	2.94	0.004
PC/Re	-0.0129	0.348	0.033	0.513	0.000	-0.39	0.700
PC/S1	-0.2612	0.410	0.039	0.298	0.002	-6.65	0.000
PC/S2	-0.2612	0.410	0.039	0.311	0.001	-6.65	0.000
PC/S3	-0.2643	0.408	0.039	0.319	0.001	-6.76	0.000
PC/S4	-0.2640	0.408	0.039	0.320	0.001	-6.76	0.000
PC/S5	-0.2616	0.410	0.039	0.304	0.001	-6.66	0.000
PC/S6	-0.2571	0.408	0.039	0.253	0.008	-6.58	0.000
MA/ES	0.0356	0.129	0.012	0.915	0.000	2.87	0.005
MA/Re	-0.0249	0.342	0.033	0.504	0.000	-0.76	0.448
MA/S1	-0.2732	0.398	0.038	0.297	0.002	-7.16	0.000
MA/S2	-0.2732	0.398	0.038	0.309	0.001	-7.16	0.000
MA/S3	-0.2763	0.396	0.038	0.319	0.001	-7.28	0.000
MA/S4	-0.2760	0.396	0.038	0.318	0.001	-7.27	0.000
MA/S5	-0.2737	0.398	0.038	0.303	0.001	-7.17	0.000
MA/S6	-0.2692	0.396	0.038	0.247	0.010	-7.09	0.000
ES/Re	-0.0605	0.352	0.034	0.474	0.000	-1.80	0.075
ES/S1	-0.3088	0.397	0.038	0.301	0.001	-8.12	0.000
ES/S2	-0.3088	0.396	0.038	0.316	0.001	-8.14	0.000
ES/S3	-0.3119	0.393	0.038	0.329	0.000	-8.29	0.000
ES/S4	-0.3116	0.393	0.038	0.328	0.000	-8.28	0.000
ES/S5	-0.3092	0.397	0.038	0.308	0.001	-8.14	0.000
ES/S6	-0.3048	0.398	0.038	0.239	0.012	-8.00	0.000
Re/S1	-0.2483	0.458	0.044	0.196	0.041	-5.66	0.000
Re/S2	-0.2483	0.461	0.044	0.195	0.042	-5.62	0.000
Re/S3	-0.2514	0.457	0.044	0.211	0.028	-5.74	0.000
Re/S4	-0.2511	0.457	0.044	0.210	0.028	-5.73	0.000
Re/S5	-0.2487	0.459	0.044	0.196	0.041	-5.65	0.000
Re/S6	-0.2442	0.453	0.043	0.160	0.097	-5.63	0.000
S1/2	0.0000	0.030	0.003	0.997	0.000	0.02	0.988
S1/3	-0.0031	0.050	0.005	0.990	0.000	-0.64	0.523
S1/4	-0.0028	0.048	0.005	0.991	0.000	-0.60	0.547
S1/5	-0.0004	0.015	0.001	0.999	0.000	-0.29	0.772
S1/6	0.0041	0.094	0.009	0.965	0.000	0.45	0.652
S2/3	-0.0031	0.027	0.003	0.997	0.000	-1.23	0.221
S2/4	-0.0028	0.024	0.002	0.998	0.000	-1.22	0.226
S2/5	-0.0005	0.018	0.002	0.999	0.000	-0.27	0.791
S2/6	0.0040	0.117	0.011	0.947	0.000	0.36	0.721
S3/4	0.0003	0.003	0.000	1.000	0.000	0.94	0.347
S3/5	0.0027	0.041	0.004	0.994	0.000	0.69	0.494
S3/6	0.0072	0.135	0.013	0.928	0.000	0.55	0.581
S4/5	0.0024	0.039	0.004	0.994	0.000	0.64	0.522
S4/6	0.0069	0.133	0.013	0.930	0.000	0.54	0.592
S5/6	0.0045	0.103	0.010	0.958	0.000	0.45	0.653

MSE/ACTUAL

RW/AC	-0.0328	0.116	0.011	0.951	0.000	-2.94	0.004
RW/PC	-0.0515	0.182	0.017	0.871	0.000	-2.95	0.004
RW/MA	-0.0268	0.135	0.013	0.924	0.000	-2.07	0.041
RW/ES	0.0017	0.034	0.003	0.995	0.000	0.53	0.601
RW/Re	-0.0833	0.369	0.035	0.520	0.000	-2.36	0.020
RW/S1	-0.3538	0.462	0.044	0.273	0.004	-7.99	0.000
RW/S2	-0.3575	0.458	0.044	0.296	0.002	-8.15	0.000
RW/S3	-0.3624	0.454	0.043	0.312	0.001	-8.34	0.000
RW/S4	-0.3618	0.454	0.043	0.310	0.001	-8.32	0.000
RW/S5	-0.3561	0.460	0.044	0.285	0.003	-8.08	0.000
RW/S6	-0.3317	0.472	0.045	0.206	0.032	-7.34	0.000
AC/PC	-0.0187	0.202	0.019	0.852	0.000	-0.97	0.336
AC/MA	0.0060	0.151	0.014	0.916	0.000	0.42	0.678
AC/ES	0.0345	0.137	0.013	0.931	0.000	2.64	0.010
AC/Re	-0.0505	0.394	0.038	0.488	0.000	-1.34	0.183
AC/S1	-0.3210	0.493	0.047	0.226	0.018	-6.80	0.000
AC/S2	-0.3247	0.489	0.047	0.248	0.009	-6.93	0.000
AC/S3	-0.3297	0.485	0.046	0.262	0.006	-7.09	0.000
AC/S4	-0.3290	0.486	0.047	0.261	0.006	-7.07	0.000
AC/S5	-0.3233	0.491	0.047	0.238	0.013	-6.87	0.000
AC/S6	-0.2989	0.501	0.048	0.169	0.078	-6.23	0.000
PC/MA	0.0247	0.212	0.020	0.827	0.000	1.22	0.226
PC/ES	0.0532	0.184	0.018	0.868	0.000	3.01	0.003
PC/Re	-0.0318	0.363	0.035	0.559	0.000	-0.92	0.362
PC/S1	-0.3023	0.468	0.045	0.293	0.002	-6.74	0.000
PC/S2	-0.3060	0.465	0.045	0.311	0.001	-6.87	0.000
PC/S3	-0.3110	0.464	0.044	0.317	0.001	-7.00	0.000
PC/S4	-0.3103	0.463	0.044	0.318	0.001	-6.99	0.000
PC/S5	-0.3047	0.467	0.045	0.302	0.001	-6.81	0.000
PC/S6	-0.2802	0.472	0.045	0.250	0.009	-6.20	0.000
MA/ES	0.0285	0.131	0.013	0.928	0.000	2.27	0.025
MA/Re	-0.0565	0.359	0.034	0.551	0.000	-1.65	0.103
MA/S1	-0.3270	0.465	0.045	0.268	0.005	-7.33	0.000
MA/S2	-0.3307	0.463	0.044	0.287	0.002	-7.46	0.000
MA/S3	-0.3357	0.459	0.044	0.300	0.002	-7.63	0.000
MA/S4	-0.3350	0.459	0.044	0.299	0.002	-7.61	0.000
MA/S5	-0.3294	0.464	0.044	0.278	0.003	-7.41	0.000
MA/S6	-0.3049	0.471	0.045	0.216	0.024	-6.76	0.000
ES/Re	-0.0850	0.360	0.034	0.542	0.000	-2.47	0.015
ES/S1	-0.3555	0.459	0.044	0.278	0.003	-8.09	0.000
ES/S2	-0.3592	0.455	0.044	0.301	0.001	-8.24	0.000
ES/S3	-0.3642	0.451	0.043	0.317	0.001	-8.43	0.000
ES/S4	-0.3635	0.451	0.043	0.315	0.001	-8.41	0.000
ES/S5	-0.3579	0.457	0.044	0.290	0.002	-8.17	0.000
ES/S6	-0.3334	0.468	0.045	0.213	0.026	-7.43	0.000
Re/S1	-0.2704	0.506	0.048	0.237	0.013	-5.58	0.000
Re/S2	-0.2742	0.508	0.049	0.239	0.012	-5.64	0.000
Re/S3	-0.2791	0.505	0.048	0.249	0.009	-5.77	0.000
Re/S4	-0.2785	0.506	0.048	0.247	0.010	-5.75	0.000
Re/S5	-0.2728	0.506	0.048	0.241	0.012	-5.63	0.000
Re/S6	-0.2484	0.514	0.049	0.184	0.056	-5.05	0.000
S1/2	-0.0038	0.033	0.003	0.997	0.000	-1.19	0.238
S1/3	-0.0087	0.056	0.005	0.991	0.000	-1.61	0.110
S1/4	-0.0081	0.054	0.005	0.992	0.000	-1.57	0.120
S1/5	-0.0024	0.017	0.002	0.999	0.000	-1.44	0.153
S1/6	0.0221	0.110	0.011	0.965	0.000	2.10	0.038

S2/3	-0.0049	0.030	0.003	0.997	0.000	-1.70	0.091
S2/4	-0.0043	0.026	0.003	0.998	0.000	-1.69	0.094
S2/5	0.0014	0.019	0.002	0.999	0.000	0.75	0.453
S2/6	0.0258	0.135	0.013	0.947	0.000	2.00	0.048
S3/4	0.0006	0.004	0.000	1.000	0.000	1.54	0.127
S3/5	0.0063	0.045	0.004	0.994	0.000	1.48	0.143
S3/6	0.0308	0.155	0.015	0.930	0.000	2.07	0.041
S4/5	0.0057	0.042	0.004	0.995	0.000	1.42	0.158
S4/6	0.0301	0.153	0.015	0.932	0.000	2.06	0.042
S5/6	0.0244	0.122	0.012	0.956	0.000	2.09	0.039

MAPE/FORECAST

RW/AC	0.0002	0.151	0.014	0.916	0.000	0.02	0.987
RW/PC	-0.0421	0.183	0.018	0.873	0.000	-2.40	0.018
RW/MA	-0.0515	0.160	0.015	0.896	0.000	-3.35	0.001
RW/ES	-0.0066	0.073	0.007	0.978	0.000	-0.94	0.350
RW/Re	0.1056	0.338	0.032	0.424	0.000	3.26	0.001
RW/S1	-0.0780	0.487	0.047	0.104	0.281	-1.67	0.097
RW/S2	-0.0716	0.485	0.046	0.116	0.230	-1.54	0.126
RW/S3	-0.0705	0.482	0.046	0.126	0.192	-1.53	0.129
RW/S4	-0.0706	0.482	0.046	0.125	0.194	-1.53	0.129
RW/S5	-0.0753	0.486	0.047	0.109	0.260	-1.62	0.109
RW/S6	-0.1045	0.499	0.048	0.049	0.614	-2.18	0.031
AC/PC	-0.0424	0.190	0.018	0.872	0.000	-2.33	0.021
AC/MA	-0.0517	0.215	0.021	0.829	0.000	-2.52	0.013
AC/ES	-0.0068	0.189	0.018	0.867	0.000	-0.37	0.708
AC/Re	0.1053	0.368	0.035	0.394	0.000	2.99	0.003
AC/S1	-0.0782	0.510	0.049	0.091	0.344	-1.60	0.112
AC/S2	-0.0718	0.509	0.049	0.100	0.300	-1.47	0.143
AC/S3	-0.0708	0.505	0.048	0.112	0.247	-1.46	0.146
AC/S4	-0.0709	0.505	0.048	0.111	0.249	-1.46	0.146
AC/S5	-0.0755	0.509	0.049	0.095	0.328	-1.55	0.124
AC/S6	-0.1047	0.522	0.050	0.040	0.680	-2.09	0.039
PC/MA	-0.0094	0.232	0.022	0.800	0.000	-0.42	0.673
PC/ES	0.0356	0.212	0.020	0.832	0.000	1.75	0.083
PC/Re	0.1477	0.380	0.036	0.345	0.000	4.06	0.000
PC/S1	-0.0359	0.487	0.047	0.167	0.082	-0.77	0.443
PC/S2	-0.0295	0.485	0.046	0.179	0.063	-0.64	0.527
PC/S3	-0.0284	0.481	0.046	0.190	0.048	-0.62	0.539
PC/S4	-0.0285	0.481	0.046	0.190	0.048	-0.62	0.537
PC/S5	-0.0332	0.486	0.047	0.172	0.074	-0.71	0.478
PC/S6	-0.0624	0.500	0.048	0.115	0.235	-1.30	0.196
MA/ES	0.0449	0.141	0.014	0.920	0.000	3.32	0.001
MA/Re	0.1571	0.353	0.034	0.393	0.000	4.64	0.000
MA/S1	-0.0265	0.485	0.046	0.132	0.171	-0.57	0.570
MA/S2	-0.0201	0.484	0.046	0.141	0.143	-0.43	0.665
MA/S3	-0.0190	0.482	0.046	0.148	0.125	-0.41	0.681
MA/S4	-0.0191	0.482	0.046	0.147	0.126	-0.41	0.679
MA/S5	-0.0238	0.484	0.046	0.137	0.156	-0.51	0.609
MA/S6	-0.0530	0.495	0.047	0.090	0.353	-1.12	0.266
ES/Re	0.1121	0.341	0.033	0.430	0.000	3.43	0.001
ES/S1	-0.0714	0.492	0.047	0.102	0.293	-1.52	0.132
ES/S2	-0.0650	0.490	0.047	0.112	0.245	-1.39	0.169
ES/S3	-0.0640	0.488	0.047	0.120	0.214	-1.37	0.174
ES/S4	-0.0641	0.488	0.047	0.120	0.215	-1.37	0.173
ES/S5	-0.0687	0.491	0.047	0.106	0.272	-1.46	0.147
ES/S6	-0.0979	0.502	0.048	0.056	0.566	-2.03	0.044
Re/S1	-0.1836	0.488	0.047	0.087	0.366	-3.93	0.000

Re/S2	-0.1772	0.489	0.047	0.087	0.367	-3.78	0.000
Re/S3	-0.1761	0.487	0.047	0.079	0.414	-3.78	0.000
Re/S4	-0.1762	0.487	0.047	0.080	0.411	-3.78	0.000
Re/S5	-0.1809	0.488	0.047	0.088	0.364	-3.87	0.000
Re/S6	-0.2101	0.490	0.047	0.108	0.266	-4.48	0.000
S1/2	0.0064	0.034	0.003	0.996	0.000	1.98	0.050
S1/3	0.0075	0.052	0.005	0.991	0.000	1.50	0.136
S1/4	0.0074	0.050	0.005	0.991	0.000	1.53	0.130
S1/5	0.0027	0.016	0.002	0.999	0.000	1.79	0.077
S1/6	-0.0265	0.096	0.009	0.968	0.000	-2.88	0.005
S2/3	0.0011	0.024	0.002	0.998	0.000	0.48	0.635
S2/4	0.0010	0.022	0.002	0.998	0.000	0.45	0.652
S2/5	-0.0037	0.020	0.002	0.999	0.000	-1.93	0.056
S2/6	-0.0329	0.125	0.012	0.946	0.000	-2.75	0.007
S3/4	-0.0001	0.002	0.000	1.000	0.000	-0.55	0.584
S3/5	-0.0048	0.040	0.004	0.994	0.000	-1.23	0.221
S3/6	-0.0340	0.143	0.014	0.930	0.000	-2.49	0.014
S4/5	-0.0047	0.039	0.004	0.995	0.000	-1.25	0.215
S4/6	-0.0339	0.141	0.014	0.931	0.000	-2.51	0.014
S5/6	-0.0292	0.107	0.010	0.960	0.000	-2.85	0.005

MSE/FORECAST

RW/AC	-0.0214	0.156	0.015	0.927	0.000	-1.44	0.154
RW/PC	-0.0598	0.224	0.021	0.851	0.000	-2.78	0.006
RW/MA	-0.0557	0.187	0.018	0.981	0.000	-3.11	0.002
RW/ES	-0.0110	0.070	0.007	0.984	0.000	-1.63	0.106
RW/Re	0.1280	0.367	0.035	0.419	0.000	3.64	0.000
RW/S1	-0.1008	0.547	0.052	0.050	0.604	-1.92	0.057
RW/S2	-0.0954	0.545	0.052	0.063	0.514	-1.83	0.070
RW/S3	-0.0941	0.543	0.052	0.071	0.461	-1.81	0.073
RW/S4	-0.0941	0.543	0.052	0.071	0.465	-1.81	0.073
RW/S5	-0.0983	0.546	0.052	0.055	0.569	-1.88	0.063
RW/S6	-0.1273	0.565	0.054	0.003	0.979	-2.35	0.020
AC/PC	-0.0384	0.228	0.022	0.852	0.000	-1.76	0.082
AC/MA	-0.0343	0.242	0.023	0.826	0.000	-1.48	0.143
AC/ES	0.0105	0.187	0.018	0.895	0.000	0.59	0.560
AC/Re	0.1494	0.403	0.039	0.366	0.000	3.87	0.000
AC/S1	-0.0794	0.570	0.055	0.035	0.715	-1.45	0.149
AC/S2	-0.0740	0.568	0.054	0.045	0.646	-1.36	0.177
AC/S3	-0.0727	0.566	0.054	0.052	0.590	-1.34	0.183
AC/S4	-0.0727	0.567	0.054	0.052	0.594	-1.34	0.183
AC/S5	-0.0769	0.570	0.055	0.038	0.694	-1.41	0.162
AC/S6	-0.1059	0.585	0.056	-0.002	0.981	-1.89	0.061
PC/MA	0.0041	0.271	0.026	0.789	0.000	0.16	0.875
PC/ES	0.0488	0.237	0.023	0.836	0.000	2.15	0.034
PC/Re	0.1878	0.426	0.041	0.311	0.001	4.61	0.000
PC/S1	-0.0410	0.546	0.052	0.138	0.152	-0.78	0.434
PC/S2	-0.0356	0.543	0.052	0.149	0.121	-0.68	0.495
PC/S3	-0.0343	0.541	0.052	0.157	0.103	-0.66	0.509
PC/S4	-0.0343	0.541	0.052	0.157	0.103	-0.66	0.509
PC/S5	-0.0385	0.545	0.052	0.142	0.142	-0.74	0.462
PC/S6	-0.0676	0.564	0.054	0.091	0.346	-1.25	0.214
MA/ES	0.0447	0.157	0.015	0.925	0.000	2.98	0.004
MA/Re	0.1837	0.398	0.038	0.369	0.000	4.82	0.000
MA/S1	-0.0451	0.550	0.053	0.090	0.351	-0.86	0.394
MA/S2	-0.0397	0.549	0.053	0.099	0.308	-0.76	0.452
MA/S3	-0.0384	0.548	0.052	0.102	0.294	-0.73	0.466

MA/S4	-0.0384	0.548	0.052	0.101	0.295	-0.73	0.466
MA/S5	-0.0426	0.549	0.053	0.094	0.330	-0.81	0.420
MA/S6	-0.0716	0.561	0.054	0.066	0.495	-1.33	0.186
ES/Re	0.1390	0.373	0.036	0.425	0.000	3.89	0.000
ES/S1	-0.0898	0.552	0.053	0.057	0.558	-1.70	0.092
ES/S2	-0.0844	0.550	0.053	0.067	0.487	-1.60	0.112
ES/S3	-0.0831	0.549	0.053	0.072	0.454	-1.58	0.117
ES/S4	-0.0832	0.549	0.053	0.072	0.456	-1.58	0.117
ES/S5	-0.0874	0.551	0.053	0.061	0.529	-1.65	0.101
ES/S6	-0.1164	0.567	0.054	0.022	0.820	-2.14	0.034
Re/S1	-0.2288	0.502	0.048	-0.065	0.503	-4.76	0.000
Re/S2	-0.2234	0.503	0.048	-0.060	0.532	-4.64	0.000
Re/S3	-0.2221	0.502	0.048	-0.054	0.578	-4.62	0.000
Re/S4	-0.2221	0.502	0.048	-0.055	0.573	-4.62	0.000
Re/S5	-0.2263	0.502	0.048	-0.063	0.513	-4.70	0.000
Re/S6	-0.2554	0.513	0.049	-0.089	0.356	-5.20	0.000
S1/2	0.0054	0.030	0.003	0.997	0.000	1.86	0.066
S1/3	0.0067	0.047	0.005	0.993	0.000	1.49	0.139
S1/4	0.0067	0.046	0.004	0.994	0.000	1.53	0.130
S1/5	0.0025	0.014	0.001	0.999	0.000	1.89	0.062
S1/6	-0.0266	0.104	0.010	0.968	0.000	-2.66	0.009
S2/3	0.0013	0.020	0.002	0.999	0.000	0.69	0.494
S2/4	0.0013	0.018	0.002	0.999	0.000	0.72	0.471
S2/5	-0.0029	0.018	0.002	0.999	0.000	-1.73	0.086
S2/6	-0.0320	0.133	0.013	0.948	0.000	-2.51	0.013
S3/4	-0.0000	0.002	0.000	1.000	0.000	-0.21	0.833
S3/5	-0.0042	0.036	0.003	0.996	0.000	-1.24	0.219
S3/6	-0.0333	0.151	0.014	0.933	0.000	-2.31	0.023
S4/5	-0.0042	0.034	0.003	0.996	0.000	-1.28	0.204
S4/6	-0.0332	0.149	0.014	0.934	0.000	-2.33	0.022
S5/6	-0.0290	0.116	0.011	0.960	0.000	-2.62	0.010

Appendix 28.

ERRORS FROM THE OPTIMAL ANNUAL MODELS FOR FORECASTING PROFIT, (109 COMPANIES).

BEST MODELS;

	1981		1982		1983	
	Non-trunc	Trun	Non-trun	Trun	Non-trun	Trun
Absolute ch.	5 yr.	5 yr.	3 yr.	5 yr.	5 yr.	5 yr.
Percentage ch.	4 yr.	2 yr.	4 yr.	2 yr.	4 yr.	4 yr.
Moving average	6 yr.	2 yr.	2 yr.	2 yr.	3 yr.	5 yr.
Exponential sm.	0.10	0.85	0.95	0.60	0.15	0.95

When more than one form of a model appears equally satisfactory the simplest form is employed, namely the model employing the smallest number of years, or, for exponential smoothing the highest weighting factor.

	NON-TRUNCATED					TRUNCATED (Max. 1.0)		
	MEAN	STD. ERROR	STD. DEV.	RANGE	MINIMUM	MEAN	STD. ERROR	STD. DEV.
1981								
MAPE/ACTUAL								
RW	1.342	0.425	4.440	43.068	0.011	0.440	0.036	0.379
AC	1.563	0.519	5.422	53.062	0.007	0.377	0.033	0.340
PC	0.960	0.130	1.352	9.273	0.000	0.496	0.036	0.378
MA	1.430	0.275	2.867	16.101	0.004	0.480	0.036	0.378
ES	1.296	0.225	2.344	14.149	0.014	0.430	0.035	0.369
Re	1.407	0.345	3.604	29.625	0.000	0.423	0.037	0.389
S1	2.425	0.468	4.888	31.837	0.012	0.738	0.033	0.343
S2	2.563	0.497	5.190	34.225	0.003	0.737	0.034	0.340
S3	2.650	0.520	5.426	35.363	0.001	0.742	0.033	0.349
S4	2.645	0.518	5.411	35.324	0.004	0.741	0.033	0.349
S5	2.915	0.576	6.014	39.565	0.020	0.751	0.033	0.346
S6	2.568	0.500	5.216	34.302	0.007	0.737	0.034	0.350
MSE/ACTUAL								
RW	21.330	17.091	178.431	1855.797	0.000	0.336	0.040	0.421
AC	31.567	25.925	270.660	2816.304	0.000	0.349	0.041	0.428
PC	2.734	0.893	9.322	85.989	0.000	0.387	0.040	0.419
MA	10.188	3.772	38.860	259.376	0.000	0.372	0.041	0.427
ES	7.123	2.607	27.221	200.568	0.000	0.319	0.039	0.412
Re	14.850	8.549	89.249	877.624	0.000	0.329	0.041	0.427
S1	29.552	12.652	132.093	1014.371	0.000	0.662	0.040	0.413
S2	33.258	14.194	148.193	1171.593	0.000	0.665	0.040	0.414
S3	36.191	15.559	162.445	1250.619	0.000	0.671	0.040	0.414
S4	36.010	15.479	161.604	1248.084	0.000	0.671	0.040	0.414
S5	44.333	19.018	198.556	1566.954	0.000	0.682	0.040	0.418
S6	33.550	14.327	149.581	1177.153	0.000	0.664	0.040	0.414

MAPE/FORECAST

RW	0.578	0.065	0.683	3.676	0.011	0.431	0.034	0.353
AC	0.629	0.105	1.098	9.192	0.007	0.418	0.035	0.368
PC	1.119	0.336	3.511	35.104	0.000	0.472	0.034	0.357
MA	0.921	0.178	1.861	18.436	0.004	0.451	0.032	0.334
ES	1.075	0.085	0.890	5.956	0.013	0.421	0.033	0.345
Re	0.782	0.195	2.034	15.125	0.000	0.376	0.033	0.343
S1	1.973	0.531	5.542	45.290	0.000	0.594	0.038	0.398
S2	1.873	0.503	5.252	43.011	0.000	0.587	0.038	0.399
S3	1.807	0.479	5.003	41.009	0.000	0.585	0.038	0.398
S4	1.810	0.481	5.018	41.157	0.000	0.585	0.038	0.398
S5	1.678	0.438	4.572	37.581	0.000	0.584	0.038	0.393
S6	1.878	0.504	5.263	43.037	0.000	0.587	0.038	0.399

MSE/FORECAST

RW	0.797	0.179	1.864	13.589	0.000	0.309	0.037	0.383
AC	1.591	0.809	8.444	84.623	0.000	0.309	0.037	0.386
PC	13.467	11.316	118.140	1232.325	0.000	0.350	0.038	0.393
MA	4.281	3.129	32.670	340.059	0.000	0.314	0.035	0.365
ES	1.942	0.379	3.962	35.637	0.000	0.295	0.036	0.379
Re	4.709	2.530	26.411	228.768	0.000	0.258	0.035	0.362
S1	34.328	20.366	212.631	2051.181	0.000	0.510	0.041	0.428
S2	30.838	18.372	191.810	1849.915	0.000	0.503	0.041	0.426
S3	28.066	16.666	174.002	1681.736	0.000	0.499	0.041	0.425
S4	28.226	16.783	175.220	1693.921	0.000	0.500	0.041	0.425
S5	23.528	13.990	146.055	1412.355	0.000	0.495	0.041	0.425
S6	30.968	18.400	192.098	1852.176	0.000	0.503	0.041	0.426

1982

MAPE/ACTUAL

RW	0.541	0.339	1.106	8.597	0.002	0.343	0.032	0.336
AC	0.609	0.121	1.267	11.487	0.003	0.369	0.033	0.344
PC	0.640	0.088	0.918	7.198	0.008	0.446	0.034	0.358
MA	0.610	0.121	1.262	10.904	0.006	0.369	0.034	0.354
ES	0.531	0.100	1.041	7.425	0.000	0.350	0.033	0.340
Re	0.597	0.137	1.435	11.933	0.000	0.351	0.034	0.352
S1	1.148	0.196	2.049	14.500	0.003	0.637	0.034	0.357
S2	1.205	0.215	2.242	16.032	0.003	0.641	0.034	0.357
S3	1.236	0.219	2.284	16.159	0.003	0.645	0.034	0.356
S4	1.231	0.218	2.277	16.131	0.005	0.644	0.034	0.356
S5	1.247	0.224	2.340	16.599	0.026	0.646	0.034	0.354
S6	1.125	0.192	2.000	14.205	0.015	0.638	0.034	0.352

MSE/ACTUAL

RW	1.505	0.753	7.862	73.931	0.000	0.230	0.034	0.351
AC	1.962	1.227	12.808	132.025	0.000	0.253	0.034	0.357
PC	1.243	0.524	5.466	51.924	0.000	0.326	0.037	0.386
MA	1.952	1.115	11.637	119.045	0.000	0.260	0.036	0.377
ES	1.355	0.621	6.485	55.139	0.000	0.237	0.035	0.363
Re	2.396	1.417	14.789	142.399	0.000	0.246	0.035	0.364
S1	5.477	2.467	25.759	210.341	0.000	0.532	0.039	0.411
S2	6.434	2.970	31.009	257.129	0.000	0.536	0.040	0.413
S3	6.694	3.045	31.792	261.209	0.000	0.541	0.040	0.416
S4	6.652	3.030	31.633	260.368	0.000	0.541	0.040	0.416
S5	6.983	3.213	33.549	276.410	0.001	0.541	0.040	0.416
S6	5.228	2.371	24.755	202.205	0.000	0.530	0.039	0.409

MAPE/FORECAST

RW	0.997	0.256	2.674	22.498	0.002	0.369	0.034	0.357
AC	0.842	0.155	1.615	10.249	0.003	0.374	0.035	0.365
PC	1.450	0.351	3.662	30.735	0.008	0.446	0.035	0.370
MA	1.430	0.367	3.828	25.244	0.007	0.386	0.035	0.364
ES	0.939	0.243	2.535	20.975	0.000	0.368	0.033	0.345
Re	9.410	8.379	87.474	913.784	0.000	0.364	0.035	0.362
S1	2.982	0.887	9.260	70.819	0.000	0.545	0.039	0.410
S2	2.841	0.860	8.975	70.819	0.000	0.536	0.039	0.403
S3	2.695	0.800	8.353	63.877	0.000	0.533	0.038	0.397
S4	2.714	0.807	8.421	64.603	0.000	0.533	0.038	0.398
S5	2.709	0.819	8.550	67.243	0.000	0.532	0.038	0.396
S6	3.144	0.953	9.947	78.342	0.000	0.553	0.039	0.410

MSE/FORECAST

RW	8.080	4.820	50.326	506.250	0.000	0.262	0.036	0.373
AC	3.294	1.208	12.607	105.120	0.000	0.272	0.037	0.389
PC	15.390	8.941	93.350	945.091	0.000	0.334	0.039	0.407
MA	16.560	7.370	76.950	637.565	0.000	0.280	0.038	0.392
ES	7.246	4.216	44.017	439.959	0.000	0.254	0.035	0.367
Re	7670.1	7660.5	79977.8	835001.9	0.000	0.263	0.036	0.379
S1	93.853	51.785	540.651	5015.316	0.000	0.464	0.042	0.434
S2	87.885	50.347	525.635	5015.316	0.000	0.448	0.041	0.427
S3	76.386	42.126	439.805	4080.273	0.000	0.440	0.040	0.422
S4	77.630	42.949	448.403	4173.484	0.000	0.442	0.040	0.423
S5	79.770	45.530	475.347	4521.656	0.000	0.439	0.040	0.422
S6	107.909	61.744	644.623	6137.395	0.000	0.472	0.042	0.438

MAPE/ACTUAL

RW	0.592	0.092	0.960	5.610	0.004	0.378	0.030	0.315
AC	0.732	0.124	1.298	7.294	0.003	0.393	0.033	0.347
PC	0.509	0.058	0.610	3.173	0.008	0.394	0.032	0.338
MA	0.544	0.065	0.675	3.831	0.005	0.362	0.026	0.274
ES	0.506	0.059	0.612	5.532	0.019	0.378	0.030	0.314
Re	0.626	0.083	0.869	6.935	0.001	0.442	0.035	0.367
S1	1.996	0.821	8.575	88.905	0.002	0.685	0.034	0.355
S2	2.072	0.857	8.949	80.092	0.007	0.685	0.035	0.361
S3	2.217	0.885	9.236	95.729	0.010	0.689	0.035	0.361
S4	2.121	0.882	9.206	95.417	0.007	0.688	0.035	0.361
S5	2.025	0.835	8.721	90.394	0.008	0.686	0.034	0.358
S6	1.804	0.723	7.544	78.258	0.008	0.681	0.032	0.331

MSE/ACTUAL

RW	1.265	0.434	4.535	31.508	0.000	0.241	0.033	0.344
AC	2.206	0.758	7.918	53.245	0.000	0.274	0.036	0.375
PC	0.628	0.142	1.480	10 116	0.000	0.268	0.035	0.367
MA	0.748	0.209	2.187	14.713	0.000	0.206	0.028	0.291
ES	0.628	0.299	3.008	30.815	0.000	0.240	0.033	0.344
Re	1.141	0.454	4.744	48.107	0.000	0.329	0.039	0.403
S1	76.833	72.468	756.904	7904.367	0.000	0.595	0.040	0.416
S2	83.648	78.891	823.642	8601.285	0.000	0.599	0.040	0.421
S3	89.053	84.070	877.717	9166.039	0.000	0.604	0.040	0.422
S4	88.474	83.517	871.943	9105.734	0.000	0.603	0.040	0.422
S5	79.465	74.958	782.585	8172.531	0.000	0.597	0.040	0.419
S6	59.647	56.184	586.573	6125.574	0.000	0.573	0.038	0.402

MAPE/FORECAST

RW	0.959	0.213	2.227	16.825	0.004	0.449	0.033	0.346
AC	1.454	0.597	6.235	62.109	0.003	0.449	0.036	0.376
PC	1.226	0.287	2.993	22.394	0.008	0.450	0.035	0.368
MA	1.050	0.153	1.597	7.604	0.005	0.458	0.032	0.333
ES	0.885	0.076	0.793	4.982	0.019	0.451	0.033	0.348
Re	0.583	0.180	1.882	19.258	0.001	0.346	0.026	0.274
S1	1.800	0.480	5.010	45.165	0.000	0.527	0.036	0.380
S2	1.733	0.465	4.850	43.958	0.000	0.520	0.037	0.382
S3	1.680	0.446	4.658	42.046	0.000	0.519	0.037	0.382
S4	1.684	0.447	4.672	42.201	0.000	0.520	0.037	0.382
S5	1.778	0.474	4.951	44.626	0.000	0.524	0.036	0.381
S6	2.049	0.547	5.707	51.342	0.000	0.553	0.036	0.378

MSE/FORECAST

RW	5.837	3.238	33.803	283.218	0.000	0.320	0.037	0.387
AC	40.627	35.531	370.957	3857.830	0.000	0.342	0.040	0.414
PC	10.382	5.708	59.594	501.805	0.000	0.337	0.039	0.410
MA	3.628	0.984	10.276	57.892	0.000	0.320	0.036	0.376
ES	1.408	0.314	3.279	25.016	0.000	0.323	0.037	0.389
Re	3.848	3.402	35.516	370.393	0.000	0.194	0.026	0.270
S1	28.109	18.991	198.271	2039.889	0.000	0.421	0.039	0.407
S2	26.309	17.966	187.575	1932.296	0.000	0.415	0.039	0.409
S3	24.318	16.459	171.841	1767.840	0.000	0.414	0.039	0.409
S4	24.462	16.579	173.090	1780.892	0.000	0.414	0.039	0.409
S5	27.452	18.542	193.581	1991.480	0.000	0.418	0.039	0.407
S6	36.474	24.539	256.190	2635.986	0.000	0.447	0.040	0.413

Appendix 29.

ERRORS FROM THE OPTIMAL PREDICTION MODELS FOR FORECASTING PROFIT, (109 COMPANIES).

BEST MODELS;

	Non-t. 1981	Trunc. 1981	Non-t. 1982	Trunc. 1982	Non-t. 1983	Trunc. 1983
Absolute ch.	4 yr.	5 yr.	5 yr.	5 yr.	3 yr.	5 yr.
Percentage ch.	4 yr.	3 yr.	3 yr.	2 yr,	4 yr.	3 yr.
Moving average	3 yr.	2 yr.	6 yr.	2 yr.	2 yr.	2 yr.
Exponential sm.	0.45	0.95	0.10	0.85	0.95	0.60

When more than one form of a model appears equally satisfactory the simplest form is employed, namely the model employing the smallest number of years, or, for exponential smoothing the highest weighting factor.

	NON-TRUNCATED					TRUNCATED (Max. 1.0)		
	MEAN	STD. ERROR	STD. DEV.	RANGE	MINIMUM	MEAN	STD. ERROR	STD. DEV.
1981								
MAPE/ACTUAL								
RW	1.342	0.425	4.440	43.068	0.011	0.440	0.036	0.379
PC	1.654	0.565	5.904	58.185	0.002	0.377	0.033	0.340
PC	0.960	0.130	1.352	9.273	0.000	0.498	0.037	0.391
MA	1.521	0.361	3.770	30.880	0.008	0.480	0.036	0.378
ES	1.333	0.296	3.088	22.913	0.000	0.446	0.036	0.375
Re	1.263	0.248	2.591	22.981	0.043	0.561	0.030	0.331
S1	2.425	0.468	4.888	31.837	0.012	0.738	0.033	0.343
S2	2.563	0.497	5.190	34.225	0.003	0.737	0.034	0.350
S3	2.650	0.520	5.426	35.363	0.001	0.742	0.033	0.349
S4	2.645	0.518	5.411	35.324	0.004	0.741	0.033	0.349
S5	2.915	0.576	6.014	39.565	0.020	0.751	0.033	0.346
S6	2.568	0.500	5.216	34.302	0.007	0.737	0.034	0.350
MSE/ACTUAL								
RW	21.330	17.091	178.431	1855.797	0.000	0.336	0.040	0.421
AC	37.272	31.167	325.395	3385.728	0.000	0.349	0.041	0.428
PC	2.734	0.893	9.322	85.989	0.000	0.399	0.041	0.432
MA	16.399	9.152	95.550	954.057	0.000	0.372	0.041	0.427
ES	11.223	5.338	55.728	525.038	0.000	0.339	0.040	0.417
Re	8.246	4.929	51.460	530.128	0.002	0.412	0.037	0.385
S1	29.552	12.652	132.093	1014.371	0.000	0.662	0.040	0.413
S2	33.258	14.194	148.193	1171.593	0.000	0.665	0.040	0.414
S3	36.191	15.559	162.445	1250.619	0.000	0.671	0.040	0.414
S4	36.010	15.479	161.604	1248.084	0.000	0.671	0.040	0.414
S5	44.333	19.018	198.556	1566.954	0.000	0.682	0.040	0.418
S6	33.550	14.327	149.581	1177.153	0.000	0.664	0.040	0.414

MAPE/FORECAST

RW	0.578	0.065	0.683	3.676	0.011	0.431	0.034	0.353
AC	0.919	0.239	2.490	20.111	0.003	0.418	0.035	0.368
PC	1.119	0.336	3.511	35.104	0.000	0.463	0.035	0.370
MA	7.198	5.660	59.092	613.133	0.008	0.451	0.032	0.334
ES	1.488	0.662	6.907	70.116	0.000	0.434	0.033	0.348
Re	2.721	1.313	13.709	140.203	0.004	0.663	0.031	0.326
S1	1.973	0.531	5.542	45.290	0.000	0.594	0.038	0.398
S2	1.873	0.503	5.252	43.011	0.000	0.587	0.038	0.399
S3	1.807	0.479	5.003	41.009	0.000	0.585	0.038	0.398
S4	1.810	0.481	5.018	41.157	0.000	0.585	0.038	0.398
S5	1.678	0.438	4.572	37.581	0.000	0.584	0.038	0.393
S6	1.878	0.504	5.263	43.037	0.000	0.587	0.038	0.399

MSE/FORECAST

RW	0.797	0.179	1.864	13.589	0.000	0.309	0.037	0.383
AC	6.988	4.246	44.329	404.536	0.000	0.309	0.037	0.386
PC	13.467	11.316	118.140	1232.325	0.000	0.349	0.038	0.399
MA	3511.6	3448.9	36007.1	375942.001	0.000	0.314	0.035	0.365
ES	49.487	45.141	471.286	4916.293	0.000	0.308	0.036	0.380
Re	193.61	180.51	1884.55	19669.537	0.002	0.545	0.038	0.396
S1	34.328	20.366	212.631	2051.181	0.000	0.510	0.041	0.428
S2	30.838	18.372	191.810	1849.915	0.000	0.503	0.041	0.426
S3	28.066	16.666	174.002	1681.736	0.000	0.499	0.041	0.425
S4	28.226	16.783	175.220	1693.921	0.000	0.500	0.041	0.425
S5	23.528	13.990	146.055	1412.355	0.000	0.495	0.041	0.425
S6	30.968	18.400	192.098	1852.176	0.000	0.503	0.041	0.426

1982

MAPE/ACTUAL

RW	0.541	0.339	1.106	8.597	0.002	0.343	0.032	0.336
AC	0.585	0.110	1.149	7.281	0.001	0.369	0.033	0.344
PC	0.605	0.083	0.868	6.585	0.005	0.445	0.034	0.356
MA	1.080	0.219	2.284	16.721	0.006	0.369	0.034	0.354
ES	1.042	0.179	1.872	14.059	0.010	0.346	0.032	0.338
Re	1.728	0.501	5.229	52.401	0.002	0.609	0.033	0.347
S1	1.148	0.196	2.049	14.500	0.003	0.637	0.034	0.357
S2	1.205	0.215	2.242	16.032	0.003	0.641	0.034	0.357
S3	1.236	0.219	2.284	16.159	0.003	0.645	0.034	0.356
S4	1.231	0.218	2.277	16.131	0.005	0.644	0.034	0.356
S5	1.247	0.224	2.340	16.599	0.026	0.646	0.034	0.354
S6	1.125	0.192	2.000	14.205	0.015	0.638	0.034	0.352

MSE/ACTUAL

RW	1.505	0.753	7.862	73.931	0.000	0.230	0.034	0.351
AC	1.651	0.722	7.541	53.029	0.000	0.253	0.034	0.357
PC	1.112	0.465	4.858	47.099	0.000	0.324	0.037	0.383
MA	6.335	2.945	30.748	279.810	0.000	0.260	0.036	0.377
ES	4.559	2.049	21.389	197.931	0.000	0.239	0.033	0.341
Re	30.074	25.207	263.169	2746.036	0.000	0.491	0.040	0.413
S1	5.477	2.467	25.759	210.341	0.000	0.532	0.039	0.411
S2	6.434	2.970	31.009	257.129	0.000	0.536	0.040	0.413
S3	6.694	3.045	31.792	261.209	0.000	0.671	0.040	0.414
S4	6.652	3.030	31.633	260.368	0.000	0.541	0.040	0.416
S5	6.983	3.213	33.549	276.410	0.001	0.541	0.040	0.416
S6	5.228	2.371	24.755	202.205	0.000	0.530	0.039	0.409

MAPE/FORECAST

RW	0.997	0.256	2.674	22.498	0.002	0.369	0.034	0.357
AC	47.765	46.797	488.574	5101.733	0.001	0.374	0.035	0.365
PC	1.541	0.396	4.139	35.293	0.008	0.470	0.037	0.384
MA	1.292	0.501	5.233	53.731	0.006	0.386	0.035	0.364
ES	1.247	0.170	1.770	16.629	0.010	0.370	0.034	0.355
Re	0.793	0.153	1.598	13.986	0.002	0.483	0.030	0.313
S1	2.982	0.887	9.260	70.819	0.000	0.545	0.039	0.410
S2	2.841	0.860	8.975	70.819	0.000	0.536	0.039	0.403
S3	2.695	0.800	8.353	63.877	0.000	0.533	0.038	0.397
S4	2.714	0.807	8.421	64.603	0.000	0.533	0.038	0.398
S5	2.709	0.819	8.550	67.243	0.000	0.532	0.038	0.396
S6	3.144	0.953	9.947	78.342	0.000	0.553	0.039	0.410

MSE/FORECAST

RW	8.080	4.820	50.326	506.250	0.000	0.262	0.036	0.373
AC	238795.9	238786.0	>1000000	>1000000		0.272	0.037	0.389
PC	19.349	11.742	122.586	1245.990	0.000	0.367	0.041	0.425
MA	28.804	26.500	276.672	2887.649	0.000	0.280	0.038	0.392
ES	4.658	2.553	26.655	276.860	0.000	1.260	0.036	0.371
Re	3.159	1.873	19.557	195.662	0.000	0.331	0.035	0.362
S1	93.853	51.785	540.651	5015.316	0.000	0.464	0.042	0.434
S2	87.885	50.347	525.633	5015.316	0.000	0.448	0.041	0.427
S3	76.386	42.126	439.805	4080.273	0.000	0.440	0.040	0.422
S4	77.630	42.949	448.403	4173.484	0.000	0.442	0.040	0.423
S5	79.770	45.530	475.347	4521.656	0.000	0.439	0.040	0.422
S6	107.909	61.744	644.623	6137.395	0.000	0.472	0.042	0.438

1983

MAPE/ACTUAL

RW	0.592	0.092	0.960	5.610	0.004	0.378	0.030	0.315
AC	1.039	0.240	2.505	22.153	0.014	0.393	0.033	0.347
PC	0.509	0.058	0.610	3.173	0.008	0.424	0.032	0.337
MA	0.546	0.066	0.688	3.766	0.002	0.412	0.030	0.314
ES	0.584	0.089	0.931	5.424	0.000	0.398	0.029	0.304
Re	0.446	0.068	0.712	4.946	0.013	0.331	0.026	0.274
S1	1.996	0.821	8.575	88.905	0.002	0.685	0.034	0.355
S2	2.072	0.857	8.949	92.737	0.007	0.685	0.035	0.361
S3	2.127	0.885	9.236	95.729	0.010	0.689	0.035	0.361
S4	2.121	0.882	9.206	95.417	0.007	0.688	0.035	0.361
S5	2.025	0.835	8.721	90.394	0.008	0.686	0.034	0.358
S6	1.804	0.723	7.544	78.258	0.008	0.681	0.032	0.331

MSE/ACTUAL

RW	1.265	0.434	4.535	31.508	0.000	0.241	0.033	0.344
AC	7.299	4.582	47.838	491.380	0.000	0.274	0.036	0.375
PC	0.628	0.142	1.480	10 116	0.000	0.293	0.035	0.368
MA	1.302	1.018	10.630	110.913	0.000	0.190	0.025	0.260
ES	1.199	0.405	4.233	29.430	0.000	0.250	0.032	0.337
Re	0.701	0.285	2.976	24.591	0.000	0.184	0.027	0.279
S1	76.833	72.468	756.904	7904.367	0.000	0.595	0.040	0.416
S2	83.648	78.891	823.642	8601.285	0.000	0.599	0.040	0.421
S3	89.053	84.070	877.717	9166.039	0.000	0.604	0.040	0.422
S4	88.474	83.517	871.943	9105.734	0.000	0.603	0.040	0.422
S5	79.465	74.958	782.585	8172.531	0.000	0.597	0.040	0.419
S6	59.647	56.184	586.573	6125.574	0.000	0.573	0.038	0.402

MAPE/FORECAST

RW	0.959	0.213	2.227	16.825	0.004	0.449	0.033	0.346
AC	2.999	1.362	14.218	137.432	0.014	0.449	0.036	0.376
PC	1.226	0.287	2.993	22.394	0.008	0.491	0.036	0.374
MA	4.520	3.145	32.830	341.126	0.002	0.500	0.034	0.356
ES	1.020	0.267	2.788	26.177	0.000	0.489	0.033	0.350
Re	0.556	0.097	1.008	8.577	0.013	0.372	0.031	0.320
S1	1.800	0.480	5.010	45.165	0.000	0.527	0.036	0.380
S2	1.733	0.465	4.850	43.958	0.000	0.520	0.037	0.382
S3	1.680	0.446	4.658	42.046	0.000	0.519	0.037	0.382
S4	1.684	0.447	4.672	42.201	0.000	0.520	0.037	0.382
S5	1.778	0.474	4.951	44.626	0.000	0.524	0.036	0.381
S6	2.049	0.547	5.707	51.342	0.000	0.553	0.036	0.378

MSE/FORECAST

RW	5.837	3.238	33.803	283.218	0.000	0.320	0.037	0.387
AC	209.30	175.10	1828.07	18891.441	0.000	0.342	0.040	0.414
PC	10.382	5.708	59.594	501.805	0.000	0.380	0.041	0.424
MA	1088.30	1067.5	11145.0	116368.4	0.000	0.376	0.039	0.409
ES	8.743	6.370	66.509	685.219	0.000	0.264	0.036	0.374
Re	1.315	0.694	7.250	73.785	0.000	0.240	0.033	0.348
S1	28.109	18.991	198.271	2039.889	0.000	0.421	0.039	0.407
S2	26.309	17.966	187.575	1932.296	0.000	0.415	0.039	0.409
S3	24.318	16.459	171.841	1767.840	0.000	0.414	0.039	0.409
S4	24.462	16.579	173.090	1780.892	0.000	0.414	0.039	0.409
S5	27.452	18.542	193.581	1991.480	0.000	0.418	0.039	0.407
S6	36.474	24.539	256.190	2635.986	0.000	0.447	0.040	0.413

Appendix 30.

COMPARISON OF THE NON-TRUNCATED ERRORS FOR THE OPTIMAL PREDICTION MODELS FOR FORECASTING PROFITS, (109 COS.)

<u>SPEARMAN RANK CORRELATIONS.</u>

<u>1981</u>

MAPE/ACTUAL AND MSE/ACTUAL.

	ABS.C.	PER.C.	MOV.A.	EXP.SM.	REG.	SEG.1	SEG.2	SEG.3	SEG.4	SEG.5	SEG.6
RW	0.8373	0.7044	0.6605	0.7173	0.5466	0.2066	0.2047	0.1999	0.2003	0.1928	0.2067
	.001	.001	.001	.001	.001	.016	.016	.019	.018	.022	.016
ABS.CH.		0.8077	0.6290	0.6234	0.4751	0.1417	0.1500	0.1481	0.1488	0.1513	0.1515
		.001	.001	.001	.001	.071	.060	.062	.061	.058	.058
PER.CH.			0.5367	0.5419	0.3983	0.1649	0.1737	0.1721	0.1730	0.1607	0.1753
			.001	.001	.001	.043	.035	.037	.036	.048	.034
MOV.AV.				0.9319	0.4774	0.0701	0.0644	0.0563	0.0561	0.0499	0.0660
				.001	.001	.235	.253	.280	.281	.303	.248
EXP.SM.					0.5476	0.1224	0.1134	0.1047	0.1044	0.0881	0.1153
					.001	.102	.120	.139	.140	.181	.116
REG.						0.0767	0.0713	0.0704	0.0696	0.0733	0.0738
						.214	.231	.234	.236	.224	.223

SEG.1	0.9967 .001	0.9938 .001	0.9938 .001	0.9737 .001	0.9967 .001
SEG.2		0.9981 .001	0.9982 .001	0.9843 .001	0.9998 .001
SEG.3			1.0000 .001	0.9893 .001	0.9979 .001
SEG.4				0.9894 .001	0.9980 .001
SEG.5					0.9842 .001

MAPE/FORECAST AND MSE/FORECAST.

RW	0.8111	0.7411	0.6066	0.6732	0.3411	0.0814	0.0869	0.0862	0.0864	0.0906	0.0853
	.001	.001	.001	.001	.001	.200	.184	.186	.186	.174	.189
ABS.CH.		0.8176	0.5036	0.4958	0.2510	-0.0253	-0.0174	-0.0220	-0.0227	-0.0150	-0.0189
		.001	.001	.001	.004	.397	.429	.410	.408	.439	.423
PER.CH.			0.4844	0.4727	0.2542	0.0520	0.0632	0.0616	0.0621	0.0650	0.0607
			.001	.001	.004	.296	.257	.262	.261	.251	.265
MOV.AV.				0.9350	0.1925	0.1117	0.1108	0.1041	0.1050	0.1011	0.1080
				.001	.022	.126	.141	.139	.140	.148	.132
EXP.SM.					0.3013	0.1757	0.1739	0.1666	0.1675	0.1633	0.1720
					.001	.034	.035	.042	.041	.045	.037
REG.						0.0400	0.0363	0.0347	0.0352	0.0276	0.0362
						.340	.354	.360	.358	.388	.354
SEG.1							0.9964	0.9908	0.9914	0.9725	0.9963
							.001	.001	.001	.001	.001
SEG.2								0.9976	0.9979	0.9859	0.9998
								.001	.001	.001	.001
SEG.3									0.9999	0.9931	0.9972
									.001	.001	.001
SEG.4										0.9927	0.9975
										.001	.001
SEG.5											0.9858
											.001

1982

MAPE/ACTUAL AND MSE/ACTUAL.

RW.	0.7819	0.7723	0.5184	0.4017	0.6832	0.2504	0.2399	0.2226	0.2255	0.2170	0.2519
	.001	.001	.001	.001	.001	.004	.006	.010	.009	.012	.004
ABS.CH.		0.7369	0.3414	0.2077	0.4648	0.2542	0.2500	0.2424	0.2438	0.2397	0.2546
		.001	.001	.015	.001	.004	.004	.006	.005	.006	.004
PER.CH.			0.4902	0.3721	0.4983	0.1957	0.1868	0.1859	0.1853	0.1860	0.1958
			.001	.001	.001	.021	.026	.026	.027	.026	.021
MOV.AV.				0.8158	0.4080	0.0206	0.0223	0.0289	0.0292	0.0245	0.0129
				.001	.001	.416	.409	.383	.382	.400	.447
EXP.SM.					0.4414	-0.0012	-0.0008	-0.0017	0.0017	-0.0031	0.0028
					.001	.495	.497	.493	.493	.487	.488
REG.						0.2442	0.2306	0.2220	0.2216	0.2179	0.2466
						.005	.008	.010	.010	.011	.005
SEG.1							0.9916	0.9842	0.9856	0.9814	0.9969
							.001	.001	.001	.001	.001
SEG.2								0.9963	0.9971	0.9957	0.9841
								.001	.001	.001	.001
SEG.3									0.9998	0.9989	0.9734
									.001	.001	.001

SEG.4										0.9988	0.9754
										.001	.001
SEG.5											0.9708
											.000

MAPE/FORECAST AND MSE/FORECAST.

RW	0.7692	0.8329	0.4287	0.1809	0.6534	0.2367	0.2410	0.2354	0.2313	0.2315	0.2360
	.001	.001	.001	.030	.001	.007	.006	.007	.008	.008	.007
ABS.CH.		0.7849	0.1999	0.0349	0.4343	0.1683	0.1830	0.1839	0.1799	0.1791	0.1616
		.001	.019	.359	.001	.040	.028	.028	.031	.031	.047
PER.CH.			0.4628	0.2208	0.5475	0.1873	0.2023	0.2110	0.2061	0.2095	0.1809
			.001	.011	.001	.026	.017	.014	.016	.014	.030
MOV.AV.				0.7846	0.3085	0.0501	0.0542	0.0663	0.0658	0.0657	0.0512
				.001	.001	.303	.288	.247	.248	.249	.299
EXP.SM.					0.2948	-0.0008	-0.0001	0.0054	0.0067	0.0092	0.0038
					.001	.497	.500	.478	.473	.462	.484
REG.						0.2828	0.2845	0.2869	0.2832	0.2854	0.2799
						.001	.001	.001	.001	.001	.002
SEG.1							0.9941	0.9862	0.9873	0.9845	0.9976
							.001	.001	.001	.001	.001
SEG.2								0.9961	0.9967	0.9957	0.9886
								.001	.001	.001	.001

SEG.3									0.9998	0.9993	0.9778
									.001	.001	.001
SEG.4										0.9992	0.9791
										.001	.001
SEG.5											0.9763
											.001

1983

MAPE/ACTUAL AND MSE/ACTUAL.

RW	0.8423	0.8309	0.8709	0.9944	0.6023	0.1997	0.2148	0.2269	0.2258	0.2124	0.1917
	.001	.001	.001	.001	.001	.019	.012	.009	.009	.013	.023
ABS.CH.		0.7721	0.7747	0.8188	0.5547	0.2039	0.2165	0.2256	0.2256	0.2161	0.1710
		.001	.001	.001	.001	.017	.012	.009	.009	.012	.038
PER.CH.			0.7613	0.8300	0.5429	0.2210	0.2319	0.2433	0.2424	0.2293	0.1933
			.001	.001	.001	.010	.008	.005	.006	.008	.022
MOV.AV.				0.8775	0.7425	0.2638	0.2699	0.2759	0.2748	0.2703	0.2509
				.001	.001	.003	.002	.002	.002	.002	.004
EXP.SM.					0.5990	0.2205	0.2354	0.2472	0.2462	0.2330	0.2141
					.001	.011	.007	.005	.005	.007	.013
REG.						0.1002	0.0956	0.1005	0.1001	0.0951	0.1009
						.150	.161	.149	.150	.163	.148

SEG.1							0.9926 .001	0.9862 .001	0.9867 .001	0.9949 .001	0.9714 .001
SEG.2								0.9966 .001	0.9968 .001	0.9988 .001	0.9490 .001
SEG.3									0.9999 .001	0.9940 .001	0.9335 .001
SEG.4										0.9943 .001	0.9348 .001
SEG.5											0.9563

<u>MAPE/FORECAST</u> <u>AND</u> <u>MSE/ACTUAL</u>

RW	0.8066 .001	0.8661 .001	0.8607 .001	0.9935 .001	0.6241 .001	0.0952 .162	0.1057 .137	0.1177 .111	0.1162 .114	0.0996 .152	0.0639 .255
ABS.CH.		0.8006 .001	0.7094 .001	0.7811 .001	0.4897 .001	0.0929 .168	0.0999 .151	0.1096 .128	0.1085 .131	0.0960 .160	0.0504 .301
PER.CH.			0.7753 .001	0.8614 .001	0.5551 .001	0.0747 .220	0.0856 .188	0.1009 .148	0.0987 .154	0.0788 .208	0.0202 .418
MOV.AV.				0.8752 .001	0.7464 .001	0.1151 .117	0.1261 .096	0.1360 .079	0.1350 .081	0.1220 .103	0.0785 .209
EXP.SM.					0.6306 .001	0.1012 .147	0.1121 .123	0.1239 .100	0.1223 .103	0.1060 .136	0.0699 .235

REG.	0.0220 .410	0.0218 .411	0.0229 .407	0.0219 .411	0.0224 .409	0.0039 .484
SEG.1		0.9962 .001	0.9916 .001	0.9921 .001	0.9988 .001	0.9785 .001
SEG.2			0.9975 .001	0.9977 .001	0.9987 .001	0.9637 .001
SEG.3				0.9999 .001	0.9945 .001	0.9500 .001
SEG.4					0.9949 .001	0.9511 .001
SEG.5						0.9724 .001

T-TESTS, FOR MODELS THAT DIFFER FROM THE OPTIMAL SINGLE MODEL ONLY.

	(DIFFERENCE) MEAN	STANDARD DEVIATION	STANDARD ERROR	CORR.	2-TAIL PROB.	T VALUE	2-TAIL PROB.
1981							
MAPE/ACTUAL							
RW/AC	-0.3123	1.627	0.156	0.990	0.000	-2.00	0.048
RW/MA	-0.1795	5.107	0.489	0.234	0.014	0.37	0.714
RW/ES	0.0087	4.172	0.400	0.432	0.000	0.02	0.983
RW/Re	0.0784	2.258	0.216	0.927	0.000	0.36	0.718
AC/PC	0.6936	5.608	0.537	0.328	0.001	1.29	0.199
AC/MA	0.1328	6.375	0.611	0.189	0.049	0.22	0.828
AC/ES	0.3210	5.514	0.528	0.383	0.000	0.61	0.545
AC/Re	-0.3907	3.742	0.358	0.901	0.000	-1.09	0.278
AC/S1	-0.7711	5.805	0.556	0.434	0.000	-1.39	0.168
AC/S2	-0.9088	5.869	0.562	0.446	0.000	-1.62	0.109
AC/S3	-0.9960	6.049	0.579	0.432	0.000	-1.72	0.088
AC/S4	-0.9910	6.039	0.578	0.433	0.000	-1.71	0.090
AC/S5	-1.2598	6.286	0.602	0.443	0.000	-2.09	0.039
AC/S6	-0.9137	5.884	0.564	0.446	0.000	-1.62	0.108
PC/MA	-0.5608	3.295	0.316	0.508	0.000	-1.78	0.078
PC/ES	-0.3726	2.580	0.247	0.563	0.000	-1.51	0.135
PC/Re	-0.3029	2.214	0.212	0.519	0.000	-1.43	0.156
MA/ES	0.1882	1.155	0.111	0.963	0.000	1.70	0.092
MA/Re	0.2579	3.826	0.367	0.322	0.001	0.70	0.483
MA/S1	-0.9039	6.118	0.586	0.018	0.850	-1.54	0.126
MA/S2	-1.0416	6.363	0.609	0.017	0.861	-1.71	0.090
MA/S3	-1.1288	6.557	0.628	0.016	0.869	-1.80	0.075
MA/S4	-1.1238	6.545	0.627	0.016	0.869	-1.79	0.076
MA/S5	-1.3926	7.049	0.675	0.014	0.883	-2.06	0.042
MA/S6	-1.0465	6.383	0.611	0.017	0.858	-1.71	0.090
ES/PC	0.3726	2.580	0.247	0.563	0.000	1.51	0.135
ES/Re	0.0697	2.829	0.271	0.515	0.000	0.26	0.797
ES/S1	-1.0920	5.452	0.522	0.122	0.205	-2.09	0.039
ES/S2	-1.2298	5.702	0.546	0.124	0.200	-2.25	0.026
ES/S3	-1.3170	5.914	0.566	0.119	0.216	-2.33	0.022
ES/S4	-1.3120	5.901	0.565	0.120	0.216	-2.32	0.022
ES/S5	-1.5808	6.419	0.615	0.120	0.215	-2.57	0.011
ES/S6	-1.2347	5.723	0.548	0.124	0.200	-2.25	0.026
Re/S1	-1.1618	4.621	0.443	0.365	0.000	-2.62	0.010
Re/S2	-1.2995	4.859	0.465	0.373	0.000	-2.79	0.006
Re/S3	-1.3867	5.096	0.488	0.362	0.000	-2.84	0.005
Re/S4	-1.3817	5.082	0.487	0.363	0.000	-2.84	0.005
Re/S5	-1.6505	5.598	0.536	0.369	0.000	-3.08	0.003
Re/S6	-1.3044	4.883	0.468	0.373	0.000	-2.79	0.006

MSE/ACTUAL

RW/AC	-15.9418	147.305	14.109	0.999	0.000	-1.13	0.261
RW/MA	4.9311	201.424	19.293	0.012	0.905	0.26	0.799
RW/ES	10.1068	177.251	16.978	0.177	0.065	0.60	0.553
RW/Re	13.0841	127.854	12.246	0.988	0.000	1.07	0.288
AC/PC	34.5373	325.002	31.130	0.057	0.559	1.11	0.270
AC/MA	20.8728	339.007	32.471	0.001	0.989	0.64	0.522
AC/ES	26.0485	321.070	30.753	0.163	0.091	0.85	0.399
AC/Re	29.0259	274.919	26.332	0.984	0.000	1.10	0.273
AC/S1	7.7192	297.094	28.456	0.408	0.000	0.27	0.787
AC/S2	4.0135	293.474	28.110	0.433	0.000	0.14	0.887
AC/S3	1.0805	299.422	28.679	0.403	0.000	0.04	0.970
AC/S4	1.2620	299.121	28.651	0.404	0.000	0.04	0.965
AC/S5	-6.9995	300.653	28.797	0.425	0.000	-0.24	0.808
AC/S6	3.7219	293.804	28.141	0.431	0.000	0.13	0.895
PC/MA	-13.6645	93.492	8.955	0.267	0.005	1.53	0.130
PC/ES	-8.4888	52.895	5.066	0.380	0.000	-1.68	0.097
PC/Re	-5.5115	50.733	4.859	0.168	0.081	-1.13	0.259
MA/ES	5.1757	42.595	4.080	0.979	0.000	1.27	0.207
MA/Re	8.1530	106.907	10.240	0.035	0.714	0.80	0.428
MA/S1	-13.1536	164.873	15.792	-0.024	0.805	-0.83	0.407
MA/S2	-16.8593	178.236	17.072	-0.024	0.805	-0.99	0.326
MA/S3	-19.7923	190.427	18.240	-0.024	0.805	-1.09	0.280
MA/S4	-19.6108	189.699	18.170	-0.024	0.805	-1.08	0.283
MA/S5	-27.8723	222.127	21.276	-0.024	0.806	-1.31	0.193
MA/S6	-17.1509	179.402	17.184	-0.024	0.806	-1.00	0.320
ES/Re	2.9773	67.480	6.463	0.209	0.029	0.46	0.646
ES/S1	-18.3293	141.225	13.527	0.041	0.669	-1.36	0.178
ES/S2	-22.0351	155.938	14.936	0.045	0.639	-1.48	0.143
ES/S3	-24.9680	169.583	16.243	0.041	0.675	-1.54	0.127
ES/S4	-24.7866	168.778	16.166	0.041	0.673	-1.53	0.128
ES/S5	-33.0481	203.558	19.497	0.044	0.648	-1.70	0.093
ES/S6	-22.3267	157.245	15.061	0.045	0.640	-1.48	0.141
Re/S1	-21.3067	121.118	11.601	0.399	0.000	-1.84	0.069
Re/S2	-25.0124	134.744	12.906	0.423	0.000	-1.94	0.055
Re/S3	-27.9453	149.806	14.349	0.394	0.000	-1.95	0.054
Re/S4	-27.7639	148.942	14.266	0.396	0.000	-1.95	0.054
Re/S5	-36.0254	182.977	17.526	0.415	0.000	-2.06	0.042
Re/S6	-25.3040	136.145	13.040	0.421	0.000	-1.94	0.055

MAPE/FORECAST

RW/AC	-0.3409	2.281	0.218	0.431	0.000	-1.56	0.122
RW/MA	-6.6202	58.981	5.649	0.168	0.081	-1.17	0.244
RW/ES	-0.9096	6.871	0.658	0.103	0.286	-1.38	0.170
RW/Re	-2.1428	13.612	1.304	0.166	0.085	-1.64	0.103
AC/PC	-0.2005	4.139	0.396	0.080	0.409	-0.51	0.614
AC/MA	-6.2793	59.080	5.659	0.026	0.790	-1.11	0.270
AC/ES	-0.5687	7.311	0.700	0.013	0.891	-0.81	0.419
AC/Re	-1.8019	13.282	1.272	0.259	0.006	1.42	0.160
AC/S1	-1.0540	6.183	0.592	-0.047	0.624	-1.78	0.078
AC/S2	-0.9545	5.923	0.567	-0.050	0.609	-1.68	0.095
AC/S3	-0.8881	5.700	0.546	-0.050	0.603	-1.63	0.107
AC/S4	-0.9814	5.713	0.547	-0.050	0.604	-1.63	0.106
AC/S5	-0.7594	5.326	0.510	-0.055	0.571	-1.49	0.140
AC/S6	-0.9592	5.934	0.568	-0.050	0.605	-1.69	0.094

PC/MA	-6.0788	59.110	5.662	0.024	0.801	-1.07	0.285
PC/ES	-0.3682	7.722	0.740	0.009	0.930	-0.50	0.620
PC/Re	-1.6014	13.382	1.282	0.220	0.022	-1.25	0.214
MA/ES	5.7106	59.128	5.663	0.053	0.583	1.01	0.316
MA/Re	4.4774	60.645	5.809	0.001	0.990	0.77	0.443
MA/S1	5.2253	59.490	5.698	-0.025	0.795	0.92	0.361
MA/S2	5.3248	59.451	5.694	-0.024	0.803	0.94	0.352
MA/S3	5.3912	59.423	5.692	-0.024	0.805	0.95	0.346
MA/S4	5.3879	59.424	5.692	-0.024	0.805	0.95	0.346
MA/S5	5.5199	59.372	5.687	-0.023	0.815	0.97	0.334
MA/S6	5.3202	59.452	5.694	-0.024	0.803	0.93	0.352
ES/Re	-1.2332	15.395	1.485	-0.007	0.941	-0.84	0.405
ES/S1	-0.4853	9.001	0.862	-0.034	0.728	-0.56	0.575
ES/S2	-0.3858	8.820	0.845	-0.034	0.723	-0.46	0.649
ES/S3	-0.3194	8.675	0.831	-0.036	0.708	-0.38	0.701
ES/S4	-0.3227	8.683	0.832	-0.036	0.709	-0.39	0.699
ES/S5	-0.1907	8.420	0.806	-0.036	0.712	-0.24	0.813
ES/S6	-0.3905	8.826	0.845	-0.034	0.723	-0.46	0.645
Re/S1	0.7479	14.546	1.393	0.047	0.631	0.54	0.593
Re/S2	0.8474	14.449	1.384	0.047	0.629	0.61	0.542
Re/S3	0.9138	14.379	1.377	0.045	0.640	0.66	0.508
Re/S4	0.9105	14.383	1.378	0.045	0.640	0.66	0.510
Re/S5	1.0425	14.258	1.366	0.044	0.646	0.76	0.447
Re/S6	0.8427	14.453	1.384	0.047	0.630	0.61	0.544

MSE/FORECAST

RW/AC	-6.1912	44.056	4.220	0.167	0.082	-1.47	0.145
RW/MA	-3510.827	36006.93	3448.838	0.081	0.405	-1.02	0.311
RW/ES	-48.6898	471.326	45.145	-0.020	0.840	1.08	0.283
RW/Re	-192.8171	1884.450	180.498	0.057	0.559	1.07	0.288
AC/PC	-6.4793	126.646	12.130	-0.011	0.908	-0.53	0.594
AC/MA	-3504.636	36007.60	3448.903	-0.011	0.908	-1.02	0.312
AC/ES	-42.4987	474.027	45.404	-0.015	0.877	-0.94	0.351
AC/Re	-186.6259	1880.347	180.105	0.107	0.270	-1.04	0.302
AC/S1	-27.3397	218.232	20.903	-0.024	0.806	-1.31	0.194
AC/S2	-23.8500	197.894	18.955	-0.024	0.805	-1.26	0.211
AC/S3	-21.0782	180.585	17.297	-0.024	0.805	-1.22	0.226
AC/S4	-21.2378	181.765	17.410	-0.024	0.805	-1.22	0.225
AC/S5	-16.5551	153.727	14.724	-0.024	0.803	-1.12	0.263
AC/S6	-23.9797	198.179	18.982	-0.024	0.805	-1.26	0.209
PC/MA	-3498.157	36008.37	3448.976	-0.009	0.924	-1.01	0.313
PC/ES	-36.0193	487.141	46.660	-0.011	0.909	-0.77	0.442
PC/Re	-180.1466	1884.509	180.503	0.032	0.743	-1.00	0.320
MA/ES	3462.137	36013.60	3449.477	-0.007	0.940	1.00	0.318
MA/Re	3318.010	36074.89	3455.348	-0.010	0.919	0.96	0.339
MA/S1	3477.296	36011.03	3449.231	-0.016	0.872	1.01	0.316
MA/S2	3480.786	36010.56	3449.187	-0.016	0.873	1.01	0.315
MA/S3	3483.558	36010.20	3449.152	-0.016	0.873	1.01	0.315
MA/S4	3483.398	36010.22	3449.154	-0.016	0.873	1.01	0.315
MA/S5	3488.081	36009.63	3449.097	-0.015	0.874	1.01	0.314
ES/Re	-144.1272	1947.423	186.529	-0.011	0.913	-0.77	0.441
ES/S1	15.1589	520.278	49.834	-0.017	0.862	0.30	0.762
ES/S2	18.6487	511.788	49.020	-0.017	0.863	0.38	0.704
ES/S3	21.4205	505.116	48.381	-0.017	0.862	0.44	0.659
ES/S4	21.2608	505.552	48.423	-0.017	0.863	0.44	0.661
ES/S5	25.9436	495.757	47.485	-0.017	0.862	0.55	0.586
ES/S6	18.5190	511.909	49.032	-0.017	0.863	0.38	0.706
Re/S1	159.2861	1896.891	181.689	-0.002	0.985	0.88	0.383

Re/S2	162.7759	1894.602	181.470	-0.002	0.987	0.90	0.372
Re/S3	165.5477	1892.906	181.307	-0.002	0.984	0.91	0.363
Re/S4	165.3880	1893.018	181.318	-0.002	0.984	0.91	0.364
Re/S5	170.0708	1890.490	181.076	-0.002	0.984	0.94	0.350
Re/S6	162.6462	1894.644	181.474	-0.002	0.986	0.90	0.372

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MAPE/ACTUAL

RW/PC	-0.0638	0.468	0.045	0.916	0.000	-1.42	0.157
RW/MA	-0.5393	1.800	0.172	0.633	0.000	-3.13	0.002
RW/ES	-0.5010	1.087	0.104	0.856	0.000	-4.81	0.000
RW/Re	-1.1864	4.306	0.412	0.866	0.000	-2.88	0.005
AC/PC	-0.0205	0.657	0.063	0.823	0.000	-0.33	0.745
AC/MA	-0.4960	1.852	0.177	0.592	0.000	-2.80	0.006
AC/ES	-0.4577	1.245	0.119	0.761	0.000	-3.84	0.000
AC/Re	-1.1430	4.474	0.428	0.720	0.000	-2.67	0.009
PC/MA	-0.4755	1.934	0.185	0.562	0.000	-2.57	0.012
PC/ES	-0.4372	1.310	0.126	0.782	0.000	-3.48	0.001
PC/Re	-1.1225	4.532	0.434	0.832	0.000	-2.59	0.011
PC/S1	-0.5430	2.231	0.214	-0.008	0.937	-2.54	0.012
PC/S2	-0.6000	2.415	0.231	-0.012	0.898	-2.59	0.011
PC/S3	-0.6305	2.454	0.235	-0.013	0.892	-2.68	0.008
PC/S4	-0.6265	2.447	0.234	-0.013	0.894	-2.67	0.009
PC/S5	-0.6416	2.508	0.240	-0.015	0.876	-2.67	0.009
PC/S6	-0.5206	2.187	0.209	-0.008	0.937	-2.49	0.014
MA/ES	0.0383	1.097	0.105	0.879	0.000	0.36	0.716
MA/Re	-0.6471	4.552	0.436	0.496	0.000	1.48	0.141
MA/S1	-0.0675	3.083	0.295	-0.010	0.921	-0.23	0.820
MA/S2	-0.1245	3.222	0.309	-0.014	0.888	-0.40	0.687
MA/S3	-0.1551	3.247	0.311	-0.011	0.910	-0.50	0.619
MA/S4	-0.1510	3.242	0.311	-0.011	0.909	-0.49	0.628
MA/S5	-0.1661	3.291	0.315	-0.013	0.892	-0.53	0.599
MA/S6	-0.0451	3.053	0.292	-0.012	0.905	-0.15	0.878
ES/Re	-0.6854	3.871	0.371	0.810	0.000	1.85	0.067
ES/S1	-0.1058	2.822	0.270	-0.034	0.725	-0.39	0.696
ES/S2	-0.1628	2.977	0.285	-0.040	0.683	-0.57	0.569
ES/S3	-0.1934	3.009	0.288	-0.039	0.688	-0.67	0.504
ES/S4	-0.1893	3.003	0.288	-0.039	0.688	-0.66	0.512
ES/S5	-0.2044	3.056	0.293	-0.041	0.674	-0.70	0.486
ES/S6	-0.0834	2.786	0.267	-0.034	0.724	-0.31	0.755
Re/S1	0.5796	5.704	0.546	-0.047	0.629	1.06	0.291
Re/S2	0.5226	5.791	0.555	-0.050	0.608	0.94	0.348
Re/S3	0.4920	5.812	0.557	-0.051	0.598	0.88	0.379
Re/S4	0.4961	5.808	0.556	-0.051	0.599	0.89	0.375
Re/S5	0.4810	5.838	0.559	-0.052	0.594	0.86	0.392
Re/S6	0.6020	5.683	0.544	-0.046	0.638	1.11	0.271

MSE/ACTUAL

RW/PC	6.9675	50.560	4.843	0.000	0.999	1.44	0.153
RW/MA	1.7448	59.396	5.689	-0.016	0.868	0.31	0.760
RW/ES	-3.0532	14.162	1.356	0.948	0.000	-2.25	0.026
RW/Re	-21.9949	268.542	25.722	-0.012	0.900	-0.86	0.394
AC/PC	0.5386	4.812	0.461	0.782	0.000	1.17	0.245
AC/MA	-4.6840	28.767	2.755	0.377	0.000	-1.70	0.092
AC/ES	-2.9077	15.952	1.528	0.806	0.000	-1.90	0.060

AC/Re	-28.4237	258.061	24.718	0.685	0.000	-1.15	0.253
PC/MA	-5.2227	29.413	2.817	0.348	0.000	-1.85	0.066
PC/ES	-3.4464	16.941	1.623	0.934	0.000	-2.12	0.036
PC/Re	-28.9624	258.620	24.771	0.937	0.000	-1.17	0.245
PC/S1	-4.3645	26.357	2.525	-0.030	0.756	-1.73	0.087
PC/S2	-5.3222	31.530	3.020	-0.030	0.758	-1.76	0.081
PC/S3	-5.5821	32.307	3.094	-0.030	0.754	-1.80	0.074
PC/S4	-5.5396	32.149	3.079	-0.030	0.754	-1.80	0.075
PC/S5	-5.8684	34.043	3.261	-0.030	0.755	-1.80	0.075
PC/S6	-4.1198	25.396	2.432	-0.030	0.758	-1.69	0.093
MA/ES	1.7763	24.796	2.375	0.599	0.000	0.75	0.456
MA/Re	-23.7397	257.575	24.671	0.238	0.013	-0.96	0.338
MA/S1	0.8582	40.671	3.896	-0.029	0.769	0.22	0.826
MA/S2	-0.0995	44.294	4.243	-0.029	0.766	-0.02	0.981
MA/S3	-0.3594	44.838	4.295	-0.028	0.775	-0.08	0.933
MA/S4	-0.3169	44.724	4.284	-0.028	0.774	-0.07	0.941
MA/S5	-0.6457	46.142	4.420	-0.028	0.771	-0.15	0.884
MA/S6	1.1029	40.053	3.836	-0.029	0.763	0.29	0.774
ES/Re	-25.5160	244.176	23.388	0.897	0.000	-1.09	0.278
ES/S1	-0.9181	34.059	3.262	-0.035	0.715	-0.28	0.779
ES/S2	-1.8758	38.289	3.667	-0.035	0.714	-0.51	0.610
ES/S3	-2.1357	38.942	3.730	-0.035	0.714	-0.57	0.568
ES/S4	-2.0932	38.809	3.717	-0.035	0.714	-0.56	0.575
ES/S5	-2.4220	40.421	3.872	-0.035	0.714	-0.63	0.533
ES/S6	-0.6734	33.304	3.190	-0.035	0.715	-0.21	0.833
Re/S1	24.5979	265.011	25.383	-0.023	0.814	0.97	0.335
Re/S2	23.6401	265.684	25.448	-0.023	0.816	0.93	0.355
Re/S3	23.3803	265.805	25.460	-0.023	0.813	0.92	0.360
Re/S4	23.4228	265.781	25.457	-0.023	0.813	0.92	0.360
Re/S5	23.0940	266.054	25.483	-0.023	0.814	0.91	0.367
Re/S6	24.8425	264.890	25.372	-0.023	0.816	0.98	0.330

MAPE/FORECAST

RW/PC	-0.5442	1.551	0.149	0.988	0.000	3.66	0.000
RW/MA	-0.2958	5.722	0.548	0.064	0.506	-0.54	0.590
RW/ES	-0.2502	2.894	0.277	0.201	0.036	-0.90	0.369
RW/Re	0.2036	2.525	0.242	0.390	0.000	0.84	0.402
AC/PC	46.2245	488.457	46.786	0.032	0.738	0.99	0.325
AC/MA	46.4729	488.605	46.800	-0.000	0.996	0.99	0.323
AC/ES	46.5185	488.571	46.797	0.003	0.972	0.99	0.322
AC/Re	46.9723	488.528	46.793	0.030	0.756	1.00	0.318
PC/MA	0.2484	6.187	0.593	0.144	0.136	0.42	0.676
PC/ES	0.2940	4.026	0.386	0.277	0.004	0.76	0.447
PC/Re	0.7478	3.814	0.365	0.389	0.000	2.05	0.043
PC/S1	-1.4408	9.966	0.955	0.046	0.632	-1.51	0.134
PC/S2	-1.2999	9.721	0.931	0.043	0.658	-1.40	0.166
PC/S3	-1.1538	9.147	0.876	0.047	0.630	-1.32	0.191
PC/S4	-1.1729	9.211	0.882	0.046	0.634	-1.33	0.186
PC/S5	-1.1722	9.355	0.896	0.044	0.652	-1.31	0.194
PC/S6	-1.6010	10.603	1.016	0.043	0.655	-1.58	0.118
MA/ES	0.0456	3.654	0.350	0.927	0.000	0.13	0.896
MA/Re	0.4994	5.331	0.511	0.091	0.349	0.98	0.330
MA/S1	-1.6892	10.438	1.000	0.043	0.656	-1.69	0.094
MA/S2	-1.5483	10.190	0.976	0.044	0.652	-1.59	0.116
MA/S3	-1.4021	9.657	0.925	0.045	0.646	-1.52	0.132
MA/S4	-1.4213	9.715	0.930	0.045	0.645	-1.53	0.130
MA/S5	-1.4206	9.843	0.943	0.044	0.646	-1.51	0.135
MA/S6	-1.8494	11.036	1.057	0.043	0.660	-1.75	0.083

ES/Re	0.4538	2.165	0.207	0.176	0.066	2.19	0.031
ES/S1	-1.7348	9.333	0.894	0.054	0.577	-1.94	0.055
ES/S2	-1.5939	9.055	0.867	0.054	0.580	-1.84	0.069
ES/S3	-1.4478	8.441	0.809	0.055	0.567	-1.79	0.076
ES/S4	-1.4669	8.509	0.815	0.055	0.567	-1.80	0.075
ES/S5	-1.4662	8.658	0.829	0.054	0.574	-1.77	0.080
ES/S6	-1.8950	10.007	0.958	0.052	0.588	-1.98	0.051
Re/S1	-2.1886	8.961	0.858	0.271	0.004	-2.55	0.012
Re/S2	-2.0477	8.702	0.834	0.257	0.007	-2.46	0.016
Re/S3	-1.9015	8.066	0.773	0.272	0.004	-2.46	0.015
Re/S4	-1.9207	8.137	0.779	0.270	0.005	-2.46	0.015
Re/S5	-1.9200	8.301	0.795	0.260	0.006	-2.41	0.017
Re/S6	-2.3488	9.653	0.925	0.259	0.007	-2.54	0.012

MSE/FORECAST

RW/PC	-11.2698	72.439	6.938	0.998	0.000	-1.62	0.107
RW/MA	-20.7241	281.792	26.991	-0.012	0.904	-0.77	0.444
RW/ES	3.4213	56.441	5.406	0.021	0.825	0.63	0.528
RW/Re	4.9203	51.848	4.966	0.115	0.232	0.99	0.324
AC/PC	238776.58	2492999.8	238786.1	0.009	0.925	1.00	0.320
AC/MA	238767.13	2493001.3	238786.2	-0.010	0.922	1.00	0.320
AC/ES	238794.27	2492998.9	238786.0	-0.011	0.911	1.00	0.320
AC/Re	238792.77	2492998.8	238786.0	-0.008	0.937	1.00	0.320
PC/MA	-9.4543	302.906	29.013	-0.003	0.978	-0.33	0.745
PC/ES	14.6911	124.638	11.938	0.031	0.748	1.23	0.221
PC/Re	16.1901	121.900	11.676	0.115	0.235	1.39	0.168
PC/S1	-74.5037	555.564	53.213	-0.010	0.918	-1.40	0.164
PC/S2	-68.5360	541.060	51.824	-0.011	0.909	-1.32	0.189
PC/S3	-57.0362	457.727	43.842	-0.010	0.919	-1.30	0.196
PC/S4	-58.2804	466.043	44.639	-0.010	0.917	-1.31	0.194
PC/S5	-60.8196	495.361	47.447	-0.011	0.912	-1.28	0.203
PC/S6	-88.4633	657.093	62.938	-0.011	0.910	-1.41	0.163
MA/ES	24.1453	250.241	23.969	0.992	0.000	1.01	0.316
MA/Re	25.6444	277.503	26.580	-0.007	0.941	0.96	0.337
MA/S1	-65.0495	610.126	58.440	-0.011	0.907	-1.11	0.268
MA/S2	-59.0818	596.670	57.151	-0.011	0.910	-1.03	0.304
MA/S3	-47.5820	522.195	50.017	-0.011	0.908	-0.95	0.344
MA/S4	-48.8262	529.497	50.717	-0.011	0.909	-0.96	0.338
MA/S5	-51.3653	555.428	53.200	-0.011	0.911	-0.97	0.336
MA/S6	-79.0091	703.935	67.425	-0.011	0.909	-1.17	0.244
ES/Re	1.4990	32.957	3.517	0.006	0.947	0.47	0.636
ES/S1	-89.1948	541.682	51.884	-0.014	0.885	-1.72	0.088
ES/S2	-83.2271	526.674	50.446	-0.014	0.887	-1.65	0.102
ES/S3	-71.7273	440.979	42.238	-0.014	0.887	-1.70	0.092
ES/S4	-72.9715	449.561	43.060	-0.014	0.887	-1.69	0.093
ES/S5	-75.1124	478.421	45.048	-0.014	0.888	-1.64	0.103
ES/S6	-103.1544	645.142	61.793	-0.014	0.886	-1.67	0.098
Re/S1	-90.6938	538.784	51.606	0.113	0.240	-1.76	0.082
Re/S2	-84.7261	524.097	50.199	0.097	0.315	-1.69	0.094
Re/S3	-73.2263	437.989	41.952	0.115	0.234	-1.75	0.084
Re/S4	-74.4705	446.628	42.779	0.112	0.245	-1.74	0.085
Re/S5	-77.0097	477.074	45.695	0.100	0.300	-1.69	0.095
Re/S6	-104.6534	642.590	61.549	0.098	0.308	-1.70	0.092

1983

MAPE/ACTUAL

RW/AC	-0.4464	2.133	0.204	0.551	0.000	-2.19	0.031
RW/MA	0.0468	0.375	0.036	0.950	0.000	1.30	0.195
RW/ES	0.0085	0.040	0.004	1.000	0.000	2.21	0.029
RW/Re	0.1464	0.542	0.052	0.830	0.000	2.82	0.006
AC/PC	0.5294	2.291	0.219	0.459	0.000	2.41	0.018
AC/MA	0.4932	2.223	0.213	0.524	0.000	2.32	0.022
AC/ES	0.4548	2.140	0.205	0.549	0.000	2.22	0.029
AC/Re	0.5927	2.276	0.218	0.450	0.000	2.72	0.008
AC/S1	-0.9568	8.926	0.855	0.003	0.975	-1.12	0.266
AC/S2	-1.0328	9.286	0.889	0.003	0.974	-1.16	0.248
AC/S3	-1.0881	9.563	0.916	0.003	0.977	-1.19	0.238
AC/S4	-1.0825	9.534	0.913	0.003	0.976	-1.19	0.238
AC/S5	-0.9863	9.067	0.868	0.003	0.975	-1.14	0.259
AC/S6	-0.7654	7.942	0.761	0.003	0.975	-1.01	0.317
PC/MA	-0.0362	0.369	0.035	0.845	0.000	-1.02	0.308
PC/ES	-0.0746	0.520	0.050	0.852	0.000	-1.50	0.137
PC/Re	0.0633	0.478	0.046	0.749	0.000	1.38	0.169
MA/ES	-0.0383	0.342	0.033	0.955	0.000	-1.17	0.244
MA/Re	0.0996	0.475	0.046	0.770	0.000	-2.19	0.031
MA/S1	-1.4499	8.594	0.823	0.013	0.897	-1.76	0.081
MA/S2	-1.5260	8.967	0.859	0.013	0.891	-1.78	0.078
MA/S3	-1.5812	9.253	0.886	0.013	0.893	-1.78	0.077
MA/S4	-1.5757	9.223	0.883	0.013	0.892	-1.78	0.077
MA/S5	-1.4795	8.740	0.837	0.013	0.895	-1.77	0.080
MA/S6	-1.2586	7.568	0.725	0.011	0.911	-1.74	0.085
ES/Re	0.1379	0.524	0.050	0.829	0.000	2.75	0.007
ES/S1	-1.4116	8.617	0.825	0.008	0.930	-1.71	0.090
ES/S2	-1.4876	8.989	0.861	0.009	0.925	-1.73	0.087
ES/S3	-1.5429	9.275	0.888	0.009	0.926	-1.74	0.085
ES/S4	-1.5373	9.245	0.885	0.009	0.926	-1.74	0.085
ES/S5	-1.4411	8.763	0.839	0.009	0.929	-1.72	0.089
ES/S6	-1.2202	7.595	0.727	0.007	0.942	-1.68	0.096
Re/S1	-1.5495	8.607	0.824	-0.004	0.971	-1.88	0.063
Re/S2	-1.6255	8.980	0.860	-0.003	0.973	-1.89	0.061
Re/S3	-1.6808	9.267	0.888	-0.004	0.965	-1.89	0.061
Re/S4	-1.6752	9.236	0.885	-0.004	0.966	-1.89	0.061
Re/S5	-1.5790	8.753	0.838	-0.003	0.973	-1.88	0.062
Re/S6	-1.3582	7.579	0.726	-0.002	0.982	-1.87	0.064

MSE/ACTUAL

RW/AC	-6.0338	47.225	4.523	0.182	0.059	-1.33	0.185
RW/MA	0.4978	2.605	0.250	0.939	0.000	1.99	0.049
RW/ES	0.0655	0.315	0.030	1.000	0.000	2.17	0.032
RW/Re	0.5634	3.124	0.361	0.879	0.000	1.80	0.085
AC/PC	6.6703	47.640	4.563	0.149	0.123	1.46	0.147
AC/MA	6.5316	47.520	4.552	0.168	0.080	1.44	0.154
AC/ES	6.0994	47.254	4.526	0.181	0.059	1.35	0.181
AC/Re	6.5973	47.442	4.544	0.164	0.089	1.45	0.149
AC/S1	-69.5346	759.066	72.705	-0.014	0.888	-0.96	0.341
AC/S2	-76.3496	825.683	79.086	-0.014	0.888	-0.97	0.337
AC/S3	-81.7539	879.673	84.257	-0.014	0.888	-0.97	0.334
AC/S4	-81.1755	873.907	83.705	-0.014	0.888	-0.97	0.334
AC/S5	-72.1662	784.698	75.160	-0.014	0.888	-0.96	0.339

AC/S6	-52.3485	589.170	56.432	-0.014	0.888	-0.93	0.356
PC/MA	-0.1387	1.124	0.108	0.878	0.000	-1.29	0.201
PC/ES	-0.5709	2.997	0.287	0.888	0.000	-1.99	0.049
PC/Re	-0.0729	1.914	0.183	0.838	0.000	-0.40	0.691
MA/ES	-0.4322	2.291	0.219	0.945	0.000	-1.97	0.051
MA/Re	0.0657	1.817	0.174	0.795	0.000	0.38	0.706
MA/S1	-76.0662	756.960	72.504	-0.024	0.800	-1.05	0.296
MA/S2	-82.8812	823.698	78.896	-0.024	0.801	-1.05	0.296
MA/S3	-88.2855	877.773	84.075	-0.025	0.800	-1.05	0.296
MA/S4	-87.7071	871.999	83.522	-0.025	0.800	-1.05	0.296
MA/S5	-78.6978	782.642	74.963	-0.024	0.801	-1.05	0.296
MA/S6	-58.8801	586.631	56.189	-0.024	0.801	-1.05	0.297
ES/Re	0.4980	2.055	0.197	0.895	0.000	2.53	0.013
ES/S1	-75.6339	757.012	72.509	-0.023	0.815	-1.04	0.299
ES/S2	-82.4490	823.749	78.901	-0.023	0.815	-1.04	0.298
ES/S3	-87.8533	877.823	84.080	-0.023	0.815	-1.04	0.298
ES/S4	-87.2749	872.049	83.527	-0.023	0.815	-1.04	0.298
ES/S5	-78.2655	782.693	74.968	-0.023	0.815	-1.04	0.299
ES/S6	-58.4478	586.684	56.194	-0.023	0.816	-1.04	0.301
Re/S1	-76.1319	756.970	72.505	-0.020	0.835	-1.05	0.296
Re/S2	-82.9469	823.707	78.897	-0.020	0.836	-1.05	0.295
Re/S3	-88.3512	877.782	84.076	-0.020	0.835	-1.05	0.296
Re/S4	-87.7729	872.008	83.523	-0.020	0.835	-1.05	0.296
Re/S5	-78.7635	782.651	74.964	-0.020	0.836	-1.05	0.296
Re/S6	-58.9458	586.640	56.190	-0.020	0.837	-1.05	0.296

MAPE/FORECAST

RW/AC	-2.0398	14.075	1.348	0.143	0.139	-1.51	0.133
RW/MA	-3.5610	32.865	3.148	0.018	0.850	-1.13	0.260
RW/ES	-0.0603	0.967	0.093	0.950	0.000	-0.65	0.517
RW/Re	0.4039	2.091	0.200	0.357	0.000	-2.02	0.046
AC/PC	1.7732	14.114	1.352	0.140	0.147	1.31	0.192
AC/MA	-1.5212	35.870	3.436	-0.007	0.941	-0.44	0.659
AC/ES	1.9795	14.179	1.358	0.112	0.247	1.46	0.148
AC/Re	2.4437	14.157	1.356	0.096	0.322	1.80	0.074
AC/S1	1.1997	15.266	1.462	-0.041	0.675	0.82	0.414
AC/S2	1.2657	15.202	1.456	-0.039	0.685	0.87	0.387
AC/S3	1.3191	15.131	1.449	-0.039	0.691	0.91	0.365
AC/S4	1.3157	15.136	1.450	-0.039	0.691	0.91	0.366
AC/S5	1.2202	15.243	1.460	-0.040	0.679	0.84	0.405
AC/S6	0.9503	15.551	1.489	-0.044	0.652	0.64	0.525
PC/MA	-3.2944	32.930	3.154	0.012	0.900	-1.04	0.299
PC/ES	0.2064	0.991	0.095	0.944	0.000	2.17	0.032
PC/Re	0.6706	2.769	0.265	0.383	0.000	2.53	0.013
MA/ES	3.5007	32.907	3.152	0.015	0.878	1.11	0.269
MA/Re	3.9649	32.809	3.143	0.036	0.711	1.26	0.210
MA/S1	2.7209	33.264	3.186	-0.011	0.911	0.85	0.395
MA/S2	2.7869	33.242	3.184	-0.012	0.905	0.88	0.383
MA/S3	2.8403	33.215	3.181	-0.012	0.900	0.89	0.374
MA/S4	2.8369	33.216	3.182	-0.012	0.901	0.89	0.375
MA/S5	2.7414	33.258	3.186	-0.012	0.905	0.86	0.391
MA/S6	2.4715	33.375	3.197	-0.009	0.922	0.77	0.441
ES/Re	0.4642	2.711	0.260	0.257	0.007	1.79	0.077
ES/S1	-0.7798	5.810	0.557	-0.032	0.744	-1.40	0.164
ES/S2	-0.7138	5.665	0.543	-0.030	0.760	-1.32	0.191
ES/S3	-0.6604	5.497	0.527	-0.029	0.765	-1.25	0.212
ES/S4	-0.6638	5.510	0.528	-0.029	0.765	-1.26	0.211
ES/S5	-0.7593	5.760	0.552	-0.031	0.749	-1.38	0.172

ES/S6	-1.0292	6.443	0.617	-0.036	0.706	-1.67	0.098
Re/S1	-1.2440	5.009	0.480	0.102	0.293	-2.59	0.011
Re/S2	-1.1780	4.849	0.464	0.105	0.279	-2.54	0.013
Re/S3	-1.1246	4.661	0.446	0.105	0.279	-2.52	0.013
Re/S4	-1.1280	4.675	0.448	0.105	0.278	-2.52	0.013
Re/S5	-1.2235	4.954	0.475	0.102	0.290	-2.58	0.011
Re/S6	-1.4934	5.699	0.546	0.096	0.319	-2.74	0.007

MSE/FORECAST

RW/AC	-203.4613	1828.350	175.124	0.001	0.991	-1.16	0.248
RW/MA	-1082.517	11145.54	1067.549	-0.016	0.873	-1.01	0.313
RW/ES	-2.9057	39.584	3.791	0.889	0.000	0.77	0.445
RW/Re	4.5220	33.891	3.246	0.095	0.325	1.39	0.166
AC/PC	198.9164	1829.040	175.190	0.000	0.999	1.14	0.259
AC/MA	-879.0559	11314.06	1083.690	-0.011	0.908	-0.81	0.419
AC/ES	200.5555	1829.608	175.245	-0.005	0.960	1.14	0.255
AC/Re	207.9833	1828.086	175.099	0.001	0.996	1.19	0.238
AC/S1	181.1895	1841.972	176.429	-0.016	0.868	1.03	0.307
AC/S2	182.9891	1840.645	176.302	-0.016	0.869	1.04	0.302
AC/S3	184.9795	1838.879	176.133	-0.016	0.868	1.05	0.296
AC/S4	184.8364	1839.012	176.145	-0.016	0.869	1.05	0.296
AC/S5	181.8068	1841.430	176.377	-0.016	0.868	1.03	0.305
AC/S6	172.8245	1850.060	177.204	-0.016	0.867	0.98	0.332
PC/MA	-1077.9723	11146.07	1067.60	-0.016	0.869	-1.01	0.315
PC/ES	1.6391	30.042	2.878	0.892	0.000	0.57	0.570
PC/Re	9.0669	59.308	5.681	0.100	0.300	1.60	0.113
MA/ES	1079.611	11145.96	1067.590	-0.012	0.901	1.01	0.314
MA/Re	1087.039	11145.04	1067.501	-0.011	0.913	1.02	0.311
MA/S1	1060.245	11149.33	1067.912	-0.013	0.892	0.99	0.323
MA/S2	1062.045	11148.99	1067.879	-0.013	0.893	0.99	0.322
MA/S3	1064.035	11148.55	1067.838	-0.013	0.892	1.00	0.321
MA/S4	1063.892	11148.58	1067.841	-0.013	0.892	1.00	0.321
MA/S5	1060.863	11149.20	1067.900	-0.013	0.892	0.99	0.323
MA/S6	1051.880	11151.25	1068.096	-0.013	0.893	0.98	0.327
ES/Re	7.4278	66.682	6.387	0.031	0.752	1.16	0.247
ES/S1	-19.3660	210.208	20.134	-0.017	0.859	-0.96	0.338
ES/S2	-17.5664	200.076	19.164	-0.017	0.861	-0.92	0.361
ES/S3	-15.5760	185.317	17.750	-0.017	0.860	-0.88	0.382
ES/S4	-15.7191	186.483	17.862	-0.017	0.860	-0.88	0.381
ES/S5	-18.7487	206.019	19.733	-0.017	0.859	-0.95	0.344
ES/S6	-27.7310	265.797	25.459	-0.017	0.858	-1.09	0.278
Re/S1	-26.7938	198.171	18.981	0.032	0.741	-1.41	0.161
Re/S2	-24.9941	187.480	17.957	0.032	0.738	-1.39	0.167
Re/S3	-23.0037	171.760	16.452	0.032	0.739	-1.40	0.165
Re/S4	-23.1469	173.008	16.571	0.032	0.739	-1.40	0.165
Re/S5	-26.1764	193.753	18.558	0.032	0.741	-1.41	0.161
Re/S6	-35.1587	256.063	24.526	0.032	0.744	-1.43	0.155

Appendix 31.

T-TESTS OF THE TRUNCATED ERRORS FOR OPTIMAL PREDICTION MODELS OF PROFITS (109 COS.)

(FOR MODELS THAT DIFFER FROM THE OPTIMAL SINGLE MODEL ONLY.)

	(DIFFERENCE) MEAN	STANDARD DEVIATION	STANDARD ERROR	CORR.	2-TAIL PROB.	T VALUE	2-TAIL PROB.
1981							
MAPE/ACTUAL							
ES/RW	0.0062	0.100	0.010	0.965	0.000	0.64	0.522
ES/AC	0.0029	0.139	0.013	0.935	0.000	0.21	0.831
ES/PC	-0.0522	0.252	0.024	0.784	0.000	-2.16	0.033
ES/MA	-0.0336	0.211	0.020	0.844	0.000	-1.66	0.099
ES/Re	-0.1152	0.308	0.029	0.613	0.000	-3.90	0.000
ES/S1	-0.2925	0.465	0.045	0.165	0.087	-6.56	0.000
ES/S2	-0.2913	0.469	0.045	0.165	0.086	-6.48	0.000
ES/S3	-0.2957	0.470	0.045	0.159	0.098	-6.56	0.000
ES/S4	-0.2956	0.470	0.045	0.160	0.097	-6.56	0.000
ES/S5	-0.3047	0.468	0.045	0.160	0.096	-6.80	0.000
ES/S6	-0.2909	0.469	0.045	0.165	0.086	-6.47	0.000
Re/RW	0.1213	0.315	0.030	0.600	0.000	4.02	0.000
Re/AC	0.1180	0.350	0.034	0.528	0.000	3.52	0.001
Re/PC	0.0630	0.356	0.034	0.507	0.000	1.85	0.067
Re/MA	0.0816	0.336	0.032	0.542	0.000	2.54	0.013
Re/S1	-0.1773	0.430	0.041	0.146	0.131	-4.31	0.000
Re/S2	-0.1761	0.434	0.042	0.147	0.128	-4.24	0.000
Re/S3	-0.1805	0.434	0.042	0.145	0.132	-4.35	0.000
Re/S4	-0.1804	0.434	0.042	0.146	0.130	-4.34	0.000
Re/S5	-0.1895	0.433	0.041	0.140	0.147	-4.57	0.000
Re/S6	-0.1757	0.435	0.042	0.144	0.135	-4.22	0.000
MSE/ACTUAL							
ES/RW	0.0025	0.113	0.011	0.964	0.000	0.23	0.821
ES/AC	-0.0108	0.143	0.014	0.943	0.000	-0.79	0.429
ES/PC	-0.0609	0.265	0.025	0.807	0.000	-2.40	0.018
ES/MA	-0.0334	0.240	0.023	0.838	0.000	-1.45	0.150
ES/Re	-0.0733	0.306	0.029	0.712	0.000	-2.50	0.014
ES/S1	-0.3236	0.532	0.051	0.178	0.065	-6.35	0.000
ES/S2	-0.3263	0.533	0.051	0.178	0.064	-6.39	0.000
ES/S3	-0.3324	0.534	0.051	0.174	0.071	-6.50	0.000
ES/S4	-0.3322	0.534	0.051	0.174	0.070	-6.49	0.000
ES/S5	-0.3436	0.537	0.051	0.173	0.071	-6.68	0.000
ES/S6	-0.3259	0.533	0.051	0.178	0.064	-6.38	0.000
Re/RW	0.0758	0.314	0.030	0.700	0.000	2.52	0.013
Re/AC	0.0625	0.344	0.033	0.646	0.000	1.90	0.061
Re/PC	0.0124	0.355	0.034	0.628	0.000	0.37	0.715

Re/MA	0.0400	0.338	0.032	0.658	0.000	1.24	0.219
Re/S1	-0.2503	0.523	0.050	0.141	0.144	-4.99	0.000
Re/S2	-0.2530	0.523	0.050	0.145	0.133	-5.05	0.000
Re/S3	-0.2591	0.523	0.050	0.144	0.136	-5.17	0.000
Re/S4	-0.2589	0.523	0.050	0.144	0.134	-5.17	0.000
Re/S5	-0.2702	0.525	0.050	0.148	0.124	-5.38	0.000
Re/S6	-0.2526	0.524	0.050	0.142	0.140	-5.03	0.000
MAPE/FORECAST							
ES/RW	0.0028	0.085	0.008	0.971	0.000	0.34	0.733
ES/AC	0.0164	0.138	0.013	0.927	0.000	1.24	0.219
ES/PC	-0.0287	0.199	0.019	0.847	0.000	-1.50	0.136
ES/MA	-0.0168	0.198	0.019	0.832	0.000	-0.89	0.378
ES/Re	-0.2289	0.392	0.038	0.324	0.001	-6.09	0.000
ES/S1	-0.1606	0.499	0.048	0.108	0.262	-3.36	0.001
ES/S2	-0.1532	0.498	0.048	0.118	0.221	-3.22	0.002
ES/S3	-0.1514	0.496	0.048	0.120	0.215	-3.19	0.002
ES/S4	-0.1515	0.496	0.048	0.120	0.214	-3.19	0.002
ES/S5	-0.1505	0.491	0.047	0.126	0.192	-3.20	0.002
ES/S6	-0.1533	0.498	0.048	0.117	0.227	-3.21	0.002
Re/RW	0.2317	0.388	0.037	0.351	0.000	6.24	0.000
Re/AC	0.2453	0.433	0.041	0.227	0.018	5.91	0.000
Re/PC	0.2002	0.434	0.042	0.225	0.018	4.81	0.000
Re/MA	0.2121	0.420	0.040	0.193	0.045	5.28	0.000
Re/S1	0.0683	0.515	0.049	-0.001	0.995	1.39	0.168
Re/S2	0.0757	0.516	0.049	-0.001	0.988	1.53	0.129
Re/S3	0.0775	0.515	0.049	-0.002	0.983	1.57	0.119
Re/S4	0.0774	0.515	0.049	-0.002	0.985	1.57	0.120
Re/S5	0.0784	0.514	0.049	-0.010	0.917	1.59	0.114
Re/S6	0.0756	0.517	0.049	-0.003	0.976	1.53	0.129
MSE/FORECAST							
ES/RW	-0.0011	0.085	0.008	0.975	0.000	-0.14	0.889
ES/AC	-0.0005	0.136	0.013	0.937	0.000	-0.04	0.969
ES/PC	-0.0412	0.192	0.018	0.880	0.000	-2.25	0.027
ES/MA	-0.0055	0.226	0.022	0.816	0.000	-0.25	0.799
ES/Re	-0.2368	0.434	0.042	0.375	0.000	-5.70	0.000
ES/S1	-0.2019	0.537	0.051	0.120	0.213	-3.93	0.000
ES/S2	-0.1945	0.532	0.051	0.133	0.169	-3.82	0.000
ES/S3	-0.1913	0.531	0.051	0.136	0.159	-3.76	0.000
ES/S4	-0.1914	0.531	0.051	0.136	0.159	-3.77	0.000
ES/S5	-0.1868	0.526	0.050	0.150	0.119	-3.71	0.000
ES/S6	-0.1948	0.532	0.051	0.132	0.173	-3.82	0.000
Re/RW	0.2357	0.424	0.041	0.407	0.000	5.80	0.000
Re/AC	0.2363	0.457	0.044	0.318	0.001	5.40	0.000
Re/PC	0.1956	0.459	0.044	0.334	0.000	4.45	0.000
Re/MA	0.2313	0.471	0.045	0.234	0.014	5.12	0.000
Re/S1	0.0349	0.570	0.055	0.043	0.654	0.64	0.525
Re/S2	0.0423	0.568	0.054	0.048	0.622	0.78	0.438
Re/S3	0.0455	0.567	0.054	0.047	0.625	0.84	0.404
Re/S4	0.0454	0.567	0.054	0.047	0.624	0.84	0.406
Re/S5	0.0500	0.566	0.054	0.051	0.598	0.92	0.358
Re/S6	0.0420	0.568	0.054	0.046	0.635	0.77	0.442

1982

MAPE/ACTUAL

PC/RW	0.1019	0.234	0.022	0.772	0.000	4.54	0.000
PC/AC	0.0767	0.263	0.025	0.719	0.000	3.05	0.003
PC/MA	0.0768	0.279	0.027	0.690	0.000	2.87	0.005
PC/ES	0.0959	0.288	0.028	0.658	0.000	3.47	0.001
PC/Re	-0.1636	0.361	0.035	0.478	0.000	-4.74	0.000
PC/S1	-0.1918	0.450	0.043	0.202	0.035	-4.45	0.000
PC/S2	-0.1951	0.454	0.044	0.187	0.052	-4.48	0.000
PC/S3	-0.1996	0.456	0.044	0.178	0.064	-4.57	0.000
PC/S4	-0.1989	0.456	0.044	0.179	0.062	-4.56	0.000
PC/S5	-0.2002	0.456	0.044	0.172	0.073	-4.58	0.000
PC/S6	-0.1924	0.446	0.043	0.207	0.031	-4.51	0.000
Re/RW	0.2658	0.289	0.028	0.642	0.000	9.59	0.000
Re/AC	0.2406	0.297	0.028	0.633	0.000	8.47	0.000
Re/MA	0.2407	0.336	0.032	0.542	0.000	7.49	0.000
Re/ES	0.2629	0.313	0.030	0.584	0.000	8.78	0.000
Re/S1	-0.0278	0.429	0.041	0.259	0.007	-0.68	0.499
Re/S2	-0.0312	0.429	0.041	0.258	0.007	-0.76	0.449
Re/S3	-0.0357	0.431	0.041	0.247	0.009	-0.86	0.390
Re/S4	-0.0350	0.431	0.041	0.249	0.009	-0.85	0.398
Re/S5	-0.0363	0.430	0.041	0.246	0.010	-0.88	0.381
Re/S6	-0.0285	0.426	0.041	0.259	0.006	-0.70	0.486

MSE/ACTUAL

PC/RW	0.0938	0.267	0.026	0.739	0.000	3.66	0.000
PC/AC	0.0702	0.290	0.028	0.696	0.000	2.53	0.013
PC/MA	0.0640	0.306	0.029	0.675	0.000	2.18	0.031
PC/ES	0.0869	0.309	0.030	0.659	0.000	2.94	0.004
PC/Re	-0.1651	0.408	0.039	0.481	0.000	4.23	0.000
PC/S1	-0.2088	0.506	0.048	0.189	0.049	-4.31	0.000
PC/S2	-0.2126	0.514	0.049	0.169	0.078	-4.32	0.000
PC/S3	-0.2178	0.520	0.050	0.155	0.108	-4.37	0.000
PC/S4	-0.2170	0.519	0.050	0.157	0.103	-4.36	0.000
PC/S5	-0.2169	0.521	0.050	0.151	0.116	-4.35	0.000
PC/S6	-0.2061	0.502	0.048	0.200	0.038	-4.29	0.000
Re/RW	0.2286	0.387	0.037	0.519	0.000	6.16	0.000
Re/AC	0.2374	0.330	0.032	0.641	0.000	7.50	0.000
Re/MA	0.2312	0.367	0.035	0.573	0.000	6.58	0.000
Re/ES	0.2577	0.355	0.034	0.585	0.000	7.57	0.000
Re/S1	-0.0416	0.531	0.051	0.171	0.076	-0.82	0.414
Re/S2	-0.0454	0.533	0.051	0.170	0.078	-0.89	0.375
Re/S3	-0.0506	0.534	0.051	0.171	0.076	-0.99	0.325
Re/S4	-0.0499	0.534	0.051	0.171	0.075	-0.98	0.332
Re/S5	-0.0497	0.535	0.051	0.167	0.082	-0.97	0.334
Re/S6	-0.0389	0.532	0.051	0.165	0.087	-0.76	0.447

MAPE/FORECAST

PC/RW	0.1011	0.231	0.022	0.809	0.000	4.58	0.000
PC/AC	0.0956	0.255	0.024	0.770	0.000	3.92	0.000
PC/MA	0.0839	0.305	0.029	0.670	0.000	2.88	0.005
PC/ES	0.1020	0.310	0.030	0.644	0.000	3.44	0.001
PC/Re	-0.0375	0.301	0.029	0.625	0.000	-1.30	0.196
PC/S1	-0.0750	0.491	0.047	0.237	0.013	-1.59	0.114

PC/S2	-0.0663	0.488	0.047	0.234	0.014	-1.42	0.159
PC/S3	-0.0628	0.483	0.046	0.236	0.014	-1.36	0.178
PC/S4	-0.0633	0.484	0.046	0.235	0.014	-1.36	0.175
PC/S5	-0.0625	0.484	0.046	0.229	0.016	-1.35	0.181
PC/S6	-0.0826	0.494	0.047	0.229	0.017	-1.75	0.083
Re/RW	0.1142	0.278	0.027	0.662	0.000	4.28	0.000
Re/AC	0.1087	0.302	0.029	0.612	0.000	3.76	0.000
Re/MA	0.0970	0.325	0.031	0.547	0.000	3.11	0.002
Re/ES	0.1132	0.289	0.028	0.630	0.000	4.10	0.000
Re/S1	-0.0619	0.457	0.044	0.223	0.020	-1.41	0.160
Re/S2	-0.0532	0.451	0.043	0.226	0.018	-1.23	0.221
Re/S3	-0.0497	0.447	0.043	0.225	0.019	-1.16	0.248
Re/S4	-0.0502	0.448	0.043	0.226	0.018	-1.17	0.244
Re/S5	-0.0494	0.446	0.043	0.223	0.020	-1.16	0.250
Re/S6	-0.0696	0.458	0.044	0.220	0.021	-1.59	0.116

MSE/FORECAST

PC/RW	0.1051	0.259	0.025	0.797	0.000	4.23	0.000
PC/AC	0.0955	0.279	0.027	0.768	0.000	3.57	0.001
PC/MA	0.0870	0.338	0.032	0.661	0.000	2.69	0.008
PC/ES	0.1138	0.339	0.033	0.642	0.000	3.50	0.001
PC/Re	0.0039	0.333	0.032	0.629	0.000	0.12	0.903
PC/S1	-0.0963	0.545	0.052	0.196	0.041	-1.85	0.068
PC/S2	-0.0810	0.542	0.052	0.191	0.047	-1.56	0.122
PC/S3	-0.0730	0.538	0.052	0.194	0.043	-1.42	0.159
PC/S4	-0.0742	0.539	0.052	0.193	0.045	-1.44	0.154
PC/S5	-0.0713	0.539	0.052	0.190	0.048	-1.38	0.171
PC/S6	-0.1049	0.549	0.053	0.193	0.044	-1.99	0.049
Re/RW	0.0683	0.293	0.028	0.682	0.000	2.43	0.017
Re/AC	0.0586	0.340	0.033	0.592	0.000	1.80	0.075
Re/MA	0.0501	0.352	0.034	0.567	0.000	1.49	0.139
Re/ES	0.0703	0.307	0.029	0.650	0.000	2.39	0.018
Re/S1	-0.1332	0.498	0.048	0.227	0.017	-2.79	0.006
Re/S2	-0.1179	0.493	0.047	0.228	0.017	-2.50	0.014
Re/S3	-0.1099	0.488	0.047	0.233	0.015	-2.35	0.020
Re/S4	-0.1110	0.488	0.047	0.233	0.015	-2.37	0.019
Re/S5	-0.1081	0.488	0.047	0.232	0.015	-2.31	0.023
Re/S6	-0.1417	0.502	0.048	0.224	0.019	-2.95	0.004

<u>1983</u>

MAPE/ACTUAL

ES/RW	0.0200	0.129	0.012	0.913	0.000	1.61	0.109
ES/AC	0.0044	0.174	0.017	0.865	0.000	0.27	0.791
ES/PC	-0.0566	0.243	0.023	0.743	0.000	-2.43	0.017
ES/MA	-0.0144	0.110	0.011	0.938	0.000	-1.37	0.173
ES/Re	0.0459	0.213	0.020	0.744	0.000	2.25	0.027
ES/S1	-0.2877	0.399	0.038	0.276	0.004	-7.53	0.000
ES/S2	-0.2876	0.399	0.038	0.289	0.004	-7.53	0.000
ES/S3	-0.2908	0.397	0.038	0.299	0.003	-7.65	0.000
ES/S4	-0.2905	0.397	0.038	0.298	0.003	-7.64	0.000
ES/S5	-0.2881	0.399	0.038	0.283	0.005	-7.54	0.000
ES/S6	-0.2836	0.396	0.038	0.225	0.037	-7.48	0.000
Re/RW	-0.0470	0.213	0.020	0.746	0.000	-2.30	0.023
Re/AC	-0.0626	0.247	0.024	0.744	0.000	-2.65	0.000
Re/PC	-0.0934	0.235	0.022	0.723	0.000	-4.16	0.000

Re/MA	-0.0815	0.223	0.021	0.722	0.000	-3.82	0.000
Re/S1	-0.3547	0.383	0.037	0.280	0.003	-9.67	0.000
Re/S2	-0.3547	0.384	0.037	0.291	0.002	-9.64	0.000
Re/S3	-0.3578	0.382	0.037	0.303	0.001	-9.79	0.000
Re/S4	-0.3575	0.382	0.037	0.302	0.001	-9.78	0.000
Re/S5	-0.3551	0.383	0.037	0.287	0.002	-9.68	0.000
Re/S6	-0.3507	0.372	0.036	0.255	0.007	-9.85	0.000

MSE/ACTUAL

ES/RW	0.0089	0.148	0.014	0.906	0.000	0.63	0.530
ES/AC	-0.0239	0.179	0.017	0.879	0.000	-1.39	0.166
ES/PC	-0.0731	0.256	0.024	0.766	0.000	-2.98	0.004
ES/MA	-0.0179	0.138	0.013	0.919	0.000	-1.35	0.181
ES/Re	0.0558	0.224	0.021	0.758	0.000	-2.61	0.010
ES/S1	-0.3448	0.464	0.044	0.254	0.008	-7.75	0.000
ES/S2	-0.3486	0.462	0.044	0.273	0.004	-7.88	0.000
ES/S3	-0.3535	0.459	0.044	0.285	0.003	-8.05	0.000
ES/S4	-0.3529	0.459	0.044	0.284	0.003	-8.03	0.000
ES/S5	-0.3472	0.463	0.044	0.264	0.005	-7.83	0.000
ES/S6	-0.3228	0.470	0.045	0.200	0.037	-7.17	0.000
Re/RW	-0.0576	0.225	0.022	0.758	0.000	-2.67	0.009
Re/AC	-0.0903	0.269	0.026	0.699	0.000	-3.51	0.001
Re/PC	-0.1090	0.252	0.024	0.730	0.000	-4.52	0.000
Re/MA	-0.0843	0.231	0.022	0.749	0.000	-3.81	0.000
Re/S1	-0.4113	0.435	0.042	0.264	0.006	-9.86	0.000
Re/S2	-0.4151	0.436	0.042	0.276	0.004	-9.94	0.000
Re/S3	-0.4200	0.434	0.042	0.284	0.003	-10.09	0.000
Re/S4	-0.4194	0.435	0.042	0.282	0.003	-10.07	0.000
Re/S5	-0.4137	0.435	0.042	0.274	0.004	-9.93	0.000
Re/S6	-0.3893	0.431	0.041	0.237	0.013	-9.43	0.000

MAPE/FORECAST

ES/RW	0.0403	0.154	0.015	0.902	0.000	2.73	0.007
ES/AC	0.0406	0.234	0.022	0.794	0.000	1.81	0.074
ES/PC	-0.0300	0.265	0.025	0.733	0.000	-1.18	0.241
ES/MA	-0.0112	0.092	0.009	0.966	0.000	-1.26	0.209
ES/Re	0.0832	0.256	0.025	0.714	0.000	3.39	0.001
ES/S1	-0.0377	0.483	0.046	0.128	0.186	-0.82	0.417
ES/S2	-0.0313	0.481	0.046	0.139	0.148	-0.68	0.498
ES/S3	-0.0302	0.478	0.046	0.146	0.129	-0.66	0.511
ES/S4	-0.0303	0.478	0.046	0.146	0.130	-0.66	0.510
ES/S5	-0.0350	0.481	0.046	0.134	0.166	-0.76	0.450
ES/S6	-0.0642	0.493	0.047	0.083	0.389	-1.36	0.177
Re/RW	-0.0767	0.246	0.024	0.729	0.000	-3.25	0.002
Re/AC	-0.0764	0.299	0.029	0.642	0.000	-2.67	0.009
Re/PC	-0.1188	0.309	0.030	0.614	0.000	-4.02	0.000
Re/MA	-0.1282	0.287	0.027	0.644	0.000	-4.66	0.000
Re/S1	-0.1547	0.485	0.046	0.047	0.631	-3.33	0.001
Re/S2	-0.1483	0.483	0.046	0.060	0.532	-3.20	0.002
Re/S3	-0.1472	0.480	0.046	0.074	0.447	-3.20	0.002
Re/S4	-0.1473	0.480	0.046	0.073	0.452	-3.21	0.002
Re/S5	-0.1520	0.484	0.046	0.051	0.597	-3.27	0.001
Re/S6	-0.1812	0.498	0.048	-0.013	0.890	-3.80	0.000

MSE/FORECAST

ES/RW	0.0403	0.179	0.017	0.898	0.000	2.35	0.020
ES/AC	0.0189	0.258	0.025	0.800	0.000	0.76	0.446
ES/PC	-0.0475	0.283	0.027	0.758	0.000	-1.76	0.082
ES/MA	-0.0154	0.095	0.009	0.973	0.000	-1.70	0.093
ES/Re	0.0913	0.287	0.027	0.712	0.000	3.32	0.001
ES/S1	-0.0605	0.549	0.053	0.078	0.418	-1.15	0.252
ES/S2	-0.0551	0.547	0.052	0.089	0.359	-1.05	0.295
ES/S3	-0.0538	0.546	0.052	0.092	0.341	-1.03	0.306
ES/S4	-0.0538	0.546	0.052	0.092	0.342	-1.03	0.306
ES/S5	-0.0580	0.547	0.052	0.083	0.389	-1.11	0.271
ES/S6	-0.0870	0.561	0.054	0.050	0.609	-1.62	0.108
Re/RW	-0.0803	0.276	0.026	0.723	0.000	-3.04	0.003
Re/AC	-0.1017	0.326	0.031	0.647	0.000	-3.26	0.001
Re/PC	-0.1401	0.353	0.034	0.598	0.000	-4.15	0.000
Re/MA	-0.1360	0.329	0.031	0.633	0.000	-4.32	0.000
Re/S1	-0.1811	0.538	0.052	-0.013	0.897	-3.51	0.001
Re/S2	-0.1757	0.537	0.051	-0.002	0.982	-3.42	0.001
Re/S3	-0.1744	0.534	0.051	0.009	0.929	-3.41	0.001
Re/S4	-0.1744	0.535	0.051	0.008	0.936	-3.41	0.001
Re/S5	-0.1786	0.538	0.052	-0.009	0.922	-3.47	0.001
Re/S6	-0.2076	0.556	0.053	-0.063	0.518	-3.90	0.000

Appendix 32.

ERROR MEASURES FOR MULTIPLE FORM PROFIT FORECASTS (92 COMPANIES)

	NON-TRUNCATED					TRUNCATED (Max 1.0)		
	MEAN	STD. ERROR	STD. DEV.	RANGE	MINIMUM	MEAN	STD. ERROR	STD. DEV.
ABSOLUTE CHANGE;								
1980								
MAPE/ACTUAL								
1y	3.065	1.924	18.456	176.819	0.026	0.536	0.041	0.389
2y	2.454	1.440	13.810	132.551	0.002	0.534	0.040	0.386
3y	2.325	1.281	12.290	117.824	0.011	0.528	0.041	0.392
4y	2.241	1.202	11.528	110.425	0.000	0.513	0.042	0.403
5y	2.168	1.155	11.075	106.016	0.001	0.510	0.042	0.400
MSE/ACTUAL								
1y	346.336	339.893	3260.14	31274.2	0.001	0.437	0.046	0.441
2y	194.655	190.950	1831.53	17571.4	0.000	0.432	0.046	0.438
3y	154.814	150.895	1447.33	13885.2	0.000	0.431	0.046	0.445
4y	136.478	132.510	1270.99	12193.8	0.000	0.295	0.038	0.367
5y	126.021	122.142	1171.54	11239.6	0.000	0.293	0.038	0.367
MAPE/FORECAST								
1y	1.226	0.443	4.250	36.439	0.026	0.449	0.036	0.342
2y	0.902	0.186	1.781	10.592	0.002	0.443	0.035	0.333
3y	0.781	0.151	1.446	10.894	0.011	0.440	0.035	0.339
4y	0.700	0.119	1.143	7.451	0.000	0.422	0.036	0.344
5y	0.778	0.149	1.425	8.575	0.001	0.421	0.036	0.341
MSE/FORECAST								
1y	19.366	14.810	142.050	1329.642	0.001	0.317	0.039	0.375
2y	3.952	1.701	16.319	112.244	0.000	0.307	0.038	0.365
3y	2.679	1.360	13.047	118.934	0.000	0.308	0.039	0.370
4y	1.783	0.691	6.629	55.527	0.000	0.424	0.047	0.449
5y	2.615	1.042	9.997	73.544	0.000	0.418	0.047	0.449
1981								
MAPE/ACTUAL								
1y	3.841	1.548	14.846	104.662	0.007	0.549	0.040	0.387
2y	2.142	0.845	8.102	72.139	0.003	0.503	0.041	0.392
3y	1.991	0.744	7.133	63.969	0.001	0.485	0.042	0.404
4y	1.848	0.667	6.397	58.185	0.002	0.490	0.041	0.396
5y	1.736	0.612	5.870	53.062	0.007	0.475	0.041	0.393

MSE/ACTUAL

1y	232.773	151.00	1448.38	10955.59	0.000	0.449	0.046	0.440
2y	69.513	57.133	548.005	5204.480	0.000	0.405	0.046	0.440
3y	54.285	44.752	429.245	4092.112	0.000	0.397	0.046	0.445
4y	43.895	36.916	354.084	3385.728	0.000	0.356	0.042	0.407
5y	37.099	30.706	294.519	2816.304	0.000	0.333	0.041	0.391

MAPE/FORECAST

1y	1.350	0.344	3.299	27.467	0.007	0.554	0.039	0.378
2y	86.839	86.072	825.570	7919.345	0.003	0.471	0.038	0.361
3y	3.819	2.677	25.681	245.565	0.001	0.452	0.040	0.380
4y	1.019	0.281	2.691	20.111	0.003	0.463	0.039	0.379
5y	0.684	0.122	1.170	9.192	0.007	0.446	0.039	0.369

MSE/FORECAST

1y	12.585	8.387	80.449	754.821	0.000	0.448	0.044	0.422
2y	681698	681696	>1000000	>1000000	0.000	0.351	0.041	0.393
3y	666.95	655.36	6286.07	60302.687	0.000	0.347	0.043	0.408
4y	8.203	5.024	48.192	404.536	0.000	0.395	0.045	0.433
5y	1.821	0.956	9.174	84.623	0.000	0.378	0.045	0.431

1982

MAPE/ACTUAL

1y	1.179	0.397	3.810	32.307	0.001	0.432	0.038	0.367
2y	1.366	0.591	5.664	50.350	0.008	0.417	0.038	0.367
3y	0.605	0.136	1.305	11.487	0.003	0.388	0.036	0.347
4y	0.562	0.117	1.125	9.159	0.002	0.375	0.036	0.341
5y	0.580	0.124	1.189	7.281	0.001	0.364	0.036	0.349

MSE/ACTUAL

1y	15.751	11.561	110.887	1043.793	0.000	0.319	0.041	0.390
2y	33.596	27.812	266.759	2535.970	0.000	0.307	0.041	0.391
3y	2.051	1.439	13.799	132.025	0.000	0.270	0.037	0.357
4y	1.568	0.941	9.022	83.938	0.000	0.293	0.041	0.397
5y	1.735	0.842	8.077	53.029	0.000	0.285	0.042	0.401

MAPE/FORECAST

1y	2.073	0.779	7.468	49.999	0.001	0.414	0.039	0.372
2y	2.966	1.823	17.488	165.986	0.008	0.435	0.040	0.387
3y	0.873	0.171	1.640	10.249	0.003	0.396	0.038	0.363
4y	1.295	0.411	3.964	28.794	0.002	0.394	0.039	0.374
5y	56.444	55.444	531.798	5101.733	0.001	0.380	0.039	0.376

MSE/FORECAST

1y	59.454	35.348	339.050	2499.954	0.000	0.308	0.042	0.406
2y	311.30	299.47	2872.43	27553.887	0.000	0.337	0.044	0.422
3y	3.420	1.364	13.047	118.934	0.000	0.288	0.040	0.386
4y	17.079	10.505	100.757	829.213	0.000	0.255	0.036	0.347
5y	282920	282909	>1000000	>1000000	0.000	0.253	0.038	0.360

1983

MAPE/ACTUAL

1y	0.913	0.108	1.726	9.673	0.006	0.417	0.037	0.350
2y	0.867	0.162	1.552	8.667	0.004	0.420	0.037	0.355
3y	1.174	0.282	2.704	22.153	0.014	0.469	0.039	0.370
4y	0.879	0.158	1.516	7.807	0.000	0.425	0.037	0.358
5y	0.815	0.145	1.394	7.294	0.003	0.414	0.037	0.358

MSE/ACTUAL

1y	3.781	1.465	14.055	93.688	0.000	0.295	0.041	0.390
2y	3.133	1.163	11.157	75.177	0.000	0.301	0.041	0.396
3y	8.610	5.422	52.008	491.380	0.000	0.356	0.043	0.415
4y	3.046	1.041	9.988	60.951	0.000	0.355	0.043	0.412
5y	2.587	0.894	8.570	53.245	0.000	0.351	0.044	0.419

MAPE/FORECAST

1y	43.692	36.291	348.090	3277.792	0.006	0.470	0.039	0.373
2y	1.278	0.421	4.041	35.236	0.004	0.465	0.038	0.367
3y	3.364	1.610	15.443	137.432	0.014	0.523	0.040	0.383
4y	1.273	0.432	4.148	37.771	0.000	0.471	0.038	0.367
5y	0.980	0.239	2.289	19.842	0.003	0.460	0.039	0.376

MSE/FORECAST

1y	121758	116833	>1000000	>1000000	0.000	0.358	0.043	0.410
2y	17.786	13.676	131.180	1241.836	0.000	0.349	0.042	0.407
3y	247.21	207.39	1989.18	18891.441	0.000	0.419	0.045	0.432
4y	18.637	15.535	149.007	1426.619	0.000	0.307	0.041	0.395
5y	6.144	4.308	41.319	393.807	0.000	0.298	0.041	0.390

PERCENTAGE CHANGE

1980

MAPE/ACTUAL

1y	129.391	27.83	1226.15	11762.229	0.017	0.597	0.039	0.379
2y	65.645	64.433	618.020	5929.026	0.006	0.597	0.041	0.389
3y	55.502	54.251	520.359	4992.333	0.015	0.348	0.036	0.349
4y	38.036	36.508	350.172	3360.202	0.001	0.667	0.037	0.356
5y	38.272	36.738	352.376	3381.318	0.029	0.422	0.035	0.335

MSE/ACTUAL

1y	282920	282909	>1000000	>1000000	0.000	0.498	0.045	0.435
2y	382107	382102	>1000000	>1000000	0.000	0.507	0.046	0.442
3y	270913	270907	>1000000	>1000000	0.000	0.241	0.039	0.377
4y	122734	122728	>1000000	>1000000	0.000	0.366	0.038	0.364
5y	124284	124277	>1000000	>1000000	0.000	0.376	0.038	0.366

MAPE/FORECAST

1y	10.668	9.658	92.635	889.235	0.000	0.488	0.035	0.338
2y	1.297	0.541	5.185	49.235	0.000	0.470	0.035	0.338
3y	1.145	0.407	3.905	36.378	0.000	0.307	0.032	0.308
4y	1.084	0.360	3.452	32.364	0.000	0.512	0.034	0.323
5y	1.132	0.345	3.311	30.572	0.000	0.524	0.033	0.319

MSE/FORECAST

1y	8601.77	8594.9	82439.4	790738.2	0.000	0.351	0.039	0.373
2y	28.272	26.335	252.596	2424.051	0.000	0.334	0.039	0.370
3y	16.395	14.391	138.030	1323.330	0.000	0.335	0.038	0.368
4y	12.962	11.387	109.217	1047.436	0.000	0.366	0.038	0.364
5y	12.129	10.168	97.531	934.642	0.000	0.376	0.038	0.366

1981

MAPE/ACTUAL

1y	2.597	1.247	11.964	111.952	0.003	0.539	0.039	0.372
2y	1.377	0.528	5.061	48.117	0.001	0.532	0.039	0.375
3y	1.063	0.161	1.548	8.630	0.001	0.525	0.041	0.393
4y	1.037	0.148	1.421	9.271	0.002	0.555	0.039	0.376
5y	1.742	0.448	4.295	31.926	0.003	0.577	0.038	0.361

MSE/ACTUAL

1y	148.330	136.27	1307.06	12534.08	0.000	0.428	0.044	0.419
2y	27.229	25.155	241.274	2315.324	0.000	0.405	0.046	0.440
3y	3.500	1.074	10.302	74.494	0.000	0.397	0.046	0.445
4y	3.073	1.051	10.077	85.989	0.000	0.375	0.041	0.395
5y	21.278	12.601	120.866	1019.441	0.000	0.385	0.041	0.392

MAPE/FORECAST

1y	2.248	0.936	8.978	83.845	0.003	0.557	0.038	0.367
2y	1.386	0.288	2.765	16.033	0.001	0.504	0.037	0.357
3y	0.873	0.124	1.187	5.559	0.001	0.488	0.039	0.374
4y	1.252	0.397	3.805	35.102	0.002	0.499	0.037	0.356
5y	0.775	0.094	0.897	4.173	0.003	0.515	0.036	0.347

MSE/FORECAST

1y	84.788	76.423	733.027	7030.590	0.000	0.444	0.043	0.409
2y	9.485	4.039	38.744	257.068	0.000	0.380	0.042	0.399
3y	2.157	0.544	5.221	30.914	0.000	0.376	0.042	0.405
4y	15.887	13.403	128.555	1232.325	0.000	0.375	0.041	0.395
5y	1.397	0.321	3.079	17.438	0.000	0.385	0.041	0.392

1982

MAPE/ACTUAL

1y	0.745	0.133	1.275	11.060	0.003	0.502	0.040	0.382
2y	0.713	0.185	1.777	16.618	0.016	0.448	0.037	0.358
3y	0.626	0.096	0.921	6.858	0.005	0.451	0.038	0.364
4y	0.654	0.102	0.974	7.198	0.008	0.463	0.037	0.357
5y	0.669	0.107	1.029	7.883	0.010	0.477	0.035	0.339

MSE/ACTUAL

1y	2.162	1.333	12.787	122.392	0.000	0.396	0.044	0.417
2y	3.630	3.005	28.819	276.694	0.000	0.327	0.040	0.386
3y	1.230	0.550	5.272	47.099	0.000	0.334	0.041	0.391
4y	1.367	0.618	5.930	51.924	0.000	0.360	0.043	0.414
5y	1.496	0.733	7.032	62.299	0.000	0.345	0.042	0.402

MAPE/FORECAST

1y	6.170	2.367	22.701	179.067	0.003	0.473	0.040	0.381
2y	2.396	0.693	6.644	54.087	0.016	0.486	0.041	0.394
3y	1.716	0.466	4.469	35.293	0.005	0.462	0.040	0.381
4y	1.609	0.412	3.954	30.735	0.008	0.470	0.039	0.375
5y	1.642	0.424	4.065	28.844	0.010	0.469	0.037	0.356

MSE/FORECAST

1y	547.793	361.15	3464.04	32066.14	0.000	0.368	0.044	0.422
2y	49.401	32.287	309.682	2927.177	0.000	0.390	0.046	0.439
3y	22.703	13.894	133.266	1245.990	0.000	0.357	0.044	0.418
4y	18.053	10.578	101.464	945.091	0.000	0.340	0.041	0.392
5y	19.040	9.956	95.493	832.578	0.000	0.345	0.042	0.402

1983

MAPE/ACTUAL

1y	2.354	1.180	11.319	105.196	0.002	0.427	0.036	0.342
2y	0.927	0.252	2.415	21.178	0.004	0.459	0.038	0.363
3y	0.724	0.165	1.579	13.703	0.006	0.454	0.036	0.343
4y	0.553	0.068	0.648	3.173	0.008	0.416	0.036	0.350
5y	0.605	0.085	0.817	4.666	0.002	0.414	0.038	0.369

MSE/ACTUAL

1y	132.274	120.35	1154.41	11066.63	0.000	0.298	0.039	0.379
2y	6.629	4.936	47.345	448.681	0.000	0.341	0.042	0.407
3y	2.990	2.081	19.958	187.932	0.000	0.323	0.040	0.384
4y	0.721	0.166	1.593	10.116	0.000	0.352	0.044	0.418
5y	1.026	0.300	2.880	21.791	0.000	0.367	0.045	0.430

MAPE/FORECAST

1y	3.213	1.681	16.125	119.273	0.002	0.462	0.037	0.351
2y	1.773	0.479	4.595	30.804	0.004	0.494	0.039	0.372
3y	2.075	0.708	6.788	57.395	0.006	0.516	0.039	0.370
4y	1.321	0.333	3.193	22.394	0.008	0.466	0.039	0.370
5y	2.467	1.284	12.315	115.869	0.002	0.462	0.041	0.394

MSE/FORECAST

1y	267.511	187.26	1796.16	14226.44	0.000	0.335	0.040	0.381
2y	24.030	13.532	129.79	949.136	0.000	0.381	0.044	0.423
3y	49.878	36.545	350.53	3294.833	0.000	0.402	0.045	0.428
4y	11.830	6.746	64.702	501.805	0.000	0.352	0.044	0.418
5y	156.107	145.94	1399.85	13426.18	0.000	0.367	0.045	0.430

MOVING AVERAGE

1980

MAPE/ACTUAL

2y	1.434	0.490	4.701	43.968	0.001	0.486	0.040	0.387
3y	1.309	0.344	3.300	29.201	0.004	0.492	0.039	0.370
4y	1.232	0.272	2.607	21.780	0.009	0.509	0.037	0.358
5y	1.151	0.226	2.172	17.320	0.032	0.527	0.035	0.340
6y	1.102	0.196	1.880	14.347	0.027	0.549	0.034	0.325

MSE/ACTUAL

2y	23.910	20.999	201.417	1933.298	0.000	0.384	0.045	0.435
3y	12.486	9.289	89.099	852.940	0.000	0.378	0.044	0.421
4y	8.241	5.211	49.983	474.725	0.000	0.396	0.043	0.411
5y	5.992	3.350	32.131	301.079	0.000	0.393	0.042	0.399
6y	4.713	2.340	22.443	206.590	0.001	0.406	0.041	0.393

MAPE/FORECAST

2y	0.682	0.093	0.893	4.293	0.001	0.460	0.037	0.352
3y	0.704	0.088	0.848	5.187	0.004	0.493	0.037	0.353
4y	0.779	0.089	0.851	4.896	0.009	0.541	0.037	0.350
5y	0.964	0.141	1.349	10.533	0.033	0.591	0.036	0.345
6y	1.320	0.381	3.650	34.825	0.027	0.641	0.035	0.338

MSE/FORECAST

2y	1.253	0.346	3.322	18.439	0.000	0.335	0.040	0.383
3y	1.207	0.350	3.357	26.953	0.000	0.366	0.041	0.395
4y	1.323	0.333	3.193	24.061	0.000	0.415	0.042	0.399
5y	2.728	1.257	12.053	111.639	0.001	0.468	0.042	0.400
6y	14.923	13.190	126.512	1214.670	0.001	0.524	0.042	0.403

1981

MAPE/ACTUAL

2y	1.768	0.558	5.349	46.467	0.008	0.501	0.039	0.377
3y	1.658	0.397	3.811	30.878	0.009	0.509	0.039	0.370
4y	1.650	0.381	3.654	23.093	0.001	0.508	0.037	0.356
5y	1.630	0.353	3.381	18.383	0.005	0.521	0.035	0.340
6y	1.538	0.319	3.062	16.101	0.004	0.530	0.034	0.324

MSE/ACTUAL

2y	31.423	23.590	226.268	2159.970	0.000	0.391	0.045	0.428
3y	18.965	10.827	103.851	954.057	0.000	0.395	0.044	0.422
4y	15.927	6.964	66.797	533.326	0.000	0.384	0.043	0.409
5y	13.966	5.422	52.009	338.131	0.000	0.386	0.041	0.397
6y	11.641	4.388	42.087	259.376	0.000	0.384	0.040	0.386

MAPE/FORECAST

2y	1.093	0.419	4.021	38.110	0.008	0.466	0.035	0.333
3y	1.800	0.883	8.466	76.361	0.009	0.492	0.036	0.342
4y	0.773	0.141	1.351	11.249	0.001	0.517	0.036	0.342
5y	1.796	1.103	10.581	101.877	0.005	0.545	0.035	0.334
6y	0.960	0.210	2.015	18.436	0.004	0.587	0.035	0.333

MSE/FORECAST

2y	17.189	15.786	151.412	1453.001	0.000	0.327	0.038	0.369
3y	74.141	64.005	613.916	5832.516	0.000	0.358	0.040	0.383
4y	2.404	1.421	13.630	126.562	0.000	0.382	0.040	0.385
5y	113.97	112.82	1082.09	10380.113	0.000	0.407	0.040	0.384
6y	4.936	3.706	35.550	340.059	0.000	0.454	0.041	0.391

1982

MAPE/ACTUAL

2y	0.662	0.141	1.357	10.904	0.006	0.384	0.037	0.359
3y	1.186	0.397	3.811	33.732	0.002	0.448	0.038	0.365
4y	1.124	0.317	3.042	25.233	0.012	0.454	0.038	0.365
5y	1.186	0.281	2.700	20.149	0.001	0.476	0.038	0.367
6y	1.177	0.256	2.453	16.721	0.006	0.490	0.038	0.364

MSE/ACTUAL

2y	2.258	1.319	12.650	119.045	0.000	0.275	0.040	0.385
3y	15.772	12.483	119.731	1138.011	0.000	0.333	0.042	0.402
4y	10.415	7.143	68.513	637.272	0.000	0.338	0.043	0.410
5y	8.615	4.743	45.494	406.025	0.000	0.360	0.044	0.417
6y	7.336	3.480	33.381	279.810	0.000	0.372	0.044	0.418

MAPE/FORECAST

2y	1.603	0.430	4.121	25.244	0.007	0.406	0.039	0.370
3y	3.528	1.800	17.265	125.049	0.002	0.466	0.038	0.369
4y	0.961	0.173	1.662	10.129	0.012	0.481	0.038	0.364
5y	0.920	0.149	1.425	9.399	0.001	0.507	0.037	0.356
6y	1.438	0.592	5.683	53.731	0.006	0.537	0.037	0.353

MSE/FORECAST

2y	19.366	8.705	83.497	637.565	0.000	0.301	0.042	0.401
3y	307.283	211.96	2033.08	15637.74	0.000	0.352	0.043	0.408
4y	3.656	1.481	14.201	102.829	0.000	0.362	0.042	0.405
5y	2.855	1.088	10.439	88.360	0.000	0.382	0.042	0.400
6y	34.013	31.394	301.116	2887.649	0.000	0.412	0.041	0.397

1983

MAPE/ACTUAL

2y	0.591	0.076	0.733	3.776	0.002	0.434	0.034	0.322
3y	0.581	0.075	0.721	3.831	0.005	0.427	0.032	0.307
4y	0.627	0.177	1.699	16.041	0.006	0.390	0.031	0.294
5y	0.537	0.140	1.344	12.725	0.013	0.375	0.029	0.282
6y	0.503	0.118	1.131	10.525	0.006	0.362	0.028	0.265

MSE/ACTUAL

2y	0.882	0.245	2.348	14.277	0.000	0.291	0.038	0.361
3y	0.851	0.427	2.366	14.713	0.000	0.275	0.036	0.342
4y	3.250	2.796	26.821	257.493	0.000	0.237	0.033	0.319
5y	2.076	1.762	16.902	162.245	0.000	0.219	0.032	0.305
6y	1.518	1.206	11.567	110.913	0.000	0.200	0.028	0.269

MAPE/FORECAST

2y	4.907	3.709	35.573	341.126	0.002	0.524	0.037	0.354
3y	1.031	0.153	1.466	7.120	0.005	0.532	0.037	0.352
4y	0.890	0.147	1.412	8.297	0.006	0.489	0.037	0.350
5y	1.440	0.507	4.867	44.379	0.013	0.474	0.035	0.337
6y	1.378	0.556	5.330	39.127	0.006	0.489	0.036	0.342

MSE/FORECAST

2y	1275.73	1264.78	12131.4	116368.4	0.000	0.399	0.043	0.411
3y	3.190	0.910	8.728	50.771	0.000	0.405	0.043	0.415
4y	2.765	1.037	9.949	68.929	0.000	0.361	0.042	0.399
5y	25.501	21.429	205.540	1970.633	0.000	0.336	0.040	0.384
6y	30.003	20.788	199.390	1531.405	0.000	0.355	0.039	0.376

EXPONENTIAL SMOOTHING.

<u>1980</u>

MAPE/ACTUAL

.95	1.832	0.915	8.772	83.829	0.003	0.490	0.040	0.388
.90	1.785	0.867	8.314	79.398	0.004	0.491	0.040	0.388
.85	1.738	0.819	7.857	74.968	0.005	0.491	0.041	0.389
.80	1.691	0.772	7.401	70.543	0.000	0.491	0.041	0.389
.75	1.644	0.724	6.947	66.109	0.005	0.491	0.041	0.389
.70	1.596	0.677	6.494	61.681	0.002	0.491	0.041	0.390
.65	1.548	0.630	6.043	57.251	0.000	0.488	0.040	0.387
.60	1.501	0.583	5.593	52.801	0.017	0.487	0.040	0.380
.55	1.453	0.536	5.144	48.375	0.010	0.487	0.039	0.374
.50	1.404	0.490	4.698	43.931	0.019	0.486	0.038	0.369
.45	1.353	0.444	4.255	39.513	0.000	0.487	0.038	0.366
.40	1.305	0.398	3.813	35.062	0.013	0.493	0.037	0.358
.35	1.255	0.352	3.376	30.621	0.012	0.499	0.037	0.351
.30	1.204	0.307	2.944	26.183	0.004	0.508	0.036	0.345
.25	1.157	0.263	2.519	21.709	0.029	0.523	0.035	0.332
.20	1.109	0.220	2.109	17.278	0.003	0.542	0.034	0.321
.15	1.061	0.180	1.727	12.810	0.009	0.563	0.032	0.311
.10	1.013	0.146	1.398	8.347	0.001	0.583	0.032	0.302
.05	0.981	0.122	1.168	6.194	0.042	0.619	0.030	0.285

MSE/ACTUAL

.95	79.467	76.368	732.496	7027.8	0.000	0.389	0.046	0.438
.90	71.557	68.510	657.120	6304.8	0.000	0.390	0.046	0.437
.85	64.084	61.077	585.834	5621.0	0.000	0.390	0.045	0.436
.80	57.046	54.071	518.635	4976.4	0.000	0.390	0.045	0.435
.75	50.440	47.492	455.524	4370.9	0.000	0.390	0.045	0.435
.70	44.264	41.338	396.500	3804.7	0.000	0.391	0.046	0.437
.65	38.515	35.611	341.564	3277.7	0.000	0.386	0.045	0.434
.60	33.191	30.310	290.719	2789.8	0.000	0.380	0.045	0.431
.55	28.288	25.435	243.962	2341.1	0.000	0.375	0.045	0.428
.50	23.805	20.987	201.297	1931.6	0.000	0.371	0.044	0.424
.45	19.738	16.965	162.726	1561.3	0.000	0.370	0.044	0.420
.40	16.086	13.371	128.254	1230.2	0.000	0.369	0.043	0.413
.35	12.848	10.206	97.890	938.376	0.000	0.371	0.042	0.406
.30	10.024	7.470	71.648	685.778	0.000	0.375	0.041	0.397
.25	7.617	5.166	49.555	472.507	0.001	0.382	0.041	0.390
.20	5.630	3.302	31.672	298.652	0.000	0.396	0.040	0.384
.15	4.074	1.893	18.158	164.327	0.000	0.412	0.039	0.372
.10	2.961	0.991	9.502	69.691	0.000	0.430	0.037	0.353
.05	2.312	0.668	6.405	38.896	0.002	0.463	0.036	0.341

MAPE/FORECAST

.95	1.183	0.395	3.786	27.203	0.003	0.435	0.035	0.339
.90	0.854	0.186	1.789	13.613	0.004	0.440	0.036	0.342
.85	0.773	0.139	1.330	9.114	0.005	0.445	0.036	0.347
.80	0.747	0.121	1.158	6.892	0.000	0.448	0.036	0.349
.75	0.762	0.121	1.164	5.774	0.005	0.451	0.036	0.349
.70	1.473	0.740	7.093	67.796	0.002	0.455	0.036	0.350
.65	2.007	1.316	12.618	121.363	0.000	0.460	0.037	0.351
.60	0.787	0.151	1.444	11.612	0.017	0.467	0.036	0.345
.55	0.726	0.108	1.034	6.203	0.010	0.473	0.035	0.339
.50	0.714	0.097	0.933	5.141	0.019	0.480	0.035	0.338
.45	0.718	0.093	0.890	5.051	0.000	0.493	0.036	0.341
.40	0.737	0.090	0.865	4.911	0.013	0.513	0.036	0.341
.35	0.764	0.089	0.852	4.754	0.012	0.536	0.036	0.345
.30	0.804	0.088	0.848	4.565	0.004	0.563	0.036	0.348
.25	0.863	0.089	0.851	4.298	0.030	0.600	0.036	0.344
.20	0.947	0.091	0.873	4.094	0.003	0.641	0.035	0.340
.15	1.069	0.097	0.934	4.212	0.009	0.686	0.035	0.340
.10	1.263	0.112	1.076	4.898	0.001	0.725	0.036	0.342
.05	1.622	0.148	1.416	6.123	0.044	0.768	0.034	0.326

MSE/FORECAST

.95	15.575	10.064	96.527	740.176	0.000	0.302	0.039	0.370
.90	3.893	2.134	20.465	185.438	0.000	0.309	0.039	0.371
.85	2.348	1.020	9.784	83.151	0.000	0.317	0.039	0.378
.80	1.885	0.678	6.508	47.496	0.000	0.321	0.040	0.380
.75	1.921	0.620	5.943	33.389	0.000	0.324	0.040	0.380
.70	51.938	49.947	479.07	4596.54	0.000	0.328	0.040	0.381
.65	161.517	160.08	1535.5	14729.1	0.000	0.333	0.040	0.381
.60	2.682	1.508	14.461	135.243	0.000	0.336	0.039	0.378
.55	1.584	0.550	5.279	38.603	0.000	0.337	0.039	0.374
.50	1.370	0.431	3.964	26.623	0.000	0.344	0.039	0.379
.45	1.299	0.370	3.553	25.515	0.000	0.358	0.040	0.382
.40	1.283	0.349	3.343	24.243	0.000	0.378	0.040	0.385
.35	1.302	0.333	3.198	22.715	0.000	0.405	0.041	0.393
.30	1.357	0.322	3.092	20.875	0.000	0.436	0.041	0.395
.25	1.461	0.317	3.041	18.725	0.001	0.477	0.042	0.400
.20	1.650	0.323	3.102	16.787	0.000	0.526	0.042	0.404
.15	2.006	0.356	3.410	17.824	0.000	0.585	0.043	0.413
.10	2.741	0.452	4.331	24.004	0.000	0.641	0.043	0.409
.05	4.616	0.777	7.451	38.037	0.002	0.694	0.042	0.405

<u>1981</u>

MAPE/ACTUAL

.95	1.480	0.470	4.511	40.004	0.004	0.474	0.039	0.375
.90	1.447	0.445	4.271	36.933	0.018	0.467	0.039	0.370
.85	1.470	0.425	4.078	33.902	0.003	0.454	0.039	0.369
.80	1.473	0.409	3.920	30.849	0.020	0.457	0.038	0.369
.75	1.477	0.395	3.792	27.834	0.010	0.464	0.040	0.380
.70	1.479	0.385	3.688	24.828	0.001	0.467	0.040	0.380
.65	1.481	0.375	3.601	21.822	0.005	0.471	0.039	0.373
.60	1.476	0.368	3.525	22.270	0.008	0.475	0.038	0.368
.55	1.467	0.360	3.455	22.950	0.007	0.482	0.038	0.365
.50	1.450	0.353	3.387	23.168	0.001	0.483	0.037	0.358
.45	1.441	0.345	3.310	22.913	0.000	0.490	0.037	0.357
.40	1.431	0.336	3.224	22.188	0.003	0.494	0.037	0.357
.35	1.416	0.326	3.128	20.995	0.003	0.499	0.036	0.348
.30	1.391	0.315	3.025	19.334	0.001	0.505	0.035	0.336
.25	1.378	0.303	2.905	17.195	0.007	0.514	0.034	0.327
.20	1.391	0.288	2.763	14.563	0.033	0.528	0.033	0.316
.15	1.392	0.274	2.627	13.669	0.012	0.543	0.032	0.302
.10	1.385	0.262	2.514	14.149	0.014	0.569	0.031	0.300
.05	1.379	0.255	2.448	15.252	0.031	0.611	0.030	0.292

MSE/ACTUAL

.95	22.317	17.465	167.52	1600.60	0.000	0.364	0.044	0.420
.90	20.225	14.923	143.14	1365.33	0.000	0.353	0.043	0.416
.85	18.612	12.654	121.38	1149.54	0.000	0.341	0.043	0.415
.80	17.369	10.713	102.76	952.93	0.000	0.344	0.043	0.416
.75	16.407	9.158	87.838	775.289	0.000	0.358	0.045	0.429
.70	15.645	8.026	76.986	616.482	0.000	0.361	0.045	0.430
.65	15.018	7.305	70.063	476.412	0.000	0.359	0.044	0.422
.60	14.472	6.906	66.239	496.272	0.000	0.360	0.043	0.416
.55	13.961	6.694	64.203	527.007	0.000	0.364	0.043	0.413
.50	13.450	6.529	62.627	536.801	0.000	0.360	0.042	0.407
.45	12.912	6.309	60.516	525.038	0.000	0.366	0.042	0.407
.40	12.327	5.975	57.306	492.408	0.000	0.369	0.042	0.407
.35	11.686	5.509	52.836	440.911	0.000	0.369	0.042	0.403
.30	10.987	4.931	47.295	373.863	0.000	0.366	0.041	0.392
.25	10.244	4.296	41.205	295.907	0.000	0.371	0.040	0.387
.20	9.486	3.694	35.434	213.028	0.001	0.377	0.039	0.379
.15	8.766	3.248	31.156	187.190	0.000	0.385	0.038	0.360
.10	8.170	3.075	29.491	200.568	0.000	0.413	0.037	0.353
.05	7.831	3.205	30.742	233.556	0.001	0.458	0.036	0.350

MAPE/FORECAST

.95	0.650	0.086	0.826	4.983	0.004	0.458	0.036	0.348
.90	0.848	0.246	2.364	22.121	0.017	0.450	0.036	0.345
.85	0.660	0.094	0.903	5.183	0.003	0.441	0.036	0.346
.80	0.766	0.153	1.466	11.857	0.021	0.453	0.037	0.351
.75	1.843	0.962	9.229	87.475	0.010	0.445	0.036	0.348
.70	3.266	2.187	20.979	198.473	0.001	0.446	0.036	0.346
.65	0.764	0.123	1.182	6.138	0.005	0.453	0.035	0.340
.60	0.694	0.095	0.915	5.070	0.008	0.463	0.035	0.340
.55	0.705	0.103	0.988	6.654	0.007	0.473	0.035	0.338
.50	0.813	0.153	1.466	9.561	0.001	0.477	0.034	0.328
.45	1.655	0.782	7.504	70.116	0.000	0.493	0.034	0.330
.40	1.365	0.587	5.633	53.185	0.003	0.509	0.035	0.340
.35	2.860	1.487	14.260	124.929	0.003	0.529	0.035	0.339
.30	1.047	0.279	2.677	19.282	0.001	0.547	0.035	0.338
.25	2.104	1.098	10.535	99.569	0.007	0.576	0.035	0.335
.20	0.923	0.137	1.314	8.754	0.034	0.611	0.035	0.336
.15	0.937	0.099	0.952	6.825	0.012	0.653	0.035	0.338
.10	1.074	0.099	0.947	5.956	0.013	0.699	0.036	0.342
.05	1.399	0.130	1.245	5.863	0.030	0.751	0.034	0.324

MSE/FORECAST

.95	1.097	0.328	3.147	24.872	0.000	0.392	0.040	0.386
.90	6.247	5.322	51.046	490.091	0.000	0.320	0.040	0.384
.85	1.243	0.376	3.603	26.899	0.000	0.313	0.040	0.385
.80	2.713	1.568	15.042	141.079	0.000	0.327	0.041	0.390
.75	87.642	83.171	797.745	7653.6	0.000	0.318	0.040	0.386
.70	445.989	428.26	4107.8	39391.8	0.000	0.317	0.040	0.383
.65	1.966	0.663	6.358	37.739	0.000	0.320	0.039	0.379
.60	1.309	0.386	3.701	25.779	0.000	0.329	0.039	0.377
.55	1.463	0.542	5.202	44.364	0.000	0.337	0.039	0.378
.50	2.787	1.294	12.414	91.443	0.000	0.334	0.038	0.364
.45	58.439	53.475	512.91	4916.29	0.000	0.350	0.038	0.369
.40	33.243	30.747	294.91	2828.95	0.000	0.374	0.040	0.380
.35	209.327	171.63	1646.3	15608.1	0.000	0.393	0.040	0.383
.30	8.184	5.192	49.797	371.843	0.000	0.412	0.040	0.388
.25	114.206	107.78	1033.83	9915.4	0.000	0.442	0.040	0.386
.20	2.561	1.128	10.824	77.234	0.001	0.486	0.042	0.400
.15	1.775	0.549	5.266	46.748	0.000	0.539	0.042	0.405
.10	2.041	0.446	4.281	35.637	0.000	0.604	0.043	0.413
.05	3.492	0.671	6.439	34.724	0.001	0.668	0.041	0.397

1982

MAPE/ACTUAL

.95	0.552	0.115	1.104	7.425	0.000	0.345	0.035	0.332
.90	0.552	0.110	1.054	6.535	0.004	0.351	0.035	0.339
.85	0.562	0.108	1.035	7.082	0.005	0.353	0.035	0.340
.80	0.576	0.110	1.056	7.621	0.006	0.357	0.036	0.343
.75	0.594	0.117	1.120	8.152	0.000	0.360	0.036	0.348
.70	0.613	0.128	1.224	8.651	0.005	0.363	0.037	0.352
.65	0.638	0.141	1.352	9.121	0.009	0.364	0.036	0.348
.60	0.666	0.156	1.495	9.757	0.006	0.365	0.036	0.350
.55	0.713	0.170	1.633	11.304	0.001	0.384	0.037	0.353
.50	0.761	0.184	1.764	12.666	0.001	0.396	0.037	0.355
.45	0.810	0.196	1.879	13.769	0.004	0.409	0.037	0.356
.40	0.856	0.205	1.971	14.545	0.000	0.421	0.038	0.362
.35	0.901	0.212	2.033	14.906	0.002	0.431	0.038	0.363
.30	0.953	0.215	2.058	14.780	0.005	0.453	0.037	0.357
.25	1.002	0.214	2.051	14.096	0.001	0.479	0.037	0.353
.20	1.051	0.210	2.019	12.735	0.032	0.507	0.035	0.338
.15	1.097	0.207	1.988	10.846	0.000	0.542	0.033	0.319
.10	1.142	0.210	2.012	14.059	0.010	0.587	0.031	0.295
.05	1.192	0.227	2.174	18.230	0.011	0.646	0.027	0.263

MSE/ACTUAL

.95	1.510	0.733	7.034	55.139	0.000	0.228	0.037	0.353
.90	1.404	0.646	6.196	42.755	0.000	0.237	0.038	0.364
.85	1.374	0.630	6.040	50.226	0.000	0.239	0.038	0.366
.80	1.434	0.675	6.478	58.168	0.000	0.244	0.039	0.370
.75	1.594	0.775	7.434	66.455	0.000	0.249	0.039	0.377
.70	1.857	0.932	8.939	74.919	0.000	0.254	0.040	0.381
.65	2.216	1.152	11.046	83.254	0.000	0.252	0.039	0.375
.60	2.655	1.430	13.719	95.321	0.000	0.254	0.039	0.376
.55	3.147	1.750	16.783	127.802	0.000	0.271	0.039	0.379
.50	3.658	2.079	19.942	160.448	0.000	0.282	0.040	0.381
.45	4.148	2.379	22.819	189.680	0.000	0.293	0.040	0.386
.40	4.575	2.607	25.001	211.565	0.000	0.306	0.041	0.398
.35	4.901	2.721	26.097	222.263	0.000	0.317	0.042	0.401
.30	5.099	2.692	25.817	218.595	0.000	0.332	0.042	0.403
.25	5.165	2.514	24.109	198.727	0.000	0.352	0.042	0.404
.20	5.136	2.239	21.479	162.987	0.001	0.371	0.042	0.400
.15	5.113	2.066	19.818	117.633	0.000	0.394	0.040	0.386
.10	5.306	2.421	23.217	197.931	0.000	0.431	0.038	0.365
.05	6.096	3.681	35.308	332.750	0.000	0.486	0.035	0.339

MAPE/FORECAST

.95	1.035	0.285	2.738	20.975	0.000	0.379	0.037	0.352
.90	1.102	0.319	3.061	20.720	0.004	0.381	0.037	0.354
.85	2.060	1.141	10.941	102.658	0.005	0.381	0.037	0.352
.80	1.312	0.422	4.044	25.242	0.006	0.381	0.037	0.351
.75	1.438	0.499	4.789	33.434	0.000	0.381	0.037	0.351
.70	3.107	1.790	17.165	153.172	0.005	0.382	0.037	0.352
.65	7.601	6.542	62.750	602.179	0.009	0.386	0.037	0.353
.60	1.662	0.647	6.202	43.045	0.006	0.391	0.037	0.357
.55	1.990	0.971	9.316	86.527	0.001	0.414	0.038	0.364
.50	1.229	0.317	3.040	18.050	0.001	0.428	0.038	0.366
.45	1.386	0.448	4.295	37.519	0.004	0.441	0.038	0.363
.40	6.535	4.328	41.509	371.707	0.000	0.454	0.038	0.363
.35	0.999	0.175	1.681	9.251	0.002	0.469	0.038	0.362
.30	1.315	0.442	4.235	39.692	0.005	0.505	0.037	0.358
.25	1.135	0.213	2.046	15.852	0.001	0.543	0.037	0.354
.20	1.227	0.260	2.495	19.528	0.031	0.598	0.036	0.346
.15	4.243	3.127	29.992	288.268	0.000	0.667	0.035	0.337
.10	1.335	0.197	1.888	16.629	0.010	0.741	0.033	0.319
.05	1.587	0.140	1.343	8.738	0.011	0.813	0.029	0.283

MSE/FORECAST

.95	8.486	4.988	47.846	439.959	0.000	0.266	0.038	0.369
.90	10.479	5.717	54.833	429.490	0.000	0.269	0.039	0.372
.85	122.640	114.59	1099.2	10539.6	0.000	0.268	0.039	0.370
.80	17.899	9.871	94.680	637.455	0.000	0.267	0.039	0.372
.75	24.753	14.787	141.83	1117.84	0.000	0.267	0.039	0.373
.70	301.073	257.95	2474.2	23463.3	0.000	0.268	0.039	0.373
.65	3952.5	3941.5	37805.7	362630.1	0.000	0.272	0.039	0.375
.60	40.805	26.000	249.384	1853.4	0.000	0.279	0.040	0.381
.55	89.811	81.442	781.161	7487.2	0.000	0.302	0.041	0.392
.50	10.651	4.887	46.876	325.854	0.000	0.315	0.042	0.399
.45	20.166	15.365	147.378	1408.0	0.000	0.325	0.041	0.396
.40	1746.9	1518.5	14564.5	138166.1	0.000	0.336	0.041	0.397
.35	3.793	1.248	11.973	85.627	0.000	0.349	0.041	0.396
.30	19.473	17.115	164.16	1575.86	0.000	0.382	0.042	0.400
.25	5.428	2.803	26.883	251.338	0.000	0.419	0.042	0.402
.20	7.663	4.521	43.365	382.541	0.001	0.476	0.042	0.406
.15	907.714	903.20	8663.2	83098.6	0.000	0.556	0.042	0.407
.10	5.311	3.021	28.972	276.860	0.000	0.650	0.042	0.399
.05	4.304	0.956	9.165	76.550	0.000	0.740	0.039	0.371

1983

MAPE/ACTUAL

.95	0.648	0.104	0.997	5.424	0.000	0.403	0.034	0.324
.90	0.636	0.101	0.964	5.217	0.002	0.402	0.034	0.324
.85	0.625	0.097	0.929	4.991	0.008	0.402	0.034	0.323
.80	0.615	0.093	0.891	4.749	0.011	0.404	0.033	0.319
.75	0.609	0.088	0.849	4.487	0.014	0.410	0.033	0.314
.70	0.601	0.084	0.805	4.204	0.016	0.418	0.033	0.317
.65	0.592	0.080	0.764	3.910	0.010	0.421	0.033	0.318
.60	0.582	0.076	0.727	3.600	0.018	0.420	0.033	0.316
.55	0.570	0.073	0.700	3.337	0.001	0.418	0.033	0.313
.50	0.557	0.071	0.684	3.740	0.013	0.416	0.032	0.309
.45	0.540	0.071	0.683	4.551	0.006	0.412	0.032	0.303
.40	0.521	0.072	0.694	5.300	0.005	0.403	0.031	0.294
.35	0.503	0.074	0.710	5.921	0.008	0.499	0.037	0.351
.30	0.502	0.074	0.714	6.319	0.037	0.409	0.028	0.269
.25	0.501	0.074	0.713	6.495	0.006	0.418	0.028	0.266
.20	0.512	0.072	0.694	6.242	0.025	0.426	0.024	0.230
.15	0.533	0.069	0.660	5.524	0.027	0.444	0.022	0.214
.10	0.575	0.065	0.620	4.335	0.002	0.485	0.024	0.225
.05	0.644	0.065	0.622	5.435	0.019	0.554	0.025	0.243

MSE/ACTUAL

.95	1.402	0.478	4.582	29.420	0.000	0.266	0.038	0.361
.90	1.324	0.443	4.253	27.244	0.000	0.265	0.037	0.359
.85	1.245	0.409	3.921	24.987	0.000	0.264	0.037	0.358
.80	1.164	0.374	3.586	22.653	0.000	0.264	0.037	0.356
.75	1.083	0.338	3.245	20.255	0.000	0.266	0.037	0.352
.70	1.003	0.302	2.901	17.814	0.000	0.274	0.037	0.355
.65	0.928	0.267	2.561	15.364	0.000	0.277	0.037	0.357
.60	0.862	0.235	2.252	13.091	0.000	0.275	0.037	0.354
.55	0.809	0.214	2.054	11.104	0.000	0.272	0.037	0.352
.50	0.773	0.219	2.097	14.085	0.000	0.360	0.042	0.407
.45	0.753	0.256	2.458	20.772	0.000	0.261	0.036	0.341
.40	0.748	0.318	3.053	28.138	0.000	0.248	0.034	0.326
.35	0.752	0.386	3.707	35.152	0.000	0.240	0.033	0.321
.30	0.757	0.440	4.221	40.398	0.001	0.239	0.031	0.301
.25	0.755	0.460	4.408	42.260	0.000	0.245	0.031	0.297
.20	0.739	0.430	4.126	39.285	0.001	0.234	0.026	0.245
.15	0.715	0.353	3.390	30.815	0.001	0.242	0.024	0.229
.10	0.711	0.280	2.685	18.802	0.000	0.286	0.026	0.246
.05	0.798	0.327	3.140	29.751	0.000	0.365	0.028	0.264

MAPE/FORECAST

.95	1.096	0.483	4.636	43.744	0.000	0.477	0.037	0.351
.90	1.265	0.483	4.636	43.744	0.000	0.477	0.037	0.351
.85	1.598	0.815	7.817	74.986	0.008	0.479	0.037	0.354
.80	2.008	1.209	11.593	111.443	0.011	0.485	0.037	0.353
.75	2.113	1.265	12.134	116.477	0.014	0.495	0.037	0.351
.70	2.056	1.049	10.058	94.536	0.016	0.504	0.037	0.353
.65	2.770	1.198	11.490	76.410	0.010	0.508	0.037	0.353
.60	1.872	0.802	7.695	71.001	0.018	0.511	0.037	0.353
.55	1.898	0.957	9.177	87.888	0.001	0.514	0.037	0.352
.50	5.842	4.310	41.344	393.957	0.013	0.517	0.036	0.349
.45	1.665	0.714	6.845	64.869	0.006	0.515	0.036	0.345
.40	1.430	0.460	4.408	36.388	0.005	0.517	0.036	0.347
.35	5.666	4.520	43.354	416.073	0.008	0.525	0.036	0.345
.30	2.084	1.041	9.981	95.283	0.036	0.547	0.034	0.329
.25	3.816	1.856	17.807	140.169	0.006	0.572	0.034	0.327
.20	1.191	0.278	2.670	23.889	0.026	0.626	0.034	0.325
.15	0.924	0.086	0.828	4.974	0.027	0.680	0.033	0.316
.10	1.170	0.145	1.390	11.682	0.002	0.725	0.033	0.317
.05	1.515	0.144	1.377	8.399	0.019	0.788	0.034	0.322

MSE/FORECAST

.95	10.003	7.540	72.324	685.219	0.000	0.345	0.041	0.396
.90	22.861	20.796	199.467	1913.7	0.000	0.349	0.042	0.401
.85	62.999	61.113	586.178	5624.0	0.000	0.354	0.042	0.405
.80	136.972	135.00	1294.9	12421.9	0.000	0.358	0.042	0.406
.75	150.096	147.48	1414.6	13570.2	0.000	0.367	0.042	0.405
.70	104.292	97.224	932.537	8940.1	0.000	0.378	0.043	0.409
.65	138.271	85.294	818.112	5840.1	0.000	0.382	0.043	0.409
.60	62.069	54.935	526.921	5043.7	0.000	0.385	0.043	0.410
.55	86.909	83.935	805.072	7724.4	0.000	0.386	0.043	0.408
.50	1724.9	1687.0	16181.2	155212.7	0.000	0.387	0.042	0.406
.45	49.122	45.730	438.624	4208.8	0.000	0.383	0.042	0.403
.40	21.265	15.179	145.588	1324.4	0.000	0.387	0.042	0.405
.35	1891.3	1881.7	18048.4	173122.6	0.000	0.393	0.041	0.398
.30	102.879	98.725	946.940	9085.7	0.001	0.407	0.040	0.386
.25	328.203	237.9	2281.78	19648.9	0.000	0.433	0.040	0.383
.20	8.470	6.247	59.924	571.908	0.001	0.433	0.040	0.383
.15	1.532	0.367	3.520	25.016	0.001	0.561	0.040	0.388
.10	3.278	1.501	14.400	136.515	0.000	0.625	0.041	0.392
.05	4.170	1.002	9.608	70.857	0.000	0.723	0.040	0.387

Appendix 33.

REGRESSION MODELS EMPLOYED FOR PROFIT FORECASTS

109 COMPANIES

ATT80 = 2.72449 + (ATT79 x 0.57899) - (ATT75 x 0.30183) + (ATT74 x 1.17605) - (ATT76 x 0.48761)

ATT81 = 0.43987 + (ATT80 x 0.89850) + (ATT76 x 1.20030) - (ATT74 x 0.52991) - (ATT75 x 0.60982) - (ATT79 x 0.05123)

ATT82 = 1.35425 + (ATT81 x 1.02532) - (ATT79 x 0.12069) + (ATT75 x 0.70929) - (ATT74 x 0.57702)

ATT83 = 3.47681 + (ATT82 x 0.93150) + (ATT74 x 0.86249) - (ATT81 x 0.27769) + (ATT78 x 0.51910) - (ATT77 x 0.40624)

92 COMPANIES

ATT80 = 2.0032 + (ATT79 x 0.5701) - (ATT75 x 0.3708) + (ATT74 x 1.2297) - (ATT76 x 0.4881)

ATT81 = 0.2900 + (ATT80 x 0.9202) + (ATT76 x 1.4843) - (ATT74 x 0.5746) - (ATT77 x 1.0503) - (ATT75 x 0.6782) + (ATT78 x 0.6916) - (ATT79 x 0.0432)

ATT82 = 1.5536 + (ATT81 x 1.0060) - (ATT79 x 0.0879) + (ATT75 x 0.3522) - (ATT74 x 0.6518) + (ATT76 x 0.2729)

ATT83 = 4.1815 + (ATT82 * 0.9299) + (ATT74 x 1.0144) - (ATT81 x 0.2859) + (ATT78 x 0.7754) - (ATT77 x 0.4541) - (ATT73 x 0.4101)

ATTRIBUTABLE PROFIT GT #1 million

ATT80 = -12.8222 + (ATT79 x 0.1743) + (ATT74 x 0.6700) - (ATT76 x 2.3470) + (ATT77 x 2.3694) - (ATT75 x 2.2499) + (ATT78 x 1.6301)

ATT81 = -1.2119 + (ATT80 x 0.9278) + (ATT76 x 1.3285) - (ATT73 x 0.8745) - (ATT74 x 0.4628) - (ATT75 x 0.7146) + (ATT78 x 0.3245) - (ATT79 x 0.0255)

ATT82 = 2.5021 + (ATT81 x 1.4799) - (ATT80 x 0.4144) - (ATT74 x 0.2959) + (ATT75 x 0.5335) - (ATT73 x 0.6892)

ATT83 = 6.8383 + (ATT82 x 1.1903) + (ATT74 x 1.7338) - (ATT81 x 0.4413) - (ATT73 x 1.3137) + (ATT75 x 0.4321)

ATTRIBUTABLE PROFIT GT #2 million

$$ATT80 = -13.991 + (ATT79 \times 0.1754) + (ATT74 \times 0.6367) - (ATT76 \times 2.3414) + (ATT77 \times 2.3391) - (ATT75 \times 2.2915) + (ATT78 \times 1.7011)$$

$$ATT81 = 0.1098 + (ATT80 \times 1.5048) - (ATT74 \times 0.7942) - (ATT77 \times 1.0572) + (ATT78 \times 0.821) - (ATT75 \times 0.0774)$$

$$ATT82 = 2.5045 + (ATT81 \times 1.4882) - (ATT80 \times 0.4180) - (ATT74 \times 0.2818) + (ATT75 \times 0.5439) - (ATT73 \times 0.7283)$$

$$ATT83 = 7.33229 + (ATT82 \times 1.1789) + (ATT74 \times 1.7351) - (ATT81 \times 0.4304) - (ATT73 \times 1.3327) + (ATT75 \times 0.4421)$$

ATTRIBUTABLE PROFIT GT #3 million

$$ATT80 = -3.7281 + (ATT79 \times 1.17547) - (ATT75 \times 2.85) + (ATT80 \times 1.3060) - (ATT74 \times 1.6160) + (ATT76 \times 0.7378)$$

$$ATT81 = -1.9782 + (ATT80 \times 1.1415) + (ATT76 \times 0.3648) - (ATT79 \times 0.5641) + (ATT78 \times 0.4212) + (ATT74 \times 0.2074)$$

$$ATT82 = 2.6203 + (ATT81 \times 1.4890) - (ATT80 \times 0.4183) - (ATT74 \times 0.2775) + (ATT75 \times 0.5455) - (ATT73 \times 0.7380)$$

$$ATT83 = 8.0302 + (ATT82 \times 1.6479) + (ATT74 \times 1.6849) - (ATT81 \times 1.0222) - (ATT73 \times 0.8967) + (ATT79 \times 0.1556)$$

ATTRIBUTABLE PROFIT GT #4 million

$$ATT80 = -2.2683 + (ATT79 \times 1.1855) - (ATT74 \times 2.9116) + (ATT78 \times 1.3040) - (ATT74 \times 1.6472) + (ATT76 \times 0.7778)$$

$$ATT81 = -0.9709 + (ATT80 \times 1.1454) + (ATT76 \times 0.3792) - (ATT79 \times 0.5636) + (ATT78 \times 0.4010) + (ATT74 \times 0.2060)$$

$$ATT82 = 2.6146 + (ATT81 \times 1.4925) - (ATT80 \times 0.4209) - (ATT74 \times 0.2772) + (ATT75 \times 0.5437) - (ATT73 \times 0.7380)$$

$$ATT83 = 8.9123 + (ATT82 \times 1.6463) + (ATT74 \times 1.6982) - (ATT81 \times 1.0216) - (ATT73 \times 0.9215) + (ATT79 \times 0.1562)$$

Appendix 34.

COMPARISON OF THE ERROR MEASURES FOR THE OPTIMAL OVERALL FORM OF EACH MODEL FOR FORECASTING PROFITS (92 COMPANIES)

BEST MODEL;	Non-truncated	Truncated
Absolute Change	5 yr.	5 yr.
Percentage Change	4 yr.	3 yr.
Moving Average	6 yr.	2 yr.
Exponential Smoothing	0.20	0.85

	NON-TRUNCATED					TRUNCATED		
	MEAN	STD. ERROR	STD. DEV.	RANGE	MINIMUM	MEAN	STD. ERROR	STD. DEV.
1981								
MAPE/ACTUAL								
RW	0.617	0.074	0.709	3.676	0.011	0.455	0.037	0.353
AC	1.736	0.612	5.870	53.062	0.007	0.475	0.041	0.393
PC	1.037	0.148	1.421	9.231	0.002	0.525	0.041	0.393
MA	1.538	0.319	3.062	16.101	0.004	0.501	0.039	0.377
ES	1.391	0.288	2.763	14.563	0.033	0.454	0.039	0.369
Re	1.662	0.467	4.475	37.119	0.003	0.438	0.041	0.397
S1	2.645	0.550	5.276	31.837	0.012	0.732	0.036	0.347
S2	2.790	0.584	5.601	34.225	0.003	0.729	0.037	0.354
S3	2.890	0.611	5.856	35.363	0.001	0.733	0.037	0.354
S4	2.884	0.609	5.841	35.324	0.004	0.733	0.037	0.354
S5	3.174	0.677	6.490	39.565	0.020	0.741	0.037	0.353
S6	2.796	0.587	5.629	34.302	0.007	0.728	0.037	0.355
MSE/ACTUAL								
RW	0.878	0.208	1.994	13.589	0.000	0.330	0.041	0.389
AC	37.099	30.706	294.519	2816.304	0.000	0.333	0.041	0.391
PC	3.073	1.051	10.077	85.989	0.000	0.397	0.046	0.445
MA	11.641	4.388	42.087	259.376	0.000	0.391	0.045	0.428
ES	9.486	3.694	35.434	213.028	0.001	0.341	0.043	0.415
Re	22.571	15.190	145.701	1378.012	0.000	0.348	0.046	0.439
S1	34.525	14.943	143.333	1014.371	0.000	0.654	0.043	0.417
S2	38.816	16.765	160.803	1171.593	0.000	0.655	0.044	0.419
S3	42.275	18.378	176.273	1250.619	0.000	0.661	0.044	0.419
S4	42.060	18.283	175.360	1248.084	0.000	0.661	0.044	0.419
S5	51.731	22.463	215.461	1566.954	0.000	0.672	0.044	0.425
S6	39.159	16.922	162.311	1177.153	0.000	0.655	0.044	0.419

MAPE/FORECAST

RW	1.477	0.501	4.804	43.068	0.011	0.468	0.040	0.379
AC	0.684	0.122	1.170	9.192	0.007	0.446	0.039	0.369
PC	1.252	0.397	3.805	35.102	0.002	0.488	0.039	0.374
MA	0.960	0.210	2.015	18.436	0.004	0.466	0.035	0.333
ES	0.923	0.137	1.314	8.754	0.034	0.441	0.036	0.346
Re	0.625	0.106	1.013	6.317	0.003	0.406	0.038	0.364
S1	1.805	0.593	5.692	45.290	0.000	0.592	0.042	0.401
S2	1.717	0.563	5.401	43.001	0.000	0.582	0.042	0.403
S3	1.655	0.536	5.141	41.009	0.000	0.580	0.042	0.402
S4	1.659	0.538	5.158	41.157	0.000	0.580	0.042	0.402
S5	1.539	0.490	4.700	37.581	0.000	0.577	0.042	0.398
S6	1.720	0.563	5.404	43.037	0.000	0.583	0.042	0.403

MSE/FORECAST

RW	25.008	20.242	194.154	1844.797	0.000	0.361	0.044	0.425
AC	1.821	0.956	9.174	84.623	0.000	0.378	0.045	0.431
PC	15.887	13.403	128.555	1232.325	0.000	0.376	0.042	0.405
MA	4.936	3.706	35.550	340.059	0.000	0.327	0.038	0.369
ES	2.561	1.128	10.824	77.234	0.001	0.313	0.040	0.385
Re	1.405	0.558	5.351	39.939	0.000	0.296	0.041	0.391
S1	35.303	23.996	230.163	2051.181	0.000	0.509	0.045	0.431
S2	31.801	21.652	207.679	1849.905	0.000	0.500	0.045	0.430
S3	28.879	19.638	188.363	1681.736	0.000	0.496	0.045	0.429
S4	29.064	19.777	189.697	1693.921	0.000	0.496	0.045	0.429
S5	24.207	16.482	158.086	1412.355	0.000	0.489	0.045	0.429
S6	31.844	21.676	207.909	1852.176	0.000	0.501	0.045	0.430

1982

MAPE/ACTUAL

RW	1.104	0.301	2.887	22.498	0.002	0.383	0.038	0.361
AC	0.580	0.124	1.189	7.281	0.001	0.364	0.036	0.349
PC	0.654	0.102	0.974	7.198	0.008	0.451	0.038	0.364
MA	1.177	0.256	2.453	16.721	0.006	0.384	0.037	0.359
ES	1.051	0.210	2.019	12.735	0.032	0.353	0.035	0.340
Re	0.880	0.250	2.398	20.082	0.003	0.403	0.039	0.376
S1	0.943	0.145	1.389	11.621	0.003	0.629	0.038	0.363
S2	0.974	0.154	1.477	12.383	0.003	0.633	0.038	0.363
S3	1.008	0.160	1.538	12.757	0.003	0.638	0.038	0.363
S4	1.003	0.159	1.529	12.680	0.005	0.637	0.038	0.363
S5	1.010	0.163	1.559	13.000	0.026	0.639	0.038	0.361
S6	0.922	0.140	1.344	11.369	0.015	0.630	0.037	0.356

MSE/ACTUAL

RW	9.464	5.704	54.709	506.250	0.000	0.275	0.040	0.380
AC	1.725	0.842	8.077	53.029	0.000	0.285	0.042	0.401
PC	1.367	0.618	5.930	51.924	0.000	0.334	0.041	0.391
MA	7.336	3.480	33.381	279.810	0.000	0.275	0.040	0.320
ES	5.136	2.239	21.479	162.987	0.001	0.239	0.038	0.366
Re	6.461	4.482	42.993	403.396	0.000	0.302	0.042	0.407
S1	2.797	1.495	14.342	135.111	0.000	0.526	0.043	0.412
S2	3.106	1.695	16.253	153.398	0.000	0.531	0.043	0.417
S3	3.356	1.804	17.300	162.830	0.000	0.537	0.044	0.420
S4	3.318	1.782	17.094	160.901	0.000	0.536	0.044	0.420
S5	3.423	1.876	17.991	169.684	0.001	0.536	0.044	0.420
S6	2.637	1.431	13.724	129.594	0.000	0.522	0.043	0.411

MAPE/FORECAST

RW	0.562	0.122	1.173	8.597	0.002	0.350	0.035	0.338
AC	56.444	55.444	531.798	5101.733	0.001	0.380	0.039	0.376
PC	1.609	0.412	3.954	30.735	0.008	0.462	0.040	0.381
MA	1.438	0.592	5.683	53.731	0.006	0.406	0.039	0.370
ES	1.227	0.260	2.495	19.528	0.031	0.381	0.037	0.352
Re	1.285	0.326	3.126	18.419	0.003	0.393	0.039	0.370
S1	3.280	1.046	10.037	70.819	0.000	0.528	0.043	0.410
S2	3.130	1.014	9.730	70.819	0.000	0.519	0.042	0.402
S3	2.964	0.944	9.054	63.877	0.000	0.515	0.041	0.396
S4	2.985	0.952	9.128	64.603	0.000	0.516	0.041	0.397
S5	2.985	0.966	9.269	67.243	0.000	0.515	0.041	0.394
S6	3.466	1.124	10.783	78.342	0.000	0.537	0.043	0.409

MSE/FORECAST

RW	1.678	0.890	8.532	73.931	0.000	0.235	0.037	0.356
AC	282920	282909	>1000000	>1000000	0.000	0.253	0.038	0.360
PC	18.053	10.578	101.464	945.091	0.000	0.357	0.044	0.418
MA	34.013	31.394	301.116	2887.649	0.000	0.301	0.042	0.401
ES	7.663	4.521	43.365	382.541	0.001	0.268	0.039	0.370
Re	11.315	5.206	49.933	339.380	0.000	0.290	0.042	0.400
S1	110.408	61.248	587.468	5015.32	0.000	0.445	0.045	0.431
S2	103.448	59.557	571.248	5015.32	0.000	0.429	0.044	0.423
S3	89.859	49.823	477.887	4080.273	0.000	0.421	0.043	0.417
S4	91.325	50.798	487.238	4173.484	0.000	0.422	0.044	0.418
S5	93.892	53.858	516.588	4521.656	0.000	0.419	0.043	0.417
S6	127.019	73.038	700.560	6137.39	0.000	0.454	0.045	0.436

1983

MAPE/ACTUAL

RW	1.032	0.247	2.373	16.825	0.004	0.471	0.036	0.347
AC	0.815	0.145	1.394	7.294	0.003	0.414	0.037	0.358
PC	0.553	0.068	0.648	3.173	0.008	0.454	0.036	0.343
MA	0.503	0.118	1.131	10.525	0.006	0.434	0.034	0.322
ES	0.512	0.072	0.694	6.242	0.025	0.402	0.034	0.323
Re	0.760	0.108	1.037	7.348	0.001	0.480	0.040	0.379
S1	1.215	0.186	1.782	12.601	0.002	0.691	0.037	0.353
S2	1.257	0.196	1.875	13.359	0.007	0.691	0.037	0.359
S3	1.287	0.200	1.920	13.474	0.010	0.694	0.037	0.360
S4	1.284	0.200	1.915	13.471	0.007	0.694	0.037	0.359
S5	1.230	0.190	1.820	12.960	0.008	0.691	0.037	0.356
S6	1.115	0.164	1.571	11.372	0.008	0.687	0.034	0.326

MSE/ACTUAL

RW	6.635	3.826	36.700	283.218	0.000	0.341	0.041	0.394
AC	2.587	0.894	8.570	53.245	0.000	0.351	0.044	0.419
PC	0.721	0.166	1.593	10.116	0.000	0.323	0.040	0.384
MA	1.518	1.206	11.567	110.913	0.000	0.291	0.038	0.361
ES	0.739	0.430	4.126	39.285	0.001	0.264	0.037	0.358
Re	1.642	0.612	5.874	54.007	0.000	0.372	0.043	0.415
S1	4.617	2.046	19.622	158.833	0.000	0.600	0.043	0.413
S2	5.058	2.255	21.629	178.627	0.000	0.604	0.044	0.418
S3	5.305	2.343	22.469	181.838	0.000	0.610	0.044	0.420
S4	5.277	2.332	22.364	181.652	0.000	0.609	0.044	0.419
S5	4.792	2.137	20.502	168.168	0.000	0.602	0.043	0.416
S6	3.684	1.646	15.784	129.514	0.000	0.577	0.041	0.398

MAPE/FORECAST

RW	0.658	0.107	1.029	5.610	0.004	0.403	0.034	0.325
AC	0.980	0.239	2.289	19.842	0.003	0.460	0.039	0.376
PC	1.321	0.333	3.193	22.394	0.008	0.516	0.039	0.370
MA	1.378	0.556	5.330	39.127	0.006	0.524	0.037	0.354
ES	1.191	0.278	2.670	23.889	0.026	0.479	0.037	0.354
Re	0.661	0.175	1.677	14.128	0.001	0.373	0.031	0.295
S1	1.794	0.551	5.290	45.165	0.000	0.526	0.039	0.378
S2	1.736	0.535	5.133	43.958	0.000	0.519	0.039	0.379
S3	1.676	0.513	4.920	42.046	0.000	0.518	0.039	0.378
S4	1.679	0.515	4.936	42.201	0.000	0.519	0.039	0.378
S5	1.778	0.546	5.235	44.626	0.000	0.523	0.039	0.378
S6	2.049	0.629	6.029	51.342	0.000	0.553	0.039	0.376

MSE/FORECAST

RW	1.480	0.512	4.910	31.518	0.000	0.267	0.038	0.362
AC	2.587	0.894	8.570	53.245	0.000	0.298	0.041	0.390
PC	11.830	6.746	64.702	501.805	0.000	0.402	0.045	0.428
MA	30.003	20.788	199.390	1531.405	0.000	0.399	0.043	0.411
ES	8.470	6.247	59.924	571.908	0.001	0.354	0.042	0.405
Re	3.218	2.240	21.482	199.629	0.000	0.225	0.031	0.301
S1	30.894	22.457	215.404	2039.889	0.000	0.418	0.042	0.400
S2	29.071	21.252	203.844	1932.296	0.000	0.412	0.042	0.401
S3	26.754	19.465	186.703	1767.840	0.000	0.410	0.042	0.401
S4	26.918	19.607	188.063	1780.892	0.000	0.410	0.042	0.401
S5	30.271	21.929	210.339	1991.480	0.000	0.415	0.042	0.400
S6	40.155	29.019	278.337	2635.986	0.000	0.445	0.043	0.410

Appendix 35.

COMPARISON OF THE ERROR MEASURES FOR THE OPTIMAL PREDICTION FORM OF EACH MODEL FOR FORECASTING PROFIT (92 COMPANIES)

BEST MODEL;

	Non-t. 1981	Trunc. 1981	Non-t. 1982	Trunc. 1982	Non-t. 1983	Trunc. 1983
Absolute Ch	4 yr.	5 yr.	5 yr.	5 yr.	4 yr.	5 yr.
Percentage Ch	4 yr.	3 yr.	3 yr.	3 yr.	4 yr.	3 yr.
Moving Average	3 yr.	2 yr.	6 yr.	2 yr.	2 yr.	2 yr.
Exponential Sm.	0.40	0.95	0.15	0.85	0.90	0.95

	NON-TRUNCATED					TRUNCATED (Max 1.0)		
	MEAN	STD. ERROR	STD. DEV.	RANGE	MININMUM	MEAN	STD. ERROR	STD. DEV.
1981								
MAPE/ACTUAL								
RW	0.617	0.074	0.709	3.676	0.011	0.455	0.037	0.353
AC	1.848	0.667	6.397	58.185	0.002	0.475	0.041	0.393
PC	1.037	0.148	1.421	9.271	0.002	0.525	0.041	0.393
MA	1.658	0.397	3.811	30.878	0.009	0.501	0.039	0.377
ES	1.431	0.336	3.224	22.188	0.003	0.474	0.039	0.375
Re	2.380	0.676	6.484	53.078	0.023	0.586	0.033	0.318
S1	2.645	0.550	5.276	31.837	0.012	0.732	0.036	0.347
S2	2.790	0.584	5.601	34.225	0.003	0.729	0.037	0.354
S3	2.890	0.611	5.856	35.363	0.001	0.733	0.037	0.354
S4	2.884	0.609	5.841	35.324	0.004	0.733	0.037	0.354
S5	3.174	0.677	6.490	39.565	0.020	0.741	0.037	0.353
S6	2.796	0.587	5.629	34.302	0.007	0.728	0.037	0.355
MSE/ACTUAL								
RW	0.878	0.208	1.994	13.589	0.000	0.330	0.041	0.389
AC	48.895	36.916	354.084	3385.728	0.000	0.333	0.041	0.391
PC	3.073	1.051	10.077	85.989	0.000	0.397	0.046	0.445
MA	18.965	10.827	103.851	954.057	0.000	0.391	0.045	0.428
ES	12.327	5.975	57.306	492.408	0.000	0.364	0.044	0.420
Re	47.248	31.338	300.580	2819.676	0.001	0.444	0.040	0.384
S1	34.525	14.943	143.333	1014.371	0.000	0.654	0.043	0.417
S2	38.816	16.765	160.803	1171.593	0.000	0.655	0.044	0.419
S3	42.275	18.378	176.273	1250.619	0.000	0.661	0.044	0.419
S4	42.060	18.283	175.360	1248.084	0.000	0.661	0.044	0.419
S5	51.731	22.463	215.461	1566.954	0.000	0.672	0.044	0.425
S6	39.159	16.922	162.311	1177.153	0.000	0.655	0.044	0.419

MAPE/FORECAST

RW	1.477	0.501	4.804	43.068	0.011	0.468	0.040	0.379
AC	1.019	0.281	2.691	20.111	0.003	0.446	0.039	0.369
PC	1.252	0.397	3.805	35.102	0.002	0.488	0.039	0.374
MA	1.800	0.883	8.466	76.361	0.009	0.466	0.035	0.333
ES	1.365	0.587	5.633	53.185	0.003	0.458	0.036	0.348
Re	1.665	0.782	7.496	72.496	0.023	0.665	0.035	0.335
S1	1.805	0.593	5.692	45.290	0.000	0.592	0.042	0.401
S2	1.717	0.563	5.401	43.011	0.000	0.582	0.042	0.403
S3	1.655	0.536	5.141	41.009	0.000	0.580	0.042	0.402
S4	1.659	0.538	5.158	41.157	0.000	0.580	0.042	0.402
S5	1.539	0.490	4.700	37.581	0.000	0.577	0.042	0.398
S6	1.720	0.563	5.404	43.037	0.000	0.583	0.042	0.403

MSE/FORECAST

RW	25.008	20.242	194.154	1844.797	0.000	0.361	0.044	0.425
AC	8.203	5.024	48.992	404.536	0.000	0.378	0.045	0.431
PC	15.887	13.403	128.555	1232.325	0.000	0.376	0.042	0.405
MA	74.141	64.005	613.916	5832.516	0.000	0.327	0.038	0.369
ES	33.243	30.747	294.913	2828.952	0.000	0.392	0.040	0.386
Re	58.353	57.055	547.255	5250.347	0.001	0.553	0.042	0.401
S1	35.303	23.996	230.163	2051.181	0.000	0.509	0.045	0.431
S2	31.801	21.652	207.679	1849.915	0.000	0.500	0.045	0.430
S3	28.879	19.368	188.363	1681.736	0.000	0.496	0.045	0.439
S4	29.064	19.777	189.697	1693.921	0.000	0.496	0.045	0.429
S5	24.207	16.482	158.086	1412.355	0.000	0.489	0.045	0.429
S6	31.844	21.676	207.909	1852.176	0.000	0.501	0.045	0.430

1982

MAPE/ACTUAL

RW	1.104	0.301	2.887	22.498	0.002	0.383	0.038	0.361
AC	0.580	0.124	1.189	7.281	0.001	0.364	0.036	0.349
PC	0.626	0.096	0.921	6.858	0.005	0.451	0.038	0.364
MA	1.177	0.256	2.453	16.721	0.006	0.384	0.037	0.359
ES	1.097	0.207	1.988	10.846	0.000	0.353	0.035	0.340
Re	1.129	0.237	2.273	15.836	0.004	0.460	0.037	0.354
S1	0.943	0.145	1.389	11.621	0.003	0.629	0.038	0.363
S2	0.974	0.154	1.477	12.383	0.003	0.633	0.038	0.363
S3	1.008	0.160	1.538	12.757	0.003	0.638	0.038	0.363
S4	1.003	0.159	1.529	12.680	0.005	0.637	0.038	0.363
S5	1.010	0.163	1.559	13.000	0.026	0.639	0.038	0.361
S6	0.922	0.140	1.344	11.369	0.015	0.630	0.037	0.356

MSE/ACTUAL

RW	9.464	5.704	54.709	506.250	0.000	0.275	0.040	0.380
AC	1.735	0.848	8.077	53.029	0.000	0.285	0.042	0.401
PC	1.230	0.550	5.272	47.099	0.000	0.334	0.041	0.391
MA	7.336	3.480	33.381	279.810	0.000	0.275	0.040	0.385
ES	5.113	2.066	19.818	117.633	0.000	0.239	0.038	0.366
Re	6.385	3.020	28.965	250.884	0.000	0.335	0.042	0.406
S1	2.797	1.495	14.342	135.111	0.000	0.526	0.043	0.412
S2	3.106	1.695	16.253	153.398	0.000	0.531	0.043	0.417
S3	3.356	1.804	17.300	162.830	0.000	0.537	0.044	0.420
S4	3.318	1.782	17.094	160.901	0.000	0.536	0.044	0.420
S5	3.423	1.876	17.991	169.684	0.001	0.536	0.044	0.420
S6	2.637	1.431	13.724	129.594	0.000	0.522	0.043	0.411

MAPE/FORECAST

RW	0.562	0.122	1.173	8.597	0.002	0.350	0.035	0.338
AC	56.444	55.444	531.798	5101.733	0.001	0.380	0.039	0.376
PC	1.716	0.466	4.469	35.293	0.005	0.462	0.040	0.381
MA	1.438	0.592	5.683	53.731	0.006	0.406	0.039	0.370
ES	4.243	3.127	29.992	288.268	0.000	0.381	0.037	0.352
Re	1.042	0.358	3.435	32.201	0.004	0.458	0.037	0.350
S1	3.280	1.046	10.037	70.819	0.000	0.528	0.043	0.410
S2	3.130	1.014	9.730	70.819	0.000	0.519	0.042	0.402
S3	2.964	0.944	9.054	63.877	0.000	0.515	0.041	0.396
S4	2.985	0.952	9.128	64.603	0.000	0.516	0.041	0.397
S5	2.985	0.966	9.269	67.243	0.000	0.515	0.041	0.394
S6	3.466	1.124	10.783	78.342	0.000	0.537	0.043	0.409

MSE/FORECAST

RW	1.678	0.890	8.532	73.931	0.000	0.235	0.037	0.356
AC	282920	282909	>1000000	>1000000	0.000	0.253	0.038	0.360
PC	22.703	13.894	133.266	1245.990	0.000	0.357	0.044	0.418
MA	34.013	31.394	301.116	2887.649	0.000	0.301	0.042	0.401
ES	907.714	903.20	8663.20	83098.56	0.000	0.268	0.039	0.370
Re	12.759	11.273	108.122	1037.124	0.000	0.331	0.041	0.396
S1	110.408	61.248	587.468	5015.32	0.000	0.445	0.045	0.431
S2	103.448	59.557	571.248	5015.32	0.000	0.429	0.044	0.423
S3	89.859	49.823	477.887	4080.273	0.000	0.421	0.043	0.417
S4	91.325	50.798	487.238	4173.484	0.000	0.422	0.044	0.418
S5	93.892	53.858	516.588	4521.656	0.000	0.419	0.043	0.417
S6	127.019	73.038	700.560	6137.39	0.000	0.454	0.045	0.436

1983

MAPE/ACTUAL

RW	1.032	0.247	2.373	16.825	0.004	0.471	0.036	0.347
AC	0.879	0.158	1.516	7.807	0.000	0.414	0.037	0.358
PC	0.553	0.068	0.648	3.173	0.008	0.454	0.036	0.343
MA	0.591	0.076	0.733	3.776	0.002	0.434	0.034	0.322
ES	0.636	0.101	0.964	5.217	0.002	0.403	0.034	0.324
Re	0.553	0.081	0.776	5.805	0.012	0.417	0.032	0.310
S1	1.215	0.186	1.782	12.601	0.002	0.691	0.037	0.353
S2	1.257	0.196	1.875	13.359	0.007	0.691	0.037	0.359
S3	1.287	0.200	1.920	13.474	0.010	0.694	0.037	0.360
S4	1.284	0.200	1.915	13.471	0.007	0.694	0.037	0.359
S5	1.230	0.190	1.820	12.960	0.008	0.691	0.037	0.356
S6	1.115	0.164	1.571	11.372	0.008	0.687	0.034	0.326

MSE/ACTUAL

RW	6.635	3.826	36.700	283.218	0.000	0.341	0.041	0.394
AC	3.046	1.041	9.988	60.951	0.000	0.351	0.044	0.419
PC	0.721	0.166	1.593	10.116	0.000	0.323	0.040	0.384
MA	0.882	0.245	2.348	14.277	0.000	0.291	0.038	0.361
ES	1.324	0.443	4.253	27.244	0.000	0.266	0.038	0.361
Re	0.903	0.389	3.729	33.838	0.000	0.269	0.036	0.346
S1	4.617	2.046	19.622	158.833	0.000	0.600	0.043	0.413
S2	5.058	2.255	21.629	178.627	0.000	0.604	0.044	0.418
S3	5.305	2.343	22.469	181.838	0.000	0.610	0.044	0.420
S4	5.277	2.332	22.364	181.652	0.000	0.609	0.044	0.419
S5	4.792	2.137	20.502	168.168	0.000	0.602	0.043	0.416
S6	3.684	1.646	15.784	129.514	0.000	0.577	0.041	0.398

MAPE/FORECAST

RW	0.658	0.107	1.029	5.610	0.004	0.403	0.034	0.325
AC	1.273	0.432	4.148	37.771	0.000	0.460	0.039	0.376
PC	1.321	0.333	3.193	22.394	0.008	0.516	0.039	0.370
MA	4.907	3.709	35.573	341.126	0.002	0.524	0.037	0.354
ES	1.265	0.483	4.636	43.744	0.000	0.474	0.036	0.348
Re	1.770	0.536	5.144	38.401	0.012	0.476	0.035	0.338
S1	1.794	0.551	5.290	45.165	0.000	0.526	0.039	0.378
S2	1.736	0.535	5.133	43.958	0.000	0.519	0.039	0.379
S3	1.676	0.513	4.920	42.046	0.000	0.518	0.039	0.378
S4	1.679	0.515	4.936	42.201	0.000	0.519	0.039	0.378
S5	1.778	0.546	5.235	44.626	0.000	0.523	0.039	0.378
S6	2.049	0.629	6.029	51.342	0.000	0.553	0.039	0.376

MSE/FORECAST

RW	1.480	0.512	4.910	31.518	0.000	0.267	0.038	0.362
AC	18.637	15.535	149.007	1426.619	0.000	0.298	0.041	0.390
PC	11.830	6.746	64.702	501.805	0.000	0.402	0.045	0.428
MA	1275.73	1264.8	12131.4	116368.4	0.000	0.399	0.043	0.411
ES	22.861	20.796	199.467	1913.745	0.000	0.345	0.041	0.396
Re	29.311	17.246	165.416	1475.608	0.000	0.339	0.040	0.386
S1	30.894	22.457	215.404	2039.889	0.000	0.418	0.042	0.400
S2	29.071	21.252	203.844	1932.296	0.000	0.412	0.042	0.401
S3	26.754	19.465	186.703	1767.840	0.000	0.410	0.042	0.401
S4	26.918	19.607	188.063	1780.892	0.000	0.410	0.042	0.401
S5	30.271	21.929	210.339	1991.480	0.000	0.415	0.042	0.400
S6	40.155	29.019	278.337	2635.986	0.000	0.445	0.043	0.410

Appendix 36.

T-TESTS OF THE NON-TRUNCATED ERRORS FOR THE OPTIMAL PREDICTION MODELS FOR FORECASTING PROFIT (92 COS.)

	(DIFFERENCE) MEAN	STANDARD DEVIATION	STANDARD ERROR	CORR.	2-TAIL PROB.	T VALUE	2-TAIL PROB.
1981							
MAPE/ACTUAL							
RW/AC	-0.2590	1.137	0.119	0.997	0.000	-2.18	0.032
RW/PC	0.4405	4.424	0.461	0.404	0.000	0.95	0.342
RW/MA	-0.0611	4.587	0.478	0.388	0.000	-0.13	0.899
RW/ES	0.0849	4.411	0.460	0.417	0.000	0.18	0.854
RW/Re	-0.9032	6.065	0.632	0.455	0.000	-1.43	0.157
RW/S1	-1.1675	5.428	0.566	0.423	0.000	-2.06	0.042
RW/S2	-1.3131	5.571	0.581	0.435	0.000	-2.26	0.026
RW/S3	-1.4131	5.802	0.605	0.421	0.000	-2.34	0.022
RW/S4	-1.4071	5.788	0.603	0.422	0.000	-2.33	0.022
RW/S5	-1.6946	6.180	0.644	0.432	0.000	-2.63	0.010
RW/S6	-1.3187	5.591	0.583	0.435	0.000	-2.26	0.026
AC/PC	0.6995	5.511	0.575	0.366	0.000	1.22	0.227
AC/MA	0.1978	5.519	0.575	0.372	0.000	0.34	0.732
AC/ES	0.3439	5.377	0.561	0.404	0.000	0.61	0.541
AC/Re	-0.6442	6.512	0.679	0.448	0.000	-0.95	0.345
AC/S1	-0.9085	5.981	0.624	0.428	0.000	-1.46	0.149
AC/S2	-1.0542	6.071	0.633	0.441	0.000	-1.67	0.099
AC/S3	-1.1541	6.278	0.655	0.427	0.000	-1.76	0.081
AC/S4	-1.1481	6.267	0.653	0.427	0.000	-1.76	0.082
AC/S5	-1.4356	6.571	0.685	0.438	0.000	-2.10	0.039
AC/S6	-1.0597	6.089	0.635	0.440	0.000	-1.67	0.098
PC/MA	-0.5016	2.460	0.257	0.614	0.000	-1.96	0.054
PC/ES	-0.3556	2.090	0.218	0.610	0.000	-1.63	0.106
PC/Re	-1.3437	6.166	0.643	0.328	0.001	-2.09	0.039
PC/S1	-1.6080	5.254	0.548	0.150	0.153	-2.94	0.004
PC/S2	-1.7536	5.570	0.581	0.148	0.158	-3.02	0.003
PC/S3	-1.8535	5.815	0.606	0.150	0.154	-3.06	0.003
PC/S4	-1.8476	5.800	0.605	0.150	0.154	-3.06	0.003
PC/S5	-2.1351	6.430	0.670	0.148	0.159	-3.18	0.002
PC/S6	-1.7592	5.597	0.583	0.149	0.156	-3.01	0.003
MA/ES	0.1461	0.601	0.063	0.989	0.000	2.33	0.022
MA/Re	-0.8420	4.513	0.471	0.782	0.000	-1.79	0.077
MA/S1	-1.1064	5.966	0.622	0.050	0.636	-1.78	0.079
MA/S2	-1.2520	6.245	0.651	0.051	0.629	-1.92	0.058
MA/S3	-1.3519	6.477	0.675	0.048	0.651	-2.00	0.048
MA/S4	-1.3460	6.463	0.674	0.048	0.650	-2.00	0.049
MA/S5	-1.6334	7.037	0.734	0.048	0.648	-2.23	0.028
MA/S6	-1.2575	6.269	0.654	0.051	0.627	-1.92	0.057
ES/Re	-0.9881	4.851	0.506	0.746	0.000	-1.95	0.054
ES/S1	-1.2524	5.653	0.589	0.100	0.342	-2.12	0.036
ES/S2	-1.3980	5.938	0.619	0.102	0.332	-2.26	0.026
ES/S3	-1.4980	6.179	0.644	0.098	0.353	-2.33	0.022
ES/S4	-1.4920	6.165	0.643	0.098	0.352	-2.32	0.022
ES/S5	-1.7795	6.751	0.704	0.099	0.346	-2.53	0.013
ES/S6	-1.4036	5.963	0.622	0.103	0.331	-2.26	0.026

Re/S1	-0.2643	7.559	0.788	0.186	0.076	-0.34	0.738
Re/S2	-0.4099	7.721	0.805	0.190	0.070	-0.51	0.612
Re/S3	-0.5099	7.897	0.823	0.184	0.079	-0.62	0.537
Re/S4	-0.5039	7.886	0.822	0.184	0.079	-0.61	0.541
Re/S5	-0.7914	8.268	0.862	0.187	0.074	-0.92	0.361
Re/S6	-0.4155	7.737	0.807	0.190	0.070	-0.52	0.608
S1/2	-0.1456	0.386	0.040	0.999	0.000	-3.62	0.000
S1/3	-0.2456	0.588	0.061	1.000	0.000	-4.01	0.000
S1/4	-0.2396	0.572	0.060	1.000	0.000	-4.02	0.000
S1/5	-0.5271	1.236	0.129	0.999	0.000	-4.09	0.000
S1/6	-0.1512	0.402	0.042	0.999	0.000	-3.60	0.001
S2/3	-0.0999	0.341	0.036	0.999	0.000	-2.81	0.006
S2/4	-0.0940	0.319	0.033	0.999	0.000	-2.82	0.006
S2/5	-0.3815	0.895	0.093	1.000	0.000	-4.09	0.000
S2/6	-0.0056	0.045	0.005	1.000	0.000	-1.19	0.238
S3/4	0.0060	0.022	0.002	1.000	0.000	2.58	0.011
S3/5	-0.2815	0.668	0.070	0.999	0.000	-4.04	0.000
S3/6	0.0944	0.310	0.032	0.999	0.000	2.92	0.004
S4/5	-0.2875	0.678	0.071	0.999	0.000	-4.07	0.000
S4/6	0.0884	0.289	0.030	0.999	0.000	2.94	0.004
S5/6	0.3759	0.866	0.090	1.000	0.000	4.16	0.000

MSE/ACTUAL

RW/AC	-12.0917	100.520	10.480	1.000	0.000	-1.15	0.252
RW/PC	21.9342	193.502	20.174	0.091	0.391	1.09	0.280
RW/MA	13.3670	194.339	20.261	0.104	0.324	0.66	0.511
RW/ES	16.2418	192.273	20.046	0.140	0.182	0.81	0.420
RW/Re	-22.2419	323.433	33.720	0.201	0.055	-0.66	0.511
RW/S1	-9.5178	188.966	19.701	0.405	0.000	-0.48	0.630
RW/S2	-13.8089	191.652	19.981	0.430	0.000	-0.69	0.491
RW/S3	-17.2678	203.435	21.210	0.400	0.000	-0.81	0.418
RW/S4	-17.0528	202.789	21.142	0.401	0.000	-0.81	0.422
RW/S5	-26.6503	220.795	23.019	0.422	0.000	-1.16	0.250
RW/S6	-14.1516	192.553	20.075	0.428	0.000	-0.70	0.483
AC/PC	34.0259	293.989	30.651	0.070	0.510	1.11	0.270
AC/MA	25.4587	293.679	30.618	0.091	0.386	0.83	0.408
AC/ES	28.3335	292.148	30.459	0.129	0.222	0.93	0.355
AC/Re	-10.1502	376.490	39.252	0.200	0.056	-0.26	0.797
AC/S1	2.5739	270.282	28.179	0.405	0.000	0.09	0.927
AC/S2	-1.7172	268.044	27.946	0.430	0.000	-0.06	0.951
AC/S3	-5.1761	276.063	28.782	0.401	0.000	-0.18	0.858
AC/S4	-4.9611	275.643	28.738	0.402	0.000	-0.17	0.863
AC/S5	-14.5586	281.960	29.396	0.422	0.000	-0.50	0.622
AC/S6	-2.0599	268.554	27.999	0.428	0.000	-0.07	0.942
PC/MA	-8.5672	36.269	3.781	0.657	0.000	-2.27	0.026
PC/ES	-5.6924	25.693	2.679	0.656	0.000	-2.13	0.036
PC/Re	-44.1760	300.123	31.290	0.062	0.556	-1.41	0.161
PC/S1	-31.4520	143.413	14.952	0.027	0.797	-2.10	0.038
PC/S2	-35.7431	160.859	16.771	0.026	0.807	-2.13	0.036
PC/S3	-39.2019	176.285	18.379	0.027	0.795	-2.13	0.036
PC/S4	-38.9870	175.374	18.284	0.027	0.796	-2.13	0.036
PC/S5	-48.5845	215.110	22.427	0.027	0.801	-2.17	0.033
PC/S6	-36.0858	162.359	16.927	0.026	0.804	-2.13	0.036
MA/ES	2.8748	13.503	1.408	0.976	0.000	2.04	0.044
MA/Re	-35.6089	276.246	28.801	0.625	0.000	-1.24	0.219
MA/S1	-22.8848	150.026	15.641	0.016	0.880	-1.46	0.147
MA/S2	-27.1759	166.790	17.389	0.014	0.894	-1.56	0.122

MA/S3	-30.6348	181.890	18.963	0.016	0.878	-1.62	0.110
MA/S4	-30.4198	180.998	18.870	0.016	0.879	-1.61	0.110
MA/S5	-40.0173	219.813	22.917	0.014	0.892	-1.75	0.084
MA/S6	-27.5186	168.249	17.541	0.014	0.894	-1.57	0.120
ES/Re	-38.4836	286.183	29.837	0.503	0.000	-1.29	0.200
ES/S1	-25.7596	146.425	15.266	0.008	0.937	-1.69	0.095
ES/S2	-30.0507	163.441	17.040	0.012	0.913	-1.76	0.081
ES/S3	-33.5095	178.761	18.637	0.008	0.940	-1.80	0.075
ES/S4	-33.2946	177.857	18.543	0.008	0.939	-1.80	0.076
ES/S5	-42.8921	217.048	22.629	0.011	0.918	-1.90	0.061
ES/S6	-30.3934	164.922	17.194	0.011	0.913	-1.77	0.080
Re/S1	12.7240	324.712	33.854	0.063	0.549	0.38	0.708
Re/S2	8.4330	331.038	34.513	0.068	0.517	0.24	0.808
Re/S3	4.9741	338.848	35.327	0.062	0.555	0.14	0.888
Re/S4	5.1891	338.383	35.279	0.063	0.553	0.15	0.883
Re/S5	-4.4085	357.751	37.298	0.067	0.526	-0.12	0.906
Re/S6	8.0903	331.729	34.585	0.068	0.519	0.23	0.816
S1/2	-4.2911	20.234	2.110	0.998	0.000	-2.03	0.045
S1/3	-7.7499	32.959	3.436	1.000	0.000	-2.26	0.027
S1/4	-7.5350	32.048	3.341	1.000	0.000	-2.26	0.027
S1/5	-17.1325	72.476	7.556	0.998	0.000	-2.27	0.026
S1/6	-4.6338	21.038	2.193	0.998	0.000	-2.11	0.037
S2/3	-3.4589	19.516	2.035	0.998	0.000	-1.70	0.093
S2/4	-3.2439	18.259	1.904	0.998	0.000	-1.70	0.092
S2/5	-12.8414	54.400	5.672	1.000	0.000	-2.26	0.026
S2/6	-0.3427	2.027	0.211	1.000	0.000	-1.62	0.108
S3/4	0.2150	1.294	0.135	1.000	0.000	1.59	0.115
S3/5	-9.3826	40.509	4.223	0.998	0.000	-2.22	0.029
S3/6	3.1162	17.576	1.832	0.998	0.000	1.70	0.092
S4/5	-9.5975	41.117	4.287	0.999	0.000	-2.24	0.028
S4/6	2.9012	16.326	1.702	0.998	0.000	1.70	0.092
S5/6	12.4987	52.858	5.511	1.000	0.000	2.27	0.026

MAPE/FORECAST

RW/AC	-0.0669	0.676	0.070	0.852	0.000	-0.95	0.345
RW/PC	-0.6352	3.741	0.390	0.183	0.081	-1.63	0.107
RW/MA	-0.3431	2.078	0.217	0.085	0.419	-1.58	0.117
RW/ES	-0.3203	1.056	0.110	0.218	0.037	-2.91	0.005
RW/Re	-1.0483	7.392	0.771	0.196	0.061	-1.36	0.177
RW/S1	-1.1884	5.791	0.604	-0.079	0.452	-1.97	0.052
RW/S2	-1.1005	5.502	0.574	-0.079	0.454	-1.92	0.058
RW/S3	-1.0380	5.244	0.547	-0.078	0.457	-1.90	0.061
RW/S4	-1.0417	5.261	0.549	-0.079	0.457	-1.90	0.061
RW/S5	-0.9226	4.809	0.501	-0.079	0.456	-1.84	0.069
RW/S6	-1.1029	5.506	0.574	-0.079	0.453	-1.92	0.058
AC/PC	-0.5683	3.814	0.398	0.146	0.165	-1.43	0.156
AC/MA	-0.2762	2.280	0.238	0.048	0.647	-1.16	0.248
AC/ES	-0.2534	1.432	0.149	0.101	0.340	-1.70	0.093
AC/Re	-0.9814	7.533	0.785	0.049	0.645	-1.25	0.215
AC/S1	-1.1215	5.886	0.614	-0.066	0.532	-1.83	0.071
AC/S2	-1.0336	5.600	0.584	-0.065	0.535	-1.77	0.080
AC/S3	-0.9711	5.346	0.557	-0.065	0.537	-1.74	0.085
AC/S4	-0.9748	5.362	0.559	-0.065	0.537	-1.74	0.085
AC/S5	-0.8556	4.917	0.513	-0.065	0.538	-1.67	0.099
AC/S6	-1.0360	5.604	0.584	-0.066	0.534	-1.77	0.080
PC/MA	0.2621	5.604	0.584	-0.066	0.538	-1.67	0.099
PC/ES	0.3149	3.798	0.396	0.132	0.210	0.80	0.429

PC/Re	-0.4131	8.151	0.850	0.075	0.479	-0.49	0.622
PC/S1	-0.5532	5.204	0.543	0.457	0.000	-1.02	0.311
PC/S2	-0.4653	4.976	0.519	0.460	0.000	-0.90	0.372
PC/S3	-0.4028	4.806	0.501	0.455	0.000	-0.80	0.424
PC/S4	-0.4065	4.819	0.502	0.455	0.000	-0.81	0.421
PC/S5	-0.2873	4.501	0.469	0.456	0.000	-0.61	0.542
PC/S6	-0.4677	4.979	0.519	0.459	0.000	-0.90	0.370
MA/ES	0.0228	1.586	0.165	0.638	0.000	0.14	0.891
MA/Re	-0.7052	7.189	0.750	0.285	0.006	-0.94	0.349
MA/S1	-0.8453	5.822	0.607	0.112	0.290	-1.39	0.167
MA/S2	-0.7574	5.546	0.578	0.114	0.281	-1.31	0.193
MA/S3	-0.6949	5.308	0.553	0.112	0.290	-1.26	0.212
MA/S4	-0.6986	5.324	0.555	0.112	0.289	-1.26	0.211
MA/S5	-0.5795	4.899	0.511	0.114	0.281	-1.13	0.260
MA/S6	-0.7598	5.548	0.578	0.114	0.280	-1.31	0.192
ES/Re	-0.7280	6.864	0.716	0.702	0.000	-1.02	0.312
ES/S1	-0.8681	5.754	0.600	0.018	0.865	-1.45	0.151
ES/S2	-0.7802	5.467	0.570	0.018	0.865	-1.37	0.174
ES/S3	-0.7177	5.213	0.543	0.016	0.876	-1.32	0.190
ES/S4	-0.7214	5.229	0.545	0.017	0.876	-1.32	0.189
ES/S5	-0.6023	4.781	0.498	0.016	0.882	-1.21	0.230
ES/S6	-0.7826	5.470	0.570	0.018	0.864	-1.37	0.173
Re/S1	-0.1401	9.430	0.983	-0.004	0.973	-0.14	0.887
Re/S2	-0.0522	9.259	0.965	-0.004	0.969	-0.05	0.957
Re/S3	0.0103	9.118	0.951	-0.006	0.954	0.01	0.991
Re/S4	0.0066	9.127	0.952	-0.006	0.954	0.01	0.994
Re/S5	0.1257	8.882	0.926	-0.008	0.939	0.14	0.892
Re/S6	-0.0546	9.261	0.965	-0.004	0.970	-0.06	0.955
S1/2	0.0879	0.298	0.031	1.000	0.000	2.82	0.006
S1/3	0.1504	0.558	0.058	1.000	0.000	2.58	0.011
S1/4	0.1467	0.541	0.056	1.000	0.000	2.60	0.011
S1/5	0.2658	1.006	0.105	0.999	0.000	2.54	0.013
S1/6	0.0855	0.295	0.031	1.000	0.000	2.78	0.007
S2/3	0.0625	0.266	0.028	1.000	0.000	2.25	0.027
S2/4	0.0588	0.249	0.026	1.000	0.000	2.27	0.026
S2/5	0.1779	0.710	0.074	1.000	0.000	2.40	0.018
S2/6	-0.0024	0.011	0.001	1.000	0.000	-2.10	0.038
S3/4	-0.0037	0.018	0.002	1.000	0.000	-2.00	0.048
S3/5	0.1154	0.449	0.047	1.000	0.000	2.47	0.016
S3/6	-0.0649	0.270	0.028	1.000	0.000	-2.31	0.023
S4/5	0.1191	0.466	0.049	1.000	0.000	2.45	0.016
S4/6	-0.0612	0.252	0.026	1.000	0.000	-2.33	0.022
S5/6	-0.1803	0.713	0.074	1.000	0.000	-2.42	0.017

MSE/FORECAST

RW/AC	-0.9433	7.658	0.798	0.806	0.000	-1.18	0.240
RW/PC	-15.0087	128.612	13.409	-0.021	0.846	-1.12	0.266
RW/MA	-4.0582	35.637	3.715	-0.016	0.881	-1.09	0.278
RW/ES	-0.8968	5.345	0.557	0.149	0.156	-1.61	0.111
RW/Re	-57.5167	547.430	57.073	0.113	0.282	-1.01	0.316
RW/S1	-34.4247	230.289	24.009	-0.059	0.575	-1.43	0.155
RW/S2	-30.9233	207.806	21.665	-0.059	0.575	-1.43	0.157
RW/S3	-28.0005	188.491	19.652	-0.059	0.576	-1.42	0.158
RW/S4	-28.1861	189.825	19.791	-0.059	0.576	-1.42	0.158
RW/S5	-23.3462	158.298	16.504	-0.059	0.575	-1.41	0.161
RW/S6	-30.9657	208.037	21.689	-0.059	0.575	-1.43	0.157
AC/PC	-14.0654	128.920	13.441	-0.004	0.969	-1.05	0.298

AC/MA	-3.1149	36.816	3.838	-0.011	0.913	-0.81	0.419
AC/ES	0.0465	10.448	1.089	0.028	0.789	0.04	0.966
AC/Re	-56.5734	547.820	57.114	-0.010	0.925	-0.99	0.325
AC/S1	-33.4815	230.609	24.043	-0.029	0.785	-1.39	0.167
AC/S2	-29.9800	208.145	21.701	-0.029	0.785	-1.38	0.170
AC/S3	-27.0573	188.849	19.689	-0.029	0.786	-1.37	0.173
AC/S4	-27.2428	190.182	19.828	-0.029	0.786	-1.37	0.173
AC/S5	-22.4030	158.695	16.545	-0.029	0.786	-1.35	0.179
AC/S6	-30.0225	208.375	21.725	-0.029	0.785	-1.38	0.170
PC/MA	10.9505	129.847	13.537	0.102	0.334	0.81	0.421
PC/ES	14.1119	128.640	13.412	0.004	0.967	1.05	0.295
PC/Re	-42.5080	562.614	58.657	-0.001	0.995	-0.72	0.470
PC/S1	-19.4161	220.072	22.944	0.356	0.000	-0.85	0.400
PC/S2	-15.9146	201.297	20.987	0.358	0.000	-0.76	0.450
PC/S3	-12.9919	186.950	19.491	0.352	0.001	-0.67	0.507
PC/S4	-13.1774	188.007	19.601	0.352	0.001	-0.67	0.503
PC/S5	-8.3375	164.961	17.198	0.352	0.001	-0.48	0.629
PC/S6	-15.9570	201.524	21.010	0.358	0.000	-0.76	0.450
MA/ES	3.1614	33.881	3.532	0.383	0.000	0.89	0.373
MA/Re	-53.4585	545.645	56.887	0.089	0.400	-0.94	0.350
MA/S1	-30.3665	232.827	24.274	0.002	0.986	-1.25	0.214
MA/S2	-26.8651	210.622	21.959	0.002	0.983	-1.22	0.224
MA/S3	-23.9423	191.623	19.978	0.002	0.986	-1.20	0.234
MA/S4	-24.1279	192.934	20.115	0.002	0.986	-1.20	0.233
MA/S5	-19.2880	162.035	16.893	0.002	0.983	-1.14	0.257
MA/S6	-26.9075	210.849	21.983	0.002	0.983	-1.22	0.224
ES/Re	-56.6199	542.911	56.602	0.901	0.000	-1.00	0.320
ES/S1	-33.5280	230.361	24.017	-0.026	0.804	-1.40	0.166
ES/S2	-30.0265	207.884	21.673	-0.026	0.803	-1.39	0.169
ES/S3	-27.1038	188.575	19.660	-0.026	0.803	-1.38	0.171
ES/S4	-27.2893	189.909	19.799	-0.026	0.803	-1.38	0.171
ES/S5	-22.4495	158.394	16.514	-0.026	0.803	-1.36	0.177
ES/S6	-30.0690	208.114	21.697	-0.026	0.803	-1.39	0.169
Re/S1	23.0919	597.221	62.265	-0.015	0.887	0.37	0.712
Re/S2	26.5934	588.610	61.367	-0.015	0.887	0.43	0.666
Re/S3	29.5161	581.829	60.660	-0.015	0.886	0.49	0.628
Re/S4	29.3306	582.280	60.707	-0.015	0.886	0.48	0.630
Re/S5	34.1705	572.342	59.671	-0.015	0.886	0.57	0.568
Re/S6	26.5510	588.693	61.376	-0.015	0.887	0.43	0.666
S1/2	3.5015	22.511	2.347	1.000	0.000	1.49	0.139
S1/3	6.4242	41.811	4.359	1.000	0.000	1.47	0.144
S1/4	6.2387	40.480	4.220	1.000	0.000	1.48	0.143
S1/5	11.0785	72.013	7.508	1.000	0.000	1.48	0.144
S1/6	3.4590	22.278	2.323	1.000	0.000	1.49	0.140
S2/3	2.9227	19.367	2.019	1.000	0.000	1.45	0.151
S2/4	2.7372	18.039	1.881	1.000	0.000	1.46	0.149
S2/5	7.5771	49.529	5.164	1.000	0.000	1.47	0.146
S2/6	-0.0424	0.251	0.026	1.000	0.000	-1.62	0.109
S3/4	-0.1855	1.339	0.140	1.000	0.000	-1.33	0.187
S3/5	4.6543	30.209	3.149	1.000	0.000	1.48	0.143
S3/6	-2.9652	19.592	2.043	1.000	0.000	-1.45	0.150
S4/5	4.8398	31.540	3.288	1.000	0.000	1.47	0.145
S4/6	-2.7796	18.262	1.904	1.000	0.000	-1.46	0.148
S5/6	-7.6195	49.758	5.188	1.000	0.000	-1.47	0.145

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MAPE/ACTUAL

RW/AC	0.0003	0.775	0.081	0.774	0.000	0.00	0.997
RW/PC	-0.0919	0.437	0.046	0.934	0.000	-2.02	0.046
RW/MA	-0.0994	1.065	0.111	0.655	0.000	-0.90	0.373
RW/ES	0.0100	0.318	0.033	0.965	0.000	0.30	0.765
RW/Re	-0.5672	1.650	0.172	0.716	0.000	-3.30	0.001
RW/S1	-0.3805	1.836	0.191	-0.020	0.854	-1.99	0.050
RW/S2	-0.4118	1.912	0.199	-0.028	0.792	-2.07	0.042
RW/S3	-0.4453	1.964	0.205	-0.032	0.765	-2.17	0.032
RW/S4	-0.4410	1.956	0.204	-0.031	0.769	-2.16	0.033
RW/S5	-0.4472	1.982	0.207	-0.034	0.751	-2.16	0.033
RW/S6	-0.3600	1.799	0.188	-0.017	0.874	-1.92	0.058
AC/PC	-0.0922	0.887	0.093	0.651	0.000	-1.00	0.321
AC/MA	-0.0997	1.329	0.139	0.439	0.000	-0.72	0.473
AC/ES	0.0096	0.754	0.079	0.763	0.000	0.12	0.903
AC/Re	-0.5676	2.048	0.213	0.437	0.000	-2.66	0.009
AC/S1	-0.3808	1.785	0.186	0.003	0.976	-2.05	0.044
AC/S2	-0.4121	1.860	0.194	-0.003	0.975	-2.13	0.036
AC/S3	-0.4457	1.911	0.199	-0.006	0.956	-2.24	0.028
AC/S4	-0.4413	1.903	0.198	-0.005	0.959	-2.22	0.029
AC/S5	-0.4476	1.929	0.201	-0.008	0.940	-2.23	0.029
AC/S6	-0.3604	1.749	0.182	0.004	0.970	-1.98	0.051
PC/MA	-0.0075	1.021	0.106	0.661	0.000	-0.07	0.944
PC/ES	0.1018	0.436	0.045	0.910	0.000	2.24	0.028
PC/Re	-0.4753	1.716	0.179	0.716	0.000	-2.66	0.009
PC/S1	-0.2886	1.728	0.180	-0.039	0.709	-1.60	0.113
PC/S2	-0.3199	1.808	0.188	-0.048	0.652	-1.70	0.093
PC/S3	-0.3535	1.860	0.194	-0.048	0.651	-1.82	0.072
PC/S4	-0.3491	1.851	0.193	-0.047	0.653	-1.81	0.074
PC/S5	-0.3553	1.880	0.196	-0.051	0.629	-1.81	0.073
PC/S6	-0.2682	1.691	0.176	-0.040	0.706	-1.52	0.132
MA/ES	0.1093	0.860	0.090	0.773	0.000	1.22	0.226
MA/Re	-0.4678	1.175	0.123	0.912	0.000	-3.82	0.000
MA/S1	-0.2811	1.949	0.203	-0.007	0.944	-1.38	0.170
MA/S2	-0.3124	2.020	0.211	-0.015	0.890	-1.48	0.141
MA/S3	-0.3459	2.070	0.216	-0.018	0.862	-1.60	0.112
MA/S4	-0.3416	2.062	0.215	-0.018	0.866	-1.59	0.115
MA/S5	-0.3478	2.086	0.218	-0.020	0.851	-1.60	0.113
MA/S6	-0.2607	1.914	0.200	-0.005	0.963	-1.31	0.195
ES/Re	-0.5772	1.576	0.164	0.791	0.000	-3.51	0.001
ES/S1	-0.3904	1.748	0.182	-0.005	0.960	-2.14	0.035
ES/S2	-0.4217	1.826	0.190	-0.013	0.899	-2.22	0.029
ES/S3	-0.4553	1.879	0.196	-0.017	0.875	-2.32	0.022
ES/S4	-0.4509	1.871	0.195	-0.016	0.879	-2.31	0.023
ES/S5	-0.4572	1.898	0.198	-0.019	0.859	-2.31	0.023
ES/S6	-0.3700	1.711	0.178	-0.003	0.975	-2.07	0.041
Re/S1	0.1867	2.676	0.279	-0.011	0.918	0.67	0.505
Re/S2	0.1554	2.733	0.285	-0.019	0.859	0.55	0.587
Re/S3	0.1219	2.772	0.289	-0.022	0.838	0.42	0.674
Re/S4	0.1262	2.765	0.288	-0.021	0.842	0.44	0.663
Re/S5	0.1200	2.786	0.290	-0.024	0.822	0.41	0.680
Re/S6	0.2072	2.651	0.276	-0.009	0.929	0.75	0.455
S1/2	-0.0313	0.105	0.011	0.999	0.000	-2.86	0.005
S1/3	-0.0649	0.176	0.018	0.998	0.000	-3.54	0.001
S1/4	-0.0605	0.165	0.017	0.998	0.000	-3.52	0.001
S1/5	-0.0668	0.194	0.020	0.998	0.000	-3.30	0.001

S1/6	0.0204	0.068	0.007	0.999	0.000	2.90	0.005
S2/3	-0.0336	0.084	0.009	0.999	0.000	-3.83	0.000
S2/4	-0.0292	0.073	0.008	0.999	0.000	-3.82	0.000
S2/5	-0.0354	0.094	0.010	1.000	0.000	-3.62	0.000
S2/6	0.0517	0.159	0.017	0.998	0.000	3.11	0.002
S3/4	0.0044	0.012	0.001	1.000	0.000	3.48	0.001
S3/5	-0.0019	0.037	0.004	1.000	0.000	-0.49	0.625
S3/6	0.0853	0.237	0.025	0.996	0.000	3.45	0.001
S4/5	-0.0062	0.043	0.004	1.000	0.000	-1.40	0.164
S4/6	0.0809	0.226	0.024	0.996	0.000	3.44	0.001
S5/6	0.0872	0.251	0.026	0.996	0.000	3.33	0.001

MSE/ACTUAL

RW/AC	0.1094	9.274	0.967	0.443	0.000	0.11	0.910
RW/PC	0.3109	2.921	0.305	0.983	0.000	1.02	0.310
RW/MA	-0.5804	11.961	1.247	0.416	0.000	-0.47	0.643
RW/ES	0.2736	3.940	0.411	0.905	0.000	0.67	0.507
RW/Re	-4.7054	24.498	2.554	0.619	0.000	-1.84	0.069
RW/S1	-1.1198	16.899	1.762	-0.029	0.784	-0.64	0.527
RW/S2	-1.4282	18.578	1.937	-0.029	0.781	-0.74	0.463
RW/S3	-1.6782	19.520	2.035	-0.030	0.775	-0.82	0.412
RW/S4	-1.6399	19.334	2.016	-0.030	0.775	-0.81	0.418
RW/S5	-1.7431	20.138	2.100	-0.030	0.777	-0.83	0.409
RW/S6	-0.9595	16.363	1.706	-0.028	0.790	-0.56	0.575
AC/PC	0.2015	9.160	0.955	0.305	0.003	0.21	0.833
AC/MA	-0.6898	13.820	1.441	0.221	0.034	-0.48	0.633
AC/ES	0.1642	8.266	0.862	0.460	0.000	0.19	0.849
AC/Re	-4.8148	28.170	2.937	0.230	0.027	-1.64	0.105
AC/S1	-1.2292	17.107	1.784	-0.021	0.839	-0.69	0.492
AC/S2	-1.5376	18.763	1.956	-0.022	0.835	-0.79	0.434
AC/S3	-1.7877	19.693	2.053	-0.023	0.829	-0.87	0.386
AC/S4	-1.7493	19.510	2.034	-0.023	0.829	-0.86	0.392
AC/S5	-1.8526	20.306	2.117	-0.023	0.830	-0.88	0.384
AC/S6	-1.0689	16.579	1.728	-0.021	0.845	-0.62	0.538
PC/MA	-0.8912	11.188	1.166	0.467	0.000	-0.76	0.447
PC/ES	-0.0373	2.588	0.270	0.910	0.000	-0.14	0.890
PC/Re	-5.0163	25.278	2.635	0.667	0.000	-1.90	0.060
PC/S1	-1.4307	15.694	1.636	-0.032	0.762	-0.87	0.384
PC/S2	-1.7391	17.481	1.823	-0.032	0.759	-0.95	0.343
PC/S3	-1.9891	18.472	1.926	-0.033	0.755	-1.03	0.304
PC/S4	-1.9508	18.277	1.905	-0.033	0.755	-1.02	0.309
PC/S5	-2.0540	19.124	1.994	-0.033	0.756	-1.03	0.306
PC/S6	-1.2704	15.120	1.576	-0.031	0.766	-0.81	0.422
MA/ES	0.8539	8.968	0.935	0.753	0.000	0.91	0.363
MA/Re	-4.1251	17.237	1.797	0.952	0.000	-2.30	0.024
MA/S1	-0.5395	19.335	2.016	-0.022	0.832	-0.27	0.790
MA/S2	-0.8478	20.825	2.171	-0.023	0.827	-0.39	0.697
MA/S3	-1.0979	21.675	2.260	-0.024	0.821	-0.49	0.628
MA/S4	-1.0596	21.507	2.242	-0.024	0.822	-0.47	0.638
MA/S5	-1.1628	22.235	2.318	-0.024	0.823	-0.50	0.617
MA/S6	-0.3791	18.865	1.967	-0.022	0.838	-0.19	0.848
ES/Re	-4.9790	23.701	2.471	0.864	0.000	-2.01	0.047
ES/S1	-1.3934	15.794	1.647	-0.030	0.774	-0.85	0.400
ES/S2	-1.7018	17.573	1.832	-0.031	0.770	-0.93	0.355
ES/S3	-1.9518	18.561	1.935	-0.032	0.763	-1.01	0.316
ES/S4	-1.9135	18.366	1.915	-0.032	0.763	-1.00	0.320
ES/S5	-2.0167	19.209	2.003	-0.032	0.765	-1.01	0.317

ES/S6	-1.2331	15.223	1.587	-0.029	0.781	-0.78	0.439
Re/S1	3.5856	32.592	3.398	-0.030	0.780	1.06	0.294
Re/S2	3.2772	33.533	3.496	-0.030	0.776	0.94	0.351
Re/S3	3.0272	34.092	3.554	-0.031	0.770	0.85	0.397
Re/S4	3.0655	33.981	3.543	-0.031	0.770	0.87	0.389
Re/S5	2.9623	34.460	3.593	-0.031	0.772	0.82	0.412
Re/S6	3.7459	32.298	3.367	-0.029	0.786	1.11	0.269
S1/2	-0.3084	1.925	0.201	1.000	0.000	-1.54	0.128
S1/3	-0.5584	2.969	0.309	1.000	0.000	-1.80	0.074
S1/4	-0.5201	2.762	0.288	1.000	0.000	-1.81	0.074
S1/5	-0.6233	3.657	0.381	1.000	0.000	-1.63	0.106
S1/6	0.1603	0.650	0.068	1.000	0.000	2.36	0.020
S2/3	-0.2501	1.080	0.113	1.000	0.000	-2.22	0.029
S2/4	-0.2117	0.878	0.091	1.000	0.000	-2.31	0.023
S2/5	-0.3150	1.738	0.181	1.000	0.000	-1.74	0.086
S2/6	0.4687	2.541	0.265	1.000	0.000	1.77	0.080
S3/4	0.0383	0.207	0.022	1.000	0.000	1.77	0.080
S3/5	-0.0649	0.719	0.075	1.000	0.000	-0.87	0.389
S3/6	0.7188	3.601	0.375	1.000	0.000	1.91	0.059
S4/5	-0.1032	0.917	0.096	1.000	0.000	-1.08	0.283
S4/6	0.6804	3.394	0.354	1.000	0.000	1.92	0.058
S5/6	0.7837	4.278	0.446	1.000	0.000	1.76	0.082

MAPE/FORECAST

RW/AC	-0.1909	4.079	0.425	0.319	0.002	-0.45	0.655
RW/PC	-0.5059	1.255	0.131	0.981	0.000	-3.86	0.000
RW/MA	-0.4991	4.022	0.419	0.384	0.000	-1.19	0.237
RW/ES	0.0020	1.302	0.136	0.906	0.000	0.01	0.988
RW/Re	0.0574	3.951	0.412	0.238	0.022	0.14	0.890
RW/S1	-2.1766	10.337	1.078	0.039	0.715	-2.02	0.046
RW/S2	-2.0262	10.052	1.048	0.035	0.739	-1.93	0.056
RW/S3	-1.8599	9.397	0.980	0.038	0.716	-1.90	0.061
RW/S4	-1.8810	9.469	0.987	0.038	0.720	-1.91	0.060
RW/S5	-1.8856	9.633	1.004	0.036	0.736	-1.88	0.064
RW/S6	-2.3601	11.058	1.153	0.036	0.735	-2.05	0.044
AC/PC	-0.3149	4.715	0.492	0.288	0.005	-0.64	0.523
AC/MA	-0.3082	5.016	0.523	0.227	0.029	-0.59	0.557
AC/ES	0.1929	4.364	0.455	0.244	0.019	0.42	0.673
AC/Re	0.2483	4.480	0.467	0.275	0.008	0.53	0.596
AC/S1	-1.9857	10.857	1.132	0.020	0.852	-1.75	0.083
AC/S2	-1.8353	10.575	1.102	0.020	0.846	-1.66	0.099
AC/S3	-1.6690	9.947	1.037	0.020	0.854	-1.61	0.111
AC/S4	-1.6901	10.016	1.044	0.020	0.852	-1.62	0.109
AC/S5	-1.6947	10.170	1.060	0.020	0.847	-1.60	0.113
AC/S6	-2.1692	11.554	1.205	0.021	0.845	-1.80	0.075
PC/MA	0.0067	4.483	0.467	0.384	0.000	0.01	0.989
PC/ES	0.5078	1.820	0.190	0.896	0.000	2.68	0.009
PC/Re	0.5632	4.671	0.487	0.214	0.041	1.16	0.250
PC/S1	-1.6708	10.630	1.108	0.043	0.687	-1.51	0.135
PC/S2	-1.5203	10.360	1.080	0.039	0.714	-1.41	0.163
PC/S3	-1.3540	9.723	1.014	0.043	0.685	-1.34	0.185
PC/S4	-1.3751	9.793	1.021	0.042	0.690	-1.35	0.181
PC/S5	-1.3797	9.954	1.038	0.040	0.708	-1.33	0.187
PC/S6	-1.8543	11.334	1.182	0.039	0.711	-1.57	0.120
MA/ES	0.5011	3.894	0.406	0.443	0.000	1.23	0.220
MA/Re	0.5565	4.395	0.458	0.340	0.001	1.21	0.228
MA/S1	-1.6775	10.477	1.092	0.096	0.362	-1.54	0.128

MA/S2	-1.5271	10.218	1.065	0.091	0.391	-1.43	0.155
MA/S3	-1.3608	9.582	0.999	0.096	0.365	-1.36	0.177
MA/S4	-1.3819	9.652	1.006	0.095	0.368	-1.37	0.173
MA/S5	-1.3864	9.818	1.024	0.091	0.389	-1.35	0.179
MA/S6	-1.8610	11.182	1.166	0.091	0.386	-1.60	0.114
ES/Re	0.0554	3.891	0.406	0.295	0.004	0.14	0.892
ES/S1	-2.1786	10.354	1.080	0.047	0.655	-2.02	0.047
ES/S2	-2.0282	10.072	1.050	0.044	0.679	-1.93	0.057
ES/S3	-1.8619	9.418	0.982	0.047	0.653	-1.90	0.061
ES/S4	-1.8830	9.491	0.989	0.047	0.657	-1.90	0.060
ES/S5	-1.8875	9.654	1.007	0.044	0.674	-1.88	0.064
ES/S6	-2.3621	11.074	1.155	0.044	0.677	-2.05	0.044
Re/S1	-2.2340	10.267	1.070	0.106	0.315	-2.09	0.040
Re/S2	-2.0836	9.996	1.042	0.101	0.338	-2.00	0.049
Re/S3	-1.9173	9.351	0.975	0.105	0.321	-1.97	0.052
Re/S4	-1.9384	9.421	0.982	0.104	0.322	-1.97	0.051
Re/S5	-1.9429	9.590	1.000	0.100	0.343	-1.94	0.055
Re/S6	-2.4175	10.983	1.145	0.102	0.335	-2.11	0.037
S1/2	0.1504	0.487	0.051	0.999	0.000	2.96	0.004
S1/3	0.3168	0.988	0.103	1.000	0.000	3.08	0.003
S1/4	0.2957	0.914	0.095	1.000	0.000	3.10	0.003
S1/5	0.2911	0.820	0.085	0.999	0.000	3.41	0.001
S1/6	-0.1835	0.823	0.086	0.999	0.000	-2.14	0.035
S2/3	0.1663	0.766	0.080	0.999	0.000	2.08	0.040
S2/4	0.1452	0.682	0.071	0.999	0.000	2.04	0.044
S2/5	0.1406	0.443	0.046	1.000	0.000	3.04	0.003
S2/6	-0.3340	1.053	0.110	1.000	0.000	-3.04	0.003
S3/4	-0.0211	0.086	0.009	1.000	0.000	-2.36	0.020
S3/5	-0.0257	0.395	0.041	0.999	0.000	-0.62	0.535
S3/6	-0.5003	1.762	0.184	0.999	0.000	-2.72	0.008
S4/5	-0.0046	0.325	0.034	1.000	0.000	-0.14	0.893
S4/6	-0.4792	1.681	0.175	0.999	0.000	-2.73	0.008
S5/6	-0.4746	1.490	0.155	1.000	0.000	-3.05	0.003

MSE/FORECAST

RW/AC	-7.6150	109.237	11.389	0.110	0.297	-0.67	0.505
RW/PC	-8.5887	47.016	4.902	0.998	0.000	-1.75	0.083
RW/MA	-9.9019	93.090	9.705	0.142	0.176	-1.02	0.310
RW/ES	-1.0150	28.652	2.987	0.863	0.000	-0.34	0.735
RW/Re	-3.5482	121.422	12.659	0.040	0.702	-0.28	0.780
RW/S1	-100.9441	590.824	61.598	0.015	0.887	-1.64	0.105
RW/S2	-93.9836	574.724	59.919	0.016	0.881	-1.57	0.120
RW/S3	-80.3945	481.813	50.232	0.015	0.889	-1.60	0.113
RW/S4	-81.8609	491.116	51.202	0.015	0.887	-1.60	0.113
RW/S5	-84.9010	523.882	54.618	0.016	0.883	-1.55	0.124
RW/S6	-117.4432	703.113	73.305	0.016	0.882	-1.60	0.113
AC/PC	-0.9737	136.583	14.240	0.088	0.406	-0.07	0.946
AC/MA	-2.2869	129.555	13.507	0.020	0.849	-0.17	0.866
AC/ES	6.6000	112.637	11.743	0.043	0.686	0.56	0.575
AC/Re	4.0668	143.566	14.968	0.080	0.449	0.27	0.786
AC/S1	-93.3292	598.875	62.437	0.029	0.787	-1.49	0.138
AC/S2	-86.3686	582.812	60.762	0.028	0.793	-1.42	0.159
AC/S3	-72.7795	491.198	51.211	0.029	0.787	-1.42	0.159
AC/S4	-74.2459	500.349	52.165	0.028	0.788	-1.42	0.158
AC/S5	-77.2860	532.574	55.525	0.028	0.793	-1.39	0.167
AC/S6	-109.8282	710.098	74.033	0.028	0.793	-1.48	0.141
PC/MA	-1.3132	121.523	12.670	0.147	0.161	-0.10	0.918

PC/ES	7.5737	60.252	6.282	0.869	0.000	1.21	0.231
PC/Re	5.0405	148.210	15.452	0.025	0.811	0.33	0.745
PC/S1	-92.3554	597.583	62.302	0.014	0.893	-1.48	0.142
PC/S2	-85.3949	581.719	60.648	0.015	0.885	-1.41	0.163
PC/S3	-71.8058	489.931	51.079	0.014	0.894	-1.41	0.163
PC/S4	-73.2721	499.107	52.035	0.014	0.893	-1.41	0.163
PC/S5	-76.3122	531.461	55.409	0.015	0.887	-1.38	0.172
PC/S6	-108.8544	708.957	73.914	0.015	0.886	-1.47	0.144
MA/ES	8.8869	92.309	9.624	0.159	0.130	0.92	0.358
MA/Re	6.3537	132.195	13.782	0.094	0.373	0.46	0.646
MA/S1	-91.0422	594.890	62.022	0.018	0.862	-1.47	0.146
MA/S2	-84.0817	578.935	60.358	0.020	0.853	-1.39	0.167
MA/S3	-70.4926	486.661	50.738	0.019	0.860	-1.39	0.168
MA/S4	-71.9589	495.885	51.700	0.019	0.859	-1.39	0.167
MA/S5	-74.9990	528.439	55.094	0.020	0.853	-1.36	0.177
MA/S6	-107.5412	706.673	73.676	0.019	0.856	-1.46	0.148
ES/Re	-2.5332	119.713	12.481	0.075	0.475	-0.20	0.840
ES/S1	-99.9291	591.027	61.619	0.018	0.862	-1.62	0.108
ES/S2	-92.9686	574.920	59.940	0.019	0.856	-1.55	0.124
ES/S3	-79.3795	482.018	50.254	0.018	0.863	-1.58	0.118
ES/S4	-80.8458	491.319	51.224	0.018	0.861	-1.58	0.118
ES/S5	-83.8859	524.078	54.639	0.019	0.858	-1.54	0.128
ES/S6	-116.4281	703.307	73.325	0.019	0.857	-1.59	0.116
Re/S1	-97.3959	597.880	62.333	0.001	0.994	-1.56	0.122
Re/S2	-90.4354	582.135	60.692	0.003	0.981	-1.49	0.140
Re/S3	-76.8463	490.621	51.151	0.001	0.993	-1.50	0.136
Re/S4	-78.3127	499.756	52.103	0.001	0.992	-1.50	0.136
Re/S5	-81.3528	532.060	55.471	0.002	0.982	-1.47	0.146
Re/S6	-113.8950	709.054	73.924	0.002	0.983	-1.54	0.127
S1/2	6.9605	38.698	4.035	0.998	0.000	1.73	0.088
S1/3	20.5496	109.587	11.425	1.000	0.000	1.80	0.075
S1/4	19.0833	100.307	10.458	1.000	0.000	1.82	0.071
S1/5	16.0432	73.892	7.704	0.998	0.000	2.08	0.040
S1/6	-16.4990	118.002	12.303	0.999	0.000	-1.34	0.183
S2/3	13.5891	98.567	10.276	0.998	0.000	1.32	0.189
S2/4	12.1227	88.667	9.244	0.999	0.000	1.31	0.193
S2/5	9.0826	51.224	5.340	1.000	0.000	1.70	0.092
S2/6	-23.4596	128.964	13.445	1.000	0.000	-1.74	0.084
S3/4	-1.4664	9.929	1.035	1.000	0.000	-1.42	0.160
S3/5	-4.5065	50.387	5.253	0.998	0.000	-0.86	0.393
S3/6	-37.0487	224.473	23.403	0.999	0.000	-1.58	0.117
S4/5	-3.0401	40.946	4.269	0.999	0.000	-0.71	0.478
S4/6	-35.5823	214.726	22.387	0.999	0.000	-1.59	0.115
S5/6	-32.5422	179.962	18.762	1.000	0.000	-1.73	0.086

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MAPE/ACTUAL

RW/AC	-0.1570	0.400	0.042	0.991	0.000	-3.77	0.000
RW/PC	0.1045	0.593	0.062	0.845	0.000	1.69	0.094
RW/MA	0.0771	0.709	0.074	0.726	0.000	1.04	0.300
RW/ES	0.1249	1.152	0.120	0.123	0.244	1.04	0.301
RW/Re	0.1045	1.129	0.118	0.242	0.020	0.89	0.377
RW/S1	-0.5571	1.941	0.202	0.127	0.228	-2.75	0.007
RW/S2	-0.5989	2.019	0.211	0.129	0.219	-2.85	0.005
RW/S3	-0.6294	2.058	0.215	0.129	0.220	-2.93	0.004
RW/S4	-0.6266	2.053	0.214	0.129	0.219	-2.93	0.004

RW/S5	-0.5724	1.973	0.206	0.128	0.225	-2.78	0.007
RW/S6	-0.4571	1.772	0.185	0.120	0.255	-2.47	0.015
AC/PC	0.2615	0.917	0.096	0.843	0.000	2.73	0.008
AC/MA	0.2341	0.986	0.103	0.741	0.000	2.28	0.025
AC/ES	0.2820	1.451	0.151	0.149	0.157	1.86	0.066
AC/Re	0.2615	1.419	0.148	0.246	0.018	1.77	0.081
AC/S1	-0.4001	2.106	0.220	0.137	0.191	-1.82	0.072
AC/S2	-0.4419	2.175	0.227	0.140	0.184	-1.95	0.054
AC/S3	-0.4724	2.210	0.230	0.140	0.184	-2.05	0.043
AC/S4	-0.4696	2.205	0.230	0.140	0.182	-2.04	0.044
AC/S5	-0.4154	2.135	0.223	0.138	0.189	-1.87	0.065
AC/S6	-0.3001	1.960	0.204	0.130	0.217	-1.47	0.145
PC/MA	-0.0274	0.572	0.060	0.655	0.000	-0.46	0.647
PC/ES	0.0205	0.908	0.095	0.035	0.740	0.22	0.830
PC/Re	-0.0000	0.862	0.090	0.278	0.007	-0.00	0.000
PC/S1	-0.6616	1.789	0.187	0.171	0.103	-3.55	0.001
PC/S2	-0.7034	1.875	0.195	0.173	0.099	-3.60	0.001
PC/S3	-0.7339	1.918	0.200	0.172	0.101	-3.67	0.000
PC/S4	-0.7311	1.913	0.199	0.173	0.100	-3.67	0.000
PC/S5	-0.6769	1.824	0.190	0.172	0.102	-3.56	0.001
PC/S6	-0.5616	1.598	0.167	0.165	0.117	-3.37	0.001
MA/ES	0.0479	0.924	0.096	0.108	0.307	0.50	0.620
MA/Re	0.0274	0.824	0.086	0.396	0.000	0.32	0.751
MA/S1	-0.6342	1.667	0.174	0.356	0.000	-3.65	0.000
MA/S2	-0.6760	1.748	0.182	0.363	0.000	-3.71	0.000
MA/S3	-0.7065	1.794	0.187	0.357	0.000	-3.78	0.000
MA/S4	-0.7037	1.788	0.186	0.358	0.000	-3.77	0.000
MA/S5	-0.6495	1.699	0.177	0.361	0.000	-3.67	0.000
MA/S6	-0.5342	1.477	0.154	0.356	0.000	-3.47	0.001
ES/Re	-0.0205	0.620	0.065	0.638	0.000	-0.32	0.752
ES/S1	-0.6820	1.918	0.200	0.029	0.782	-3.41	0.001
ES/S2	-0.7239	2.006	0.209	0.030	0.779	-3.46	0.001
ES/S3	-0.7544	2.049	0.214	0.029	0.781	-3.53	0.001
ES/S4	-0.7515	2.044	0.213	0.029	0.783	-3.53	0.001
ES/S5	-0.6974	1.955	0.204	0.030	0.774	-3.42	0.001
ES/S6	-0.5820	1.723	0.180	0.033	0.758	-3.24	0.002
Re/S1	-0.6616	1.921	0.200	0.032	0.760	-3.30	0.001
Re/S2	-0.7034	2.006	0.209	0.032	0.759	-3.36	0.001
Re/S3	-0.7339	2.050	0.214	0.030	0.780	-3.43	0.001
Re/S4	-0.7311	2.045	0.213	0.030	0.777	-3.43	0.001
Re/S5	-0.6769	1.955	0.204	0.033	0.756	-3.32	0.001
Re/S6	-0.5616	1.727	0.180	0.036	0.730	-3.12	0.002
S1/2	-0.0419	0.110	0.011	0.999	0.000	-3.65	0.000
S1/3	-0.0723	0.155	0.016	0.999	0.000	-4.48	0.000
S1/4	-0.0695	0.149	0.016	0.999	0.000	-4.46	0.000
S1/5	-0.0153	0.051	0.005	1.000	0.000	-2.90	0.005
S1/6	0.1000	0.244	0.025	0.997	0.000	3.93	0.000
S2/3	-0.0305	0.070	0.007	1.000	0.000	-4.16	0.000
S2/4	-0.0277	0.062	0.007	1.000	0.000	-4.25	0.000
S2/5	0.0265	0.064	0.007	1.000	0.000	3.97	0.000
S2/6	0.1418	0.343	0.036	0.996	0.000	3.97	0.000
S3/4	0.0028	0.009	0.001	1.000	0.000	2.93	0.004
S3/5	0.0570	0.119	0.012	0.999	0.000	4.60	0.000
S3/6	0.1723	0.396	0.041	0.994	0.000	4.17	0.000
S4/5	0.0542	0.112	0.012	0.999	0.000	4.62	0.000
S4/6	0.1695	0.390	0.041	0.994	0.000	4.16	0.000
S5/6	0.1153	0.282	0.029	0.997	0.000	3.92	0.000

MSE/ACTUAL

RW/AC	-1.1069	3.794	0.396	0.988	0.000	-2.80	0.006
RW/PC	0.7585	3.579	0.373	0.884	0.000	2.03	0.045
RW/MA	0.6285	4.228	0.441	0.509	0.000	1.43	0.157
RW/ES	0.7651	5.773	0.602	0.068	0.518	1.27	0.207
RW/Re	0.5773	6.042	0.630	0.041	0.697	0.92	0.362
RW/S1	-3.1372	20.125	2.098	0.021	0.840	-1.50	0.138
RW/S2	-3.5784	22.073	2.301	0.022	0.834	-1.55	0.123
RW/S3	-3.8252	22.902	2.388	0.020	0.848	-1.60	0.113
RW/S4	-3.7974	22.797	2.377	0.021	0.846	-1.60	0.114
RW/S5	-3.3115	20.981	2.187	0.022	0.836	-1.51	0.134
RW/S6	-2.2039	16.416	1.711	0.024	0.819	-1.29	0.201
AC/PC	1.8654	7.247	0.756	0.860	0.000	2.47	0.015
AC/MA	1.7354	7.603	0.793	0.524	0.000	2.19	0.031
AC/ES	1.8720	8.880	0.926	0.105	0.321	2.02	0.046
AC/Re	1.6842	9.208	0.960	0.040	0.703	1.75	0.083
AC/S1	-2.0303	21.176	2.208	0.030	0.778	-0.92	0.360
AC/S2	-2.4715	23.017	2.400	0.031	0.770	-1.03	0.306
AC/S3	-2.7183	23.815	2.483	0.029	0.784	-1.09	0.276
AC/S4	-2.6905	23.714	2.472	0.029	0.781	-1.09	0.279
AC/S5	-2.2046	21.982	2.292	0.031	0.772	-0.96	0.339
AC/S6	-1.0970	17.714	1.847	0.033	0.758	-0.59	0.554
PC/MA	-0.1300	1.959	0.204	0.570	0.000	-0.64	0.526
PC/ES	0.0066	3.740	0.390	0.004	0.972	0.02	0.987
PC/Re	-0.1812	3.964	0.413	0.062	0.560	-0.44	0.662
PC/S1	-3.8956	19.571	2.040	0.073	0.492	-1.91	0.059
PC/S2	-4.3369	21.568	2.249	0.075	0.478	-1.93	0.057
PC/S3	-4.5837	22.411	2.337	0.071	0.499	-1.96	0.053
PC/S4	-4.5559	22.306	2.326	0.072	0.495	-1.96	0.053
PC/S5	-4.0700	20.450	2.132	0.074	0.482	-1.91	0.059
PC/S6	-2.9624	15.742	1.641	0.077	0.468	-1.81	0.074
MA/ES	0.1366	4.128	0.430	0.003	0.979	0.32	0.752
MA/Re	-0.0512	4.113	0.429	0.147	0.163	-0.12	0.905
MA/S1	-3.7657	18.551	1.934	0.501	0.000	-1.95	0.055
MA/S2	-4.2069	20.517	2.139	0.513	0.000	-1.97	0.052
MA/S3	-4.4537	21.383	2.229	0.501	0.000	-2.00	0.049
MA/S4	-4.4259	21.273	2.218	0.503	0.000	-2.00	0.049
MA/S5	-3.9400	19.410	2.024	0.509	0.000	-1.95	0.055
MA/S6	-2.8325	14.722	1.535	0.508	0.000	-1.85	0.068
ES/Re	-0.1878	1.678	0.175	0.893	0.000	-1.07	0.286
ES/S1	-3.9022	20.010	2.086	0.029	0.781	-1.87	0.065
ES/S2	-4.3435	21.991	2.293	0.029	0.781	-1.89	0.061
ES/S3	-4.5902	22.822	2.379	0.030	0.779	-1.93	0.057
ES/S4	-4.5625	22.718	2.369	0.030	0.779	-1.93	0.057
ES/S5	-4.0766	20.882	2.177	0.029	0.781	-1.87	0.064
ES/S6	-2.9690	16.238	1.693	0.029	0.787	-1.75	0.083
Re/S1	-3.7145	20.023	2.088	0.014	0.898	-1.78	0.079
Re/S2	-4.1557	21.997	2.293	0.013	0.900	-1.81	0.073
Re/S3	-4.4025	22.829	2.380	0.014	0.891	-1.85	0.068
Re/S4	-4.3747	22.725	2.369	0.014	0.892	-1.85	0.068
Re/S5	-3.8888	20.891	2.178	0.013	0.901	-1.79	0.078
Re/S6	-2.7812	16.260	1.695	0.011	0.914	-1.64	0.104
S1/2	-0.4413	2.147	0.224	0.999	0.000	-1.97	0.052
S1/3	-0.6880	2.856	0.298	1.000	0.000	-2.31	0.023
S1/4	-0.6602	2.756	0.287	1.000	0.000	-2.30	0.024
S1/5	-0.1743	0.997	0.104	1.000	0.000	-1.68	0.097
S1/6	0.9332	3.870	0.403	1.000	0.000	2.31	0.023
S2/3	-0.2468	1.135	0.118	0.999	0.000	-2.09	0.040

S2/4	-0.2190	0.968	0.101	1.000	0.000	-2.17	0.033
S2/5	0.2669	1.170	0.122	1.000	0.000	2.19	0.031
S2/6	1.3745	5.877	0.613	0.999	0.000	2.24	0.027
S3/4	0.0278	0.172	0.018	1.000	0.000	1.55	0.125
S3/5	0.5137	2.024	0.211	1.000	0.000	2.43	0.017
S3/6	1.6212	6.719	0.701	0.999	0.000	2.31	0.023
S4/5	0.4859	1.897	0.198	1.000	0.000	2.46	0.016
S4/6	1.5935	6.610	0.689	0.999	0.000	2.31	0.023
S5/6	1.1076	4.739	0.494	1.000	0.000	2.24	0.027

MAPE/FORECAST

RW/AC	0.0512	1.683	0.176	0.740	0.000	0.29	0.771
RW/PC	-0.2898	0.890	0.093	0.992	0.000	-3.12	0.002
RW/MA	0.0005	2.240	0.234	0.397	0.000	0.00	0.998
RW/ES	0.1073	2.504	0.261	0.012	0.908	0.41	0.682
RW/Re	-0.7386	5.375	0.560	0.131	0.212	-1.32	0.191
RW/S1	-0.7626	5.869	0.612	-0.033	0.752	-1.25	0.216
RW/S2	-0.7040	5.722	0.597	-0.031	0.766	-1.18	0.241
RW/S3	-0.6443	5.527	0.576	-0.030	0.775	-1.12	0.266
RW/S4	-0.6479	5.541	0.578	-0.030	0.774	-1.12	0.265
RW/S5	-0.7477	5.823	0.607	-0.033	0.755	-1.23	0.221
RW/S6	-1.0171	6.566	0.685	-0.039	0.710	-1.49	0.141
AC/PC	-0.3410	2.173	0.227	0.733	0.000	-1.50	0.136
AC/MA	-0.0507	2.517	0.262	0.157	0.135	-0.19	0.847
AC/ES	0.0562	2.462	0.257	-0.037	0.730	0.22	0.827
AC/Re	-0.7898	5.243	0.547	0.179	0.088	-1.44	0.152
AC/S1	-0.8138	5.872	0.612	-0.052	0.622	-1.33	0.187
AC/S2	-0.7552	5.724	0.597	-0.050	0.633	-1.27	0.209
AC/S3	-0.6954	5.528	0.576	-0.049	0.642	-1.21	0.231
AC/S4	-0.6990	5.542	0.578	-0.049	0.642	-1.21	0.229
AC/S5	-0.7988	5.825	0.607	-0.052	0.625	-1.32	0.192
AC/S6	-1.0682	6.571	0.685	-0.057	0.587	-1.56	0.122
PC/MA	0.2903	2.914	0.304	0.412	0.000	0.96	0.342
PC/ES	0.3972	3.244	0.338	0.067	0.527	1.17	0.243
PC/Re	-0.4488	5.673	0.591	0.136	0.196	-0.76	0.450
PC/S1	-0.4728	6.192	0.646	-0.005	0.963	-0.73	0.466
PC/S2	-0.4142	6.052	0.631	-0.003	0.978	-0.66	0.513
PC/S3	-0.3544	5.870	0.612	-0.002	0.988	-0.58	0.564
PC/S4	-0.3580	5.883	0.613	-0.002	0.987	-0.58	0.561
PC/S5	-0.4578	6.148	0.641	-0.005	0.965	-0.71	0.477
PC/S6	-0.7272	6.854	0.715	-0.011	0.916	-1.02	0.312
MA/ES	0.1069	1.343	0.140	0.425	0.000	0.76	0.447
MA/Re	-0.7391	4.646	0.484	0.466	0.000	-1.53	0.131
MA/S1	-0.7631	5.006	0.522	0.327	0.001	-1.46	0.147
MA/S2	-0.7045	4.850	0.506	0.330	0.001	-1.39	0.167
MA/S3	-0.6447	4.648	0.485	0.330	0.001	-1.33	0.187
MA/S4	-0.6483	4.662	0.486	0.330	0.001	-1.33	0.186
MA/S5	-0.7482	4.958	0.517	0.327	0.001	-1.45	0.151
MA/S6	-1.0176	5.728	0.597	0.322	0.002	-1.70	0.092
ES/Re	-0.8460	5.081	0.530	0.156	0.136	-1.60	0.114
ES/S1	-0.8700	5.016	0.523	0.400	0.000	-1.66	0.100
ES/S2	-0.8113	4.859	0.507	0.402	0.000	-1.60	0.113
ES/S3	-0.7516	4.651	0.485	0.400	0.000	-1.55	0.125
ES/S4	-0.7552	4.667	0.487	0.400	0.000	-1.55	0.124
ES/S5	-0.8550	4.965	0.518	0.401	0.000	-1.65	0.102
ES/S6	-1.1244	5.747	0.599	0.401	0.000	-1.88	0.064
Re/S1	-0.0240	6.622	0.690	0.195	0.063	-0.03	0.972

Re/S2	0.0346	6.513	0.679	0.197	0.060	0.05	0.959
Re/S3	0.0944	6.378	0.665	0.197	0.059	0.14	0.887
Re/S4	0.0908	6.387	0.666	0.198	0.059	0.14	0.892
Re/S5	-0.0091	6.590	0.687	0.194	0.063	-0.01	0.990
Re/S6	-0.2785	7.149	0.745	0.189	0.071	-0.37	0.710
S1/2	0.0586	0.170	0.018	1.000	0.000	3.30	0.001
S1/3	0.1184	0.375	0.039	1.000	0.000	3.03	0.003
S1/4	0.1147	0.360	0.038	1.000	0.000	3.06	0.003
S1/5	0.0149	0.075	0.008	1.000	0.000	1.91	0.060
S1/6	-0.2545	0.752	0.078	1.000	0.000	-3.24	0.002
S2/3	0.0598	0.223	0.023	1.000	0.000	2.58	0.012
S2/4	0.0561	0.208	0.022	1.000	0.000	2.59	0.011
S2/5	-0.0437	0.121	0.013	1.000	0.000	-3.46	0.001
S2/6	-0.3131	0.911	0.095	1.000	0.000	-3.30	0.001
S3/4	-0.0036	0.019	0.002	1.000	0.000	-1.85	0.067
S3/5	-0.1034	0.329	0.034	1.000	0.000	-3.02	0.003
S3/6	-0.3728	1.126	0.117	0.999	0.000	-3.18	0.002
S4/5	-0.0998	0.315	0.033	1.000	0.000	-3.04	0.003
S4/6	-0.3692	1.111	0.116	0.999	0.000	-3.19	0.002
S5/6	-0.2694	0.801	0.083	1.000	0.000	-3.23	0.002

MSE/FORECAST

RW/AC	0.4913	34.702	3.618	0.610	0.000	0.14	0.892
RW/PC	-5.1948	28.060	2.925	0.999	0.000	-1.78	0.079
RW/MA	3.4450	34.969	3.646	0.313	0.002	0.94	0.347
RW/ES	5.1027	36.980	3.855	-0.032	0.762	1.32	0.189
RW/Re	-22.6766	169.272	17.648	0.005	0.965	-1.28	0.202
RW/S1	-24.2592	219.365	22.870	-0.024	0.822	-1.06	0.292
RW/S2	-22.4362	207.970	21.682	-0.024	0.824	-1.03	0.304
RW/S3	-20.1194	191.124	19.926	-0.024	0.823	-1.01	0.315
RW/S4	-20.2832	192.459	20.065	-0.024	0.823	-1.01	0.315
RW/S5	-23.6830	214.665	22.380	-0.024	0.822	-1.06	0.293
RW/S6	-33.5196	281.618	29.361	-0.024	0.820	-1.14	0.257
AC/PC	-5.6861	51.628	5.383	0.604	0.000	-1.06	0.294
AC/MA	2.9537	42.362	4.417	-0.015	0.885	0.67	0.505
AC/ES	4.6114	41.593	4.336	-0.035	0.738	1.06	0.290
AC/Re	-23.1679	168.735	17.592	0.044	0.679	-1.32	0.191
AC/S1	-24.7505	220.172	22.955	-0.021	0.844	-1.08	0.284
AC/S2	-22.9276	208.823	21.771	-0.021	0.845	-1.05	0.295
AC/S3	-20.6107	192.053	20.023	-0.021	0.845	-1.03	0.306
AC/S4	-20.7745	193.381	20.161	-0.021	0.845	-1.03	0.306
AC/S5	-24.1743	215.491	22.466	-0.021	0.844	-1.08	0.285
AC/S6	-34.0109	282.244	29.426	-0.021	0.842	-1.16	0.251
PC/MA	8.6398	62.472	6.513	0.319	0.002	1.33	0.188
PC/ES	10.2975	64.814	6.757	-0.005	0.965	1.52	0.131
PC/Re	-17.4818	177.364	18.491	0.004	0.968	-0.95	0.347
PC/S1	-19.0644	226.121	23.575	-0.020	0.853	-0.81	0.421
PC/S2	-17.2415	215.058	22.421	-0.019	0.854	-0.77	0.444
PC/S3	-14.9246	198.783	20.725	-0.019	0.854	-0.72	0.473
PC/S4	-15.0884	200.068	20.859	-0.019	0.854	-0.72	0.471
PC/S5	-18.4882	221.559	23.099	-0.020	0.852	-0.80	0.426
PC/S6	-28.3248	287.007	29.923	-0.020	0.851	-0.95	0.346
MA/ES	1.6577	7.917	0.825	0.421	0.000	2.01	0.048
MA/Re	-26.1216	163.519	17.048	0.242	0.020	-1.53	0.129
MA/S1	-27.7042	210.694	21.966	0.554	0.000	-1.26	0.210
MA/S2	-25.8813	199.133	20.761	0.555	0.000	-1.25	0.216

MA/S3	-23.5645	182.013	18.976	0.554	0.000	-1.24	0.218
MA/S4	-23.7282	183.371	19.118	0.554	0.000	-1.24	0.218
MA/S5	-27.1281	205.929	21.470	0.554	0.000	-1.26	0.210
MA/S6	-36.9646	273.601	28.525	0.554	0.000	-1.30	0.198
ES/Re	-27.7793	165.279	17.232	0.049	0.640	-1.61	0.110
ES/S1	-29.3619	213.556	22.265	0.531	0.000	-1.32	0.191
ES/S2	-27.5390	201.994	21.059	0.532	0.000	-1.31	0.194
ES/S3	-25.2221	184.859	19.273	0.531	0.000	-1.31	0.194
ES/S4	-25.3859	186.219	19.415	0.531	0.000	-1.31	0.194
ES/S5	-28.7857	208.786	21.767	0.531	0.000	-1.32	0.189
ES/S6	-38.6223	276.483	28.825	0.531	0.000	-1.34	0.184
Re/S1	-1.5826	259.976	27.104	0.087	0.412	-0.06	0.954
Re/S2	0.2403	251.102	26.179	0.087	0.410	0.01	0.993
Re/S3	2.5571	238.454	24.861	0.087	0.411	0.10	0.918
Re/S4	2.3934	239.435	24.963	0.087	0.411	0.10	0.924
Re/S5	-1.0065	256.317	26.723	0.087	0.412	-0.04	0.970
Re/S6	-10.8430	311.271	32.452	0.086	0.414	-0.33	0.739
S1/2	1.8229	11.651	1.215	1.000	0.000	1.50	0.137
S1/3	4.1398	28.703	2.992	1.000	0.000	1.38	0.170
S1/4	3.9760	27.343	2.851	1.000	0.000	1.39	0.166
S1/5	0.5762	4.853	0.506	1.000	0.000	1.14	0.258
S1/6	-9.2604	62.948	6.563	1.000	0.000	-1.41	0.162
S2/3	2.3168	17.209	1.794	1.000	0.000	1.29	0.200
S2/4	2.1530	15.852	1.653	1.000	0.000	1.30	0.196
S2/5	-1.2468	6.964	0.726	1.000	0.000	-1.72	0.089
S2/6	-11.0833	74.513	7.768	1.000	0.000	-1.43	0.157
S3/4	-0.1638	1.373	0.143	1.000	0.000	-1.14	0.255
S3/5	-3.5636	23.949	2.497	1.000	0.000	-1.43	0.157
S3/6	-13.4002	91.648	9.555	1.000	0.000	-1.40	0.164
S4/5	-3.3998	22.596	2.356	1.000	0.000	-1.44	0.152
S4/6	-13.2364	90.289	9.413	1.000	0.000	-1.41	0.163
S5/6	-9.8366	67.708	7.059	1.000	0.000	-1.39	0.167

Appendix 37.

COMPARISON OF ERROR MEASURES FOR PROFIT FORECASTS BASED UPON O.E.C.D. AND E.I.U. FORECASTS, AND T-TESTS (24 COMPANIES).

	NON-TRUNCATED					TRUNCATED (max. 1.0)		
	MEAN	STD. ERROR	STD. DEV.	RANGE	MINIMUM	MEAN	STD. ERROR	STD. DEV.
MAPE/ACTUAL								
E.I.U.								
1981	2.050	0.549	2.690	9.778	0.191	0.859	0.048	0.237
1982	0.718	0.123	0.601	2.057	0.003	0.600	0.082	0.401
1983	1.000	0.205	1.005	4.042	0.002	0.663	0.076	0.371
O.E.C.D.								
1981	2.016	0.539	2.638	9.408	0.191	0.854	0.048	0.235
1982	0.715	0.119	0.582	1.980	0.002	0.605	0.082	0.401
1983	0.974	0.193	0.947	3.993	0.007	0.670	0.074	0.364
MSE/ACTUAL								
E.I.U.								
1981	11.136	5.443	26.665	99.330	0.036	0.792	0.068	0.331
1982	0.862	0.247	1.210	4.241	0.000	0.514	0.090	0.439
1983	1.968	0.773	3.785	16.354	0.000	0.572	0.089	0.434
O.E.C.D.								
1981	10.736	5.210	25.525	92.110	0.036	0.782	0.067	0.327
1982	0.837	0.229	1.120	3.931	0.000	0.520	0.089	0.437
1983	1.807	0.723	3.543	15.998	0.000	0.576	0.087	0.428
MAPE/FORECAST								
E.I.U.								
1981	1.753	0.646	3.164	15.351	0.000	0.650	0.084	0.410
1982	2.224	1.178	5.770	27.556	0.000	0.473	0.094	0.458
1983	0.770	0.326	1.596	7.899	0.000	0.418	0.072	0.353
O.E.C.D.								
1981	1.795	0.677	3.315	16.148	0.000	0.647	0.084	0.411
1982	2.279	1.186	5.809	27.702	0.000	0.477	0.094	0.462
1983	0.816	0.347	1.699	8.424	0.000	0.437	0.074	0.364

MSE/FORECAST

E.I.U.

1981	12.668	9.796	47.989	235.666	0.000	0.584	0.091	0.444
1982	36.853	31.578	154.702	759.35	0.000	0.425	0.095	0.463
1983	3.033	2.587	12.673	62.390	0.000	0.294	0.069	0.337

O.E.C.D.

1981	13.756	10.829	53.053	260.742	0.000	0.581	0.091	0.447
1982	37.530	31.917	156.360	767.39	0.000	0.432	0.096	0.472
1983	3.433	2.943	14.416	70.970	0.000	0.318	0.072	0.351

T - T E S T

	(DIFFERENCE) MEAN	STANDARD DEVIATION	STANDARD ERROR	CORR.	2-TAIL PROB.	T VALUE	2-TAIL PROB.
MAPE/ACTUAL							
1981	0.0340	0.091	0.019	1.000	0.000	1.82	0.081
1982	0.0024	0.032	0.007	0.999	0.000	0.37	0.714
1983	0.0261	0.123	0.025	0.994	0.000	1.04	0.310
MSE/ACTUAL							
1981	0.3997	1.486	0.303	0.999	0.000	1.32	0.201
1982	0.0253	0.104	0.021	0.999	0.000	1.19	0.245
1983	0.1603	0.585	0.119	0.989	0.000	1.34	0.192
MAPE/FORECAST							
1981	-0.0428	0.165	0.034	1.000	0.000	-1.27	0.217
1982	-0.0546	0.112	0.023	1.000	0.000	-2.39	0.025
1983	-0.0458	0.132	0.027	0.999	0.000	-1.71	0.102
MSE/FORECAST							
1981	-1.0877	5.111	1.043	1.000	0.000	-1.04	0.308
1982	-0.6769	1.883	0.384	1.000	0.000	-1.76	0.092
1983	-0.4001	1.747	0.357	1.000	0.000	-1.12	0.273

TRUNCATED

MAPE/ACTUAL

1981	0.0052	0.031	0.006	0.992	0.000	0.82	0.419
1982	-0.0056	0.018	0.004	0.999	0.000	-1.54	0.137
1983	-0.0072	0.031	0.006	0.997	0.000	-1.14	0.265

MSE/ACTUAL

1981	0.0102	0.056	0.011	0.985	0.000	0.89	0.383
1982	-0.0065	0.019	0.004	0.999	0.000	-1.67	0.109
1983	-0.0041	0.025	0.005	0.998	0.000	-0.79	0.437

MAPE/FORECAST

1981	0.0029	0.014	0.003	0.999	0.000	1.03	0.314
1982	-0.0040	0.017	0.003	0.999	0.000	-1.14	0.265
1983	-0.0190	0.082	0.017	0.974	0.000	-1.14	0.267

MSE/FORECAST

1981	0.0029	0.014	0.003	1.000	0.000	1.03	0.315
1982	-0.0072	0.029	0.006	0.998	0.000	-1.20	0.243
1983	-0.0241	0.111	0.023	0.948	0.000	-1.06	0.301

Difference is EIU forecast less OECD forecast.

Appendix 38.

ERROR MEASURES FOR PROFIT FORECASTS FOR COMPANIES THAT DISCLOSE MORE THAN U.K. AND OVERSEAS.

	ALL COMPANIES (92 cos.)		ATTRIBUTABLE PROFIT GT £1m. (60 cos.)		ATTRIBUTABLE PROFIT GT £2m. (53 cos.)		ATTRIBUTABLE PROFIT GT £3m. (46 cos.)		ATTRIBUTABLE PROFIT GT £4m. (40 cos.)	
	MEAN	RANGE	MEAN	RANGE	MEAN	RANGE	MEAN	RANGE	MEAN	RANGE
RANDOM WALK										
1981										
MAPE/A.	1.477	43.068	0.377	6.170	0.277	1.298	0.252	1.221	0.216	0.728
MSE/A.	25.008	1855.792	0.792	38.205	0.164	1.712	0.133	1.518	0.077	0.545
MAPE/F.	0.617	3.676	0.308	1.708	0.304	1.708	0.253	1.136	0.250	1.136
MSE/F.	0.878	13.589	0.199	2.953	0.204	2.953	0.116	1.314	0.115	1.314
1982										
MAPE/A.	0.562	8.597	0.225	1.500	0.192	1.003	0.183	1.003	0.197	1.002
MSE/A.	1.678	73.931	0.124	2.256	0.081	1.010	0.080	1.010	0.089	1.010
MAPE/F.	1.104	22.498	0.256	2.309	0.212	0.801	0.182	0.796	0.195	0.795
MSE/F.	9.464	506.250	0.186	5.339	0.095	0.645	0.069	0.636	0.075	0.636
1983										
MAPE/A.	0.658	5.610	0.254	0.761	0.242	0.686	0.259	0.686	0.262	0.686
MSE/A.	1.480	31.518	0.098	0.585	0.086	0.482	0.095	0.482	0.098	0.482
MAPE/F.	1.032	16.825	0.454	3.254	0.390	2.265	0.423	2.265	0.434	2.265
MSE/F.	6.635	283.218	0.563	10.618	0.358	5.170	0.392	5.170	0.421	5.170

ABSOLUTE CHANGE

1980

MAPE/ACTUAL

1 yr.	3.065	176.819	3.580	176.819	3.988	176.819	0.627	4.847	0.662	4.847
2 yr.	2.454	132.551	2.814	132.551	3.114	132.551	0.606	4.929	0.630	4.929
3 yr.	2.325	117.824	2.574	117.824	2.844	117.824	0.581	5.760	0.613	5.760
4 yr.	2.241	110.425	2.457	110.425	2.709	110.425	0.580	6.157	0.618	6.157
5 yr.	2.168	106.016	2.360	106.016	2.607	106.016	0.556	5.872	0.590	5.872

MSE/ACTUAL

1 yr.	346.336	31274.22	522.476	31274.22	591.431	31274.22	1.311	23.753	1.460	23.753
2 yr.	194.655	17570.41	293.937	17570.41	332.688	17570.41	1.222	24.314	1.361	24.314
3 yr.	154.814	13885.22	232.686	13885.22	263.353	13885.21	1.302	33.311	1.461	33.311
4 yr.	136.478	12193.77	204.638	12193.77	231.595	12193.76	1.419	37.917	1.599	37.917
5 yr.	126.021	11239.65	188.625	11239.65	213.482	11239.64	1.300	34.493	1.465	34.493

MAPE/FORECAST

1 yr.	1.226	36.439	0.339	1.494	0.346	1.494	0.312	1.222	0.300	0.988
2 yr.	0.902	10.592	0.476	10.592	0.500	10.592	0.288	0.829	0.278	0.829
3 yr.	0.781	10.894	0.293	0.980	0.293	0.980	0.264	0.841	0.267	0.841
4 yr.	0.700	7.451	0.282	0.991	0.279	0.991	0.255	0.860	0.260	0.860
5 yr.	0.778	8.575	0.281	0.990	0.280	0.990	0.254	0.853	0.257	0.853

MSE/FORECAST

1 yr.	19.366	1329.642	0.214	2.309	0.227	2.309	0.176	1.555	0.153	1.028
2 yr.	3.952	122.244	2.015	112.244	2.265	112.244	0.129	0.691	0.124	0.691
3 yr.	2.679	118.934	0.141	0.983	0.143	0.983	0.113	0.726	0.119	0.726
4 yr.	1.783	55.527	0.139	0.982	0.189	0.999	0.112	0.740	0.118	0.740
5 yr.	2.615	73.544	0.135	0.981	0.140	0.982	0.108	0.730	0.114	0.730

1981

MAPE/ACTUAL

1 yr.	3.841	104.662	2.081	92.788	2.293	92.788	0.523	2.947	0.485	2.947
2 yr.	2.142	72.139	0.419	2.220	0.390	1.816	0.349	1.792	0.316	1.792
3 yr.	1.991	63.969	0.411	5.680	0.322	1.437	0.281	1.437	0.239	1.422
4 yr.	1.848	58.185	0.418	5.724	0.327	1.535	0.300	1.535	0.248	0.939
5 yr.	1.736	53.062	0.418	7.044	0.302	1.560	0.277	1.560	0.221	0.921

MSE/ACTUAL

1 yr.	232.773	10955.59	144.203	8610.92	163.207	8610.92	0.717	8.726	0.656	8.726
2 yr.	69.513	5204.480	0.428	4.939	0.364	3.308	0.285	3.307	0.228	3.307
3 yr.	54.285	4092.112	0.775	32.272	0.248	2.068	0.198	2.068	0.135	2.024
4 yr.	43.895	3385.728	0.778	32.791	0.240	2.365	0.213	2.365	0.123	0.887
5 yr.	37.099	2816.304	1.041	49.711	0.219	2.454	0.193	2.454	0.095	0.860

MAPE/FORECAST

1 yr.	1.350	27.467	1.515	27.467	1.566	27.467	1.316	27.467	1.407	27.467
2 yr.	86.839	7919.345	132.524	7919.34	149.981	7919.34	0.510	6.377	0.539	6.377
3 yr.	3.819	245.565	0.699	14.055	0.749	14.055	0.310	3.366	0.312	3.366
4 yr.	1.019	20.111	0.689	14.978	0.739	14.978	0.577	14.978	0.616	14.978
5 yr.	0.684	9.192	0.328	2.405	0.329	2.405	0.249	1.926	0.240	1.926

MSE/FORECAST

1 yr.	12.585	754.821	17.871	754.821	19.767	754.821	18.437	754.821	21.034	754.821
2 yr.	681698.3	>1000000	>1000000	>1000000	>1000000	>1000000	1.386	41.010	1.573	41.010
3 yr.	666.951	60302.68	4.592	197.557	5.177	197.557	0.378	11.333	0.416	11.333
4 yr.	8.203	404.536	4.989	224.417	5.626	224.417	5.018	224.417	5.749	224.417
5 yr.	1.831	84.623	0.322	5.815	0.341	5.815	0.160	3.737	0.163	3.737

1982

MAPE/ACTUAL

1 yr.	1.179	32.307	0.323	2.564	0.265	1.218	0.262	1.218	0.234	0.845
2 yr.	1.366	50.350	1.179	50.350	1.246	50.350	0.276	1.685	0.282	1.685
3 yr.	0.605	11.487	0.301	2.114	0.255	1.105	0.220	0.908	0.227	0.908
4 yr.	0.562	9.159	0.268	1.345	0.229	0.869	0.198	0.853	0.204	0.853
5 yr.	0.580	7.281	0.259	1.514	0.219	1.132	0.199	1.132	0.213	1.132

MSE/ACTUAL

1 yr.	15.751	1043.793	0.280	6.579	0.163	1.485	0.155	1.485	0.107	0.715
2 yr.	33.596	2535.970	42.593	2535.97	48.066	2535.97	0.190	2.865	0.205	2.865
3 yr.	2.051	132.025	0.232	4.484	0.145	1.228	0.111	0.830	0.119	0.830
4 yr.	1.568	83.938	0.165	1.816	0.108	0.761	0.087	0.734	0.093	0.734
5 yr.	1.735	53.029	0.168	2.295	0.109	1.283	0.102	1.283	0.115	1.283

MAPE/FORECAST

1 yr.	2.073	49.999	0.665	8.044	0.648	8.044	0.581	8.044	0.319	3.925
2 yr.	2.966	165.986	3.872	165.986	4.314	165.986	4.824	165.986	5.487	165.986
3 yr.	0.873	10.249	0.663	10.249	0.682	10.249	0.408	6.185	0.427	6.185
4 yr.	1.295	28.794	0.482	6.846	0.424	6.845	0.247	2.307	0.251	2.307
5 yr.	56.444	5101.733	0.374	6.516	0.268	2.121	0.205	1.846	0.218	1.846

MSE/FORECAST

1 yr.	59.454	2499.954	2.833	64.723	3.073	64.723	2.525	64.723	0.507	15.410
2 yr.	311.302	27553.88	475.214	27553.9	537.910	27553.9	619.48	27553.89	712.35	27553.89
3 yr.	3.420	118.934	3.109	105.120	3.438	105.120	1.238	38.292	1.396	38.292
4 yr.	17.079	829.213	1.423	46.898	1.194	46.898	0.237	5.339	0.257	5.339
5 yr.	282920.4	>1000000	0.936	42.480	0.244	4.505	0.139	3.411	0.156	3.411

1983

MAPE/ACTUAL

1 yr.	0.913	9.673	0.291	1.162	0.264	0.995	0.264	0.995	0.270	0.981
2 yr.	0.867	8.667	0.295	1.070	0.282	0.999	0.295	0.999	0.247	0.780
3 yr.	1.174	22.153	0.695	22.153	0.727	22.153	0.333	1.132	0.290	0.903
4 yr.	0.879	7.807	0.280	0.974	0.262	0.971	0.272	0.971	0.268	0.971
5 yr.	0.815	7.294	0.258	0.929	0.241	0.929	0.253	0.929	0.251	0.929

MSE/ACTUAL

1 yr.	3.781	93.688	0.148	1.364	0.122	1.003	0.127	1.003	0.135	1.003
2 yr.	3.133	75.177	0.147	1.153	0.126	1.058	0.137	1.058	0.129	1.058
3 yr.	8.610	491.380	8.381	491.380	9.439	491.380	0.185	1.314	0.193	1.314
4 yr.	3.046	60.951	0.140	0.949	0.117	0.943	0.127	0.943	0.129	0.943
5 yr.	2.587	53.245	0.121	0.869	0.104	0.869	0.114	0.869	0.116	0.869

MAPE/FORECAST

1 yr.	43.692	3277.792	66.421	3277.79	74.987	3277.79	86.358	3277.79	99.263	3277.78
2 yr.	1.278	35.236	1.414	35.236	1.131	35.211	1.270	35.211	1.328	35.211
3 yr.	3.364	137.432	4.273	137.431	3.552	137.431	4.030	137.431	4.551	137.431
4 yr.	1.273	37.771	1.304	37.771	0.551	5.885	0.592	5.885	0.604	5.885
5 yr.	0.980	19.842	0.624	6.924	0.504	6.924	0.547	6.924	0.564	6.924

MSE/FORECAST

1 yr.	121758.3	>1000000	186695	>1000000	211351	>1000000	243513	>1000000	280041	>1000000
2 yr.	17.786	1241.836	26.207	1241.836	24.049	1241.84	27.695	1241.84	31.584	1241.84
3 yr.	247.207	18891.44	372.148	18891.44	362.97	18891.4	418.145	18891.4	480.799	18891.4
4 yr.	18.637	1426.619	26.968	1426.619	1.243	34.636	1.412	34.636	1.549	34.636
5 yr.	6.144	393.807	1.934	47.984	1.316	47.984	1.504	47.984	1.674	47.984

PERCENTAGE CHANGE

<u>1980</u>

MAPE/ACTUAL

1 yr.	129.391	11762.22	196.812	11762.2	222.723	11762.2	0.813	4.868	0.870	4.868
2 yr.	65.645	5929.026	99.607	5925.03	112.672	5929.03	0.821	4.923	0.849	4.923
3 yr.	55.502	4992.333	84.075	4992.33	0.237	2.248	0.248	2.248	0.254	2.248
4 yr.	38.036	3360.202	57.107	3360.19	64.415	3360.19	1.000	7.729	1.031	7.729
5 yr.	38.272	3381.318	57.424	3381.32	64.835	3381.32	1.007	6.646	0.989	6.646

MSE/ACTUAL

1 yr.	>1000000		>1000000		>1000000		1.953	23.907	2.186	23.907
2 yr	382106.688		585891.720		663273.535		1.785	24.517	1.968	24.517
3 yr.	270912.694		415393.991		470257.087		2.015	35.946	2.201	35.946
4 yr.	122734.184		188186.055		213039.742		2.798	59.963	3.054	59.963
5 yr.	124284.028		190561.248		215729.153		2.626	44.828	2.711	44.828

MAPE/FORECAST

1 yr.	10.668	889.235	0.387	2.108	0.391	2.108	0.338	0.875	0.338	0.808
2 yr.	1.297	49.235	0.358	0.994	0.361	0.994	0.347	0.804	0.338	0.804
3 yr.	0.471	9.085	0.175	0.713	0.180	0.713	0.172	0.713	0.177	0.711
4 yr.	1.084	32.364	0.401	0.985	0.393	0.985	0.255	0.860	0.376	0.871
5 yr.	0.412	5.159	0.408	0.970	0.404	0.970	0.254	0.853	0.376	0.818

MSE/FORECAST

1 yr.	8601.771	790738.2	0.262	4.538	0.227	4.538	0.178	0.804	0.174	0.689
2 yr.	28.272	2424.051	0.184	1.000	0.187	1.000	0.170	0.691	0.166	0.691
3 yr.	16.395	1323.330	0.190	0.999	0.189	0.999	0.166	0.734	0.170	0.734
4 yr.	12.962	1047.436	0.222	0.999	0.215	0.999	0.192	0.784	0.194	0.784
5 yr.	12.129	934.642	0.224	0.999	0.222	0.999	0.197	0.754	0.190	0.754

1981

MAPE/ACTUAL

1 yr.	2.597	111.952	0.415	2.670	0.374	2.032	0.357	2.032	0.292	0.922
2 yr.	1.377	48.117	0.497	4.298	0.419	2.693	0.412	2.693	0.384	2.693
3 yr.	1.063	8.630	0.477	5.767	0.379	2.132	0.366	2.132	0.329	2.132
4 yr.	1.037	9.271	0.558	5.816	0.453	2.672	0.447	2.672	0.387	2.672
5 yr.	1.742	31.926	0.690	8.382	0.528	3.701	0.526	3.701	0.415	2.719

MSE/ACTUAL

1 yr.	148.330	12534.08	0.409	7.147	0.298	4.143	0.283	4.143	0.133	0.855
2 yr.	27.229	2315.324	0.741	18.475	0.430	7.256	0.448	7.256	0.400	7.256
3 yr.	3.500	74.494	0.903	33.262	0.345	4.549	0.348	4.549	0.293	4.549
4 yr.	3.073	85.989	1.063	33.852	0.478	7.155	0.496	7.155	0.364	7.155
5 yr.	21.278	1019.441	1.932	70.307	0.743	13.721	0.794	13.721	0.398	7.411

MAPE/FORECAST

1 yr.	2.248	83.845	2.263	83.845	2.500	83.845	0.727	12.293	0.772	12.293
2 yr.	1.386	16.033	0.467	3.077	0.474	3.077	0.362	2.721	0.369	2.721
3 yr.	0.873	5.559	0.377	2.679	0.379	2.679	0.290	1.996	0.288	1.996
4 yr.	1.252	35.102	0.384	2.156	0.385	2.156	0.317	1.661	0.311	1.661
5 yr.	0.775	4.173	0.388	2.020	0.377	2.020	0.314	1.421	0.299	1.421

MSE/FORECAST

1 yr.	84.788	7030.590	121.938	7030.59	137.992	7030.59	3.936	151.195	4.487	151.195
2 yr.	9.485	257.068	0.638	9.470	0.692	9.470	0.327	7.408	0.354	7.408
3 yr.	2.157	30.914	0.405	7.181	0.433	7.181	0.203	3.987	0.212	3.987
4 yr.	15.887	1232.325	0.327	4.658	0.341	4.658	0.191	2.766	0.192	2.766
5 yr.	1.397	17.438	0.290	4.093	0.291	4.093	0.169	2.028	0.159	2.028

1982

MAPE/ACTUAL

1 yr.	0.745	11.060	0.317	0.963	0.284	0.963	0.271	0.952	0.271	0.944
2 yr.	0.713	16.618	0.271	0.920	0.240	0.699	0.221	0.699	0.229	0.699
3 yr.	0.626	6.858	0.328	1.930	0.297	1.930	0.287	1.930	0.311	1.930
4 yr.	0.654	7.198	0.353	1.714	0.323	1.714	0.317	1.714	0.336	1.714
5 yr.	0.669	7.883	0.391	1.973	0.353	1.973	0.353	1.973	0.376	1.973

MSE/ACTUAL

1 yr.	2.162	122.392	0.181	0.933	0.152	0.933	0.137	0.913	0.137	0.913
2 yr.	3.630	276.694	0.130	0.878	0.097	0.512	0.087	0.512	0.093	0.512
3 yr.	1.230	47.099	0.263	3.743	0.224	3.743	0.233	3.743	0.264	3.743
4 yr.	1.367	51.924	0.267	2.964	0.226	2.964	0.237	2.964	0.266	2.964
5 yr.	1.496	62.299	0.297	3.933	0.246	3.933	0.262	3.933	0.294	3.933

MAPE/FORECAST

1 yr.	6.170	179.067	0.777	22.770	0.340	3.144	0.293	1.979	0.248	1.227
2 yr.	2.396	54.087	0.414	5.165	0.332	1.947	0.276	1.675	0.279	1.675
3 yr.	1.716	35.293	0.367	3.802	0.304	1.425	0.244	1.332	0.259	1.332
4 yr.	1.609	30.735	0.352	3.243	0.300	1.207	0.253	1.091	0.259	1.091
5 yr.	1.642	28.844	0.353	3.016	0.299	1.069	0.262	1.055	0.275	1.055

MSE/FORECAST

1 yr.	547.793	32066.14	9.035	518.639	0.398	9.907	0.235	3.931	0.123	1.535
2 yr.	49.401	2927.177	0.715	26.842	0.282	3.854	0.192	2.861	0.204	2.861
3 yr.	22.703	1245.990	0.452	14.491	0.222	2.045	0.143	1.787	0.155	1.787
4 yr.	18.053	945.091	0.353	10.569	0.180	1.476	0.122	1.208	0.131	1.208
5 yr.	19.040	832.578	0.306	9.159	0.155	1.165	0.115	1.135	0.126	1.135

1983

MAPE/ACTUAL

1 yr.	2.354	105.196	0.280	0.864	0.263	0.846	0.242	0.846	0.243	0.846
2 yr.	0.927	21.178	0.301	1.296	0.296	1.281	0.260	0.780	0.247	0.780
3 yr.	0.724	13.703	0.294	0.903	0.284	0.903	0.293	0.903	0.290	0.903
4 yr.	0.553	3.173	0.296	1.786	0.284	1.769	0.304	1.769	0.307	1.769
5 yr.	0.605	4.666	0.282	1.968	0.268	1.965	0.288	1.965	0.286	1.963

MSE/ACTUAL

1 yr.	132.274	11066.63	0.128	0.751	0.115	0.718	0.097	0.718	0.101	0.718
2 yr.	6.629	448.681	0.161	1.690	0.154	1.690	0.105	0.639	0.099	0.639
3 yr.	2.990	187.932	0.134	0.887	0.121	0.887	0.127	0.887	0.128	0.887
4 yr.	0.721	10.116	0.201	3.219	0.195	3.218	0.221	3.218	0.239	3.218
5 yr.	1.026	21.791	0.204	3.882	0.199	3.882	0.224	3.882	0.239	3.882

MAPE/FORECAST

1 yr.	3.213	119.273	0.568	6.482	0.475	5.561	0.498	5.561	0.523	5.561
2 yr.	1.773	30.804	0.546	4.826	0.440	3.966	0.453	3.966	0.435	3.966
3 yr.	2.075	57.395	0.597	4.676	0.503	3.319	0.530	3.319	0.536	3.319
4 yr.	1.321	22.394	0.506	4.284	0.418	2.915	0.453	2.915	0.455	2.915
5 yr.	2.467	115.869	0.455	3.858	0.374	2.842	0.403	2.842	0.406	2.840

MSE/FORECAST

1 yr.	267.511	14226.44	1.570	42.038	0.960	30.953	1.084	30.935	1.219	30.953
2 yr.	24.030	949.136	1.153	23.325	0.609	15.884	0.676	15.884	0.699	15.884
3 yr.	49.878	3294.833	1.155	22.221	0.694	11.264	0.758	11.264	0.821	11.264
4 yr.	11.830	501.805	0.889	18.416	0.509	8.649	0.579	8.649	0.621	8.649
5 yr.	156.107	13426.18	0.757	14.899	0.451	8.110	0.511	8.110	0.551	8.110

MOVING AVERAGE

1980

MAPE/ACTUAL

2 yr.	1.434	43.968	1.262	43.968	1.373	43.968	0.432	5.354	0.472	5.354
3 yr.	1.309	29.201	1.022	29.201	1.109	29.201	0.425	5.472	0.462	5.472
4 yr.	1.232	21.780	0.888	21.780	0.962	21.780	0.435	4.964	0.465	4.964
5 yr.	1.151	17.320	0.805	17.320	0.868	17.320	0.443	4.215	0.466	4.215
6 yr.	1.102	14.347	0.764	14.347	0.815	14.347	0.467	4.215	0.481	3.813

MSE/ACTUAL

2 yr.	23.910	1933.298	33.365	1933.30	37.737	1933.30	0.907	28.672	1.036	28.672
3 yr.	12.486	852.940	15.409	852.940	17.421	852.940	0.876	29.996	1.001	29.996
4 yr.	8.241	474.725	8.932	474.735	10.091	474.735	0.766	24.734	0.872	24.773
5 yr.	5.992	301.079	5.812	301.079	6.560	301.079	0.607	18.034	0.682	18.034
6 yr.	4.713	206.590	4.122	206.590	4.644	206.590	0.538	14.738	0.596	14.738

MAPE/FORECAST

2 yr.	0.682	4.293	0.335	1.777	0.328	1.777	0.294	1.777	0.314	1.777
3 yr.	0.704	5.187	0.396	2.591	0.392	2.591	0.363	2.591	0.387	2.591
4 yr.	0.779	4.896	0.476	3.047	0.473	3.047	0.454	3.047	0.474	3.047
5 yr.	0.964	10.533	0.576	3.224	0.572	3.224	0.563	3.224	0.579	3.224
6 yr.	1.320	34.825	0.685	3.459	0.675	3.459	0.681	3.459	0.685	3.459

MSE/FORECAST

2 yr.	1.253	18.439	0.214	3.160	0.214	3.160	0.187	3.160	0.209	3.160
3 yr.	1.207	26.953	0.330	6.736	0.334	6.736	0.322	6.736	0.362	6.736
4 yr.	1.323	24.061	0.463	9.336	0.463	9.336	0.470	9.336	0.522	9.336
5 yr.	2.728	111.639	0.631	10.610	0.621	10.610	0.649	10.610	0.706	10.610
6 yr.	14.923	1214.67	0.829	12.153	0.801	12.153	0.852	12.153	0.903	12.153

1981

MAPE/ACTUAL

2 yr.	1.768	46.467	1.290	46.467	1.249	46.466	0.354	1.934	0.337	1.934
3 yr.	1.658	30.878	1.081	30.878	0.987	30.878	0.372	1.679	0.362	1.679
4 yr.	1.650	23.093	0.957	23.093	0.861	23.093	0.387	1.488	0.383	1.488
5 yr.	1.630	18.383	0.876	18.382	0.775	18.382	0.393	1.463	0.400	1.457
6 yr.	1.538	16.101	0.805	15.259	0.719	15.259	0.401	1.286	0.416	1.286

MSE/ACTUAL

2 yr.	31.423	2159.970	37.856	2159.97	41.100	2159.97	0.257	3.780	0.245	3.780
3 yr.	18.965	954.057	18.322	954.057	18.404	954.057	0.272	2.850	0.265	2.850
4 yr.	15.927	533.326	11.025	533.326	10.488	533.326	0.280	2.218	0.275	2.218
5 yr.	13.966	338.131	7.792	338.131	6.771	338.131	0.262	2.179	0.269	2.178
6 yr.	11.641	259.376	5.398	232.958	4.745	232.958	0.239	1.665	0.254	1.665

MAPE/FORECAST

2 yr.	1.093	38.110	0.306	0.983	0.304	0.981	0.286	0.981	0.284	0.981
3 yr.	1.800	76.361	0.336	0.984	0.337	0.984	0.323	0.984	0.329	0.984
4 yr.	0.773	11.249	0.389	1.491	0.390	1.491	0.382	1.491	0.397	1.491
5 yr.	1.796	101.877	0.453	1.871	0.453	1.871	0.452	1.864	0.476	1.858
6 yr.	0.960	18.436	0.535	2.150	0.536	2.150	0.543	2.150	0.577	2.150

MSE/FORECAST

2 yr.	17.189	1453.001	0.145	0.982	0.141	0.982	0.119	0.982	0.121	0.982
3 yr.	74.141	5832.516	0.175	0.987	0.169	0.987	0.155	0.987	0.163	0.987
4 yr.	2.404	126.562	0.245	2.227	0.243	2.227	0.236	2.227	0.254	2.227
5 yr.	113.967	10380.11	0.332	3.524	0.333	3.524	0.338	3.524	0.368	3.524
6 yr.	4.936	340.059	0.461	4.640	0.464	4.640	0.485	4.640	0.531	4.640

1982

MAPE/ACTUAL

2 yr.	0.662	10.904	0.270	1.965	0.249	1.592	0.245	1.592	0.254	1.592
3 yr.	1.186	33.732	0.917	33.732	0.957	33.730	0.326	2.037	0.338	2.037
4 yr.	1.124	25.233	0.797	25.233	0.809	25.233	0.346	2.044	0.358	2.044
5 yr.	1.186	20.149	0.727	20.149	0.728	20.149	0.367	2.231	0.384	2.231
6 yr.	1.177	16.721	0.678	16.721	0.669	16.721	0.371	2.049	0.394	2.049

MSE/ACTUAL

2 yr.	2.258	119.045	0.198	3.888	0.142	2.554	0.144	2.554	0.157	2.554
3 yr.	15.772	1138.011	19.331	1138.01	21.729	1138.01	0.277	4.169	0.306	4.169
4 yr.	10.415	637.272	11.027	637.272	12.286	637.272	0.284	4.226	0.310	4.226
5 yr.	8.615	406.025	7.183	406.025	7.947	406.025	0.311	4.980	0.338	4.980
6 yr.	7.336	279.810	5.046	279.810	5.543	279.810	0.284	4.222	0.312	4.224

MAPE/FORECAST

2 yr.	1.603	25.244	0.277	1.321	0.282	1.321	0.242	1.104	0.254	1.104
3 yr.	3.528	125.049	0.297	1.283	0.302	1.280	0.259	0.667	0.266	0.667
4 yr.	0.961	10.129	0.307	0.950	0.312	0.950	0.299	0.894	0.312	0.894
5 yr.	0.920	9.399	0.344	1.291	0.348	1.291	0.351	1.291	0.371	1.291
6 yr.	1.438	53.731	0.401	1.610	0.401	1.610	0.409	1.610	0.436	1.610

MSE/FORECAST

2 yr.	19.366	637.565	0.169	1.763	0.179	1.763	0.113	1.232	0.124	1.232
3 yr.	307.283	15637.74	0.157	1.651	0.160	1.651	0.104	0.451	0.112	0.451
4 yr.	3.656	102.829	0.151	0.925	0.151	0.925	0.137	0.821	0.148	0.821
5 yr.	2.855	88.360	0.194	1.667	0.198	1.667	0.198	1.667	0.216	1.667
6 yr.	34.013	2887.649	0.262	2.611	0.270	2.611	0.280	2.611	0.306	2.611

1983

MAPE/ACTUAL

2 yr.	0.591	3.776	0.276	0.845	0.270	0.777	0.278	0.777	0.283	0.777
3 yr.	0.581	3.831	0.287	0.723	0.287	0.706	0.326	2.037	0.309	1.488
4 yr.	0.627	16.041	0.542	16.041	0.582	16.041	0.283	0.778	0.306	0.778
5 yr.	0.537	12.725	0.486	12.725	0.521	12.700	0.288	0.796	0.311	0.794
6 yr.	0.503	10.525	0.463	10.518	0.495	10.518	0.306	0.899	0.330	0.851

MSE/ACTUAL

2 yr.	0.882	14.227	0.110	0.718	0.101	0.608	0.108	0.608	0.111	0.608
3 yr.	0.851	14.713	0.114	0.530	0.111	0.517	0.113	0.517	0.124	0.517
4 yr.	3.250	257.493	4.395	257.493	4.963	257.493	0.106	0.614	0.118	0.614
5 yr.	2.076	162.245	2.806	162.245	3.167	162.244	0.108	0.694	0.120	0.694
6 yr.	1.518	110.913	1.963	110.912	2.212	110.912	0.123	0.834	0.136	0.830

MAPE/FORECAST

2 yr.	4.907	341.126	0.502	5.539	0.423	1.808	0.442	1.808	0.451	1.808
3 yr.	1.031	7.120	0.484	2.675	0.461	2.550	0.466	2.550	0.503	2.550
4 yr.	0.890	8.297	0.414	1.421	0.418	1.421	0.402	1.421	0.437	1.421
5 yr.	1.440	44.379	0.411	1.501	0.421	1.477	0.421	1.477	0.459	1.473
6 yr.	1.378	39.127	0.451	1.784	0.464	1.784	0.476	1.784	0.518	1.731

MSE/FORECAST

2 yr.	1275.735	116368.4	0.833	30.706	0.325	3.276	0.357	3.276	0.376	3.276
3 yr.	3.190	50.771	0.506	7.185	0.413	6.570	0.431	6.570	0.484	6.570
4 yr.	2.765	68.929	0.278	2.035	0.270	2.035	0.253	2.035	0.283	2.035
5 yr.	25.501	1970.633	0.265	2.292	0.272	2.291	0.271	2.291	0.304	2.290
6 yr.	30.003	1531.405	0.327	2.611	0.339	3.234	0.355	3.234	0.396	3.230

EXPONENTIAL SMOOTHING

1980

MAPE/ACTUAL

0.95	1.832	83.829	1.896	83.829	2.092	83.829	0.455	5.208	0.489	5.208
0.90	1.785	79.398	1.822	79.398	2.009	79.398	0.448	5.222	0.483	5.222
0.85	1.738	74.968	1.749	74.968	1.926	74.968	0.442	5.234	0.478	5.234
0.80	1.691	70.543	1.675	70.536	1.843	70.536	0.437	5.238	0.474	5.238
0.75	1.644	66.109	1.601	66.109	1.760	66.109	0.432	5.240	0.470	5.240
0.70	1.596	61.681	1.527	61.681	1.677	61.681	0.427	5.230	0.466	5.225
0.65	1.548	57.251	1.452	57.251	1.593	57.251	0.423	5.204	0.461	5.203
0.60	1.501	52.801	1.379	52.801	1.512	52.796	0.422	5.137	0.459	5.137
0.55	1.453	48.375	1.305	48.375	1.430	48.350	0.421	5.057	0.456	5.057
0.50	1.404	43.931	1.231	43.931	1.347	43.931	0.420	4.980	0.453	4.980
0.45	1.353	39.513	1.154	39.513	1.261	39.513	0.417	4.875	0.448	4.875
0.40	1.305	35.062	1.079	35.062	1.177	35.062	0.418	4.702	0.446	4.702
0.35	1.255	30.621	1.003	30.611	1.092	30.611	0.420	4.492	0.446	4.492
0.30	1.204	26.183	0.928	26.183	1.008	26.183	0.425	4.261	0.447	4.261
0.25	1.157	21.709	0.863	21.694	0.931	21.694	0.440	3.921	0.458	3.921
0.20	1.109	17.278	0.802	17.278	0.856	17.278	0.459	3.599	0.469	3.599
0.15	1.061	12.810	0.744	12.810	0.784	12.810	0.485	3.163	0.488	3.163
0.10	1.013	8.347	0.693	8.337	0.720	8.337	0.522	2.657	0.517	2.657
0.05	0.981	6.194	0.655	3.760	0.669	3.760	0.569	1.972	0.556	1.972

MSE/ACTUAL

0.95	79.467	7027.797	118.104	7027.80	133.668	7027.80	0.956	27.150	1.084	27.150
0.90	71.557	6304.777	106.062	6304.78	120.037	6304.78	0.946	27.311	1.074	27.311
0.85	64.084	5620.973	94.673	5620.97	107.145	5620.97	0.935	27.441	1.062	27.441
0.80	57.046	4976.363	83.937	4976.36	94.991	4976.36	0.922	27.514	1.049	27.514
0.75	50.440	4370.945	73.851	4370.94	83.575	4370.94	0.908	27.501	1.034	27.501
0.70	44.264	3804.721	64.416	3804.72	72.894	3804.72	0.891	27.371	1.015	27.371
0.65	38.515	3277.667	55.628	3277.67	62.947	3277.67	0.871	27.090	0.993	27.090
0.60	33.191	2789.820	47.488	2789.82	53.734	2789.82	0.846	26.623	0.965	26.623
0.55	28.288	2341.140	39.994	2341.14	45.251	2341.14	0.817	25.934	0.932	25.934
0.50	23.805	1931.645	33.144	1931.64	37.499	1931.64	0.783	24.993	0.893	24.993
0.45	19.738	1561.341	26.939	1561.34	30.475	1561.34	0.743	23.766	0.847	23.766
0.40	16.086	1230.242	21.378	1230.24	24.181	1230.24	0.698	22.231	0.794	22.231
0.35	12.848	938.376	16.462	938.375	18.616	938.375	0.648	20.373	0.735	20.373
0.30	10.024	685.778	12.193	695.778	13.783	685.778	0.594	18.194	0.670	18.194
0.25	7.617	472.507	8.574	472.506	9.685	472.506	0.539	15.710	0.601	15.710
0.20	5.630	298.652	5.611	298.652	6.328	298.652	0.486	12.973	0.534	12.975
0.15	4.074	164.327	3.312	164.327	3.721	164.327	0.442	10.066	0.473	10.066
0.10	2.961	69.691	1.689	69.691	1.876	69.691	0.413	7.118	0.427	7.118
0.05	2.312	38.896	0.757	14.944	0.812	14.944	0.413	4.311	0.409	4.311

MAPE/FORECAST

0.95	1.183	27.203	0.280	0.985	0.276	0.985	0.246	0.836	0.253	0.836
0.90	0.854	13.613	0.283	0.983	0.278	0.983	0.247	0.846	0.255	0.846
0.85	0.773	9.114	0.287	0.982	0.281	0.982	0.249	0.927	0.258	0.927
0.80	0.747	6.892	0.292	1.013	0.286	1.013	0.253	1.013	0.264	1.013
0.75	0.762	5.774	0.297	1.113	0.292	1.113	0.258	1.113	0.271	1.113
0.70	1.473	67.796	0.304	1.222	0.299	1.222	0.265	1.222	0.279	1.218
0.65	2.007	121.363	0.313	1.341	0.308	1.341	0.273	1.341	0.289	1.339
0.60	0.787	11.612	0.327	1.453	0.322	1.447	0.288	1.447	0.304	1.447
0.55	0.726	6.203	0.343	1.604	0.338	1.580	0.306	1.580	0.322	1.580
0.50	0.714	5.141	0.362	1.757	0.357	1.757	0.327	1.757	0.342	1.757
0.45	0.718	5.051	0.385	1.957	0.380	1.957	0.352	1.957	0.366	1.957
0.40	0.737	4.911	0.415	2.153	0.411	2.153	0.386	2.153	0.399	2.153
0.35	0.764	4.754	0.454	2.386	0.451	2.386	0.430	2.386	0.442	2.386
0.30	0.804	4.565	0.506	2.691	0.503	2.691	0.489	2.691	0.499	2.691
0.25	0.863	4.298	0.586	3.004	0.580	3.004	0.575	3.004	0.581	3.004
0.20	0.947	4.094	0.695	3.485	0.685	3.485	0.694	3.485	0.691	3.485
0.15	1.069	4.212	0.854	4.065	0.838	4.065	0.866	4.065	0.851	4.065
0.10	1.263	4.898	1.100	4.888	1.076	4.888	1.135	4.888	1.099	4.888
0.05	1.622	6.123	1.539	6.057	1.503	6.057	1.608	6.057	1.531	6.057

MSE/FORECAST

0.95	15.575	740.176	0.132	0.977	0.135	0.977	0.106	0.704	0.113	0.704
0.90	3.893	185.438	0.136	0.973	0.138	0.975	0.109	0.723	0.116	0.723
0.85	2.348	83.151	0.141	0.974	0.143	0.974	0.113	0.868	0.121	0.868
0.80	1.885	47.496	0.146	1.041	0.148	1.041	0.118	1.041	0.128	1.041
0.75	1.921	33.389	0.153	1.248	0.155	1.248	0.125	1.248	0.136	1.248
0.70	51.938	4596.539	0.162	1.498	0.164	1.498	0.134	1.498	0.146	1.497
0.65	161.517	14729.05	0.173	1.798	0.174	1.798	0.145	1.798	0.159	1.798
0.60	2.682	135.243	0.187	2.162	0.188	2.161	0.160	2.161	0.176	2.161
0.55	1.584	38.603	0.206	2.606	0.206	2.605	0.180	2.605	0.198	2.605
0.50	1.370	26.623	0.230	3.152	0.229	3.152	0.206	3.152	0.227	3.152
0.45	1.299	25.515	0.263	3.831	0.261	3.831	0.242	3.831	0.266	3.831
0.40	1.283	24.243	0.308	4.690	0.304	4.690	0.291	4.690	0.318	4.690
0.35	1.302	22.715	0.372	5.796	0.366	5.796	0.361	5.796	0.391	5.796
0.30	1.357	20.875	0.466	7.262	0.455	7.262	0.462	7.262	0.497	7.262
0.25	1.461	18.725	0.610	9.272	0.592	9.272	0.617	9.272	0.655	9.272
0.20	1.650	16.787	0.844	12.167	0.813	12.167	0.866	12.167	0.905	12.167
0.15	2.006	17.824	1.256	16.599	1.202	16.599	1.302	16.599	1.334	16.599
0.10	2.741	24.004	2.083	24.004	1.984	24.004	2.175	24.004	2.176	24.004
0.05	4.616	38.037	4.212	38.026	4.024	38.026	4.449	38.026	4.332	38.026

1981

MAPE/ACTUAL

0.95	1.480	40.004	0.458	6.522	0.363	4.458	0.254	1.200	0.219	0.752
0.90	1.447	36.933	0.532	8.387	0.441	8.387	0.258	1.161	0.224	0.854
0.85	1.470	33.902	0.598	11.853	0.509	11.853	0.262	1.128	0.229	0.947
0.80	1.473	30.849	0.655	14.872	0.569	14.872	0.265	1.116	0.233	1.048
0.75	1.477	27.834	0.707	17.429	0.622	17.429	0.272	1.141	0.242	1.141
0.70	1.479	24.828	0.753	19.517	0.699	19.517	0.282	1.219	0.255	1.219
0.65	1.481	21.822	0.791	21.126	0.708	21.126	0.293	1.271	0.269	1.271
0.60	1.476	22.270	0.822	22.270	0.738	22.270	0.303	1.311	0.282	1.311
0.55	1.467	22.950	0.844	22.950	0.760	22.950	0.312	1.339	0.294	1.339
0.50	1.450	23.168	0.857	23.168	0.774	23.168	0.319	1.356	0.306	1.356
0.45	1.441	22.913	0.862	22.913	0.779	22.913	0.326	1.351	0.318	1.342
0.40	1.431	22.188	0.857	22.188	0.774	22.188	0.333	1.324	0.330	1.324
0.35	1.416	20.995	0.847	20.995	0.762	20.995	0.343	1.277	0.345	1.277
0.30	1.391	19.334	0.830	19.333	0.743	19.333	0.356	1.207	0.363	1.207
0.25	1.378	17.195	0.805	17.195	0.716	17.192	0.371	1.101	0.384	1.101
0.20	1.391	14.563	0.777	14.563	0.683	14.563	0.392	0.948	0.408	0.948
0.15	1.392	13.669	0.740	11.492	0.641	11.492	0.415	0.795	0.435	0.726
0.10	1.385	14.149	0.705	8.099	0.598	7.942	0.449	0.765	0.465	0.765
0.05	1.379	15.252	0.690	7.822	0.573	3.886	0.514	0.824	0.516	0.824

MSE/ACTUAL

0.95	22.317	1600.605	1.200	42.585	0.544	19.904	0.133	1.450	0.080	0.571
0.90	20.225	1365.329	2.128	70.640	1.507	70.640	0.134	1.390	0.085	0.759
0.85	18.612	1149.541	3.391	141.187	2.846	141.187	0.138	1.338	0.091	0.952
0.80	17.369	952.930	4.824	221.821	4.377	221.821	0.143	1.293	0.100	1.143
0.75	16.407	775.289	6.287	304.118	5.941	304.118	0.149	1.324	0.110	1.324
0.70	15.645	616.482	7.656	380.958	7.403	380.958	0.156	1.488	0.120	1.488
0.65	15.018	476.412	8.833	446.514	8.653	446.514	0.164	1.628	0.132	1.628
0.60	14.472	496.272	9.740	496.272	9.605	496.272	0.171	1.738	0.144	1.738
0.55	13.961	527.007	10.318	527.007	10.197	527.007	0.178	1.812	0.155	1.812
0.50	13.450	536.801	10.532	536.801	10.393	536.801	0.184	1.843	0.166	1.843
0.45	12.912	525.038	10.370	525.038	10.179	523.038	0.188	1.827	0.176	1.827
0.40	12.327	492.408	9.839	492.408	9.568	492.408	0.191	1.760	0.184	1.760
0.35	11.686	440.911	8.972	440.911	8.597	440.911	0.192	1.638	0.191	1.638
0.30	10.987	373.863	7.823	373.863	7.327	373.863	0.193	1.461	0.198	1.461
0.25	10.244	295.907	6.473	295.907	5.849	295.907	0.193	1.233	0.204	1.233
0.20	9.486	213.028	5.027	213.028	4.276	213.028	0.198	0.962	0.212	0.962
0.15	8.766	187.190	3.617	132.577	2.753	132.577	0.212	0.668	0.228	0.660
0.10	8.170	200.568	2.404	65.823	1.455	63.292	0.244	0.607	0.257	0.607
0.05	7.831	233.556	1.580	61.660	0.590	15.339	0.308	0.730	0.314	0.730

MAPE/FORECAST

0.95	0.650	4.983	0.305	1.508	0.301	1.508	0.244	0.948	0.239	0.948
0.90	0.848	22.121	0.296	1.311	0.291	1.311	0.241	0.932	0.234	0.932
0.85	0.660	5.183	0.288	1.135	0.282	1.135	0.239	0.915	0.232	0.915
0.80	0.766	11.857	0.282	0.994	0.276	0.994	0.240	0.912	0.233	0.912
0.75	1.843	87.475	0.281	0.936	0.275	0.936	0.245	0.909	0.239	0.909
0.70	3.266	198.473	0.283	0.950	0.278	0.950	0.254	0.902	0.250	0.902
0.65	0.764	6.138	0.287	0.950	0.282	0.950	0.265	0.881	0.262	0.881
0.60	0.694	5.070	0.294	0.949	0.290	0.949	0.276	0.860	0.276	0.860
0.55	0.705	6.654	0.303	0.952	0.300	0.952	0.289	0.844	0.290	0.844
0.50	0.813	9.561	0.316	0.957	0.313	0.957	0.303	0.835	0.308	0.835
0.45	1.655	70.116	0.332	0.958	0.331	0.958	0.321	0.826	0.330	0.817
0.40	1.365	53.185	0.352	0.954	0.353	0.954	0.345	0.936	0.357	0.936
0.35	2.860	124.929	0.384	1.111	0.385	1.111	0.379	1.111	0.396	1.111
0.30	1.047	19.282	0.428	1.333	0.430	1.333	0.427	1.333	0.450	1.333
0.25	2.104	99.569	0.489	1.618	0.492	1.616	0.495	1.616	0.524	1.616
0.20	0.923	8.754	0.581	1.988	0.583	1.988	0.596	1.988	0.630	1.988
0.15	0.937	6.825	0.716	2.578	0.718	2.578	0.744	2.578	0.787	2.500
0.10	1.074	5.956	0.942	3.512	0.941	3.512	0.991	3.512	1.038	3.512
0.05	1.399	5.863	1.402	5.863	1.395	5.863	1.493	5.863	1.534	5.863

MSE/FORECAST

0.95	1.097	24.872	0.172	2.284	0.173	2.284	0.097	0.907	0.093	0.907
0.90	6.247	490.091	0.152	1.763	0.151	1.763	0.090	0.902	0.085	0.902
0.85	1.243	26.899	0.140	1.353	0.137	1.353	0.088	0.888	0.084	0.888
0.80	2.713	141.079	0.133	1.029	0.128	1.029	0.090	0.869	0.086	0.869
0.75	87.642	7653.590	0.129	0.894	0.124	0.894	0.093	0.845	0.090	0.845
0.70	445.989	39391.84	0.129	0.905	0.123	0.905	0.098	0.816	0.095	0.816
0.65	1.966	37.739	0.131	0.912	0.125	0.912	0.103	0.784	0.102	0.784
0.60	1.309	25.779	0.135	0.916	0.129	0.916	0.111	0.753	0.111	0.753
0.55	1.463	44.364	0.142	0.918	0.137	0.918	0.120	0.724	0.122	0.724
0.50	2.787	91.443	0.153	0.919	0.148	0.919	0.133	0.700	0.137	0.700
0.45	58.439	4916.293	0.168	0.918	0.164	0.918	0.152	0.683	0.158	0.683
0.40	33.243	2828.952	0.191	0.916	0.187	0.916	0.178	0.882	0.188	0.882
0.35	209.327	15608.13	0.225	1.241	0.223	1.241	0.217	1.241	0.232	1.241
0.30	8.184	371.843	0.279	1.783	0.278	1.783	0.278	1.783	0.301	1.783
0.25	114.206	9915.359	0.368	2.641	0.369	2.641	0.379	2.641	0.412	2.641
0.20	2.561	77.234	0.525	4.087	0.529	4.087	0.557	4.087	0.606	4.087
0.15	1.775	46.748	0.830	6.759	0.838	6.759	0.900	6.759	0.976	6.750
0.10	2.041	35.637	1.518	12.432	1.534	12.432	1.672	12.432	1.801	12.432
0.05	3.492	34.724	3.617	34.724	3.669	34.724	4.045	34.724	4.325	34.724

1982

MAPE/ACTUAL

0.95	0.552	7.425	0.229	1.552	0.198	1.066	0.185	1.066	0.202	1.066
0.90	0.552	6.535	0.243	1.605	0.216	1.126	0.190	1.126	0.208	1.126
0.85	0.562	7.082	0.263	2.017	0.240	2.017	0.197	1.192	0.214	1.192
0.80	0.576	7.621	0.287	3.315	0.270	3.315	0.204	1.259	0.221	1.259
0.75	0.594	8.152	0.315	4.820	0.303	4.820	0.212	1.335	0.228	1.335
0.70	0.613	8.651	0.346	6.440	0.340	6.440	0.220	1.402	0.236	1.402
0.65	0.638	9.121	0.382	8.109	0.377	8.109	0.228	1.467	0.245	1.467
0.60	0.666	9.757	0.419	9.757	0.416	9.757	0.237	1.538	0.253	1.538
0.55	0.713	11.304	0.457	11.300	0.455	11.300	0.247	1.602	0.263	1.602
0.50	0.761	12.666	0.491	12.666	0.490	12.666	0.258	1.661	0.274	1.661
0.45	0.810	13.769	0.522	13.769	0.522	13.769	0.270	1.702	0.287	1.702
0.40	0.856	14.545	0.547	14.545	0.548	14.544	0.282	1.731	0.301	1.731
0.35	0.901	14.906	0.566	14.906	0.567	14.906	0.295	1.733	0.317	1.731
0.30	0.953	14.780	0.583	14.780	0.581	14.780	0.313	1.700	0.336	1.700
0.25	1.002	14.096	0.595	14.096	0.590	14.096	0.336	1.634	0.360	1.619
0.20	1.051	12.735	0.604	12.735	0.594	12.735	0.369	1.477	0.391	1.477
0.15	1.097	10.846	0.605	10.715	0.591	10.715	0.408	1.314	0.429	1.314
0.10	1.142	14.059	0.606	7.849	0.588	7.849	0.464	1.016	0.482	1.016
0.05	1.192	18.230	0.610	4.116	0.588	4.116	0.544	0.835	0.549	0.835

MSE/ACTUAL

0.95	1.510	55.139	0.128	2.410	0.086	1.136	0.083	1.136	0.094	1.136
0.90	1.404	42.755	0.147	2.587	0.107	1.277	0.088	1.277	0.099	1.277
0.85	1.374	50.226	0.204	4.087	0.170	4.087	0.093	1.432	0.106	1.432
0.80	1.434	58.168	0.326	11.029	0.306	11.029	0.100	1.602	0.114	1.602
0.75	1.594	66.455	0.538	23.239	0.543	23.239	0.108	1.785	0.122	1.785
0.70	1.857	74.919	0.853	41.539	0.896	41.539	0.117	1.979	0.132	1.979
0.65	2.216	83.254	1.271	65.900	1.364	65.900	0.127	2.180	0.143	2.180
0.60	2.655	95.321	1.775	95.321	1.928	95.321	0.138	2.384	0.155	2.383
0.55	3.147	127.802	2.331	127.802	2.551	127.802	0.150	2.583	0.167	2.583
0.50	3.658	160.448	2.890	160.448	3.177	160.448	0.162	2.763	0.180	2.763
0.45	4.148	189.680	3.393	189.680	3.739	189.680	0.174	2.909	0.193	2.909
0.40	4.575	211.565	3.771	211.565	4.162	211.565	0.185	2.999	0.205	2.999
0.35	4.901	222.263	3.961	222.263	4.372	222.263	0.194	3.009	0.216	3.009
0.30	5.099	218.595	3.909	218.595	4.311	218.595	0.202	2.910	0.225	2.910
0.25	5.165	198.727	3.584	198.727	3.943	198.727	0.210	2.673	0.233	2.672
0.20	5.136	162.987	2.992	162.987	3.276	162.987	0.218	2.277	0.241	2.277
0.15	5.113	117.633	2.196	114.808	2.381	114.808	0.233	1.725	0.254	1.725
0.10	5.306	197.931	1.333	61.809	1.409	61.809	0.263	1.060	0.280	1.060
0.05	6.096	332.750	0.637	17.031	0.624	17.031	0.327	0.891	0.335	0.891

MAPE/FORECAST

0.95	1.035	20.975	0.244	1.496	0.215	0.836	0.183	0.792	0.198	0.792
0.90	1.102	20.720	0.241	0.959	0.223	0.863	0.187	0.779	0.202	0.779
0.85	2.060	102.658	0.239	0.887	0.228	0.887	0.190	0.773	0.205	0.773
0.80	1.312	25.242	0.237	0.902	0.232	0.902	0.194	0.765	0.209	0.765
0.75	1.438	33.434	0.235	0.914	0.234	0.914	0.197	0.763	0.212	0.763
0.70	3.107	153.172	0.236	0.903	0.237	0.903	0.201	0.749	0.216	0.749
0.65	7.601	602.179	0.239	0.881	0.239	0.881	0.206	0.737	0.220	0.737
0.60	1.662	43.045	0.244	0.901	0.243	0.901	0.212	0.733	0.226	0.733
0.55	1.990	86.527	0.252	0.914	0.250	0.914	0.221	0.729	0.234	0.729
0.50	1.229	18.050	0.260	0.926	0.259	0.926	0.232	0.732	0.245	0.732
0.45	1.386	37.519	0.272	0.929	0.272	0.929	0.247	0.736	0.262	0.736
0.40	6.535	371.707	0.287	0.935	0.288	0.935	0.267	0.754	0.285	0.754
0.35	0.999	9.251	0.310	0.935	0.311	0.935	0.294	0.813	0.316	0.812
0.30	1.315	39.692	0.346	0.985	0.347	0.985	0.335	0.985	0.360	0.985
0.25	1.135	15.852	0.401	1.227	0.402	1.227	0.396	1.227	0.424	1.212
0.20	1.227	19.528	0.487	1.537	0.487	1.537	0.490	1.537	0.520	1.537
0.15	4.243	288.268	0.620	2.091	0.619	2.091	0.636	2.091	0.669	2.091
0.10	1.335	16.629	0.852	2.980	0.853	2.980	0.894	2.980	0.929	2.980
0.05	1.587	8.738	1.333	5.381	1.338	5.381	1.428	5.260	1.455	5.260

MSE/FORECAST

0.95	8.486	439.959	0.135	2.238	0.096	0.699	0.069	0.627	0.077	0.627
0.90	10.479	429.490	0.115	0.926	0.099	0.751	0.069	0.613	0.078	0.613
0.85	122.640	10539.62	0.108	0.795	0.103	0.795	0.069	0.605	0.078	0.605
0.80	17.899	637.455	0.106	0.825	0.105	0.825	0.069	0.595	0.077	0.595
0.75	24.753	1117.836	0.105	0.836	0.106	0.836	0.069	0.582	0.077	0.582
0.70	301.073	23463.31	0.105	0.824	0.107	0.824	0.069	0.569	0.077	0.569
0.65	3952.487	362630.1	0.106	0.793	0.107	0.793	0.071	0.556	0.079	0.556
0.60	40.805	1853.401	0.108	0.823	0.108	0.823	0.074	0.545	0.082	0.545
0.55	89.811	7487.234	0.110	0.844	0.110	0.844	0.079	0.539	0.087	0.539
0.50	10.651	325.854	0.115	0.859	0.115	0.859	0.086	0.538	0.094	0.538
0.45	20.166	1407.976	0.122	0.869	0.122	0.869	0.098	0.547	0.106	0.547
0.40	1746.951	138166.1	0.134	0.875	0.135	0.875	0.114	0.570	0.125	0.570
0.35	3.793	85.627	0.154	0.878	0.155	0.878	0.140	0.665	0.152	0.665
0.30	19.473	1575.859	0.187	0.981	0.190	0.981	0.180	0.981	0.197	0.981
0.25	5.428	251.338	0.244	1.509	0.250	1.509	0.249	1.509	0.271	1.508
0.20	7.663	382.541	0.352	2.459	0.363	2.459	0.375	2.459	0.407	2.459
0.15	907.714	83098.56	0.575	4.375	0.595	4.374	0.634	4.374	0.683	4.374
0.10	5.311	276.860	1.121	8.964	1.161	8.964	1.263	8.964	1.346	8.964
0.05	4.304	76.550	2.987	29.073	3.092	29.073	3.413	29.056	3.599	29.056

1983

MAPE/ACTUAL

0.95	0.648	5.424	0.254	0.772	0.243	0.675	0.259	0.675	0.262	0.675
0.90	0.636	5.217	0.254	0.775	0.243	0.684	0.259	0.684	0.262	0.684
0.85	0.625	4.991	0.253	0.771	0.242	0.683	0.260	0.683	0.264	0.683
0.80	0.615	4.749	0.253	0.766	0.243	0.678	0.261	0.678	0.266	0.678
0.75	0.609	4.487	0.260	0.757	0.252	0.668	0.262	0.668	0.269	0.668
0.70	0.601	4.204	0.269	0.885	0.263	0.884	0.263	0.671	0.271	0.671
0.65	0.592	3.910	0.280	1.480	0.275	1.480	0.265	0.668	0.273	0.668
0.60	0.582	3.600	0.292	2.161	0.291	2.160	0.267	0.641	0.277	0.625
0.55	0.570	3.337	0.306	2.945	0.308	2.945	0.269	0.635	0.281	0.599
0.50	0.557	3.740	0.323	3.740	0.328	3.731	0.273	0.579	0.286	0.577
0.45	0.540	4.551	0.341	4.551	0.349	4.548	0.278	0.582	0.292	0.582
0.40	0.521	5.300	0.361	5.300	0.373	5.298	0.286	0.574	0.300	0.574
0.35	0.503	5.921	0.383	5.908	0.398	5.903	0.299	0.543	0.314	0.543
0.30	0.502	6.319	0.405	6.319	0.423	6.319	0.317	0.560	0.331	0.560
0.25	0.501	6.495	0.429	6.491	0.449	6.491	0.341	0.625	0.354	0.625
0.20	0.512	6.242	0.458	6.189	0.477	6.189	0.375	0.601	0.386	0.601
0.15	0.533	5.524	0.490	5.524	0.507	5.524	0.423	0.708	0.430	0.708
0.10	0.575	4.335	0.532	4.187	0.545	4.187	0.491	0.753	0.494	0.753
0.05	0.644	5.435	0.584	2.154	0.591	2.154	0.584	0.812	0.581	0.812

MSE/ACTUAL

0.95	1.402	29.420	0.098	0.596	0.086	0.460	0.095	0.460	0.098	0.460
0.90	1.324	27.244	0.097	0.603	0.086	0.470	0.095	0.470	0.098	0.470
0.85	1.245	24.987	0.096	0.606	0.086	0.479	0.095	0.479	0.099	0.479
0.80	1.164	22.653	0.096	0.603	0.086	0.483	0.095	0.483	0.099	0.483
0.75	1.083	20.255	0.098	0.595	0.089	0.481	0.095	0.481	0.099	0.481
0.70	1.003	17.814	0.108	0.812	0.101	0.812	0.095	0.474	0.100	0.474
0.65	0.928	15.364	0.131	2.219	0.128	2.219	0.095	0.459	0.100	0.459
0.60	0.862	13.091	0.172	4.749	0.176	4.749	0.095	0.436	0.100	0.435
0.55	0.809	11.104	0.237	8.675	0.251	8.675	0.095	0.403	0.101	0.402
0.50	0.773	14.085	0.328	14.085	0.354	14.085	0.096	0.361	0.103	0.360
0.45	0.753	20.772	0.441	20.772	0.483	20.772	0.098	0.350	0.105	0.350
0.40	0.748	28.138	0.566	28.138	0.626	28.138	0.102	0.337	0.110	0.337
0.35	0.752	35.152	0.688	35.152	0.764	35.152	0.108	0.323	0.117	0.323
0.30	0.757	40.398	0.784	40.398	0.873	40.398	0.118	0.356	0.127	0.356
0.25	0.755	42.260	0.829	42.260	0.923	42.260	0.134	0.404	0.143	0.404
0.20	0.739	39.285	0.802	39.279	0.890	39.279	0.160	0.457	0.168	0.457
0.15	0.715	30.815	0.696	30.815	0.767	30.815	0.199	0.539	0.207	0.539
0.10	0.711	18.802	0.539	17.926	0.582	17.926	0.263	0.639	0.268	0.639
0.05	0.798	29.751	0.415	4.791	0.429	4.791	0.365	0.769	0.364	0.769

MAPE/FORECAST

0.95	1.096	26.177	0.451	3.390	0.389	2.105	0.421	2.105	0.431	2.105
0.90	1.265	43.744	0.447	3.476	0.386	1.939	0.418	1.939	0.428	1.939
0.85	1.598	74.986	0.441	3.502	0.382	1.767	0.416	1.767	0.427	1.767
0.80	2.008	111.443	0.436	3.465	0.380	1.595	0.415	1.595	0.426	1.595
0.75	2.113	116.477	0.436	3.359	0.384	1.502	0.413	1.502	0.425	1.502
0.70	2.056	94.536	0.433	3.191	0.387	1.537	0.410	1.537	0.424	1.537
0.65	2.770	76.410	0.429	2.981	0.388	1.557	0.408	1.557	0.424	1.557
0.60	1.872	71.001	0.425	2.722	0.390	1.543	0.407	1.543	0.425	1.528
0.55	1.898	87.888	0.421	2.472	0.393	1.539	0.407	1.539	0.428	1.505
0.50	5.842	393.957	0.421	2.191	0.399	1.478	0.411	1.478	0.433	1.478
0.45	1.665	64.369	0.425	1.941	0.408	1.437	0.418	1.437	0.442	1.437
0.40	1.430	36.388	0.434	1.707	0.424	1.378	0.432	1.378	0.458	1.378
0.35	5.666	416.073	0.454	1.479	0.449	1.292	0.459	1.292	0.485	1.292
0.30	2.084	95.283	0.487	1.449	0.487	1.449	0.499	1.449	0.527	1.449
0.25	3.816	140.169	0.540	1.733	0.545	1.733	0.561	1.733	0.591	1.733
0.20	1.191	23.889	0.630	2.045	0.638	2.045	0.663	2.045	0.693	2.045
0.15	0.924	4.974	0.780	2.746	0.791	2.746	0.830	2.746	0.860	2.746
0.10	1.170	11.682	1.054	3.966	1.068	3.966	1.135	3.966	1.165	3.966
0.05	1.515	8.399	1.643	7.281	1.663	7.281	1.790	7.245	1.819	7.245

MSE/FORECAST

0.95	10.003	685.219	0.551	11.493	0.334	4.444	0.376	4.444	0.402	4.444
0.90	22.861	1913.745	0.538	12.098	0.319	3.769	0.361	3.769	0.386	3.769
0.85	62.999	5624.016	0.520	12.318	0.305	3.152	0.347	3.152	0.370	3.152
0.80	136.972	12421.922	0.498	12.079	0.294	2.600	0.333	2.600	0.356	2.600
0.75	150.096	13570.187	0.473	11.376	0.284	2.337	0.320	2.337	0.342	2.337
0.70	104.292	8940.078	0.443	10.286	0.277	2.418	0.307	2.418	0.329	2.418
0.65	138.271	5840.058	0.411	8.943	0.269	2.455	0.294	2.455	0.317	2.455
0.60	62.069	5043.679	0.379	7.505	0.263	2.441	0.283	2.441	0.305	2.440
0.55	86.909	7724.410	0.349	6.111	0.258	2.372	0.274	2.372	0.297	2.370
0.50	1724.898	155212.69	0.326	4.857	0.255	2.251	0.268	2.251	0.291	2.251
0.45	49.122	4208.812	0.310	3.793	0.258	2.093	0.268	2.093	0.292	2.093
0.40	21.265	1324.401	0.304	2.929	0.267	1.916	0.277	1.916	0.302	1.906
0.35	1891.257	173122.62	0.314	2.249	0.289	1.738	0.299	1.738	0.327	1.738
0.30	102.879	9085.745	0.347	2.203	0.331	2.203	0.345	2.203	0.377	2.203
0.25	328.203	19648.918	0.417	3.038	0.410	3.038	0.432	3.038	0.471	3.038
0.20	8.470	571.908	0.557	4.536	0.560	4.536	0.598	4.536	0.650	4.536
0.15	1.532	25.016	0.856	7.689	0.869	7.689	0.944	7.689	1.019	7.689
0.10	3.278	136.515	1.593	16.089	1.628	16.089	1.791	16.089	1.919	16.089
0.05	4.170	70.857	4.195	53.541	4.305	53.541	4.789	53.537	5.102	53.537

Appendix 39-1.

COMPARISON OF THE ERROR MEASURES FOR THE BEST FORM OF EACH MODEL FOR FORECASTING PROFITS OF COMPANIES WITH ATTRIBUTABLE PROFIT GREATER THAN #1m. (60 Companies)

OPTIMAL SINGLE MODEL

BEST MODEL

Absolute Change	5 year
Percentage Change	3 year
Moving Average	2 year
Exponential Smoothing	0.80

	MEAN	STD. ERROR	STD. DEV.	RANGE	MINIMUM	MAXIMUM
1981						
MAPE/ACTUAL						
RW.	0.377	0.105	0.813	6.170	0.011	6.181
AC.	0.418	0.121	0.939	7.044	0.007	7.051
PC.	0.477	0.107	0.829	5.767	0.001	5.767
MA.	1.290	0.783	6.067	46.467	0.008	46.475
ES.	0.655	0.273	2.114	14.872	0.021	14.892
Re.	0.551	0.155	1.199	8.272	0.004	8.276
S1	1.840	0.350	2.712	14.146	0.012	14.158
S2	1.948	0.379	2.933	15.346	0.003	15.349
S3	2.012	0.389	3.011	15.549	0.017	15.566
S4	2.009	0.388	3.006	15.534	0.016	15.550
S5	2.220	0.438	3.389	17.598	0.020	17.618
S6	1.949	0.380	2.945	15.452	0.007	15.459
MSE/ACTUAL						
RW.	0.792	0.636	4.924	38.205	0.000	38.206
AC.	1.041	0.827	6.409	49.711	0.000	49.711
PC.	0.903	0.558	4.323	33.262	0.000	33.262
MA.	37.856	36.001	278.862	2159.970	0.000	2159.970
ES.	4.824	3.798	29.418	221.821	0.000	221.821
Re.	1.718	1.152	8.921	68.493	0.000	68.493
S1	10.622	4.003	31.008	200.455	0.000	200.455
S2	12.256	4.690	36.331	235.592	0.000	235.592
S3	12.961	4.864	37.673	242.305	0.000	242.305
S4	12.917	4.851	37.579	241.804	0.000	241.805
S5	16.221	6.207	48.081	310.396	0.000	310.396
S6	12.325	4.749	36.787	238.977	0.000	238.977

MAPE/FORECAST

RW.	0.308	0.042	0.326	1.708	0.011	1.718
AC.	0.328	0.060	0.467	2.405	0.007	2.411
PC.	0.377	0.067	0.517	2.679	0.001	2.680
MA.	0.306	0.030	0.230	0.983	0.008	0.991
ES.	0.282	0.030	0.232	0.994	0.021	1.015
Re.	0.511	0.191	1.478	11.298	0.004	11.302
S1	1.431	0.749	5.799	45.290	0.000	45.290
S2	1.363	0.711	5.507	43.011	0.000	43.011
S3	1.320	0.678	5.250	41.009	0.000	41.009
S4	1.323	0.680	5.269	41.157	0.000	41.157
S5	1.238	0.621	4.808	37.581	0.000	37.581
S6	1.365	0.711	5.511	43.037	0.000	43.037

MSE/FORECAST

RW.	0.199	0.062	0.478	2.953	0.000	2.953
AC.	0.322	0.128	0.992	5.815	0.000	5.815
PC.	0.405	0.157	1.219	7.181	0.000	7.181
MA.	0.145	0.027	0.211	0.982	0.000	0.982
ES.	0.133	0.029	0.222	1.029	0.000	1.029
Re.	2.409	2.127	16.473	127.741	0.000	127.741
S1	35.116	34.171	264.689	2051.181	0.000	2051.181
S2	31.679	30.818	238.716	1849.915	0.000	1849.915
S3	28.840	28.016	217.009	1681.736	0.000	1681.736
S4	29.045	28.219	218.582	1693.921	0.000	1693.921
S5	24.265	23.527	182.243	1412.355	0.000	1412.355
S6	31.722	30.856	239.007	1852.176	0.000	1852.176

1982

MAPE/ACTUAL

RW.	0.225	0.035	0.273	1.500	0.002	1.502
AC.	0.259	0.041	0.320	1.514	0.001	1.515
PC.	0.328	0.051	0.397	1.930	0.005	1.935
MA.	0.270	0.045	0.352	1.965	0.006	1.971
ES.	0.287	0.064	0.498	3.315	0.006	3.321
Re.	0.281	0.059	0.457	2.874	0.001	2.875
S1	0.859	0.198	1.532	11.619	0.005	11.624
S2	0.892	0.211	1.635	12.376	0.010	12.385
S3	0.918	0.218	1.689	12.757	0.003	12.760
S4	0.914	0.217	1.679	12.680	0.005	12.685
S5	0.925	0.222	1.721	13.000	0.026	13.026
S6	0.847	0.193	1.494	11.369	0.015	11.384

MSE/ACTUAL

RW.	0.124	0.044	0.340	2.256	0.000	2.256
AC.	0.168	0.051	0.398	2.295	0.000	2.295
PC.	0.263	0.079	0.615	3.743	0.000	3.743
MA.	0.194	0.078	0.606	3.888	0.000	3.888
ES.	0.326	0.191	1.476	11.029	0.000	11.029
Re.	0.284	0.148	1.149	8.265	0.000	8.265
S1	3.047	2.247	17.405	135.111	0.000	135.111
S2	3.424	2.552	19.768	153.398	0.000	153.398
S3	3.648	2.710	20.990	162.830	0.000	162.830
S4	3.607	2.678	20.741	160.901	0.000	160.901
S5	3.770	2.824	21.873	169.684	0.001	169.684
S6	2.911	2.155	16.690	129.594	0.000	129.594

MAPE/FORECAST

RW.	0.256	0.045	0.351	2.309	0.002	2.311
AC.	0.374	0.116	0.900	6.516	0.001	6.518
PC.	0.364	0.074	0.571	3.802	0.005	3.807
MA.	0.277	0.040	0.306	1.321	0.007	1.328
ES.	0.237	0.029	0.225	0.902	0.006	0.908
Re.	0.258	0.045	0.352	1.713	0.001	1.714
S1	1.866	0.857	6.635	47.427	0.000	47.427
S2	1.754	0.796	6.167	43.695	0.000	43.695
S3	1.687	0.773	5.985	42.746	0.000	42.746
S4	1.698	0.776	6.012	42.857	0.000	42.857
S5	1.675	0.763	5.911	41.984	0.000	41.984
S6	1.946	0.886	6.862	48.811	0.000	48.811

MSE/FORECAST

RW.	0.186	0.090	0.698	5.339	0.000	5.339
AC.	0.936	0.711	5.504	42.480	0.000	42.480
PC.	0.452	0.245	1.895	14.491	0.000	14.491
MA.	0.169	0.047	0.361	1.763	0.000	1.763
ES.	0.106	0.023	0.180	0.825	0.000	0.825
Re.	0.188	0.066	0.512	2.938	0.000	2.938
S1	46.769	38.093	295.071	2249.323	0.000	2249.323
S2	40.469	32.467	251.489	1909.255	0.000	1909.255
S3	38.063	30.962	239.831	1827.239	0.000	1827.239
S4	38.426	31.150	241.285	1836.696	0.000	1836.696
S5	37.163	29.948	231.974	1762.626	0.000	1726.626
S6	50.085	40.442	313.262	2382.475	0.000	2382.475

1983

MAPE/ACTUAL

RW.	0.254	0.024	0.186	0.761	0.004	0.765
AC.	0.258	0.030	0.234	0.929	0.003	0.932
PC.	0.294	0.028	0.219	0.903	0.039	0.943
MA.	0.276	0.024	0.185	0.845	0.002	0.847
ES.	0.436	0.072	0.560	3.465	0.011	3.476
Re.	0.423	0.068	0.529	2.361	0.000	2.361
S1	1.083	0.194	1.500	10.079	0.002	10.081
S2	1.110	0.201	1.554	10.259	0.020	10.279
S3	1.136	0.209	1.620	10.760	0.010	10.770
S4	1.133	0.208	1.611	10.687	0.007	10.694
S5	1.092	0.196	1.515	10.116	0.008	10.124
S6	1.011	0.168	1.298	11.369	0.015	11.384

MSE/ACTUAL

RW.	0.098	0.018	0.137	0.585	0.000	0.586
AC.	0.121	0.026	0.204	0.869	0.000	0.869
PC.	0.134	0.025	0.191	0.887	0.002	0.889
MA.	0.110	0.018	0.141	0.718	0.000	0.718
ES.	0.096	0.017	0.130	0.603	0.000	0.603
Re.	0.454	0.138	1.071	5.573	0.000	5.573
S1	3.384	1.731	13.411	101.611	0.000	101.611
S2	3.607	1.810	14.022	105.654	0.000	105.655
S3	3.873	1.981	15.346	116.000	0.000	116.000
S4	3.838	1.955	15.141	114.359	0.000	114.359
S5	3.449	1.749	13.548	102.496	0.000	102.496
S6	2.680	1.349	10.449	79.433	0.000	79.433

MAPE/FORECAST

RW.	0.454	0.078	0.602	3.254	0.004	3.259
AC.	0.624	0.162	1.254	6.924	0.003	6.927
PC.	0.597	0.116	0.901	4.676	0.038	4.714
MA.	0.502	0.098	0.762	5.539	0.002	5.541
ES.	0.436	0.072	0.560	3.465	0.011	3.476
Re.	0.263	0.026	0.203	0.702	0.000	0.702
S1	1.397	0.396	3.065	18.033	0.000	18.033
S2	1.339	0.379	2.936	17.195	0.000	17.195
S3	1.298	0.368	2.854	16.830	0.000	16.830
S4	1.301	0.369	2.860	16.880	0.000	16.880
S5	1.379	0.392	3.037	17.842	0.000	17.842
S6	1.606	0.450	3.488	20.422	0.000	20.422

MSE/FORECAST

RW.	0.563	0.212	1.642	10.618	0.000	10.618
AC.	1.934	0.960	7.436	47.984	0.000	47.984
PC.	1.155	0.454	3.517	22.221	0.001	22.223
MA.	0.822	0.512	3.968	30.706	0.000	30.706
ES.	0.498	0.212	1.643	12.079	0.000	12.079
Re.	0.110	0.017	0.133	0.493	0.000	0.493
S1	11.188	6.211	48.110	325.204	0.000	325.204
S2	10.271	5.679	43.989	295.668	0.000	295.668
S3	9.696	5.408	41.894	283.259	0.000	283.259
S4	9.735	5.432	42.073	284.921	0.000	284.921
S5	10.967	6.096	47.223	318.343	0.000	318.343
S6	14.541	7.996	61.935	417.045	0.000	417.045

OPTIMAL PREDICTION MODEL

MODEL	1981	1982	1983
Absolute Change	5 year	3 year	5 year
Percentage Change	3 year	3 year	2 year
Moving Average	2 year	2 year	2 year
Exponential Smoothing	0.95	0.80	0.75

<u>1981</u>

MAPE/ACTUAL

RW.	0.377	0.105	0.813	6.170	0.011	6.181
AC.	0.418	0.121	0.939	7.044	0.007	7.051
PC.	0.477	0.107	0.829	5.767	0.001	5.767
MA.	1.290	0.783	6.067	46.467	0.008	46.475
ES.	0.458	0.130	1.003	6.522	0.004	6.526
Re.	1.300	0.321	2.485	14.323	0.009	14.331
S1	1.840	0.350	2.712	14.146	0.012	14.168
S2	1.948	0.379	2.933	15.346	0.003	15.349
S3	2.012	0.389	3.011	15.549	0.017	15.566
S4	2.009	0.388	3.006	15.534	0.016	15.550
S5	2.220	0.438	3.389	17.598	0.020	17.618
S6	1.949	0.380	2.945	15.452	0.007	15.459

MSE/ACTUAL

RW.	0.792	0.636	4.924	38.205	0.000	38.206
AC.	1.041	0.827	6.409	49.711	0.000	49.711
PC.	0.903	0.558	4.323	33.262	0.000	33.262
MA.	37.856	36.001	278.862	2159.970	0.000	2159.970
ES.	1.200	0.776	6.012	42.585	0.000	42.585
Re.	7.761	4.343	33.638	205.405	0.000	205.405
S1	10.622	4.003	31.008	200.455	0.000	200.455
S2	12.256	4.690	36.331	235.592	0.000	235.592
S3	12.961	4.864	37.673	242.305	0.000	242.305
S4	12.917	4.851	37.579	241.804	0.000	241.805
S5	16.221	6.207	48.081	310.396	0.000	310.396
S6	12.325	4.749	36.787	238.977	0.000	238.977

MAPE/FORECAST

RW.	0.308	0.042	0.326	1.708	0.011	1.718
AC.	0.328	0.060	0.467	2.405	0.007	2.411
PC.	0.377	0.067	0.517	2.679	0.001	2.680
MA.	0.306	0.030	0.230	0.983	0.008	0.991
ES.	0.305	0.037	0.284	1.508	0.004	1.512
Re.	2.593	0.862	6.681	45.398	0.009	45.407
S1	1.431	0.749	5.799	45.290	0.000	45.290
S2	1.363	0.711	5.507	43.011	0.000	43.011
S3	1.320	0.678	5.250	41.009	0.000	41.009
S4	1.323	0.680	5.269	41.157	0.000	41.157
S5	1.238	0.621	4.808	37.581	0.000	37.581
S6	1.365	0.711	5.511	430.370	0.000	43.037

MSE/FORECAST

RW.	0.199	0.062	0.478	2.953	0.000	2.953
AC.	0.322	0.128	0.992	5.815	0.000	5.815
PC.	0.405	0.157	1.219	7.181	0.000	7.181
MA.	0.145	0.027	0.211	0.982	0.000	0.982
ES.	0.172	0.046	0.355	2.284	0.000	2.284
Re.	50.562	35.400	274.209	2061.783	0.000	2061.783
S1	35.116	34.171	264.689	2051.181	0.000	2051.181
S2	31.679	30.818	238.716	1849.915	0.000	1849.716
S3	28.840	28.016	217.009	1681.736	0.000	1681.736
S4	29.045	28.219	218.582	1693.921	0.000	1693.921
S5	24.265	23.527	182.243	1412.355	0.000	1412.355
S6	31.722	30.856	239.007	1852.176	0.000	1852.176

1982

MAPE/ACTUAL

RW.	0.225	0.035	0.273	1.500	0.002	1.502
AC.	0.301	0.049	0.380	2.114	0.003	2.117
PC.	0.328	0.051	0.397	1.930	0.005	1.935
MA.	0.270	0.045	0.352	1.965	0.006	1.971
ES.	0.287	0.064	0.498	3.315	0.006	3.321
Re.	0.484	0.087	0.673	2.922	0.006	2.928
S1	0.859	0.198	1.532	11.619	0.005	11.624
S2	0.892	0.211	1.635	12.376	0.010	12.385
S3	0.918	0.218	1.689	12.757	0.003	12.760
S4	0.914	0.217	1.679	12.680	0.005	12.685
S5	0.925	0.222	1.721	13.000	0.026	13.026
S6	0.847	0.193	1.494	11.369	0.015	11.384

MSE/ACTUAL

RW.	0.124	0.044	0.340	2.256	0.000	2.256
AC.	0.232	0.081	0.625	4.484	0.000	4.484
PC.	0.263	0.079	0.615	3.743	0.000	3.743
MA.	0.194	0.078	0.606	3.888	0.000	3.888
ES.	0.326	0.191	1.476	11.029	0.000	11.029
Re.	0.680	0.241	1.871	8.572	0.000	8.572
S1	3.047	2.247	17.405	135.111	0.000	135.111
S2	3.424	2.552	19.768	153.398	0.000	153.398
S3	3.648	2.710	20.990	162.830	0.000	162.830
S4	3.607	2.678	20.741	160.901	0.000	160.901
S5	3.770	2.824	21.873	169.684	0.001	169.684
S6	2.911	2.155	16.690	129.594	0.000	129.595

MAPE/FORECAST

RW.	0.256	0.045	0.351	2.309	0.002	2.311
AC.	0.663	0.213	1.648	10.249	0.003	10.253
PC.	0.364	0.074	0.571	3.802	0.005	3.807
MA.	0.277	0.040	0.306	1.321	0.007	1.328
ES.	0.237	0.029	0.225	0.902	0.006	0.908
Re.	0.541	0.161	1.250	9.227	0.006	9.233
S1	1.866	0.857	6.635	47.427	0.000	47.427
S2	1.754	0.796	6.167	43.695	0.000	43.695
S3	1.687	0.773	5.985	42.746	0.000	42.746
S4	1.698	0.776	6.012	42.857	0.000	42.857
S5	1.675	0.763	5.911	41.984	0.000	41.984
S6	1.946	0.886	6.862	48.811	0.000	48.811

MSE/FORECAST

RW.	0.186	0.090	0.698	5.339	0.000	5.339
AC.	3.109	1.869	14.474	105.120	0.000	105.120
PC.	0.452	0.245	1.895	14.491	0.000	14.491
MA.	0.169	0.047	0.361	1.763	0.000	1.763
ES.	0.106	0.023	0.180	0.825	0.000	0.825
Re.	1.828	1.428	11.063	85.237	0.000	85.237
S1	46.769	38.093	295.071	2249.323	0.000	2249.323
S2	40.469	32.467	251.489	1909.255	0.000	1909.255
S3	38.063	30.962	239.831	1827.239	0.000	1827.239
S4	38.426	31.150	241.285	1836.696	0.000	1836.696
S5	37.163	29.948	231.974	1762.626	0.000	1762.626
S6	50.085	40.442	313.262	2382.475	0.000	2382.475

<u>1983</u>

MAPE/ACTUAL

RW.	0.254	0.024	0.186	0.761	0.004	0.765
AC.	0.258	0.030	0.234	0.929	0.003	0.932
PC.	0.301	0.034	0.267	1.296	0.004	1.300
MA.	0.276	0.024	0.185	0.845	0.002	0.847
ES.	0.260	0.023	0.176	0.757	0.014	0.771
Re.	0.322	0.034	0.264	1.434	0.006	1.440
S1	1.083	0.194	1.500	10.079	0.002	10.081
S2	1.110	0.201	1.554	10.259	0.020	10.279
S3	1.136	0.209	1.620	10.760	0.010	10.770
S4	1.133	0.208	1.611	10.687	0.007	10.694
S5	1.092	0.196	1.515	10.116	0.008	10.124
S6	1.011	0.168	1.298	8.904	0.008	8.913

MSE/ACTUAL

RW.	0.098	0.018	0.137	0.585	0.000	0.586
AC.	0.121	0.026	0.204	0.869	0.000	0.869
PC.	0.161	0.037	0.283	1.690	0.000	1.690
MA.	0.110	0.018	0.141	0.718	0.000	0.718
ES.	0.096	0.017	0.130	0.603	0.000	0.603
Re.	0.172	0.041	0.320	2.074	0.000	2.074
S1	3.384	1.731	13.411	101.611	0.000	101.611
S2	3.607	1.810	14.022	105.654	0.000	105.655
S3	3.873	1.981	15.346	116.000	0.000	116.000
S4	3.838	1.955	15.141	114.359	0.000	114.359
S5	3.449	1.749	13.548	102.496	0.000	102.496
S6	2.680	1.349	10.449	79.433	0.000	79.433

MAPE/FORECAST

RW.	0.454	0.078	0.602	3.254	0.004	3.259
AC.	0.624	0.162	1.254	6.924	0.003	6.927
PC.	0.546	0.120	0.932	4.826	0.004	4.830
MA.	0.502	0.098	0.762	5.539	0.002	5.541
ES.	0.436	0.069	0.536	3.359	0.014	3.378
Re	0.607	0.128	0.989	6.375	0.006	6.381
S1	1.397	0.396	3.065	18.033	0.000	18.033
S2	1.339	0.379	2.936	17.195	0.000	17.195
S3	1.298	0.368	2.854	16.830	0.000	16.830
S4	1.301	0.369	2.860	16.880	0.000	16.880
S5	1.379	0.392	3.037	17.842	0.000	17.842
S6	1.606	0.450	3.488	20.422	0.000	20.422

MSE/FORECAST

RW.	0.563	0.212	1.642	10.618	0.000	10.618
AC.	1.934	0.960	7.436	47.984	0.000	47.984
PC.	1.153	0.514	3.981	23.325	0.000	23.325
MA.	0.822	0.512	3.968	30.706	0.000	30.706
ES.	0.473	0.199	1.541	11.376	0.000	11.376
Re.	1.329	0.707	5.479	40.724	0.000	40.724
S1	11.188	6.211	48.110	325.204	0.000	325.204
S2	10.271	5.679	43.989	295.668	0.000	295.668
S3	9.696	5.408	41.894	283.259	0.000	283.259
S4	9.735	5.432	42.073	284.921	0.000	284.921
S5	10.967	6.096	47.223	318.343	0.000	318.343
S6	14.541	7.996	61.935	417.045	0.000	417.045

Appendix 39-2.

COMPARISON OF THE ERROR MEASURES FOR THE BEST FORM OF EACH MODEL FOR FORECASTING PROFITS OF COMPANIES WITH ATTRIBUTABLE PROFIT GREATER THAN #2m. (53 Companies).

OPTIMAL SINGLE MODEL

BEST MODEL

Absolute Change	5 year
Percentage Change	3 year
Moving Average	2 year
Exponential Smoothing	0.95

	MEAN	STD. ERROR	STD. DEV.	RANGE	MINIMUM	MAXIMUM
1981						
MAPE/ACTUAL						
RW.	0.277	0.041	0.299	1.298	0.011	1.308
AC.	0.302	0.049	0.360	1.560	0.007	1.566
PC.	0.379	0.062	0.453	2.132	0.001	2.133
MA.	1.249	0.872	6.348	46.466	0.010	46.476
ES.	0.363	0.089	0.648	4.458	0.004	4.462
Re.	0.451	0.070	0.513	2.218	0.011	2.229
S1	1.624	0.339	2.471	14.146	0.012	14.158
S2	1.709	0.367	2.671	15.346	0.003	15.349
S3	1.767	0.377	2.747	15.549	0.017	15.566
S4	1.764	0.377	2.742	15.534	0.016	15.550
S5	1.934	0.424	3.085	17.598	0.020	17.618
S6	1.705	0.368	2.677	15.452	0.007	15.459
MSE/ACTUAL						
RW.	0.164	0.050	0.365	1.712	0.000	1.712
AC.	0.219	0.071	0.518	2.454	0.000	2.454
PC.	0.345	0.111	0.811	4.549	0.000	4.549
MA.	41.100	40.758	296.648	2159.970	0.000	2159.970
ES.	0.544	0.376	2.738	19.904	0.000	19.904
Re.	0.462	0.132	0.962	4.969	0.000	4.969
S1	8.629	4.022	29.279	200.455	0.000	200.455
S2	9.921	4.712	34.307	235.592	0.000	235.592
S3	10.525	4.882	35.538	242.305	0.000	242.305
S4	10.487	4.869	35.450	241.804	0.000	241.805
S5	13.081	6.227	45.331	310.396	0.000	310.396
S6	9.937	4.768	34.715	238.977	0.000	238.977

MAPE/FORECAST

RW.	0.304	0.046	0.337	1.708	0.011	1.718
AC.	0.329	0.067	0.487	2.405	0.007	2.411
PC.	0.379	0.075	0.543	2.679	0.001	2.680
MA.	0.304	0.031	0.222	0.981	0.010	0.991
ES.	0.301	0.040	0.290	1.508	0.004	1.512
Re.	0.704	0.192	1.395	6.568	0.011	6.579
S1	1.482	0.847	6.170	45.290	0.000	45.290
S2	1.406	0.805	5.860	43.011	0.000	43.011
S3	1.357	0.767	5.586	41.009	0.000	41.009
S4	1.361	0.770	5.606	41.157	0.000	41.157
S5	1.265	0.703	5.117	37.581	0.000	37.581
S6	1.408	0.805	5.863	43.037	0.000	43.037

MSE/FORECAST

RW.	0.204	0.069	0.502	2.953	0.000	2.953
AC.	0.341	0.144	1.051	5.815	0.000	5.815
PC.	0.433	0.178	1.293	7.181	0.000	7.181
MA.	0.141	0.028	0.202	0.982	0.000	0.982
ES.	0.173	0.051	0.368	2.284	0.000	2.284
Re.	2.406	1.148	8.359	43.285	0.000	43.285
S1	39.546	38.686	281.637	2051.181	0.000	2051.181
S2	35.665	34.890	254.002	1849.915	0.000	1849.915
S3	32.454	31.717	230.906	1681.736	0.000	1681.736
S4	32.686	31.947	232.580	1693.921	0.000	1693.921
S5	27.285	26.636	193.916	1412.355	0.000	1412.355
S6	35.713	34.932	254.312	1852.176	0.000	1852.176

1982

MAPE/ACTUAL

RW.	0.192	0.029	0.213	1.003	0.002	1.005
AC.	0.219	0.034	0.250	1.132	0.001	1.133
PC.	0.297	0.051	0.372	1.930	0.005	1.935
MA.	0.249	0.039	0.286	1.592	0.006	1.598
ES.	0.198	0.030	0.219	1.066	0.000	1.066
Re.	0.195	0.027	0.199	0.771	0.001	0.772
S1	0.877	0.222	1.641	11.619	0.005	11.624
S2	0.917	0.236	1.722	12.376	0.010	12.385
S3	0.947	0.244	1.778	12.757	0.003	12.760
S4	0.943	0.243	1.767	12.680	0.005	12.685
S5	0.955	0.249	1.812	13.000	0.026	13.026
S6	0.861	0.216	1.574	11.369	0.015	11.384

MSE/ACTUAL

RW.	0.081	0.027	0.196	1.010	0.000	1.010
AC.	0.109	0.033	0.239	1.283	0.000	1.283
PC.	0.224	0.082	0.598	3.743	0.000	3.743
MA.	0.142	0.053	0.386	2.554	0.000	2.554
ES.	0.086	0.029	0.209	1.136	0.000	1.136
Re.	0.077	0.018	0.129	0.596	0.000	0.596
S1	3.326	2.543	18.514	135.111	0.000	135.111
S2	3.748	2.888	21.027	153.398	0.000	153.398
S3	3.999	3.067	22.326	162.830	0.000	162.830
S4	3.853	3.030	22.061	160.901	0.000	160.901
S5	4.135	3.196	23.265	169.684	0.001	169.684
S6	3.172	2.439	17.753	129.594	0.000	129.595

MAPE/FORECAST

RW.	0.212	0.031	0.226	0.801	0.002	0.803
AC.	0.268	0.058	0.419	2.121	0.001	2.122
PC.	0.304	0.050	0.363	1.425	0.005	1.430
MA.	0.282	0.044	0.318	1.321	0.007	1.328
ES.	0.215	0.031	0.224	0.836	0.000	0.836
Re.	0.233	0.046	0.332	1.792	0.001	1.793
S1	1.935	0.968	7.045	47.427	0.000	47.427
S2	1.822	0.899	6.545	43.695	0.000	43.695
S3	1.754	0.873	6.352	42.746	0.000	42.746
S4	1.766	0.877	6.381	42.857	0.000	42.857
S5	1.743	0.862	6.273	41.984	0.000	41.984
S6	2.015	1.001	7.287	48.811	0.000	48.811

MSE/FORECAST

RW.	0.095	0.024	0.177	0.645	0.000	0.645
AC.	0.244	0.108	0.783	4.505	0.000	4.505
PC.	0.222	0.064	0.467	2.045	0.000	2.045
MA.	0.179	0.052	0.379	1.763	0.000	1.763
ES.	0.096	0.024	0.175	0.699	0.000	0.699
Re.	0.163	0.067	0.491	3.217	0.000	3.217
S1	52.441	43.110	313.846	2249.323	0.000	2249.323
S2	45.349	36.742	267.482	1909.255	0.000	1909.255
S3	42.665	35.040	255.091	1827.239	0.000	1827.239
S4	43.071	35.252	256.636	1836.696	0.000	1836.696
S5	41.647	33.891	246.729	1762.626	0.000	1762.626
S6	56.155	45.767	333.187	2382.475	0.000	2382.475

1983

MAPE/ACTUAL

RW.	0.242	0.023	0.168	0.686	0.008	0.695
AC.	0.241	0.030	0.216	0.929	0.003	0.932
PC.	0.284	0.028	0.204	0.903	0.039	0.943
MA.	0.270	0.023	0.170	0.777	0.002	0.779
ES.	0.243	0.023	0.168	0.675	0.004	0.679
Re.	0.382	0.069	0.501	2.396	0.000	2.396
S1	1.071	0.211	1.538	10.079	0.002	10.079
S2	1.098	0.219	1.593	10.259	0.020	10.279
S3	1.124	0.228	1.663	10.760	0.010	10.770
S4	1.121	0.227	1.653	10.687	0.007	10.694
S5	1.080	0.213	1.553	10.116	0.008	10.124
S6	1.002	0.182	1.326	8.904	0.008	8.913

MSE/ACTUAL

RW.	0.086	0.016	0.117	0.482	0.000	0.482
AC.	0.104	0.025	0.185	0.869	0.000	0.869
PC.	0.121	0.024	0.176	0.887	0.002	0.889
MA.	0.101	0.017	0.120	0.608	0.000	0.608
ES.	0.086	0.016	0.116	0.460	0.000	0.460
Re.	0.393	0.133	0.966	5.739	0.000	5.739
S1	3.467	1.946	14.163	101.611	0.000	101.611
S2	3.695	2.033	14.803	105.654	0.000	105.655
S3	3.977	2.227	16.214	116.000	0.000	116.000
S4	3.938	2.197	15.994	114.359	0.000	114.239
S5	3.533	1.965	14.306	102.496	0.000	102.496
S6	2.731	1.514	11.024	79.433	0.000	79.433

MAPE/FORECAST

RW.	0.390	0.061	0.447	2.265	0.008	2.274
AC.	0.504	0.143	1.040	6.924	0.003	6.927
PC.	0.503	0.092	0.671	3.319	0.038	3.356
MA.	0.423	0.053	0.386	1.808	0.002	1.810
ES.	0.389	0.059	0.432	2.105	0.004	2.109
Re.	0.241	0.027	0.199	0.705	0.000	0.705
S1	1.442	0.446	3.248	18.033	0.000	18.033
S2	1.383	0.427	3.110	17.195	0.000	17.195
S3	1.339	0.415	3.024	16.830	0.000	16.830
S4	1.342	0.416	3.030	16.880	0.000	16.880
S5	1.424	0.442	3.217	17.842	0.000	17.842
S6	1.664	0.508	3.695	20.422	0.000	20.422

MSE/FORECAST

RW.	0.348	0.125	0.907	5.170	0.000	5.170
AC.	1.316	0.912	6.641	47.984	0.000	47.984
PC.	0.694	0.271	1.970	11.264	0.001	11.265
MA.	0.325	0.086	0.623	3.276	0.000	3.276
ES.	0.334	0.113	0.825	4.444	0.000	4.444
Re.	0.097	0.018	0.128	0.498	0.000	0.498
S1	12.427	7.020	51.107	325.204	0.000	325.204
S2	11.404	6.419	46.728	295.668	0.000	295.668
S3	10.762	6.113	44.505	283.259	0.000	283.259
S4	10.806	6.139	44.696	284.921	0.000	284.921
S5	12.181	6.891	50.165	318.343	0.000	318.343
S6	16.165	9.037	65.788	417.045	0.000	417.045

OPTIMAL PREDICTION MODEL

BEST MODEL	1981	1982	1983
Absolute Change	5 year	5 year	5 year
Percentage Change	3 year	3 year	2 year
Moving Average	2 year	5 year	2 year
Exponential Smoothing	0.95	0.80	0.95

	MEAN	STD. ERROR	STD. DEV.	RANGE	MINIMUM	MAXIMUM
1981						
MAPE/ACTUAL						
RW.	0.277	0.041	0.299	1.298	0.011	1.308
AC.	0.302	0.049	0.360	1.560	0.007	1.566
PC.	0.379	0.062	0.453	2.132	0.001	2.133
MA.	1.249	0.872	6.348	46.466	0.010	46.476
ES.	0.363	0.089	0.648	4.458	0.004	4.462
Re.	1.048	0.256	1.866	12.662	0.024	12.676
S1	1.624	0.339	2.471	14.146	0.012	14.158
S2	1.709	0.367	2.671	15.346	0.003	15.349
S3	1.767	0.377	2.747	15.549	0.017	15.566
S4	1.764	0.377	2.742	15.534	0.016	15.550
S5	1.934	0.424	3.085	17.598	0.020	17.618
S6	1.705	0.368	2.677	15.452	0.007	15.459

MSE/ACTUAL

RW.	0.164	0.050	0.365	1.712	0.000	1.712
AC.	0.219	0.071	0.518	2.454	0.000	2.454
PC.	0.345	0.111	0.811	4.549	0.000	4.549
MA.	41.100	40.758	296.648	2159.970	0.000	2159.970
ES.	0.544	0.376	2.738	19.904	0.000	19.904
Re.	4.514	3.041	22.136	160.936	0.001	160.937
S1	8.629	4.022	29.279	200.455	0.000	200.455
S2	9.921	4.712	34.307	235.592	0.000	235.592
S3	10.525	4.882	35.538	242.305	0.000	242.305
S4	10.487	4.869	35.450	241.804	0.000	241.805
S5	13.081	6.227	45.331	310.396	0.000	310.396
S6	9.937	4.768	34.715	238.977	0.000	238.977

MAPE/FORECAST

RW.	0.304	0.046	0.337	1.708	0.011	1.718
AC.	0.329	0.067	0.487	2.405	0.007	2.411
PC.	0.379	0.075	0.543	2.679	0.001	2.680
MA.	0.304	0.031	0.222	0.981	0.010	0.991
ES.	0.301	0.040	0.290	1.508	0.004	1.512
Re.	2.799	1.241	9.037	63.831	0.023	63.854
S1	1.482	0.847	6.170	45.290	0.000	45.290
S2	1.406	0.805	5.860	43.011	0.000	43.011
S3	1.357	0.767	5.586	41.009	0.000	41.009
S4	1.361	0.770	5.606	41.157	0.000	41.157
S5	1.265	0.703	5.117	37.581	0.000	37.581
S6	1.408	0.805	5.863	43.037	0.000	43.037

MSE/FORECAST

RW.	0.204	0.069	0.502	2.953	0.000	2.953
AC.	0.341	0.144	1.051	5.815	0.000	5.815
PC.	0.433	0.178	1.293	7.181	0.000	7.181
MA.	0.141	0.028	0.202	0.982	0.000	0.982
ES.	0.173	0.051	0.368	2.284	0.000	2.284
Re.	87.954	76.900	559.841	4077.339	0.001	4077.340
S1	39.546	38.686	281.637	2051.181	0.000	2051.181
S2	35.662	34.890	254.002	1849.915	0.000	1849.915
S3	32.454	31.717	230.906	1681.736	0.000	1681.736
S4	32.686	31.947	232.580	1693.921	0.000	1693.921
S5	27.285	26.636	193.916	1412.355	0.000	1412.355
S6	35.713	34.932	254.312	1852.176	0.000	1852.176

1982

MAPE/ACTUAL

RW.	0.192	0.029	0.213	1.003	0.002	1.005
AC.	0.219	0.034	0.250	1.132	0.001	1.133
PC.	0.297	0.051	0.372	1.930	0.005	1.935
MA.	0.728	0.378	2.749	20.149	0.001	20.150
ES.	0.270	0.067	0.488	3.315	0.006	3.321
Re.	0.584	0.084	0.609	2.475	0.013	2.488
S1	0.877	0.222	1.641	11.619	0.005	11.624
S2	0.917	0.236	1.722	12.376	0.010	12.385
S3	0.947	0.244	1.778	12.757	0.003	12.760
S4	0.943	0.243	1.767	12.680	0.005	12.685
S5	0.955	0.249	1.812	13.000	0.026	13.026
S6	0.861	0.216	1.574	11.369	0.015	11.384

MSE/ACTUAL

RW.	0.081	0.027	0.196	1.010	0.000	1.010
AC.	0.109	0.033	0.239	1.283	0.000	1.283
PC.	0.224	0.082	0.598	3.743	0.000	3.743
MA.	7.947	7.656	55.737	406.025	0.000	406.025
ES.	0.306	0.209	1.524	11.029	0.000	11.029
Re.	0.705	0.188	1.368	6.488	0.000	6.488
S1	3.326	2.543	18.514	135.111	0.000	135.111
S2	3.748	2.888	21.027	153.398	0.000	153.398
S3	3.999	3.067	22.326	162.830	0.000	162.830
S4	3.953	3.030	22.061	160.901	0.000	160.901
S5	4.135	3.196	23.265	169.684	0.001	169.684
S6	3.172	2.439	17.753	129.594	0.000	129.595

MAPE/FORECAST

RW.	0.212	0.031	0.226	0.801	0.002	0.803
AC.	0.268	0.058	0.419	2.121	0.001	2.122
PC.	0.304	0.050	0.363	1.425	0.005	1.430
MA.	0.348	0.039	0.280	1.291	0.001	1.291
ES.	0.232	0.031	0.229	0.902	0.006	0.908
Re.	9.687	7.338	53.424	385.078	0.012	385.090
S1	1.935	0.968	7.045	47.427	0.000	47.427
S2	1.822	0.899	6.545	43.695	0.000	43.695
S3	1.754	0.873	6.352	42.746	0.000	42.746
S4	1.766	0.877	6.381	42.857	0.000	42.857
S5	1.743	0.862	6.273	41.984	0.000	41.984
S6	2.015	1.001	7.287	48.811	0.000	48.811

MSE/FORECAST

RW.	0.095	0.024	0.177	0.645	0.000	0.645
AC.	0.244	0.108	0.783	4.505	0.000	4.505
PC.	0.222	0.064	0.467	2.045	0.000	2.045
MA.	0.198	0.041	0.298	1.667	0.000	1.667
ES.	0.105	0.025	0.185	0.825	0.000	0.825
Re	2894.143	2798.67	20367.365	148294.56	0.000	148294.56
S1	52.441	43.110	313.846	2249.323	0.000	2249.323
S2	45.349	36.742	267.482	1909.255	0.000	1909.255
S3	42.665	35.040	255.091	1827.239	0.000	1827.239
S4	43.071	35.252	256.636	1836.696	0.000	1836.696
S5	41.647	33.891	246.729	1762.626	0.000	1762.626
S6	56.155	45.757	333.187	2382.475	0.000	2382.475

1983

MAPE/ACTUAL

RW.	0.242	0.023	0.168	0.686	0.008	0.695
AC.	0.241	0.030	0.216	0.929	0.003	0.932
PC.	0.296	0.036	0.260	1.281	0.019	1.300
MA.	0.270	0.023	0.170	0.777	0.002	0.779
ES.	0.243	0.023	0.168	0.675	0.004	0.679
Re.	0.299	0.031	0.225	1.073	0.003	1.076
S1	1.071	0.211	1.538	10.079	0.002	10.079
S2	1.098	0.219	1.593	10.259	0.020	10.279
S3	1.124	0.228	1.663	10.760	0.010	10.770
S4	1.121	0.227	1.653	10.687	0.007	10.687
S5	1.080	0.213	1.553	10.116	0.008	10.124
S6	1.002	0.182	1.326	8.904	0.008	8.913

MSE/ACTUAL

RW.	0.086	0.016	0.117	0.482	0.000	0.482
AC.	0.104	0.025	0.185	0.869	0.000	0.869
PC.	0.154	0.039	0.283	1.690	0.000	1.690
MA.	0.101	0.017	0.120	0.608	0.000	0.608
ES.	0.086	0.016	0.116	0.460	0.000	0.460
Re.	0.139	0.029	0.210	1.158	0.000	1.158
S1	3.467	1.946	14.163	101.611	0.000	101.611
S2	3.695	2.033	14.803	105.654	0.000	105.655
S3	3.977	2.227	16.214	116.000	0.000	116.000
S4	3.938	2.197	15.994	114.359	0.000	114.359
S5	3.533	1.965	14.306	102.496	0.000	102.496
S6	2.731	1.514	11.024	79.433	0.000	79.433

MAPE/FORECAST

RW.	0.390	0.061	0.447	2.265	0.008	2.274
AC.	0.504	0.143	1.040	6.924	0.003	6.927
PC.	0.440	0.089	0.651	3.966	0.020	3.985
MA.	0.423	0.053	0.386	1.808	0.002	1.810
ES.	0.389	0.059	0.432	2.105	0.004	2.109
Re.	0.597	0.138	1.007	6.596	0.003	6.599
S1	1.442	0.446	3.248	18.033	0.000	18.033
S2	1.383	0.427	3.110	17.195	0.000	17.195
S3	1.339	0.415	3.024	16.830	0.000	16.830
S4	1.342	0.416	3.030	16.880	0.000	16.880
S5	1.424	0.442	3.217	17.842	0.000	17.842
S6	1.664	0.508	3.695	20.422	0.000	20.422

MSE/FORECAST

RW.	0.348	0.125	0.907	5.170	0.000	5.170
AC.	1.316	0.912	6.641	47.984	0.000	47.984
PC.	0.609	0.317	2.305	15.884	0.000	15.884
MA.	0.325	0.086	0.623	3.276	0.000	3.276
ES.	0.334	0.113	0.825	4.444	0.000	4.444
Re.	1.351	0.832	6.055	43.538	0.000	43.538
S1	12.427	7.020	51.107	325.204	0.000	325.204
S2	11.404	6.419	46.728	295.668	0.000	295.668
S3	10.762	6.113	44.505	283.259	0.000	283.259
S4	10.806	6.139	44.696	284.921	0.000	284.921
S5	12.181	6.891	50.165	318.343	0.000	318.343
S6	16.165	9.037	65.788	417.045	0.000	417.045

Appendix 39-3.

COMPARISON OF THE ERROR MEASURES OF THE BEST FORM OF EACH MODEL FOR FORECASTING PROFITS OF COMPANIES WITH ATTRIBUTABLE PROFIT GREATER THAN #3m. (46 Companies).

BEST MODEL

Absolute Change	5 year
Percentage Change	3 year
Moving Average	2 year
Exponential Smoothing	0.95

	MEAN	STD. ERROR	STD. DEV.	RANGE	MINIMUM	MAXIMUM
1981						
MAPE/ACTUAL						
RW.	0.252	0.039	0.266	1.221	0.011	1.232
AC.	0.277	0.051	0.345	1.560	0.007	1.566
PC.	0.366	0.069	0.468	2.132	0.001	2.133
MA.	0.354	0.054	0.367	1.934	0.010	1.944
ES.	0.254	0.039	0.263	1.200	0.004	1.204
Re.	0.230	0.051	0.343	1.765	0.000	1.765
S1	1.416	0.266	1.805	7.588	0.012	7.600
S2	1.489	0.286	1.941	8.354	0.004	8.358
S3	1.543	0.299	2.029	8.502	0.017	8.520
S4	1.541	0.298	2.024	8.489	0.016	8.506
S5	1.681	0.333	2.261	9.782	0.020	9.802
S6	1.482	0.285	1.932	8.390	0.007	8.397
MSE/ACTUAL						
RW.	0.133	0.046	0.310	1.518	0.000	1.518
AC.	0.193	0.076	0.515	2.454	0.000	2.454
PC.	0.348	0.127	0.862	4.549	0.000	4.549
MA.	0.257	0.089	0.607	3.780	0.000	3.780
ES.	0.133	0.045	0.302	1.450	0.000	1.450
Re.	0.168	0.079	0.536	3.117	0.000	3.117
S1	5.194	1.820	12.343	57.751	0.000	57.751
S2	5.902	2.090	14.177	69.859	0.000	69.859
S3	6.408	2.264	15.357	72.582	0.000	72.582
S4	6.379	2.253	15.282	72.349	0.000	72.349
S5	7.826	2.811	19.064	96.064	0.000	96.082
S6	5.849	2.079	14.103	70.514	0.000	70.514

MAPE/FORECAST

RW.	0.253	0.034	0.231	1.136	0.011	1.146
AC.	0.249	0.047	0.317	1.926	0.007	1.933
PC.	0.290	0.051	0.348	1.996	0.001	1.997
MA.	0.286	0.029	0.196	0.981	0.010	0.991
ES.	0.244	0.029	0.195	0.948	0.004	0.952
Re.	0.172	0.024	0.160	0.638	0.000	0.638
S1	0.658	0.103	0.695	2.575	0.000	2.575
S2	0.623	0.097	0.657	2.472	0.000	2.472
S3	0.610	0.094	0.636	2.422	0.000	2.422
S4	0.611	0.094	0.637	2.425	0.000	2.425
S5	0.575	0.087	0.588	2.282	0.000	2.282
S6	0.624	0.097	0.660	2.474	0.000	2.474

MSE/FORECAST

RW.	0.116	0.034	0.233	1.314	0.000	1.314
AC.	0.160	0.082	0.558	3.737	0.000	3.737
PC.	0.203	0.090	0.610	3.987	0.000	3.987
MA.	0.119	0.024	0.165	0.982	0.000	0.982
ES.	0.097	0.023	0.158	0.907	0.000	0.907
Re.	0.055	0.013	0.088	0.408	0.000	0.408
S1	0.906	0.235	1.594	6.629	0.000	6.629
S2	0.810	0.210	1.424	6.110	0.000	6.110
S3	0.768	0.199	1.347	5.868	0.000	5.868
S4	0.770	0.199	1.349	5.880	0.000	5.880
S5	0.669	0.173	1.174	5.207	0.000	5.207
S6	0.816	0.212	1.441	6.119	0.000	6.119

1982

MAPE/ACTUAL

RW.	0.182	0.032	0.218	1.003	0.002	1.005
PC.	0.199	0.037	0.253	1.132	0.001	1.133
AC.	0.287	0.058	0.393	1.930	0.005	1.935
MA.	0.245	0.043	0.293	1.592	0.006	1.598
ES.	0.185	0.033	0.224	1.066	0.000	1.066
Re.	0.183	0.028	0.190	0.794	0.001	0.795
S1	0.841	0.249	1.686	11.619	0.005	11.624
S2	0.881	0.265	1.797	12.376	0.010	12.385
S3	0.909	0.273	1.850	12.757	0.003	12.760
S4	0.905	0.271	1.839	12.680	0.005	12.685
S5	0.918	0.278	1.888	13.000	0.026	13.026
S6	0.826	0.243	1.650	11.369	0.015	11.384

MSE/ACTUAL

RW.	0.080	0.031	0.208	1.010	0.000	1.010
AC.	0.102	0.037	0.249	1.283	0.000	1.283
PC.	0.233	0.094	0.641	3.743	0.000	3.743
MA.	0.144	0.061	0.411	2.554	0.000	2.554
ES.	0.083	0.033	0.223	1.136	0.000	1.136
Re.	0.069	0.018	0.124	3.174	0.000	3.174
S1	3.489	2.927	19.851	135.111	0.000	135.111
S2	3.933	3.324	22.542	153.398	0.000	153.398
S3	4.176	3.528	23.929	162.830	0.000	162.830
S4	4.129	3.486	23.645	160.901	0.000	160.901
S5	4.331	3.677	24.939	169.684	0.001	169.684
S6	3.345	2.807	19.040	129.594	0.000	129.595

MAPE/FORECAST

RW.	0.182	0.028	0.190	0.796	0.002	0.798
AC.	0.205	0.046	0.315	1.846	0.001	1.847
PC.	0.247	0.043	0.289	1.332	0.005	1.337
MA.	0.242	0.035	0.236	1.104	0.007	1.111
ES.	0.183	0.028	0.191	0.792	0.000	0.792
Re.	0.220	0.046	0.315	1.641	0.001	1.642
S1	1.120	0.475	3.223	21.325	0.000	21.325
S2	1.074	0.459	3.114	20.683	0.000	20.683
S3	1.021	0.430	2.914	19.360	0.000	19.360
S4	1.031	0.436	2.955	19.639	0.000	19.639
S5	1.024	0.435	2.953	19.671	0.000	19.671
S6	1.175	0.503	3.414	22.623	0.000	22.623

MSE/FORECAST

RW.	0.069	0.020	0.139	0.636	0.000	0.636
AC.	0.139	0.076	0.518	3.411	0.000	3.411
PC.	0.143	0.047	0.319	1.787	0.000	1.787
MA.	0.113	0.033	0.224	1.232	0.000	1.232
ES.	0.069	0.021	0.139	0.627	0.000	0.627
Re.	0.145	0.065	0.437	2.696	0.000	2.696
S1	11.414	9.885	67.043	454.748	0.000	454.748
S2	10.642	9.298	63.061	427.804	0.000	427.804
S3	9.348	8.146	55.251	374.820	0.000	374.820
S4	9.609	8.382	56.851	385.671	0.000	385.671
S5	9.579	8.409	57.031	386.959	0.000	386.959
S6	12.784	11.123	75.439	511.781	0.000	511.781

1983

MAPE/ACTUAL

RW.	0.259	0.025	0.168	0.686	0.008	0.695
AC.	0.253	0.033	0.225	0.929	0.003	0.932
PC.	0.293	0.030	0.204	0.903	0.039	0.943
MA.	0.278	0.026	0.176	0.777	0.002	0.779
ES.	0.259	0.025	0.169	0.675	0.004	0.679
Re.	0.287	0.051	0.349	1.399	0.002	1.401
S1	1.036	0.029	1.554	10.079	0.002	10.081
S2	1.056	0.236	1.600	10.259	0.020	10.279
S3	1.081	0.247	1.676	10.760	0.010	10.770
S4	1.077	0.246	1.665	10.687	0.007	10.694
S5	1.045	0.231	1.568	10.095	0.029	10.124
S6	0.979	0.199	1.348	8.904	0.008	8.913

MSE/ACTUAL

RW.	0.095	0.018	0.122	0.482	0.000	0.482
AC.	0.114	0.029	0.196	0.869	0.000	0.869
PC.	0.127	0.027	0.182	0.887	0.002	0.889
MA.	0.108	0.019	0.127	0.608	0.000	0.608
ES.	0.095	0.018	0.122	0.460	0.000	0.460
Re.	0.201	0.063	0.430	1.963	0.000	1.963
S1	3.436	2.207	14.966	101.611	0.000	101.611
S2	3.619	2.297	15.582	105.654	0.000	105.654
S3	3.917	2.522	17.105	116.000	0.000	116.000
S4	3.873	2.487	16.864	114.359	0.000	114.359
S5	3.496	2.227	15.106	102.495	0.001	102.496
S6	2.738	1.722	11.678	79.433	0.000	79.433

MAPE/FORECAST

RW.	0.423	0.069	0.466	2.265	0.008	2.274
AC.	0.547	0.164	1.110	6.924	0.003	6.927
PC.	0.530	0.103	0.698	3.319	0.038	3.356
MA.	0.442	0.060	0.406	1.808	0.002	1.810
ES.	0.421	0.066	0.451	2.105	0.004	2.109
Re.	0.213	0.027	0.185	0.581	0.002	0.584
S1	1.512	0.506	3.434	18.033	0.000	18.033
S2	1.447	0.485	3.288	17.195	0.000	17.195
S3	1.400	0.472	3.200	16.830	0.000	16.830
S4	1.403	0.473	3.206	16.880	0.000	16.880
S5	1.494	0.502	3.402	17.842	0.000	17.842
S6	1.748	0.576	3.904	20.422	0.000	20.422

MSE/FORECAST

RW.	0.392	0.143	0.967	5.170	0.000	5.170
AC.	1.504	1.050	7.120	47.984	0.000	47.984
PC.	0.758	0.309	2.098	11.264	0.001	11.265
MA.	0.357	0.098	0.663	3.276	0.000	3.276
ES.	0.376	0.130	0.879	4.444	0.000	4.444
Re.	0.079	0.015	0.103	0.341	0.000	0.341
S1	13.819	8.068	54.722	325.204	0.000	325.204
S2	12.669	7.377	50.031	295.668	0.000	295.668
S3	11.978	7.027	47.659	283.259	0.000	283.259
S4	12.023	7.057	47.862	284.921	0.000	284.921
S5	13.556	7.920	53.715	318.343	0.000	318.343
S6	17.961	10.384	70.430	417.045	0.000	417.045

OPTIMAL PREDICTION MODEL

BEST MODEL	1981	1982	1983
Absolute Change	5 year	5 year	4 year
Percentage Change	3 year	3 year	2 year
Moving Average	2 year	2 year	2 year
Exponential Smoothing	0.45	0.85	0.95

	MEAN	STD. ERROR	STD. DEV.	RANGE	MINIMUM	MAXIMUM

1981

MAPE/ACTUAL

	MEAN	STD. ERROR	STD. DEV.	RANGE	MINIMUM	MAXIMUM
RW.	0.252	0.039	0.266	1.221	0.011	1.232
AC.	0.277	0.051	0.345	1.560	0.007	1.566
PC.	0.366	0.069	0.468	2.132	0.001	2.133
MA.	0.354	0.054	0.367	1.934	0.010	1.944
ES.	0.326	0.043	0.290	1.351	0.000	1.351
Re.	0.707	0.105	0.714	3.233	0.028	3.261
S1	1.416	0.266	1.805	7.588	0.012	7.600
S2	1.489	0.286	1.941	8.354	0.004	8.358
S3	1.543	0.299	2.029	8.502	0.017	8.520
S4	1.541	0.298	2.024	8.489	0.016	8.506
S5	1.681	0.333	2.261	9.782	0.020	9.802
S6	1.482	0.285	1.932	8.390	0.007	8.397

MSE/ACTUAL

RW.	0.133	0.046	0.310	1.518	0.000	1.518
AC.	0.193	0.076	0.515	2.454	0.000	2.454
PC.	0.348	0.127	0.862	4.549	0.000	4.549
MA.	0.257	0.089	0.607	3.780	0.000	3.780
ES.	0.188	0.050	0.337	1.827	0.000	1.827
Re.	0.999	0.299	2.029	10.631	0.001	10.632
S1	5.194	1.820	12.343	57.751	0.000	57.751
S2	5.912	2.091	14.177	69.859	0.000	69.859
S3	6.408	2.264	15.357	72.582	0.000	72.583
S4	6.379	2.253	15.282	72.349	0.000	72.349
S5	7.826	2.811	19.064	96.072	0.000	96.072
S6	5.849	2.079	14.103	70.514	0.000	70.514

MAPE/FORECAST

RW.	0.253	0.034	0.231	1.136	0.011	1.146
AC.	0.249	0.047	0.317	1.926	0.007	1.933
PC.	0.290	0.051	0.348	1.996	0.001	1.997
MA.	0.286	0.029	0.196	0.981	0.010	0.991
ES.	0.321	0.033	0.223	0.826	0.000	0.826
Re.	0.988	0.219	1.485	8.035	0.027	8.062
S1	0.658	0.103	0.695	2.575	0.000	2.575
S2	0.623	0.097	0.657	2.472	0.000	2.472
S3	0.610	0.094	0.636	2.422	0.000	2.422
S4	0.611	0.094	0.637	2.425	0.000	2.425
S5	0.575	0.087	0.588	2.282	0.000	2.282
S6	0.624	0.097	0.660	2.474	0.000	2.474

MSE/FORECAST

RW.	0.116	0.034	0.233	1.314	0.000	1.314
AC.	0.160	0.082	0.558	3.737	0.000	3.737
PC.	0.203	0.090	0.610	3.987	0.000	3.987
MA.	0.119	0.024	0.165	0.982	0.000	0.982
ES.	0.152	0.026	0.175	0.683	0.000	0.683
Re.	3.134	1.537	10.425	64.994	0.001	64.994
S1	0.906	0.235	1.594	6.629	0.000	6.629
S2	0.810	0.210	1.424	6.110	0.000	6.110
S3	0.768	0.199	1.347	5.868	0.000	5.868
S4	0.770	0.199	1.349	5.880	0.000	5.880
S5	0.669	0.173	1.174	5.207	0.000	5.207
S6	0.816	0.212	1.441	6.119	0.000	6.119

1982

MAPE/ACTUAL

RW.	0.182	0.032	0.218	1.003	0.002	1.005
AC.	0.199	0.037	0.253	1.132	0.001	1.133
PC.	0.287	0.058	0.393	1.930	0.005	1.935
MA.	0.245	0.043	0.293	1.592	0.006	1.598
ES.	0.197	0.035	0.236	1.192	0.005	1.197
Re.	0.326	0.065	0.443	2.351	0.013	2.363
S1	0.841	0.249	1.686	11.619	0.005	11.624
S2	0.881	0.265	1.797	12.376	0.010	12.385
S3	0.909	0.273	1.850	12.757	0.003	12.760
S4	0.905	0.271	1.839	12.680	0.005	12.685
S5	0.918	0.278	1.888	13.000	0.026	13.026
S6	0.826	0.243	1.650	11.369	0.015	11.384

MSE/ACTUAL

RW.	0.080	0.031	0.208	1.010	0.000	1.010
AC.	0.102	0.037	0.249	1.283	0.000	1.283
PC.	0.233	0.094	0.641	3.743	0.000	3.743
MA.	0.144	0.061	0.411	2.554	0.000	2.554
ES.	0.093	0.038	0.261	1.432	0.000	1.432
Re.	0.298	0.138	0.938	5.585	0.000	5.585
S1	3.489	2.927	19.851	135.111	0.000	135.111
S2	3.933	3.324	22.542	153.398	0.000	153.398
S3	4.176	3.528	23.929	162.830	0.000	162.830
S4	4.129	3.486	23.645	160.901	0.000	160.901
S5	4.331	3.677	24.939	169.684	0.001	169.684
S6	3.345	2.807	19.040	129.594	0.000	129.595

MAPE/FORECAST

RW.	0.182	0.028	0.190	0.796	0.002	0.798
AC.	0.205	0.046	0.315	1.846	0.001	1.847
PC.	0.247	0.043	0.289	1.332	0.005	1.337
MA.	0.242	0.035	0.236	1.104	0.007	1.111
ES.	0.190	0.027	0.184	0.773	0.005	0.778
Re.	0.254	0.027	0.184	0.690	0.013	0.703
S1	1.120	0.475	3.223	21.325	0.000	21.325
S2	1.074	0.459	3.114	20.683	0.000	20.683
S3	1.021	0.430	3.914	19.360	0.000	19.360
S4	1.031	0.436	2.955	19.639	0.000	19.369
S5	1.024	0.435	2.953	19.671	0.000	19.671
S6	1.175	0.503	3.414	22.623	0.000	22.623

MSE/FORECAST

RW.	0.069	0.020	0.139	0.636	0.000	0.636
AC.	0.139	0.076	0.518	3.411	0.000	3.411
PC.	0.143	0.047	0.319	1.787	0.000	1.787
MA.	0.113	0.033	0.224	1.232	0.000	1.232
ES.	0.069	0.019	0.131	0.605	0.000	0.605
Re.	0.098	0.018	0.120	0.494	0.000	0.494
S1	11.414	9.885	67.043	454.748	0.000	454.748
S2	10.642	9.298	63.061	427.804	0.000	427.804
S3	9.348	8.146	55.251	374.820	0.000	374.820
S4	9.609	8.382	56.851	385.671	0.000	385.671
S5	9.579	8.409	57.031	386.959	0.000	386.959
S6	12.784	11.123	75.439	511.781	0.000	511.781

1983

MAPE/ACTUAL

RW.	0.259	0.025	0.168	0.686	0.008	0.695
AC.	0.272	0.034	0.232	0.971	0.000	0.971
PC.	0.260	0.029	0.194	0.780	0.019	0.799
MA.	0.278	0.026	0.176	0.777	0.002	0.779
ES.	0.259	0.025	0.169	0.675	0.004	0.679
Re.	0.315	0.034	0.229	1.079	0.002	1.081
S1	1.036	0.029	1.554	10.079	0.002	10.081
S2	1.056	0.236	1.600	10.259	0.020	10.279
S3	1.081	0.247	1.676	10.760	0.010	10.770
S4	1.077	0.246	1.665	10.687	0.007	10.694
S5	1.045	0.231	1.568	10.095	0.029	10.124
S6	0.979	0.199	1.348	8.904	0.008	8.913

MSE/ACTUAL

RW.	0.095	0.018	0.122	0.482	0.000	0.482
AC.	0.127	0.031	0.209	0.943	0.000	0.943
PC.	0.105	0.022	0.146	0.639	0.000	0.639
MA.	0.108	0.019	0.127	0.608	0.000	0.608
ES.	0.095	0.018	0.122	0.460	0.000	0.460
Re.	0.150	0.032	0.220	1.169	0.000	1.169
S1	3.436	2.207	14.966	101.611	0.000	101.611
S2	3.619	2.297	15.582	105.654	0.000	105.654
S3	3.917	2.522	17.105	116.000	0.000	116.000
S4	3.873	2.487	16.864	114.359	0.000	114.359
S5	3.496	2.227	15.106	102.495	0.001	102.496
S6	2.738	1.722	11.678	79.433	0.000	79.433

MAPE/FORECAST

RW.	0.423	0.069	0.466	2.265	0.008	2.274
AC.	0.592	0.154	1.042	5.885	0.000	5.885
PC.	0.453	0.102	0.694	3.966	0.020	3.985
MA.	0.442	0.060	0.406	1.808	0.002	1.810
ES.	0.421	0.066	0.451	2.105	0.004	2.109
Re.	0.632	0.149	1.010	6.184	0.002	6.186
S1	1.512	0.506	3.434	18.033	0.000	18.033
S2	1.447	0.485	3.288	17.195	0.000	17.195
S3	1.400	0.472	3.200	16.830	0.000	16.830
S4	1.403	0.473	3.206	16.880	0.000	16.880
S5	1.494	0.502	3.402	17.842	0.000	17.842
S6	1.748	0.576	3.904	20.422	0.000	20.422

MSE/FORECAST

RW.	0.392	0.143	0.967	5.170	0.000	5.170
AC.	1.412	0.788	5.345	34.636	0.000	34.636
PC.	0.676	0.364	2.470	15.884	0.000	15.884
MA.	0.357	0.098	0.663	3.276	0.000	3.276
ES.	0.376	0.130	0.879	4.444	0.000	4.444
Re.	1.397	0.844	5.728	38.265	0.000	38.265
S1	13.819	8.068	54.722	325.204	0.000	325.204
S2	12.669	7.377	50.031	295.668	0.000	295.668
S3	11.978	7.027	47.659	283.259	0.000	283.259
S4	12.023	7.057	47.862	284.921	0.000	284.921
S5	13.556	7.920	53.715	318.343	0.000	318.343
S6	17.961	10.384	70.430	417.045	0.000	417.045

Appendix 39-4.

COMPARISON OF THE ERROR MEASURES FOR THE BEST FORM OF EACH MODEL FOR FORECASTING PROFITS OF COMPANIES WITH ATTRIBUTABLE PROFIT GREATER THAN #4m. (40 Companies)

OPTIMAL SINGLE MODEL
BEST MODEL

Absolute Change	5 year
Percentage Change	1 year
Moving Average	2 year
Exponential Smoothing	0.95

	MEAN	STD. ERROR	STD. DEV.	RANGE	MINIMUM	MAXIMUM
1981						
MAPE/ACTUAL						
RW.	0.216	0.028	0.176	0.728	0.011	0.739
AC.	0.221	0.034	0.218	0.921	0.007	0.928
PC.	0.292	0.035	0.221	0.922	0.003	0.925
MA.	0.337	0.058	0.367	1.934	0.010	1.944
ES.	0.219	0.028	0.180	0.752	0.004	0.756
Re.	0.193	0.036	0.225	0.894	0.001	0.896
S1	1.384	0.270	1.707	7.588	0.012	7.600
S2	1.456	0.295	1.867	8.354	0.004	8.358
S3	1.500	0.307	1.940	8.502	0.017	8.520
S4	1.497	0.306	1.935	8.489	0.016	8.506
S5	1.636	0.349	2.208	9.782	0.020	9.802
S6	1.452	0.295	1.865	8.390	0.007	8.397
MSE/ACTUAL						
RW.	0.077	0.019	0.121	0.545	0.000	0.545
AC.	0.095	0.028	0.180	0.860	0.000	0.860
PC.	0.133	0.030	0.189	0.855	0.000	0.855
MA.	0.245	0.100	0.632	3.780	0.000	3.780
ES.	0.080	0.021	0.133	0.571	0.000	0.571
Re.	0.086	0.029	0.186	0.802	0.000	0.802
S1	4.756	1.826	11.548	57.751	0.000	57.751
S2	5.517	2.163	13.678	69.859	0.000	69.859
S3	5.917	2.304	14.572	72.582	0.000	72.572
S4	5.892	2.293	14.505	72.349	0.000	72.349
S5	7.429	2.968	18.774	96.072	0.000	96.072
S6	5.498	2.167	13.707	70.514	0.000	70.514

MAPE/FORECAST

RW.	0.250	0.037	0.233	1.136	0.011	1.146
AC.	0.240	0.052	0.329	1.926	0.007	1.933
PC.	0.772	0.316	1.998	12.293	0.003	12.296
MA.	0.284	0.032	0.203	0.981	0.010	0.991
ES.	0.239	0.030	0.193	0.948	0.004	0.952
Re.	0.158	0.022	0.141	0.473	0.001	0.474
S1	0.646	0.106	0.667	2.575	0.000	2.575
S2	0.604	0.099	0.626	2.472	0.000	2.472
S3	0.589	0.096	0.609	2.422	0.000	2.422
S4	0.590	0.096	0.610	2.425	0.000	2.542
S5	0.544	0.088	0.555	2.282	0.000	2.282
S6	0.605	0.099	0.626	2.474	0.000	2.474

MSE/FORECAST

RW.	0.115	0.039	0.245	1.314	0.000	1.314
AC.	0.163	0.094	0.596	3.737	0.000	3.737
PC.	4.487	3.783	23.924	151.195	0.000	159.195
MA.	0.121	0.027	0.173	0.982	0.000	0.982
ES.	0.093	0.026	0.161	0.907	0.000	0.907
Re.	0.044	0.010	0.064	0.225	0.000	0.225
S1	0.851	0.235	1.487	6.629	0.000	6.629
S2	0.747	0.204	1.293	6.110	0.000	6.110
S3	0.708	0.195	1.232	5.868	0.000	5.868
S4	0.710	0.195	1.236	5.880	0.000	5.880
S5	0.596	0.163	1.028	5.207	0.000	5.207
S6	0.748	0.204	1.292	6.119	0.000	6.119

1982

MAPE/ACTUAL

RW.	0.748	0.036	0.227	1.002	0.002	1.005
AC.	0.213	0.042	0.267	1.132	0.001	1.133
PC.	0.271	0.040	0.256	0.944	0.012	0.956
MA.	0.254	0.049	0.307	1.592	0.006	1.598
ES.	0.202	0.037	0.233	1.066	0.000	1.066
Re.	0.176	0.031	0.197	0.790	0.001	0.791
S1	0.868	0.286	1.809	11.619	0.005	11.624
S2	0.915	0.305	1.926	12.376	0.010	12.385
S3	0.947	0.314	1.983	12.757	0.003	12.760
S4	0.942	0.312	1.972	12.680	0.005	12.685
S5	0.958	0.320	2.024	13.000	0.026	13.026
S6	0.851	0.280	1.769	11.369	0.015	11.384

MSE/ACTUAL

RW.	0.089	0.035	0.221	1.010	0.000	1.010
AC.	0.115	0.042	0.265	1.283	0.000	1.283
PC.	0.137	0.035	0.224	0.913	0.000	0.913
MA.	0.157	0.069	0.438	2.554	0.000	2.554
ES.	0.094	0.038	0.237	1.136	0.000	1.136
Re.	0.069	0.020	0.129	0.625	0.000	0.625
S1	3.973	3.365	21.285	135.111	0.000	135.111
S2	4.455	3.822	24.170	153.398	0.000	153.398
S3	4.732	4.057	25.656	162.830	0.000	162.830
S4	4.678	4.008	25.352	160.901	0.000	160.901
S5	4.910	4.228	26.739	169.684	0.001	169.684
S6	3.776	3.228	20.416	129.594	0.000	129.595

MAPE/FORECAST

RW.	0.195	0.031	0.196	0.795	0.002	0.798
AC.	0.218	0.053	0.334	1.846	0.001	1.847
PC.	0.248	0.040	0.252	1.227	0.012	1.239
MA.	0.254	0.039	0.247	1.104	0.007	1.110
ES.	0.198	0.031	0.196	0.792	0.000	0.792
Re.	0.208	0.050	0.317	1.664	0.001	1.665
S1	0.595	0.173	1.093	6.041	0.000	6.041
S2	0.572	0.161	1.021	5.698	0.000	5.698
S3	0.554	0.152	0.962	5.361	0.000	5.361
S4	0.557	0.154	0.973	5.430	0.000	5.430
S5	0.551	0.150	0.946	5.276	0.000	5.276
S6	0.618	0.180	1.136	6.271	0.000	6.271

MSE/FORECAST

RW.	0.075	0.023	0.147	0.636	0.000	0.636
AC.	0.156	0.088	0.554	3.411	0.000	3.411
PC.	0.123	0.042	0.265	1.535	0.000	1.535
MA.	0.124	0.038	0.238	1.232	0.000	1.233
ES.	0.077	0.023	0.147	0.627	0.000	0.627
Re.	0.141	0.073	0.431	2.772	0.000	2.772
S1	1.519	0.927	5.865	36.495	0.000	36.495
S2	1.343	0.823	5.205	32.465	0.000	32.465
S3	1.209	0.730	4.617	28.735	0.000	28.735
S4	1.233	0.748	4.733	29.487	0.000	29.487
S5	1.175	0.707	4.471	27.837	0.000	27.837
S6	1.639	0.999	6.318	39.327	0.000	39.327

1983

MAPE/ACTUAL

RW.	0.262	0.027	0.172	0.686	0.008	0.695
AC.	0.251	0.037	0.233	0.929	0.003	0.932
PC.	0.243	0.033	0.207	0.846	0.002	0.848
MA.	0.283	0.028	0.179	0.777	0.002	0.780
ES.	0.262	0.027	0.173	0.675	0.004	0.679
Re.	0.288	0.062	0.390	1.489	0.000	1.489
S1	0.802	0.108	0.681	2.833	0.002	2.835
S2	0.814	0.113	0.716	2.920	0.038	2.957
S3	0.826	0.118	0.745	3.116	0.010	3.126
S4	0.824	0.118	0.743	3.109	0.007	3.116
S5	0.808	0.110	0.694	2.845	0.029	2.874
S6	0.778	0.091	0.576	2.348	0.008	2.357

MSE/ACTUAL

RW.	0.098	0.020	0.128	0.482	0.000	0.482
AC.	0.116	0.033	0.207	0.869	0.000	0.869
PC.	0.101	0.025	0.158	0.718	0.000	0.718
MA.	0.111	0.021	0.133	0.608	0.000	0.608
ES.	0.098	0.020	0.127	0.460	0.000	0.460
Re.	0.231	0.082	0.520	2.217	0.000	2.217
S1	1.095	0.295	1.867	8.035	0.000	8.035
S2	1.163	0.324	2.051	8.743	0.001	8.745
S3	1.223	0.349	2.209	9.772	0.000	9.772
S4	1.217	0.347	2.197	9.707	0.000	9.707
S5	1.122	0.306	1.932	8.258	0.001	8.258
S6	0.928	0.222	1.406	5.554	0.000	5.554

MAPE/FORECAST

RW.	0.434	0.077	0.489	2.265	0.008	2.274
AC.	0.564	0.186	1.179	6.924	0.003	6.927
PC.	0.523	0.156	0.985	5.561	0.002	5.564
MA.	0.451	0.066	0.421	1.808	0.002	1.810
ES.	0.431	0.075	0.472	2.105	0.004	2.109
Re.	0.202	0.030	0.190	0.598	0.000	0.598
S1	1.624	0.580	3.670	18.033	0.000	18.033
S2	1.552	0.556	3.514	17.195	0.000	17.195
S3	1.503	0.541	3.420	16.830	0.000	16.830
S4	1.506	0.542	3.427	16.880	0.000	16.880
S5	1.604	0.575	3.636	17.842	0.000	17.842
S6	1.879	0.659	4.171	20.422	0.000	20.422

MSE/FORECAST

RW.	0.421	0.163	1.031	5.170	0.000	5.170
AC.	1.674	1.206	7.629	47.984	0.000	47.984
PC.	1.219	0.791	5.004	30.953	0.000	30.953
MA.	0.376	0.111	0.703	3.276	0.000	3.276
ES.	0.402	0.148	0.936	4.444	0.000	4.444
Re.	0.076	0.017	0.109	0.358	0.000	0.358
S1	15.768	9.254	58.525	325.204	0.000	325.204
S2	14.450	8.461	53.509	295.668	0.000	295.668
S3	13.666	8.060	50.974	283.259	0.000	283.259
S4	13.716	8.094	51.192	284.921	0.000	284.921
S5	15.466	9.084	57.449	318.343	0.000	318.343
S6	20.492	11.909	75.319	417.045	0.000	417.045

OPTIMAL PREDICTION MODEL

BEST MODEL	1981	1982	1983
Absolute Change	5 year	5 year	4 year
Percentage Change	2 year	3 year	1 year
Moving Average	3 year	2 year	2 year
Exponential Smoothing	0.40	0.85	0.95

	MEAN	STD. ERROR	STD. DEV.	RANGE	MINIMUM	MAXIMUM
1981						
MAPE/ACTUAL						
RW.	0.216	0.028	0.176	0.728	0.011	0.739
AC.	0.221	0.034	0.218	0.921	0.007	0.928
PC.	0.384	0.080	0.509	2.693	0.001	2.694
MA.	0.362	0.059	0.371	1.679	0.009	1.688
ES.	0.330	0.044	0.278	1.324	0.003	1.327
Re.	0.193	0.036	0.225	0.894	0.001	0.896
S1	1.384	0.270	1.707	7.588	0.012	7.600
S2	1.456	0.295	1.867	8.354	0.004	8.358
S3	1.500	0.307	1.940	8.502	0.017	1.940
S4	1.497	0.306	1.935	8.489	0.016	8.506
S5	1.636	0.349	2.208	9.782	0.020	9.802
S6	1.452	0.295	1.865	8.390	0.007	8.397

MSE/ACTUAL

RW.	0.077	0.019	0.121	0.545	0.000	0.545
AC.	0.095	0.028	0.180	0.860	0.000	0.860
PC.	0.400	0.197	1.245	7.256	0.000	7.256
MA.	0.265	0.091	0.574	2.850	0.000	2.851
ES.	9.568	9.286	67.603	492.408	0.000	492.408
Re.	0.086	0.029	0.186	0.802	0.000	0.802
S1	4.756	1.826	11.548	57.751	0.000	57.751
S2	5.517	2.163	13.678	69.859	0.000	69.859
S3	5.917	2.304	14.572	72.582	0.000	72.583
S4	5.892	2.293	14.505	72.349	0.000	72.349
S5	7.429	2.968	18.774	96.072	0.000	96.072
S6	5.498	2.167	13.707	70.514	0.000	70.514

MAPE/FORECAST

RW.	0.250	0.037	0.233	1.136	0.011	1.146
AC.	0.240	0.052	0.329	1.926	0.007	1.933
PC.	0.369	0.075	0.473	2.721	0.001	2.722
MA.	0.329	0.037	0.236	0.984	0.009	0.994
ES.	0.357	0.039	0.249	0.936	0.003	0.939
Re.	0.158	0.022	0.141	0.473	0.001	0.474
S1	0.646	0.106	0.667	2.575	0.000	2.575
S2	0.604	0.099	0.626	2.472	0.000	2.472
S3	0.589	0.096	0.609	2.422	0.000	2.422
S4	0.590	0.096	0.610	2.425	0.000	2.425
S5	0.544	0.088	0.555	2.282	0.000	2.282
S6	0.605	0.099	0.626	2.474	0.000	2.474

MSE/FORECAST

RW.	0.115	0.039	0.245	1.314	0.000	1.314
AC.	0.163	0.094	0.596	3.737	0.000	3.737
PC.	0.354	0.188	1.188	7.408	0.000	7.408
MA.	0.163	0.033	0.211	0.987	0.000	0.987
ES.	0.187	0.032	0.230	0.916	0.000	0.916
Re.	0.044	0.010	0.064	0.225	0.000	0.225
S1	0.851	0.235	1.487	6.629	0.000	6.629
S2	0.747	0.204	1.293	6.110	0.000	6.110
S3	0.708	0.195	1.232	5.868	0.000	5.868
S4	0.710	0.195	1.236	5.880	0.000	5.880
S5	0.596	0.163	1.028	5.207	0.000	5.207
S6	0.748	0.204	1.292	6.119	0.000	6.119

1982

MAPE/ACTUAL

RW.	0.197	0.036	0.227	1.002	0.002	1.005
AC.	0.213	0.042	0.267	1.132	0.001	1.133
PC.	0.311	0.065	0.414	1.930	0.005	1.935
MA.	0.254	0.049	0.307	1.592	0.006	1.598
ES.	0.214	0.039	0.249	1.192	0.005	1.197
Re.	0.176	0.031	0.197	0.790	0.001	0.791
S1	0.868	0.286	1.809	11.619	0.005	11.624
S2	0.915	0.305	1.936	12.376	0.010	12.385
S3	0.947	0.314	1.983	12.757	0.003	12.760
S4	0.942	0.312	1.972	12.680	0.005	12.685
S5	0.958	0.320	2.024	13.000	0.026	13.026
S6	0.851	0.280	1.769	11.369	0.015	11.369

MSE/ACTUAL

RW.	0.089	0.035	0.221	1.010	0.000	1.010
AC.	0.115	0.042	0.265	1.283	0.000	1.283
PC.	0.264	0.108	0.683	3.743	0.000	3.743
MA.	0.157	0.069	0.438	2.554	0.000	2.554
ES.	0.170	0.082	0.600	4.087	0.000	4.087
Re.	0.069	0.020	0.129	0.625	0.000	0.625
S1	3.973	3.365	21.285	135.111	0.000	135.111
S2	4.455	3.822	24.170	153.398	0.000	153.398
S3	4.732	4.057	25.656	162.830	0.000	162.830
S4	4.678	4.008	25.352	160.901	0.000	160.901
S5	4.910	4.228	26.739	169.684	0.000	169.684
S6	3.776	3.228	20.416	129.594	0.000	129.595

MAPE/FORECAST

RW.	0.195	0.031	0.196	0.795	0.002	0.798
AC.	0.218	0.053	0.334	1.846	0.001	1.847
PC.	0.259	0.047	0.300	1.332	0.005	1.337
MA.	0.254	0.039	0.247	1.104	0.007	1.110
ES.	0.205	0.030	0.191	0.773	0.005	0.778
Re.	0.208	0.050	0.317	1.664	0.001	1.665
S1	0.595	0.173	1.093	6.041	0.000	6.041
S2	0.572	0.161	1.021	5.698	0.000	5.698
S3	0.554	0.152	0.962	5.361	0.000	5.361
S4	0.557	0.154	0.973	5.430	0.000	5.430
S5	0.551	0.150	0.946	5.276	0.000	5.276
S6	0.618	0.180	1.136	6.271	0.000	6.271

MSE/FORECAST

RW.	0.075	0.023	0.147	0.636	0.000	0.636
AC.	0.156	0.088	0.554	3.411	0.000	3.411
PC.	0.155	0.054	0.338	1.787	0.000	1.787
MA.	0.124	0.038	0.238	1.232	0.000	1.233
ES.	0.103	0.025	0.181	0.795	0.000	0.495
Re.	0.141	0.073	0.431	2.772	0.000	2.772
S1	1.519	0.927	5.865	36.495	0.000	36.495
S2	1.343	0.823	5.205	32.465	0.000	32.465
S3	1.209	0.730	4.617	28.735	0.000	28.735
S4	1.233	0.748	4.733	29.487	0.000	29.487
S5	1.175	0.707	4.471	27.837	0.000	27.837
S6	1.639	0.999	6.318	39.327	0.000	39.327

<u>1983</u>

MAPE/ACTUAL

RW.	0.262	0.027	0.172	0.686	0.008	0.695
AC.	0.268	0.038	0.241	0.971	0.000	0.971
PC.	0.243	0.033	0.207	0.846	0.002	0.848
MA.	0.283	0.028	0.179	0.777	0.002	0.780
ES.	0.262	0.027	0.173	0.675	0.004	0.679
Re.	0.288	0.062	0.390	1.489	0.000	1.489
S1	0.802	0.108	0.681	2.833	0.002	2.835
S2	0.814	0.113	0.716	2.920	0.038	2.957
S3	0.826	0.118	0.745	3.116	0.010	3.126
S4	0.824	0.118	0.743	3.109	0.007	3.116
S5	0.808	0.110	0.694	2.845	0.029	2.874
S6	0.778	0.091	0.576	2.348	0.008	2.357

MSE/ACTUAL

RW.	0.098	0.020	0.128	0.482	0.000	0.482
AC.	0.129	0.035	0.219	0.943	0.000	0.973
PC.	0.101	0.025	0.158	0.718	0.000	0.718
MA.	0.111	0.021	0.133	0.608	0.000	0.608
ES.	0.098	0.020	0.127	0.460	0.000	0.460
Re.	0.231	0.082	0.520	2.217	0.000	2.217
S1	1.095	0.295	1.867	8.035	0.000	8.035
S2	1.163	0.324	2.051	8.743	0.001	8.745
S3	1.223	0.349	2.209	9.772	0.000	9.773
S4	1.217	0.347	2.197	9.707	0.000	9.707
S5	1.122	0.306	1.932	8.258	0.001	8.258
S6	0.928	0.222	1.406	5.554	0.000	5.554

MAPE/FORECAST

RW.	0.434	0.077	0.489	2.265	0.008	2.274
AC.	0.604	0.174	1.102	5.885	0.000	5.885
PC.	0.523	0.156	0.985	5.561	0.002	5.564
MA.	0.451	0.066	0.421	1.808	0.002	1.810
ES.	0.431	0.075	0.472	2.105	0.004	2.109
Re.	0.202	0.030	0.190	0.598	0.000	0.598
S1	1.624	0.580	3.670	18.033	0.000	18.033
S2	1.552	0.556	3.514	17.195	0.000	17.195
S3	1.503	0.541	3.420	16.830	0.000	16.830
S4	1.506	0.542	3.427	16.880	0.000	16.880
S5	1.604	0.575	3.636	17.842	0.000	17.842
S6	1.879	0.659	4.171	20.422	0.000	20.422

MSE/FORECAST

RW.	0.421	0.163	1.031	5.170	0.000	5.170
AC.	1.549	0.904	5.719	34.636	0.000	34.636
PC.	1.219	0.791	5.004	30.953	0.000	30.953
MA.	0.376	0.111	0.703	3.276	0.000	3.276
ES.	0.402	0.148	0.936	4.444	0.000	4.444
Re.	0.076	0.017	0.109	0.358	0.000	0.358
S1	15.768	9.254	58.525	325.204	0.000	325.204
S2	14.450	8.461	53.509	295.668	0.000	295.668
S3	13.666	8.060	50.974	283.259	0.000	283.259
S4	13.716	8.094	51.192	284.921	0.000	284.921
S5	15.466	9.084	57.449	318.343	0.000	318.343
S6	20.492	11.909	75.319	417.045	0.000	417.045

Appendix 40.

T-TESTS OF ERROR MEASURES OF PROFIT FORECASTS FOR ALL CONSOLIDATED MODELS AND SEGMENT MODEL 1 FOR SAMPLES BASED UPON THE SIZE OF ATTRIBUTABLE PROFIT.

	(DIFFERENCE) MEAN	STANDARD DEVIATION	STANDARD ERROR	CORR.	2-TAIL PROB.	T VALUE	2-TAIL PROB.

ATTRIBUTABLE PROFIT GREATER THAN £1 MILLION (60 Companies)

OPTIMAL SINGLE MODEL.

1981

MAPE/ACTUAL

RW	-1.4632	2.532	0.327	0.364	0.004	-4.48	0.000
AC	-1.4223	2.518	0.325	0.373	0.003	-4.38	0.000
PC	-1.3632	2.594	0.335	0.292	0.023	-4.07	0.000
MA	-0.5503	6.598	0.852	0.019	0.886	-0.65	0.521
ES	-1.1851	3.242	0.419	0.115	0.383	-2.83	0.006
Re	-1.2890	2.638	0.341	0.282	0.029	-3.78	0.000

MSE/ACTUAL

RW	-9.8298	30.078	3.883	0.266	0.040	-2.53	0.014
AC	-9.5811	29.936	3.865	0.268	0.039	-2.48	0.016
PC	-9.7189	30.203	3.899	0.254	0.051	-2.49	0.016
MA	27.2339	281.497	36.341	-0.030	0.821	0.75	0.457
ES	-5.7979	42.209	5.449	0.025	0.850	-1.06	0.292
Re	-8.9038	30.046	3.879	0.250	0.054	-2.30	0.025

MAPE/FORECAST

RW	-1.1224	5.842	0.754	-0.103	0.434	-1.49	0.142
AC	-1.1026	5.850	0.755	-0.070	0.597	-1.46	0.150
PC	-1.0535	5.855	0.756	-0.065	0.622	-1.39	0.169
MA	-1.1248	5.717	0.738	0.374	0.003	-1.52	0.133
ES	-1.1486	5.717	0.738	0.371	0.004	-1.56	0.125
Re	-0.9193	5.850	0.755	0.093	0.479	-1.22	0.228

MSE/FORECAST

RW	-34.9166	264.715	34.175	-0.054	0.680	-1.02	0.311
AC	-34.7943	264.731	34.177	-0.041	0.755	-1.02	0.313
PC	-34.7107	264.741	34.178	-0.041	0.758	-1.02	0.314
MA	-34.9706	264.582	34.157	0.505	0.000	-1.02	0.310
ES	-34.9834	264.591	34.159	0.440	0.000	-1.02	0.310
Re	-32.7074	265.197	34.237	0.000	0.999	-0.96	0.343

1982

MAPE/ACTUAL

RW	-0.6344	1.563	0.202	-0.026	0.843	-3.14	0.003
AC	-0.6001	1.582	0.204	-0.054	0.682	-2.94	0.005
PC	-0.5308	1.607	0.207	-0.063	0.635	-2.56	0.013
MA	-0.5893	1.585	0.205	-0.038	0.773	-2.88	0.006
ES	-0.5722	1.589	0.205	0.046	0.727	-2.79	0.007
Re	-0.5782	1.641	0.212	-0.099	0.453	-2.73	0.008

MSE/ACTUAL

RW	-2.9232	17.422	2.249	-0.039	0.769	-1.30	0.199
AC	-2.8792	17.430	2.250	-0.051	0.701	-1.28	0.206
PC	-2.7839	17.448	2.253	-0.052	0.694	-1.24	0.221
MA	-2.8524	17.438	2.251	-0.036	0.787	-1.27	0.210
ES	-2.7206	17.484	2.257	-0.011	0.936	-1.21	0.233
Re	-2.7629	17.484	2.257	-0.036	0.786	-1.22	0.226

MAPE/FORECAST

RW	-1.6107	6.626	0.855	0.053	0.690	-1.88	0.065
AC	-1.4922	6.698	0.865	-0.003	0.984	-1.73	0.090
PC	-1.5026	6.657	0.859	0.005	0.971	-1.75	0.086
MA	-1.5889	6.543	0.845	0.321	0.012	-1.88	0.065
ES	-1.6291	6.597	0.852	0.185	0.156	-1.91	0.061
Re	-1.6081	6.678	0.862	-0.096	0.464	-1.87	0.067

MSE/FORECAST

RW	-46.5830	295.080	38.095	-0.012	0.925	-1.22	0.226
AC	-45.8332	295.250	38.117	-0.023	0.860	-1.20	0.234
PC	-46.3167	295.122	38.100	-0.024	0.858	-1.22	0.229
MA	-46.6000	294.959	38.079	0.310	0.016	-1.22	0.226
ES	-46.6632	295.048	38.091	0.126	0.336	-1.23	0.225
Re	-46.5809	295.100	38.097	-0.057	0.666	-1.22	0.226

1983

MAPE/ACTUAL

RW	-0.8293	1.498	0.193	0.072	0.586	-4.29	0.000
AC	-0.8249	1.486	0.192	0.138	0.292	-4.30	0.000
PC	-0.7888	1.487	0.192	0.132	0.314	-4.11	0.000
MA	-0.8072	1.508	0.195	0.014	0.913	-4.15	0.000
ES	-0.8296	1.501	0.194	0.053	0.687	-4.28	0.000
Re	-0.6600	1.631	0.211	-0.082	0.532	-3.13	0.003

MSE/ACTUAL

RW	-3.2862	13.414	1.732	-0.015	0.911	-1.90	0.063
AC	-3.2639	13.409	1.731	0.018	0.889	-1.89	0.064
PC	-3.2507	13.412	1.732	0.001	0.995	-1.88	0.065
MA	-3.2750	13.414	1.732	-0.014	0.917	-1.89	0.064
ES	-3.2888	13.413	1.732	-0.012	0.930	-1.90	0.062
Re	-2.9300	13.530	1.747	-0.072	0.587	-1.68	0.099

MAPE/FORECAST

RW	-0.9426	3.106	0.401	0.030	0.823	-2.35	0.022
AC	-0.7729	3.312	0.428	-0.001	0.995	-1.81	0.076
PC	-0.7993	3.165	0.409	0.035	0.793	-1.96	0.055
MA	-0.8948	3.151	0.407	0.010	0.931	-2.20	0.032
ES	-0.9602	3.109	0.401	0.012	0.930	-2.39	0.020
Re	-1.1339	3.082	0.398	-0.050	0.706	-2.85	0.006

MSE/FORECAST

RW	-10.6257	48.223	6.226	-0.052	0.695	-1.71	0.093
AC	0.3642	5.350	0.691	0.718	0.000	0.53	0.600
PC	-10.0329	48.418	6.251	-0.051	0.697	-1.61	0.114
MA	-10.3661	48.407	6.249	-0.034	0.798	-1.66	0.102
ES	-10.6899	48.213	6.224	-0.046	0.728	-1.72	0.091
Re	-11.0786	48.123	6.213	-0.094	0.476	-1.78	0.080

OPTIMAL PREDICTION MODELS

ABSOLUTE CHANGE

1982 (3 year)

PE/A	-0.5580	1.602	0.207	-0.064	0.628	-2.70	0.009
SE/A	-2.8144	17.446	2.252	-0.046	0.724	-1.25	0.216
PE/F	-1.2029	6.836	0.882	0.000	0.997	-1.36	0.178
SE/F	-43.6601	295.820	38.190	-0.027	0.836	-1.14	0.258

PERCENTAGE CHANGE

1983 (2 year)

PE/A	-0.7817	1.465	0.189	0.218	0.094	-4.13	0.000
SE/A	-3.2237	13.395	1.729	0.068	0.605	-1.86	0.067
PE/F	-0.8504	3.194	0.412	0.010	0.937	-2.06	0.044
SE/F	-10.0353	48.464	6.257	-0.048	0.716	-1.60	0.114

EXPONENTIAL SMOOTHING

1981 (0.95)

PE/A	-1.3823	2.617	0.338	0.278	0.031	-4.09	0.000
SE/A	-9.4220	30.242	3.904	0.223	0.087	-2.41	0.019
PE/F	-1.1257	5.739	0.741	0.236	0.069	-1.52	0.134
SE/F	-34.9439	264.624	34.163	0.183	0.162	-1.02	0.311

1983 (0.75)

PE/A	-0.8226	1.504	0.194	0.035	0.793	-4.24	0.000
SE/A	-3.2863	13.414	1.732	-0.017	0.895	-1.90	0.063
PE/F	-0.9608	3.102	0.400	0.018	0.892	-2.40	0.020
SE/F	-10.7155	48.204	6.223	-0.045	0.732	-1.72	0.090

REGRESSION MODEL

1981

PE/A	-0.5403	3.312	0.428	0.190	0.146	-1.26	0.211
SE/A	-2.8606	41.628	5.374	0.173	0.187	-0.53	0.597
PE/F	1.1529	8.990	1.161	-0.033	0.803	0.99	0.325
SE/F	15.4463	385.644	49.786	-0.024	0.856	0.31	0.757

1982

PE/A	-0.3748	1.691	0.218	-0.028	0.829	-1.72	0.091
SE/A	-2.3664	17.577	2.269	-0.039	0.769	-1.04	0.301
PE/F	-1.3256	6.425	0.829	0.259	0.045	-1.60	0.115
SE/F	-44.9409	294.022	37.958	0.113	0.389	-1.18	0.241

1983

PE/A	-0.7613	1.507	0.195	0.062	0.640	-3.91	0.000
SE/A	-3.2123	13.402	1.730	0.040	0.759	-1.86	0.068
PE/F	-0.7900	3.283	0.424	-0.067	0.609	-1.86	0.067
SE/F	-9.8594	48.692	6.286	-0.050	0.705	-1.57	0.122

ATTRIBUTABLE PROFIT GREATER THAN £2 MILLION (53 Companies)

1981

MAPE/ACTUAL

RW	-1.3465	2.430	0.334	0.198	0.154	-4.03	0.000
AC	-1.3217	2.421	0.333	0.210	0.130	-3.97	0.000
PC	-1.2445	2.482	0.341	0.069	0.625	-3.65	0.001
MA	-0.3751	6.903	0.948	-0.040	0.779	-0.40	0.694
ES	-1.2609	2.527	0.347	0.044	0.752	-3.63	0.001
Re	-1.1727	2.346	0.322	0.342	0.012	-3.64	0.001

MSE/ACTUAL

RW	-8.4646	29.226	4.014	0.152	0.278	-2.11	0.040
AC	-8.4104	29.201	4.011	0.160	0.252	-2.10	0.041
PC	-8.2835	29.267	4.020	0.029	0.839	-2.06	0.044
MA	32.4714	299.149	41.091	-0.036	0.796	0.79	0.433
ES	-8.0853	29.459	4.047	-0.019	0.891	-2.00	0.051
Re	-2.8642	18.585	2.553	-0.049	0.730	-1.12	0.267

MAPE/FORECAST

RW	-1.1784	6.214	0.854	-0.105	0.453	-1.38	0.173
AC	-1.1528	6.222	0.855	-0.068	0.626	-1.35	0.183
PC	-1.1029	6.229	0.856	-0.065	0.646	-1.29	0.203
MA	-1.1786	6.081	0.835	0.414	0.002	-1.41	0.164
ES	-1.1815	6.104	0.839	0.248	0.074	-1.41	0.165
Re	-0.7778	6.433	0.884	-0.079	0.571	-0.88	0.383

MSE/FORECAST

RW	-39.3424	281.666	38.690	-0.056	0.688	-1.02	0.314
AC	-39.2051	281.685	38.692	-0.044	0.755	-1.01	0.316
PC	-39.1131	281.697	38.694	-0.044	0.756	-1.01	0.317
MA	-39.4055	281.523	38.670	0.567	0.000	-1.02	0.313
ES	-39.3732	281.568	38.676	0.188	0.178	-1.02	0.313
Re	-37.1401	282.102	38.750	-0.041	0.772	-0.96	0.342

<u>1982</u>

MAPE/ACTUAL

RW	-0.6852	1.635	0.225	-0.034	0.808	-3.05	0.004
AC	-0.6585	1.648	0.226	-0.058	0.682	-2.91	0.005
PC	-0.5798	1.675	0.230	-0.051	0.717	-2.52	0.015
MA	-0.6282	1.663	0.228	-0.084	0.549	-2.75	0.008
ES	-0.6787	1.635	0.225	-0.027	0.848	-3.02	0.004
Re	-0.6819	1.659	0.228	-0.167	0.231	-2.99	0.004

MSE/ACTUAL

RW	-3.2445	18.524	2.545	-0.048	0.733	-1.28	0.208
AC	-3.2164	18.529	2.545	-0.058	0.682	-1.26	0.212
PC	-3.1013	18.551	2.548	-0.047	0.741	-1.22	0.229
MA	-3.1835	18.537	2.546	-0.049	0.727	-1.25	0.217
ES	-3.2395	18.525	2.545	-0.048	0.735	-1.27	0.209
Re	-3.2488	18.526	2.545	-0.089	0.528	-1.28	0.207

MAPE/FORECAST

RW	-1.7234	7.024	0.965	0.111	0.428	-1.79	0.080
AC	-1.6668	7.041	0.967	0.041	0.773	-1.72	0.091
PC	-1.6314	7.041	0.967	0.038	0.788	-1.69	0.098
MA	-1.6529	6.952	0.955	0.314	0.022	-1.73	0.089
ES	-1.7198	7.018	0.964	0.136	0.333	-1.78	0.080
Re	-1.7025	7.088	0.974	-0.106	0.450	-1.75	0.086

MSE/FORECAST

RW	-52.3464	313.840	43.109	0.034	0.809	-1.21	0.230
AC	-52.1973	313.865	43.113	-0.023	0.870	-1.21	0.231
PC	-52.2195	313.855	43.111	-0.018	0.899	-1.21	0.231
MA	-52.2624	313.729	43.094	0.309	0.024	-1.21	0.231
ES	-52.3457	313.835	43.109	0.062	0.661	-1.21	0.230
Re	-52.2788	313.874	43.114	-0.055	0.695	-1.21	0.231

<u>1983</u>

MAPE/ACTUAL

RW	-0.8296	1.552	0.213	-0.032	0.820	-3.89	0.000
AC	-0.8298	1.541	0.212	0.055	0.693	-3.92	0.000
PC	-0.7872	1.541	0.212	0.047	0.737	-3.72	0.000
MA	-0.8008	1.565	0.215	-0.107	0.445	-3.73	0.000
ES	-0.8285	1.552	0.213	-0.035	0.805	-3.89	0.000
Re	-0.6890	1.652	0.227	-0.074	0.601	-3.04	0.004

MSE/ACTUAL

RW	-3.3808	14.174	1.947	-0.085	0.545	-1.74	0.088
AC	-3.3627	14.170	1.946	-0.029	0.838	-1.73	0.090
PC	-3.3455	14.174	1.947	-0.051	0.716	-1.72	0.092
MA	-3.3656	14.176	1.947	-0.102	0.466	-1.73	0.090
ES	-3.3805	14.174	1.947	-0.086	0.538	-1.74	0.088
Re	-3.0741	14.259	1.959	-0.066	0.641	-1.57	0.123

MAPE/FORECAST

RW	-1.0520	3.273	0.450	0.012	0.930	-2.34	0.023
AC	-0.9377	3.443	0.473	-0.034	0.811	-1.98	0.053
PC	-0.9390	3.306	0.454	0.016	0.911	-2.07	0.044
MA	-1.0184	3.264	0.448	0.016	0.909	-2.27	0.027
ES	-1.0532	3.270	0.449	0.015	0.916	-2.34	0.023
Re	-1.2010	3.260	0.448	-0.029	0.834	-2.68	0.010

MSE/FORECAST

RW	-12.0787	51.168	7.028	-0.059	0.676	-1.72	0.092
AC	0.3565	2.421	0.333	0.989	0.000	1.07	0.289
PC	-11.7324	51.260	7.041	-0.058	0.678	-1.67	0.102
MA	-12.1014	51.149	7.026	-0.062	0.658	-1.72	0.091
ES	-12.0927	51.163	7.028	-0.060	0.669	-1.72	0.091
Re	-12.3299	51.116	7.021	-0.074	0.600	-1.76	0.085

OPTIMAL PREDICTION MODEL

PERCENTAGE CHANGE

1982 (2 year)

PE/A	-0.7751	1.520	0.209	0.153	0.274	-3.71	0.001
SE/A	-3.3130	14.156	1.944	0.038	0.788	-1.70	0.094
PE/F	-1.0019	3.330	0.457	-0.028	0.841	-2.19	0.033
SE/F	-11.8174	51.276	7.043	-0.051	0.716	-1.68	0.099

MOVING AVERAGE

1982 (5 year)

PE/A	-0.1487	3.116	0.428	0.051	0.716	-0.35	0.730
SE/A	4.6217	58.790	8.075	-0.003	0.981	0.57	0.570
PE/F	-1.5872	7.051	0.969	-0.002	0.988	-1.64	0.107
SE/F	-52.2432	313.856	43.111	-0.033	0.816	-1.21	0.231

EXPONENTIAL SMOOTHING

1982 (0.80)

PE/A	-0.6074	1.668	0.229	0.038	0.786	-2.65	0.011
SE/A	-3.0193	18.593	2.554	-0.011	0.940	-1.18	0.242
PE/F	-1.7034	7.007	0.962	0.182	0.191	-1.77	0.083
SE/F	-39.4180	281.532	38.671	0.483	0.000	-1.02	0.313

REGRESSION MODEL

1981

PE/A	-0.5755	3.184	0.437	-0.060	0.671	-1.32	0.194
SE/A	-4.1148	37.416	5.139	-0.041	0.773	-0.80	0.427
PE/F	1.3163	11.141	1.530	-0.039	0.779	0.86	0.394
SE/F	48.4078	632.241	86.845	-0.022	0.875	0.56	0.580

1982

PE/A	-0.2935	1.761	0.242	-0.062	0.657	-1.21	0.230
SE/A	-2.6209	18.649	2.562	-0.062	0.657	-1.02	0.311
PE/F	7.7521	54.023	7.421	-0.020	0.889	1.04	0.301
SE/F	2841.702	20377.19	2799.023	-0.024	0.867	1.02	0.315

1983

PE/A	-0.7719	1.571	0.216	-0.078	0.578	-3.58	0.001
SE/A	-3.3275	14.181	1.948	-0.075	0.593	-1.71	0.094
PE/F	-0.8446	3.469	0.476	-0.072	0.608	-1.77	0.082
SE/F	-11.0754	51.760	7.110	-0.049	0.726	-1.56	0.125

ATTRIBUTABLE PROFIT GREATER THAN £3 MILLION (46 Companies)

1981

MAPE/ACTUAL

RW	-1.1644	1.765	0.260	0.222	0.138	-4.47	0.000
AC	-1.1397	1.755	0.259	0.239	0.110	-4.40	0.000
PC	-1.0502	1.852	0.273	0.029	0.848	-3.85	0.000
MA	-1.0624	1.855	0.273	-0.035	0.818	-3.88	0.000
ES	-1.1621	1.774	0.262	0.190	0.206	-4.44	0.000
Re	-1.1859	1.754	0.259	0.241	0.106	-4.58	0.000

MSE/ACTUAL

RW	-5.0613	12.262	1.808	0.273	0.066	-2.80	0.008
AC	-5.0015	12.210	1.800	0.278	0.061	-2.78	0.008
PC	-4.8457	12.368	1.824	0.006	0.966	-2.66	0.011
MA	-4.9370	12.367	1.823	-0.014	0.925	-2.71	0.010
ES	-5.0616	12.270	1.809	0.254	0.089	-2.80	0.008
Re	-5.0262	12.163	1.793	0.356	0.015	-2.80	0.007

MAPE/FORECAST

RW	-0.4044	0.721	0.106	0.055	0.718	-3.81	0.000
AC	-0.4084	0.780	0.115	-0.056	0.713	-3.55	0.001
PC	-0.3680	0.821	0.121	-0.142	0.347	-3.04	0.004
MA	-0.3721	0.738	0.109	-0.082	0.590	-3.42	0.001
ES	-0.4136	0.711	0.105	0.056	0.711	-3.94	0.000
Re	-0.4854	0.683	0.101	0.189	0.208	-4.82	0.000

MSE/FORECAST

RW	-0.7892	1.620	0.239	-0.039	0.798	-3.30	0.002
AC	-0.7453	1.729	0.255	-0.078	0.606	-2.92	0.005
PC	-0.7029	1.764	0.260	-0.102	0.501	-2.70	0.010
MA	-0.7863	1.619	0.239	-0.102	0.499	-3.29	0.002
ES	-0.8089	1.604	0.237	-0.015	0.921	-3.42	0.001
Re	-0.8509	1.593	0.235	0.040	0.791	-3.62	0.001

1982

MAPE/ACTUAL

RW	-0.6586	1.715	0.253	-0.066	0.661	-2.61	0.012
AC	-0.6415	1.726	0.255	-0.086	0.572	-2.52	0.015
PC	-0.5544	1.759	0.259	-0.072	0.633	-2.14	0.038
MA	-0.5957	1.750	0.258	-0.135	0.372	-2.31	0.026
ES	-0.6564	1.717	0.253	-0.073	0.629	-2.59	0.013
Re	-0.6577	1.734	0.256	-0.195	0.194	-2.57	0.013

MSE/ACTUAL

RW	-3.4098	19.863	2.929	-0.053	0.727	-1.16	0.250
AC	-3.3872	19.867	2.929	-0.060	0.690	-1.16	0.254
PC	-3.2561	19.893	2.933	-0.050	0.742	-1.11	0.273
MA	-3.3452	19.877	2.931	-0.055	0.719	-1.14	0.260
ES	-3.4063	19.864	2.929	-0.053	0.729	-1.16	0.251
Re	-3.4204	19.862	2.929	-0.091	0.547	-1.17	0.249

MAPE/FORECAST

RW	-0.9372	3.211	0.473	0.091	0.550	-1.98	0.054
AC	-0.9149	3.199	0.472	0.124	0.410	-1.94	0.059
PC	-0.8726	3.226	0.476	0.035	0.819	-1.83	0.073
MA	-0.8776	3.206	0.473	0.106	0.482	-1.86	0.070
ES	-0.9366	3.210	0.473	0.096	0.526	-1.98	0.054
Re	-0.8998	3.261	0.481	-0.072	0.632	-1.87	0.068

MSE/FORECAST

RW	-11.3450	67.044	9.885	-0.009	0.955	-1.15	0.257
AC	-11.2746	67.027	9.883	0.034	0.820	-1.14	0.260
PC	-11.2709	67.045	9.885	-0.007	0.965	-1.14	0.260
MA	-11.3007	67.041	9.885	0.008	0.959	-1.14	0.259
ES	-11.3447	67.044	9.885	-0.006	0.969	-1.15	0.257
Re	-11.2685	67.067	9.889	-0.053	0.727	-1.14	0.261

1983

MAPE/ACTUAL

RW	-0.7776	1.571	0.232	-0.050	0.742	-3.36	0.002
AC	-0.7834	1.563	0.230	0.033	0.828	-3.40	0.001
PC	-0.7431	1.554	0.229	0.067	0.659	-3.24	0.002
MA	-0.7582	1.593	0.235	-0.168	0.265	-3.23	0.002
ES	-0.7776	1.573	0.232	-0.057	0.706	-3.35	0.002
Re	-0.7491	1.607	0.237	-0.044	0.773	-3.16	0.003

MSE/ACTUAL

RW	-3.3416	14.978	2.208	-0.094	0.534	-1.51	0.137
AC	-3.3226	14.974	2.208	-0.034	0.822	-1.50	0.139
PC	-3.3097	14.975	2.208	-0.043	0.778	-1.50	0.141
MA	-3.3286	14.982	2.209	-0.119	0.429	-1.51	0.139
ES	-3.3412	14.978	2.208	-0.097	0.522	-1.51	0.137
Re	-0.8350	1.644	0.242	-0.076	0.616	-3.45	0.001

MAPE/FORECAST

RW	-1.0883	3.475	0.512	-0.022	0.887	-2.12	0.039
AC	-0.9647	3.659	0.539	-0.048	0.753	-1.79	0.080
PC	-0.9814	3.524	0.520	-0.030	0.845	-1.89	0.065
MA	-1.0699	3.460	0.510	-0.006	0.970	-2.10	0.042
ES	-1.0909	3.471	0.512	-0.018	0.906	-2.13	0.039
Re	-1.2989	3.445	0.508	-0.033	0.830	-2.56	0.014

MSE/FORECAST

RW	-13.4273	54.799	8.080	-0.071	0.641	-1.66	0.103
AC	0.4204	2.596	0.383	0.989	0.000	1.10	0.278
PC	-13.0612	54.911	8.096	-0.071	0.639	-1.61	0.114
MA	-13.4625	54.775	8.076	-0.074	0.625	-1.67	0.102
ES	-13.4433	54.793	8.079	-0.072	0.633	-1.66	0.103
Re	-13.7405	54.728	8.069	-0.058	0.701	-1.70	0.095

OPTIMAL PREDICTION MODEL

PERCENTAGE CHANGE

1983 (2 year)

PE/A	-0.7759	1.553	0.229	0.067	0.658	-3.39	0.001
SE/A	-3.3317	14.963	2.206	0.026	0.866	-1.51	0.138
PE/F	-1.0587	3.533	0.521	-0.044	0.771	-2.03	0.048
SE/F	-13.1435	54.920	8.097	-0.058	0.704	-1.62	0.112

EXPONENTIAL SMOOTHING

1981 (0.45)

PE/A	-1.0904	1.835	0.271	-0.022	0.885	-4.03	0.000
SE/A	-5.0058	12.336	1.819	0.036	0.813	-2.75	0.009
PE/F	-0.3369	0.711	0.105	0.089	0.555	-3.21	0.002
SE/F	-0.7540	1.595	0.235	0.051	0.737	-3.21	0.002

1982 (0.85)

PE/A	-0.6442	1.725	0.254	-0.093	0.539	-2.53	0.015
SE/A	-3.3960	19.866	2.929	-0.052	0.730	-1.16	0.252
PE/F	-0.9296	3.211	0.473	0.094	0.535	-1.96	0.056
SE/F	-0.8171	1.601	0.236	-0.003	0.983	-3.46	0.001

REGRESSION

1981

PE/A	-0.7096	1.967	0.290	-0.039	0.797	-2.45	0.018
SE/A	-4.1953	12.562	1.852	-0.026	0.862	-2.27	0.028
PE/F	0.3304	1.617	0.238	0.037	0.809	1.39	0.173
SE/F	2.2281	10.377	1.530	0.105	0.486	1.46	0.152

1982

PE/A	-0.5143	1.797	0.265	-0.126	0.403	-1.94	0.059
SE/A	-3.1906	19.922	2.937	-0.053	0.729	-1.09	0.283
PE/F	-0.8657	3.205	0.473	0.124	0.413	-1.83	0.074
SE/F	-11.3163	67.031	9.883	0.098	0.518	-1.15	0.258

1983

PE/A	-0.7216	1.587	0.234	-0.071	0.638	-3.08	0.003
SE/A	-3.2859	14.984	2.209	-0.073	0.629	-1.49	0.144
PE/F	-0.8800	3.652	0.538	-0.076	0.615	-1.63	0.109
SE/F	-12.4253	55.339	8.159	-0.057	0.709	-1.52	0.135

ATTRIBUTABLE PROFIT GREATER THAN £4 MILLION (40 Companies).

1981

MAPE/ACTUAL

RW	-1.1674	1.728	0.273	-0.065	0.691	-4.27	0.000
AC	-1.1626	1.721	0.272	-0.001	0.996	-4.27	0.000
PC	-1.0914	1.699	0.269	0.100	0.537	-4.06	0.000
MA	-1.0463	1.809	0.286	-0.179	0.270	-3.66	0.001
ES	-1.1644	1.736	0.274	-0.108	0.507	-4.24	0.000
Re	-1.1907	1.740	0.275	-0.081	0.621	-4.33	0.000

MSE/ACTUAL

RW	-4.6789	11.561	1.828	-0.097	0.552	-2.56	0.014
AC	-4.6607	11.560	1.828	-0.055	0.734	-2.55	0.015
PC	-4.6229	11.530	1.823	0.105	0.518	-2.54	0.015
MA	-4.5105	11.633	1.839	-0.107	0.513	-2.45	0.019
ES	-4.6762	11.565	1.829	-0.122	0.453	-2.56	0.015
Re	-4.6694	11.568	1.829	-0.100	0.539	-2.55	0.015

MAPE/FORECAST

RW	-0.3963	0.712	0.113	-0.025	0.877	-3.52	0.001
AC	-0.4063	0.766	0.121	-0.077	0.636	-3.35	0.002
PC	0.1256	2.124	0.336	-0.028	0.866	0.37	0.710
MA	-0.3621	0.723	0.114	-0.133	0.412	-3.17	0.003
ES	-0.4074	0.701	0.111	-0.035	0.831	-3.68	0.001
Re	-0.4884	0.669	0.106	0.094	0.563	-4.62	0.000

MSE/FORECAST

RW	-0.7360	1.522	0.241	-0.061	0.708	-3.06	0.004
AC	-0.6887	1.645	0.260	-0.079	0.627	-2.65	0.012
PC	3.6356	24.078	3.807	-0.073	0.653	0.95	0.345
MA	-0.7307	1.517	0.240	-0.115	0.480	-3.05	0.004
ES	-0.7583	1.503	0.238	-0.045	0.785	-3.19	0.003
Re	-0.8073	1.491	0.236	-0.035	0.829	-3.42	0.001

<u>1982</u>

MAPE/ACTUAL

RW	-0.6706	1.840	0.291	-0.076	0.639	-2.31	0.027
AC	-0.6549	1.852	0.293	-0.091	0.578	-2.24	0.031
PC	-0.5974	1.838	0.291	-0.047	0.772	-2.06	0.047
MA	-0.6138	1.877	0.297	-0.141	0.385	-2.07	0.045
ES	-0.6661	1.843	0.291	-0.085	0.601	-2.29	0.028
Re	-0.6920	1.857	0.294	-0.192	0.234	-2.36	0.024

MSE/ACTUAL

RW	-3.8533	21.300	3.368	-0.061	0.709	-1.14	0.260
AC	-3.8277	21.305	3.369	-0.069	0.672	-1.14	0.263
PC	-3.8054	21.303	3.368	-0.074	0.651	-1.13	0.265
MA	-3.7860	21.316	3.370	-0.060	0.714	-1.12	0.268
ES	-3.8486	21.301	3.368	-0.061	0.710	-1.14	0.260
Re	-3.8737	21.297	3.367	-0.094	0.566	-1.15	0.257

MAPE/FORECAST

RW	-0.4001	1.013	0.160	0.483	0.002	-2.50	0.017
AC	-0.3768	0.894	0.141	0.695	0.000	-2.67	0.011
PC	-0.3464	1.052	0.166	0.275	0.086	-2.08	0.044
MA	-0.3403	1.040	0.164	0.325	0.041	-2.07	0.045
ES	-0.3966	1.016	0.161	0.471	0.002	-2.47	0.018
Re	-0.3872	1.151	0.182	-0.041	0.802	-2.13	0.040

MSE/FORECAST

RW	-1.4439	5.776	0.913	0.613	0.000	-1.58	0.122
AC	-1.3628	5.357	0.847	0.924	0.000	-1.61	0.116
PC	-1.3957	5.809	0.918	0.234	0.146	-1.52	0.137
MA	-1.3951	5.780	0.914	0.375	0.017	-1.53	0.135
ES	-1.4424	5.778	0.914	0.598	0.000	-1.58	0.122
Re	-1.3782	5.910	0.935	-0.059	0.716	-1.47	0.148

<u>1983</u>

MAPE/ACTUAL

RW	-0.5399	0.675	0.107	0.160	0.325	-5.06	0.000
AC	-0.5512	0.704	0.111	0.070	0.666	-4.95	0.000
PC	-0.5592	0.683	0.108	0.141	0.385	-5.18	0.000
AC	-0.5187	0.700	0.111	0.023	0.886	-4.69	0.000
ES	-0.5399	0.676	0.107	0.154	0.341	-5.05	0.000
Re	-0.5145	0.800	0.126	-0.046	0.777	-4.07	0.000

MSE/ACTUAL

RW	-0.9974	1.858	0.294	0.103	0.527	-3.39	0.002
AC	-0.9792	1.866	0.295	0.060	0.712	-3.32	0.002
PC	-0.9944	1.868	0.295	0.039	0.810	-3.37	0.002
MA	-0.9836	1.859	0.294	0.097	0.551	-3.35	0.002
ES	-0.9970	1.858	0.294	0.104	0.521	-3.39	0.002
Re	-0.8641	1.989	0.314	-0.102	0.530	-2.75	0.009

MAPE/FORECAST

RW	-1.1903	3.719	0.588	-0.034	0.834	-2.02	0.050
AC	-1.0601	3.919	0.620	-0.058	0.722	-1.71	0.095
PC	-1.1009	3.867	0.611	-0.072	0.661	-1.80	0.080
MA	-1.1731	3.702	0.585	-0.019	0.909	-2.00	0.052
ES	-1.1934	3.714	0.587	-0.031	0.852	-2.03	0.049
Re	-1.4225	3.671	0.580	0.018	0.910	-2.45	0.019

MSE/FORECAST

RW	-15.3476	58.616	9.268	-0.079	0.627	-1.66	0.106
AC	0.4545	2.780	0.440	0.989	0.000	1.03	0.308
PC	-14.5491	59.037	9.335	-0.060	0.713	-1.56	0.127
MA	-15.3926	58.588	9.264	-0.083	0.610	-1.66	0.105
ES	-15.3660	58.609	9.267	-0.081	0.619	-1.66	0.105
Re	-15.6925	58.529	9.254	-0.030	0.855	-1.70	0.098

OPTIMAL PREDICTION MODEL

ABSOLUTE CHANGE

1983 (4 year)

PE/A	-0.5337	0.700	0.111	0.095	0.559	-4.82	0.000
SE/A	-0.9665	1.867	0.295	0.061	0.711	-3.27	0.002
PE/F	-1.0204	3.895	0.616	-0.060	0.712	-1.66	0.106
SE/F	-14.2196	59.182	9.357	-0.067	0.683	-1.52	0.137

PERCENTAGE CHANGE

1981 (2 year)

PE/A	-0.9999	1.802	0.285	-0.043	0.791	-3.51	0.001
SE/A	-4.3561	11.713	1.852	-0.079	0.626	-2.35	0.024
PE/F	-0.2768	0.853	0.135	-0.094	0.565	-2.05	0.047
SE/F	-0.4969	1.980	0.313	-0.084	0.606	-1.59	0.120

1982 (3 year)

PE/A	-0.5571	1.887	0.298	-0.079	0.630	-1.87	0.069
SE/A	-3.6787	21.335	3.373	-0.058	0.723	-1.09	0.282
PE/F	-0.3356	0.974	0.154	0.512	0.001	-2.18	0.036
SE/F	-1.3643	5.614	0.888	0.754	0.000	-1.54	0.132

MOVING AVERAGE

1981 (3 year)

PE/A	-1.0216	1.821	0.288	-0.207	0.200	-3.55	0.001
SE/A	-4.4903	11.638	1.840	-0.132	0.418	-2.44	0.019
PE/F	-0.3165	0.723	0.114	-0.071	0.665	-2.77	0.009
SE/F	-0.6888	1.515	0.240	-0.063	0.699	-2.87	0.007

EXPONENTIAL SMOOTHING

1981 (0.40)

PE/A	-1.0537	1.798	0.284	-0.254	0.113	-3.71	0.001
SE/A	-4.5714	11.607	1.835	-0.165	0.308	-2.49	0.017
PE/F	-0.2890	0.712	0.113	0.001	0.996	-2.57	0.014
SE/F	-0.6634	1.498	0.237	0.026	0.875	-2.80	0.008

1982 (0.85)

PE/A	-0.6543	1.851	0.293	-0.104	0.522	-2.24	0.031
SE/A	-3.8366	21.304	3.368	-0.060	0.711	-1.14	0.262
PE/F	-0.3896	1.027	0.162	0.422	0.007	-2.40	0.021
SE/F	-0.7673	1.499	0.237	-0.032	0.847	-3.24	0.002

REGRESSION MODEL

1981

PE/A	-0.7171	1.969	0.311	-0.179	0.269	-2.30	0.027
SE/A	-3.8038	12.008	1.899	-0.108	0.506	-2.00	0.052
PE/F	0.4441	1.890	0.299	0.284	0.076	1.49	0.145
SE/F	4.1143	18.620	2.944	0.540	0.000	1.40	0.170

1982

PE/A	-0.5629	1.910	0.302	-0.102	0.530	-1.86	0.070
SE/A	-3.6465	21.364	3.378	-0.047	0.771	-1.08	0.287
PE/F	-0.3614	1.115	0.176	-0.036	0.827	-2.05	0.047
SE/F	-1.4326	5.875	0.929	-0.077	0.635	-1.54	0.131

1983

PE/A	-0.4859	0.696	0.110	0.103	0.526	-4.41	0.000
SE/A	-0.9422	1.853	0.293	0.125	0.443	-3.22	0.003
PE/F	-0.9843	3.907	0.618	-0.084	0.608	-1.59	0.119
SE/F	-14.2478	59.237	9.366	-0.061	0.708	-1.52	0.136

Appendix 41

COMPARISON OF THE ERROR MEASURES FOR FORECASTS BASED UPON RANDOM WALK, SEGMENT TURNOVER AND SEGMENT PROFIT BASED MODELS.

	NON-TRUNCATED			TRUNCATED				
	MEAN	STD. ERROR	STD. DEV.	RANGE	MINIMUM	MEAN	STD. ERROR	STD. DEV.
1981								
MAPE/ACTUAL								
RW	0.898	0.226	1.998	13.072	0.014	0.402	0.041	0.363
Turnover Based								
S1	1.638	0.371	3.280	26.949	0.012	0.703	0.041	0.362
S2	1.713	0.378	3.339	26.957	0.004	0.703	0.042	0.367
S3	1.785	0.414	3.654	29.951	0.001	0.706	0.041	0.365
S4	1.781	0.411	3.632	29.745	0.004	0.706	0.041	0.365
S5	1.947	0.442	3.902	31.482	0.021	0.718	0.041	0.359
S6	1.718	0.382	3.371	27.282	0.007	0.703	0.042	0.368
Profit Based								
S1	0.903	0.224	1.981	12.672	0.007	0.402	0.041	0.365
S2	0.948	0.246	2.171	14.638	0.011	0.401	0.042	0.373
S3	0.984	0.250	2.210	14.141	0.002	0.401	0.043	0.376
S4	0.983	0.250	2.211	14.191	0.003	0.401	0.043	0.376
S5	1.099	0.284	2.509	17.099	0.000	0.428	0.043	0.382
S6	0.953	0.246	2.170	14.745	0.008	0.404	0.042	0.371
MSE/ACTUAL								
RW.	4.747	2.588	22.861	171.242	0.000	0.291	0.045	0.400
Turnover Based								
S1	13.303	9.346	82.542	726.870	0.000	0.624	0.048	0.427
S2	13.940	9.369	82.743	726.971	0.000	0.627	0.049	0.429
S3	16.364	11.536	101.880	897.140	0.000	0.631	0.048	0.428
S4	16.193	11.381	100.517	885.039	0.000	0.630	0.048	0.428
S5	18.822	12.788	112.937	992.430	0.000	0.643	0.049	0.432
S6	14.168	9.596	84.746	744.712	0.000	0.628	0.049	0.429
Profit Based								
S1	4.692	2.490	21.993	160.751	0.000	0.293	0.046	0.404
S2	5.551	3.111	27.480	214.568	0.000	0.298	0.046	0.408
S3	5.789	3.098	27.362	200.007	0.000	0.301	0.047	0.411
S4	5.790	3.108	27.445	201.479	0.000	0.300	0.046	0.411
S5	7.423	4.202	37.114	292.385	0.000	0.327	0.048	0.421
S6	5.555	3.127	27.614	217.651	0.000	0.299	0.046	0.408

MAPE/FORECAST

RW.	0.520	0.075	0.667	3.672	0.014	0.393	0.038	0.333

Turnover Based

S1	2.282	0.727	6.417	45.290	0.000	0.579	0.045	0.394
S2	2.164	0.688	6.081	43.011	0.000	0.572	0.045	0.394
S3	2.085	0.656	5.795	41.009	0.000	0.569	0.044	0.391
S4	2.088	0.658	5.812	41.157	0.000	0.569	0.044	0.391
S5	1.932	0.600	5.928	37.588	0.000	0.569	0.043	0.383
S6	2.171	0.690	6.094	43.037	0.000	0.572	0.045	0.394

Profit Based

S1	0.522	0.075	0.662	3.673	0.007	0.395	0.038	0.336
S2	0.503	0.075	0.665	3.578	0.011	0.378	0.038	0.340
S3	0.478	0.070	0.621	3.419	0.002	0.370	0.039	0.340
S4	0.478	0.070	0.623	3.420	0.003	0.370	0.039	0.340
S5	0.476	0.070	0.616	3.290	0.000	0.373	0.038	0.339
S6	0.511	0.077	0.677	3.623	0.008	0.383	0.038	0.338

MSE/FORECAST

RW.	0.709	0.219	1.933	13.589	0.000	0.264	0.041	0.358

Turnover Based

S1	45.861	28.364	250.744	2051.181	0.000	0.489	0.048	0.423
S2	41.181	25.587	225.980	1849.915	0.000	0.480	0.047	0.418
S3	37.493	23.213	205.008	1681.736	0.000	0.475	0.047	0.417
S4	37.705	23.375	206.445	1693.921	0.000	0.475	0.047	0.417
S5	31.444	19.495	172.178	1412.825	0.000	0.468	0.047	0.414
S6	41.370	25.625	226.317	1852.176	0.000	0.480	0.047	0.418

Profit Based

S1	0.705	0.215	1.897	13.541	0.000	0.267	0.041	0.363
S2	0.691	0.214	1.890	12.876	0.000	0.257	0.041	0.361
S3	0.609	0.187	1.647	11.702	0.000	0.251	0.041	0.359
S4	0.611	0.187	1.651	11.721	0.000	0.251	0.041	0.359
S5	0.601	0.186	1.642	10.828	0.000	0.253	0.040	0.356
S6	0.714	0.225	1.989	13.189	0.000	0.259	0.041	0.361

1982

MAPE/ACTUAL

RW.	0.392	0.080	0.707	5.436	0.002	0.302	0.036	0.318

Turnover Based

S1	1.279	0.267	2.362	14.500	0.003	0.640	0.041	0.359
S2	1.347	0.293	2.586	16.032	0.003	0.643	0.041	0.359
S3	1.382	0.298	2.633	16.159	0.003	0.645	0.041	0.360
S4	1.384	0.297	2.627	16.132	0.003	0.646	0.041	0.360
S5	1.396	0.305	2.698	16.600	0.026	0.647	0.040	0.356
S6	1.252	0.261	2.307	14.205	0.015	0.642	0.040	0.351

Profit Based

S1	0.375	0.080	0.709	5.630	0.008	0.291	0.035	0.309
S2	0.387	0.080	0.710	5.638	0.000	0.301	0.035	0.309
S3	0.422	0.089	0.789	6.346	0.002	0.318	0.035	0.308
S4	0.414	0.088	0.774	6.218	0.003	0.314	0.035	0.308
S5	0.423	0.084	0.746	5.854	0.011	0.322	0.035	0.306
S6	0.365	0.072	0.639	4.923	0.005	0.292	0.035	0.284

MSE/ACTUAL

RW.	8.944	6.546	57.809	506.250	0.000	0.191	0.037	0.328

Turnover Based

S1	7.145	3.430	30.296	210.341	0.000	0.537	0.046	0.410
S2	8.415	4.130	36.472	257.129	0.000	0.541	0.047	0.413
S3	8.751	4.233	37.385	261.209	0.000	0.544	0.047	0.416
S4	8.726	4.213	37.212	260.368	0.000	0.546	0.047	0.417
S5	9.135	4.467	39.453	276.410	0.001	0.544	0.047	0.415
S6	6.821	3.297	29.120	202.205	0.000	0.534	0.046	0.408

Profit Based

S1	0.637	0.409	3.613	31.785	0.000	0.179	0.036	0.314
S2	0.648	0.409	3.614	34.785	0.000	0.185	0.035	0.312
S3	0.792	0.518	4.577	40.298	0.000	0.195	0.035	0.313
S4	0.763	0.498	4.395	38.698	0.000	0.192	0.035	0.312
S5	0.728	0.444	3.923	34.399	0.000	0.196	0.035	0.313
S6	0.537	0.314	2.774	24.286	0.000	0.179	0.035	0.313

MAPE/FORECAST

RW.	0.973	0.323	2.857	22.498	0.002	0.320	0.038	0.339

Turnover Based

S1	3.071	1.082	9.556	70.819	0.000	0.565	0.046	0.410
S2	2.949	1.064	9.398	70.819	0.000	0.559	0.046	0.405
S3	2.774	0.976	8.621	63.877	0.000	0.554	0.045	0.400
S4	2.760	0.962	8.494	62.583	0.000	0.554	0.045	0.400
S5	2.814	1.015	8.961	67.512	0.000	0.555	0.045	0.397
S6	3.261	1.177	10.395	78.342	0.000	0.573	0.046	0.407

Profit Based

S1	0.893	0.312	2.753	21.576	0.0080.305		0.037	0.328
S2	0.877	0.308	2.717	21.392	0.000	0.302	0.037	0.323
S3	0.821	0.280	2.471	19.398	0.002	0.304	0.035	0.311
S4	0.828	0.284	2.511	19.764	0.003	0.302	0.035	0.312
S5	0.847	0.296	2.615	20.824	0.011	0.310	0.036	0.314
S6	0.967	0.346	3.052	24.282	0.005	0.316	0.038	0.332

MSE/FORECAST

RW.	8.944	6.546	57.809	506.250	0.000	0.216	0.040	0.354

Turnover Based

S1	99.567	66.650	588.638	5015.316	0.000	0.485	0.050	0.440
S2	95.897	66.181	584.497	5015.316	0.000	0.474	0.049	0.432
S3	81.067	54.231	478.959	4080.273	0.000	0.465	0.048	0.426
S4	78.843	52.181	460.848	3916.675	0.000	0.465	0.048	0.426
S5	87.195	60.142	531.159	4557.883	0.000	0.464	0.048	0.425
S6	117.303	80.974	715.139	6137.39	0.000	0.492	0.050	0.443

Profit Based

S1	8.278	6.030	53.252	465.844	0.000	0.200	0.038	0.339
S2	8.054	5.921	52.291	457.616	0.000	0.194	0.038	0.334
S3	6.701	4.873	43.037	376.382	0.000	0.188	0.036	0.322
S4	6.911	5.056	44.649	390.758	0.000	0.188	0.036	0.322
S5	7.467	5.607	49.521	434.116	0.000	0.194	0.038	0.333
S6	10.131	7.616	67.261	589.851	0.000	0.209	0.039	0.344

1983

MAPE/ACTUAL

RW.	0.590	0.120	1.057	5.610	0.004	0.351	0.034	0.303

Turnover Based

S1	2.142	1.137	10.046	88.905	0.002	0.655	0.042	0.373
S2	2.222	1.187	10.480	92.737	0.007	0.657	0.043	0.379
S3	2.288	1.225	10.820	95.729	0.010	0.661	0.043	0.377
S4	2.281	1.221	10.784	95.417	0.007	0.661	0.043	0.377
S5	2.173	1.157	10.215	90.397	0.005	0.656	0.043	0.376
S6	1.933	1.001	8.837	78.258	0.008	0.648	0.039	0.343

Profit Based

S1	0.600	0.122	1.076	5.632	0.000	0.355	0.036	0.316
S2	0.591	0.125	1.103	5.696	0.000	0.340	0.037	0.324
S3	0.603	0.131	1.159	5.983	0.001	0.334	0.038	0.332
S4	0.602	0.131	1.154	5.947	0.000	0.335	0.037	0.331
S5	0.592	0.123	1.082	5.642	0.010	0.348	0.036	0.319
S6	0.609	0.105	0.931	5.025	0.009	0.404	0.032	0.284

MSE/ACTUAL

RW.	3.517	2.734	24.147	213.042	0.000	0.213	0.037	0.326

Turnover Based

S1	104.210	101.310	894.744	7904.37	0.000	0.567	0.048	0.423
S2	113.351	110.242	973.632	8601.28	0.000	0.573	0.048	0.428
S3	120.805	117.48	1037.563	9166.04	0.000	0.577	0.048	0.428
S4	120.002	116.72	1030.736	9105.73	0.000	0.577	0.048	0.428
S5	107.725	104.747	925.099	8172.51	0.000	0.570	0.048	0.426
S6	80.820	78.510	693.385	6125.574	0.000	0.536	0.046	0.404

Profit Based

S1	1.502	0.611	5.393	31.721	0.000	0.225	0.039	0.342
S2	1.549	0.630	5.563	32.445	0.000	0.219	0.039	0.346
S3	1.690	0.695	6.138	35.810	0.000	0.220	0.040	0.354
S4	1.678	0.687	6.067	35.373	0.000	0.220	0.040	0.353
S5	1.507	0.620	5.477	31.942	0.000	0.222	0.039	0.344
S6	1.226	0.484	4.274	25.342	0.000	0.243	0.037	0.324

MAPE/FORECAST

RW.	0.730	0.197	1.738	14.592	0.004	0.416	0.037	0.326

Turnover Based

S1	2.053	0.648	5.722	45.165	0.000	0.510	0.044	0.386
S2	1.978	0.627	5.541	43.958	0.000	0.505	0.044	0.388
S3	1.916	0.602	5.318	42.046	0.000	0.506	0.044	0.387
S4	1.920	0.604	5.336	42.201	0.000	0.506	0.044	0.387
S5	2.030	0.640	5.657	44.658	0.000	0.508	0.044	0.387
S6	2.343	0.738	6.517	51.342	0.000	0.537	0.043	0.378

Profit Based

S1	0.716	0.193	1.704	14.262	0.000	0.399	0.037	0.331
S2	0.666	0.193	1.704	14.262	0.000	0.367	0.038	0.333
S3	0.630	0.180	1.587	13.184	0.000	0.354	0.038	0.335
S4	0.633	0.181	1.597	13.283	0.000	0.355	0.038	0.335
S5	0.688	0.192	1.700	14.203	0.000	0.385	0.037	0.331
S6	0.873	0.221	1.951	16.530	0.000	0.503	0.036	0.320

MSE/FORECAST

RW.	3.517	2.734	24.147	213.042	0.000	0.278	0.040	0.353

Turnover Based

S1	36.541	26.428	233.408	2039.889	0.000	0.408	0.047	0.416
S2	34.217	25.006	220.849	1932.296	0.000	0.404	0.047	0.417
S3	31.594	22.904	202.287	1767.840	0.000	0.404	0.047	0.417
S4	31.794	23.072	203.769	1780.892	0.000	0.404	0.047	0.417
S5	35.705	25.836	228.179	1994.301	0.000	0.406	0.047	0.416
S6	47.416	34.147	301.578	2635.986	0.000	0.429	0.047	0.419

Profit Based

S1	3.366	2.611	23.060	203.410	0.000	0.267	0.040	0.354
S2	3.311	2.611	23.060	203.410	0.000	0.245	0.040	0.354
S3	2.882	2.232	19.715	173.823	0.000	0.236	0.040	0.354
S4	2.918	2.266	20.008	176.427	0.000	0.237	0.040	0.354
S5	3.325	2.590	22.873	201.718	0.000	0.256	0.040	0.354
S6	4.517	3.505	30.959	273.250	0.000	0.354	0.042	0.369

Appendix 42.

T-TESTS OF RANDOM WALK, TURNOVER BASED AND PROFIT BASED SEGMENTAL FORECASTS, (78 Companies).

	(DIFFERENCE) MEAN	STANDARD DEVIATION	STANDARD ERROR	CORR.	2-TAIL PROB.	T VALUE	2-TAIL PROB.
1981							
MAPE/ACTUAL							
Random Walk/Turnover							
S1	-0.7403	3.717	0.421	0.071	0.536	-1.76	0.083
S2	-0.8155	3.763	0.426	0.074	0.522	-1.91	0.059
S3	-0.8873	4.038	0.457	0.071	0.537	-1.94	0.056
S4	-0.8829	4.019	0.455	0.071	0.537	-1.94	0.056
S5	-1.0498	4.253	0.482	0.072	0.529	-2.16	0.032
S6	-0.8199	3.790	0.429	0.074	0.521	-1.91	0.060
Random Walk/Profit							
S1	-0.0057	0.082	0.009	0.999	0.000	-0.62	0.540
S2	-0.0500	0.202	0.023	0.999	0.000	-2.19	0.032
S3	-0.0865	0.246	0.028	0.998	0.000	-3.10	0.003
S4	-0.0849	0.244	0.028	0.998	0.000	-3.07	0.003
S5	-0.2010	0.556	0.063	0.995	0.000	-3.19	0.002
S6	-0.0554	0.213	0.024	0.998	0.000	-2.30	0.024
Turnover/Profit							
S1	0.7345	3.701	0.419	0.076	0.509	1.75	0.084
S2	0.7655	3.844	0.435	0.075	0.515	1.76	0.083
S3	0.8008	4.115	0.466	0.080	0.484	1.72	0.090
S4	0.7980	4.098	0.464	0.080	0.486	1.72	0.089
S5	0.8488	4.462	0.505	0.082	0.473	1.68	0.097
S6	0.7644	3.862	0.437	0.079	0.491	1.75	0.084
MSE/ACTUAL							
Random Walk/Turnover							
S1	-8.5559	85.933	9.730	-0.013	0.911	-0.88	0.382
S2	-9.1930	86.132	9.753	-0.013	0.909	-0.94	0.349
S3	-11.6175	104.696	11.854	-0.013	0.912	-0.98	0.330
S4	-11.4461	103.367	11.704	-0.013	0.912	-0.98	0.331
S5	-14.0747	115.510	13.079	-0.013	0.913	-1.08	0.285
S6	-9.4214	88.061	9.971	-0.013	0.910	-0.94	0.348
Random Walk/Profit							
S1	0.0549	1.283	0.145	0.999	0.000	0.38	0.706
S2	-0.8040	4.972	0.563	0.997	0.000	-1.43	0.157
S3	-1.0423	4.618	0.523	0.999	0.000	-1.99	0.050
S4	-1.0429	4.669	0.529	0.999	0.000	-1.97	0.052
S5	-2.6763	14.496	1.641	0.996	0.000	-1.63	0.107
S6	-0.8085	5.278	0.598	0.996	0.000	-1.35	0.180

Turnover/Profit

S1	8.6109	85.662	9.699	-0.011	0.922	0.89	0.377
S2	8.3890	87.531	9.911	-0.013	0.909	0.85	0.400
S3	10.5752	105.738	11.973	-0.009	0.935	0.88	0.380
S4	10.4032	104.450	11.827	-0.010	0.934	0.88	0.382
S5	11.3985	119.205	13.497	-0.009	0.936	0.84	0.401
S6	8.6129	89.434	10.126	-0.012	0.920	0.85	0.398

MAPE/FORECAST

Random Walk/Turnover

S1	-1.7620	6.491	0.735	-0.059	0.607	-2.40	0.019
S2	-1.6437	6.156	0.697	-0.060	0.603	-2.36	0.021
S3	-1.5644	5.872	0.665	-0.059	0.609	-2.35	0.021
S4	-1.5682	5.889	0.667	-0.059	0.608	-2.35	0.021
S5	-1.4122	5.380	0.609	-0.061	0.594	-2.32	0.023
S6	-1.6509	6.170	0.699	-0.060	0.599	-2.36	0.021

Random Walk/Profit

S1	-0.0019	0.065	0.007	0.995	0.000	-0.26	0.795
S2	0.0167	0.083	0.009	0.992	0.000	1.77	0.081
S3	0.0427	0.129	0.015	0.982	0.000	2.92	0.005
S4	0.0420	0.127	0.014	0.983	0.000	2.92	0.005
S5	0.0444	0.193	0.022	0.958	0.000	2.03	0.046
S6	0.0088	0.092	0.010	0.991	0.000	0.85	0.399

Turnover/Profit

S1	1.7601	6.489	0.735	-0.058	0.615	2.40	0.019
S2	1.6604	6.157	0.697	-0.060	0.599	2.38	0.020
S3	1.6070	5.864	0.664	-0.058	0.613	2.42	0.018
S4	1.6102	5.881	0.666	-0.058	0.613	2.42	0.018
S5	1.4566	5.376	0.609	-0.069	0.547	2.39	0.019
S6	1.6597	6.173	0.699	-0.062	0.588	2.37	0.020

MSE/FORECAST

Random Walk/Turnover

S1	-45.1522	250.617	28.377	-0.056	0.628	-1.59	0.116
S2	-40.4718	226.096	25.600	-0.056	0.627	-1.58	0.118
S3	-36.7841	205.125	23.226	-0.056	0.628	-1.58	0.117
S4	-36.9957	206.562	23.389	-0.056	0.628	-1.58	0.118
S5	-30.7347	172.297	19.509	-0.056	0.625	-1.58	0.119
S6	-40.6610	226.433	25.639	-0.056	0.626	-1.59	0.117

Random Walk/Profit

S1	0.0042	0.153	0.017	0.997	0.000	0.24	0.809
S2	0.0186	0.185	0.021	0.996	0.000	0.89	0.378
S3	0.1001	0.352	0.040	0.993	0.000	2.51	0.014
S4	0.0980	0.348	0.039	0.993	0.000	2.49	0.015
S5	0.1083	0.443	0.050	0.982	0.000	2.16	0.034
S6	-0.0045	0.278	0.031	0.990	0.000	-0.14	0.888

Turnover/Profit

S1	45.1564	250.616	28.377	-0.056	0.625	1.59	0.116
S2	40.4904	226.095	25.600	-0.057	0.621	1.58	0.118
S3	36.8841	205.108	23.224	-0.056	0.623	1.59	0.116
S4	37.0937	206.545	23.387	-0.057	0.623	1.59	0.117
S5	30.8430	172.278	19.507	-0.056	0.625	1.58	0.118
S6	40.6566	226.437	25.639	-0.056	0.624	1.59	0.117

1982

MAPE/ACTUAL

Random Walk/Turnover

S1	-0.8865	2.436	0.276	0.044	0.701	-3.21	0.002
S2	-0.9547	2.652	0.300	0.041	0.721	-3.18	0.002
S3	-0.9893	2.699	0.306	0.039	0.732	-3.24	0.002
S4	-0.9912	2.693	0.305	0.040	0.730	-3.25	0.002
S5	-1.0039	2.763	0.313	0.038	0.740	-3.21	0.002
S6	-0.8599	2.382	0.270	0.045	0.695	-3.19	0.002

Random Walk/Profit

S1	0.0169	0.185	0.021	0.966	0.000	0.81	0.422
S2	0.0054	0.196	0.022	0.962	0.000	0.24	0.810
S3	-0.0294	0.228	0.026	0.959	0.000	-1.14	0.258
S4	-0.0219	0.219	0.025	0.960	0.000	-0.88	0.381
S5	-0.0303	0.215	0.024	0.958	0.000	-1.25	0.216
S6	0.0270	0.201	0.023	0.960	0.000	1.18	0.240

Turnover/Profit

S1	0.9035	2.432	0.275	0.051	0.660	3.28	0.002
S2	0.9601	2.661	0.301	0.031	0.790	3.19	0.002
S3	0.9599	2.734	0.310	0.019	0.867	3.10	0.003
S4	0.9693	2.723	0.308	0.021	0.854	3.14	0.002
S5	0.9735	2.786	0.315	0.019	0.871	3.09	0.003
S6	0.8869	2.355	0.267	0.063	0.586	3.33	0.001

MSE/ACTUAL

Random Walk/Turnover

S1	-6.4982	30.556	3.460	-0.022	0.850	-1.88	0.064
S2	-7.7687	36.701	4.156	-0.022	0.850	-1.87	0.065
S3	-8.1039	37.613	4.259	-0.022	0.846	-1.90	0.061
S4	-8.0791	37.439	4.239	-0.022	0.846	-1.91	0.060
S5	-8.4882	39.672	4.492	-0.022	0.847	-1.89	0.063
S6	-6.1743	29.386	3.327	-0.021	0.853	-1.86	0.067

Random Walk/Profit

S1	0.0098	0.432	0.049	0.995	0.000	0.20	0.842
S2	-0.0010	0.447	0.051	0.994	0.000	-0.02	0.985
S3	-0.1457	1.273	0.144	0.994	0.000	-1.01	0.315
S4	-0.1162	1.100	0.125	0.994	0.000	-0.93	0.353
S5	-0.0814	0.679	0.077	0.994	0.000	-1.06	0.293
S6	0.1098	0.689	0.078	0.994	0.000	1.41	0.164

Turnover/Profit

S1	6.5080	30.581	3.463	-0.020	0.864	1.88	0.064
S2	7.7677	36.730	4.159	-0.022	0.849	1.87	0.066
S3	7.9582	37.777	4.277	-0.025	0.830	1.86	0.067
S4	7.9629	37.576	4.255	-0.024	0.833	1.87	0.065
S5	8.4067	39.748	4.501	-0.026	0.824	1.87	0.066
S6	6.2841	29.299	3.317	-0.017	0.880	1.89	0.062

MAPE/FORECAST

Random Walk/Turnover

S1	-2.1279	9.755	1.104	0.079	0.491	-1.93	0.058
S2	-2.0064	9.620	1.089	0.073	0.523	-1.84	0.069
S3	-1.8316	8.863	1.004	0.080	0.488	-1.83	0.072
S4	-1.8168	8.742	0.990	0.080	0.485	-1.84	0.070
S5	-1.8715	9.200	1.042	0.075	0.516	-1.80	0.076
S6	-2.3187	10.575	1.197	0.074	0.520	-1.94	0.056

Random Walk/Profit

S1	0.0494	0.268	0.030	0.996	0.000	1.63	0.107
S2	0.0657	0.309	0.035	0.995	0.000	1.88	0.064
S3	0.1219	0.458	0.052	0.996	0.000	2.35	0.021
S4	0.1151	0.425	0.048	0.996	0.000	2.39	0.019
S5	0.0953	0.357	0.040	0.995	0.000	2.35	0.021
S6	-0.0244	0.340	0.039	0.996	0.000	-0.63	0.528

Turnover/Profit

S1	2.1774	9.721	1.101	0.083	0.468	1.98	0.051
S2	2.0722	9.567	1.083	0.082	0.475	1.91	0.059
S3	1.9535	8.760	0.992	0.087	0.451	1.97	0.052
S4	1.9319	8.649	0.979	0.086	0.455	1.97	0.052
S5	1.9668	9.139	1.035	0.077	0.501	1.90	0.061
S6	2.2943	10.617	1.202	0.073	0.524	1.91	0.060

MSE/FORECAST

Random Walk/Turnover

S1	-90.6230	591.855	67.014	-0.007	0.954	-1.35	0.180
S2	-86.9525	587.842	66.560	-0.009	0.941	-1.31	0.195
S3	-72.1233	482.810	54.667	-0.007	0.955	-1.32	0.191
S4	-69.8987	464.820	52.631	-0.006	0.956	-1.33	0.188
S5	-78.2508	534.763	60.550	-0.008	0.944	-1.29	0.200
S6	-108.3586	717.951	81.292	-0.008	0.972	-1.33	0.186

Random Walk/Profit

S1	0.6656	4.613	0.522	1.000	0.000	1.27	0.206
S2	0.8901	5.627	0.637	1.000	0.000	1.40	0.166
S3	2.2431	14.791	1.675	1.000	0.000	1.34	0.184
S4	2.0331	13.176	1.492	1.000	0.000	1.36	0.177
S5	1.4772	8.345	0.945	1.000	0.000	1.56	0.122
S6	-1.1874	9.509	1.077	1.000	0.000	-1.10	0.274

Turnover/Profit

S1	91.2886	591.362	66.959	-0.006	0.958	1.36	0.177
S2	87.8426	587.200	66.487	-0.007	0.951	1.32	0.190
S3	74.3664	481.096	54.473	-0.005	0.966	1.37	0.176
S4	71.9318	463.237	52.451	-0.005	0.964	1.37	0.174
S5	79.7280	533.822	60.443	-0.007	0.949	1.32	0.191
S6	107.1712	718.874	81.396	-0.009	0.940	1.32	0.192

1983

MAPE/ACTUAL

Random Walk/Turnover

S1	-1.5520	10.114	1.145	-0.012	0.915	-1.36	0.179
S2	-1.6311	10.546	1.194	-0.012	0.917	-1.37	0.176
S3	-1.6971	10.884	1.232	-0.012	0.917	-1.38	0.172
S4	-1.6901	10.848	1.228	-0.012	0.918	-1.38	0.173
S5	-1.5824	10.282	1.164	-0.012	0.914	-1.36	0.178
S6	-1.3423	8.914	1.009	-0.014	0.904	-1.33	0.187

Random Walk/Profit

S1	-0.0094	0.093	0.010	0.996	0.000	-0.89	0.375
S2	-0.0003	0.121	0.014	0.955	0.000	-0.02	0.985
S3	-0.0120	0.153	0.017	0.995	0.000	-0.69	0.490
S4	-0.0114	0.151	0.017	0.995	0.000	-0.67	0.506
S5	-0.0015	0.108	0.012	0.995	0.000	-0.13	0.900
S6	-0.0184	0.177	0.020	0.992	0.000	-0.92	0.360

Turnover/Profit

S1	1.5426	10.118	1.146	-0.014	0.903	1.35	0.182
S2	1.6308	10.553	1.195	-0.014	0.904	1.36	0.176
S3	1.6850	10.899	1.234	-0.015	0.895	1.37	0.176
S4	1.6787	10.863	1.230	-0.015	0.896	1.36	0.176
S5	1.5809	10.287	1.165	-0.014	0.905	1.36	0.179
S6	1.3238	8.899	1.008	-0.014	0.900	1.31	0.193

MSE/ACTUAL

Random Walk/Turnover

S1	-102.7576	894.907	101.328	-0.028	0.808	-1.01	0.314
S2	-111.8989	973.793	110.260	-0.028	0.808	-1.01	0.313
S3	-119.3528	1037.723	117.499	-0.028	0.808	-1.02	0.313
S4	-118.5505	1030.897	116.726	-0.028	0.808	-1.02	0.313
S5	-106.2727	925.261	104.765	-0.028	0.808	-1.01	0.314
S6	-79.3676	693.552	78.529	-0.028	0.808	-1.01	0.315

Random Walk/Profit

S1	-0.0504	0.199	0.023	1.000	0.000	-2.24	0.028
S2	-0.0971	0.533	0.060	0.997	0.000	-1.61	0.112
S3	-0.2377	0.913	0.103	0.999	0.000	-2.30	0.024
S4	-0.2260	0.857	0.097	0.999	0.000	-2.33	0.022
S5	-0.0547	0.398	0.045	0.998	0.000	-1.21	0.229
S6	0.2259	1.030	0.117	0.998	0.000	1.94	0.056

Turnover/Profit

S1	102.7073	894.914	101.329	-0.029	0.804	1.01	0.314
S2	111.8018	973.809	110.262	-0.029	0.801	1.01	0.314
S3	119.1150	1037.761	117.503	-0.029	0.799	1.01	0.314
S4	118.3246	1030.932	116.730	-0.029	0.799	1.01	0.314
S5	106.2180	925.270	104.766	-0.028	0.806	1.01	0.314
S6	79.5935	693.513	78.525	-0.027	0.816	1.01	0.314

MAPE/FORECAST

Random Walk/Turnover

S1	-1.3231	6.010	0.680	-0.018	0.878	-1.94	0.056
S2	-1.2478	5.833	0.661	-0.016	0.889	-1.89	0.063
S3	-1.1861	5.621	0.636	-0.015	0.893	-1.86	0.066
S4	-1.1901	5.637	0.638	-0.015	0.893	-1.86	0.066
S5	-1.2992	5.946	0.673	-0.017	0.880	-1.93	0.057
S6	-1.6123	6.782	0.768	-0.022	0.847	-2.10	0.039

Random Walk/Profit

S1	0.0248	0.049	0.006	1.000	0.000	4.47	0.000
S2	0.0644	0.074	0.008	0.999	0.000	7.73	0.000
S3	0.1007	0.174	0.020	0.999	0.000	5.10	0.000
S4	0.0976	0.164	0.019	0.999	0.000	5.25	0.000
S5	0.0425	0.062	0.007	1.000	0.000	6.09	0.000
S6	-0.1423	0.232	0.026	0.999	0.000	-5.41	0.000

Turnover/Profit

S1	1.3479	6.000	0.679	-0.018	0.878	1.98	0.051
S2	1.3121	5.826	0.660	-0.018	0.877	1.99	0.050
S3	1.2869	5.577	0.632	-0.018	0.875	2.04	0.045
S4	1.2877	5.597	0.634	-0.018	0.876	2.03	0.046
S5	1.3417	5.935	0.672	-0.018	0.876	2.00	0.049
S6	1.4701	6.844	0.775	-0.022	0.849	1.90	0.062

MSE/FORECAST

Random Walk/Turnover

S1	-33.0241	235.122	26.622	-0.020	0.865	-1.24	0.219
S2	-30.7002	222.627	25.208	-0.019	0.867	-1.22	0.227
S3	-28.0773	204.187	23.120	-0.019	0.866	-1.21	0.228
S4	-28.2768	205.659	23.286	-0.019	0.866	-1.21	0.228
S5	-32.1879	229.920	26.033	-0.019	0.865	-1.24	0.220
S6	-43.8994	203.017	34.310	-0.020	0.864	-1.28	0.205

Random Walk/Profit

S1	0.1511	1.089	0.123	1.000	0.000	1.23	0.224
S2	0.2059	1.094	0.124	1.000	0.000	1.66	0.100
S3	0.6354	4.437	0.502	1.000	0.000	1.26	0.210
S4	0.5990	4.143	0.469	1.000	0.000	1.28	0.205
S5	0.1918	1.280	0.145	1.000	0.000	1.32	0.189
S6	-1.0001	6.814	0.772	1.000	0.000	-1.30	0.199

Turnover/Profit

S1	33.1752	234.996	26.608	-0.020	0.864	1.25	0.216
S2	30.9062	222.499	25.193	-0.020	0.865	1.23	0.224
S3	28.7127	203.639	23.058	-0.020	0.861	1.25	0.217
S4	28.8758	205.148	23.228	-0.020	0.862	1.24	0.218
S5	32.3798	229.772	26.017	-0.020	0.863	1.24	0.217
S6	42.8992	303.750	34.393	-0.019	0.868	1.25	0.216

TRUNCATED

1981

MAPE/ACTUAL

Random Walk/Turnover

S1	-0.3015	0.447	0.051	0.239	0.035	-5.95	0.000
S2	-0.3012	0.449	0.051	0.243	0.032	-5.92	0.000
S3	-0.3046	0.451	0.051	0.232	0.041	-5.96	0.000
S4	-0.3045	0.451	0.051	0.233	0.040	-5.96	0.000
S5	-0.3165	0.449	0.051	0.228	0.045	-6.22	0.000
S6	-0.3013	0.450	0.051	0.243	0.032	-5.92	0.000

Random Walk/Profit

S1	-0.0001	0.018	0.002	0.999	0.000	-0.07	0.943
S2	0.0006	0.053	0.006	0.990	0.000	0.10	0.923
S3	0.0002	0.086	0.010	0.974	0.000	0.02	0.982
S4	0.0004	0.084	0.010	0.975	0.000	0.04	0.966
S5	-0.0262	0.164	0.019	0.905	0.000	-1.41	0.161
S6	-0.0025	0.054	0.006	0.989	0.000	-0.41	0.684

Turnover/Profit

S1	0.3014	0.451	0.051	0.229	0.044	5.90	0.000
S2	0.3018	0.461	0.052	0.226	0.047	5.79	0.000
S3	0.3049	0.471	0.053	0.194	0.089	5.72	0.000
S4	0.3049	0.471	0.053	0.194	0.088	5.72	0.000
S5	0.2903	0.475	0.054	0.182	0.111	5.40	0.000
S6	0.2988	0.458	0.052	0.231	0.042	5.76	0.000

MSE/ACTUAL

Random Walk/Turnover

S1	-0.3323	0.510	0.058	0.239	0.035	-5.75	0.000
S2	-0.3356	0.512	0.058	0.237	0.037	-5.79	0.000
S3	-0.3391	0.514	0.058	0.229	0.044	-5.82	0.000
S4	-0.3389	0.514	0.058	0.229	0.043	-5.82	0.000
S5	-0.3516	0.520	0.059	0.219	0.054	-5.97	0.000
S6	-0.3361	0.512	0.058	0.237	0.037	-5.79	0.000

Random Walk/Profit

S1	-0.0012	0.027	0.003	0.998	0.000	-0.41	0.685
S2	-0.0065	0.044	0.005	0.994	0.000	-1.32	0.190
S3	-0.0091	0.065	0.007	0.988	0.000	-1.25	0.217
S4	-0.0090	0.064	0.007	0.988	0.000	-1.24	0.218
S5	-0.0359	0.135	0.015	0.947	0.000	-2.35	0.021
S6	-0.0078	0.046	0.005	0.994	0.000	-1.48	0.143

Turnover/Profit

S1	0.3311	0.517	0.059	0.227	0.046	5.66	0.000
S2	0.3291	0.523	0.059	0.220	0.053	5.56	0.000
S3	0.3300	0.530	0.060	0.202	0.076	5.50	0.000
S4	0.3299	0.530	0.060	0.203	0.075	5.50	0.000
S5	0.3158	0.539	0.061	0.201	0.077	5.17	0.000
S6	0.3283	0.522	0.059	0.222	0.051	5.55	0.000

MAPE/FORECAST

Random Walk/Turnover

S1	-0.1867	0.473	0.054	0.162	0.156	-3.49	0.001
S2	-0.1790	0.468	0.053	0.179	0.117	-3.38	0.001
S3	-0.1766	0.465	0.053	0.184	0.107	-3.36	0.001
S4	-0.1768	0.465	0.053	0.184	0.107	-3.36	0.001
S5	-0.1763	0.455	0.052	0.198	0.082	-3.42	0.001
S6	-0.1795	0.468	0.053	0.177	0.120	-3.38	0.001

Random Walk/Profit

S1	-0.0021	0.029	0.003	0.996	0.000	-0.64	0.523
S2	0.0144	0.059	0.007	0.985	0.000	2.16	0.034
S3	0.0224	0.096	0.011	0.960	0.000	2.07	0.042
S4	0.0224	0.094	0.011	0.961	0.000	2.10	0.039
S5	0.0191	0.160	0.018	0.887	0.000	1.06	0.295
S6	0.0098	0.059	0.007	0.985	0.000	1.46	0.147

Turnover/Profit

S1	0.1846	0.471	0.053	0.175	0.126	3.46	0.001
S2	0.1934	0.476	0.054	0.163	0.154	3.59	0.001
S3	0.1990	0.476	0.054	0.160	0.161	3.70	0.000
S4	0.1992	0.476	0.054	0.160	0.161	3.70	0.000
S5	0.1954	0.473	0.054	0.146	0.201	3.65	0.000
S6	0.1894	0.476	0.054	0.160	0.163	3.51	0.001

MSE/FORECAST

Random Walk/Turnover

S1	-0.2252	0.506	0.057	0.168	0.141	-3.93	0.000
S2	-0.2161	0.498	0.056	0.184	0.106	-3.83	0.000
S3	-0.2115	0.495	0.056	0.189	0.097	-3.77	0.000
S4	-0.2117	0.495	0.056	0.189	0.097	-3.78	0.000
S5	-0.2049	0.488	0.055	0.207	0.069	-3.71	0.000
S6	-0.2169	0.498	0.056	0.183	0.109	-3.84	0.000

Random Walk/Profit

S1	-0.0035	0.045	0.005	0.992	0.000	-0.68	0.495
S2	0.0067	0.059	0.007	0.987	0.000	1.00	0.318
S3	0.0124	0.088	0.010	0.970	0.000	1.25	0.216
S4	0.0124	0.087	0.010	0.971	0.000	1.26	0.211
S5	0.0105	0.126	0.014	0.938	0.000	0.73	0.465
S6	0.0044	0.060	0.007	0.986	0.000	0.65	0.520

Turnover/Profit

S1	0.2217	0.504	0.057	0.184	0.107	3.89	0.000
S2	0.2228	0.499	0.056	0.188	0.099	3.94	0.000
S3	0.2239	0.495	0.056	0.193	0.091	3.99	0.000
S4	0.2241	0.495	0.056	0.193	0.091	4.00	0.000
S5	0.2154	0.491	0.056	0.195	0.087	3.88	0.000
S6	0.2212	0.499	0.056	0.186	0.103	3.92	0.000

<u>1982</u>

MAPE/ACTUAL

Random Walk/Turnover

S1	-0.3386	0.424	0.048	0.220	0.053	-7.05	0.000
S2	-0.3415	0.424	0.048	0.219	0.054	-7.11	0.000
S3	-0.3435	0.428	0.048	0.210	0.065	-7.09	0.000
S4	-0.3448	0.428	0.048	0.210	0.066	-7.12	0.000
S5	-0.3454	0.425	0.048	0.210	0.065	-7.18	0.000
S6	-0.3408	0.417	0.047	0.229	0.044	-7.23	0.000

Random Walk/Profit

S1	0.0101	0.098	0.011	0.952	0.000	0.91	0.366
S2	0.0010	0.113	0.013	0.935	0.000	0.08	0.939
S3	-0.0163	0.132	0.015	0.912	0.000	-1.09	0.279
S4	-0.0123	0.128	0.014	0.918	0.000	-0.86	0.395
S5	-0.0205	0.133	0.015	0.910	0.000	-1.36	0.177
S6	0.0096	0.109	0.012	0.940	0.000	0.78	0.439

Turnover/Profit

S1	0.3487	0.413	0.047	0.243	0.032	7.46	0.000
S2	0.3425	0.410	0.046	0.254	0.025	7.38	0.000
S3	0.3272	0.417	0.047	0.228	0.044	6.93	0.000
S4	0.3325	0.417	0.047	0.229	0.044	7.05	0.000
S5	0.3249	0.408	0.046	0.247	0.029	7.03	0.000
S6	0.3504	0.402	0.045	0.264	0.020	7.70	0.000

MSE/ACTUAL

Random Walk/Turnover

S1	-0.3456	0.480	0.054	0.168	0.141	-6.36	0.000
S2	-0.3496	0.486	0.055	0.154	0.177	-6.36	0.000
S3	-0.3531	0.492	0.056	0.139	0.224	-6.33	0.000
S4	-0.3548	0.494	0.056	0.138	0.229	-6.35	0.000
S5	-0.3526	0.492	0.056	0.139	0.226	-6.33	0.000
S6	-0.3433	0.476	0.054	0.178	0.119	-6.37	0.000

Random Walk/Profit

S1	0.0116	0.111	0.013	0.941	0.000	0.92	0.359
S2	0.0064	0.115	0.013	0.936	0.000	0.49	0.626
S3	-0.0036	0.123	0.014	0.927	0.000	-0.26	0.798
S4	-0.0010	0.121	0.014	0.930	0.000	-0.07	0.941
S5	-0.0051	0.125	0.014	0.925	0.000	-0.36	0.717
S6	0.0119	0.115	0.013	0.937	0.000	0.92	0.361

Turnover/Profit

S1	0.3573	0.463	0.052	0.205	0.072	6.81	0.000
S2	0.3559	0.467	0.053	0.191	0.094	6.73	0.000
S3	0.3495	0.477	0.054	0.169	0.140	6.48	0.000
S4	0.3538	0.478	0.054	0.166	0.145	6.54	0.000
S5	0.3474	0.472	0.053	0.182	0.111	6.50	0.000
S6	0.3552	0.454	0.051	0.229	0.043	6.91	0.000

MAPE/FORECAST

Random Walk/Turnover

S1	-0.2453	0.461	0.052	0.250	0.027	-4.69	0.000
S2	-0.2385	0.453	0.051	0.268	0.018	-4.65	0.000
S3	-0.2337	0.447	0.051	0.277	0.014	-4.62	0.000
S4	-0.2343	0.446	0.051	0.278	0.014	-4.64	0.000
S5	-0.2350	0.445	0.050	0.277	0.014	-4.66	0.000
S6	-0.2531	0.461	0.052	0.245	0.031	-4.85	0.000

Random Walk/Profit

S1	0.0147	0.100	0.011	0.956	0.000	1.30	0.198
S2	0.0177	0.115	0.013	0.940	0.000	1.35	0.180
S3	0.0159	0.135	0.015	0.917	0.000	1.04	0.300
S4	0.0176	0.132	0.015	0.921	0.000	1.18	0.241
S5	0.0102	0.135	0.015	0.918	0.000	0.67	0.506
S6	0.0038	0.111	0.013	0.946	0.000	0.30	0.761

Turnover/Profit

S1	0.2599	0.460	0.052	0.237	0.037	4.99	0.000
S2	0.2562	0.439	0.050	0.288	0.010	5.16	0.000
S3	0.2496	0.425	0.048	0.308	0.006	5.19	0.000
S4	0.2519	0.425	0.048	0.308	0.006	5.24	0.000
S5	0.2451	0.422	0.048	0.313	0.005	5.12	0.000
S6	0.2569	0.467	0.053	0.213	0.061	4.86	0.000

MSE/FORECAST

Random Walk/Turnover

S1	-0.2695	0.485	0.055	0.266	0.019	-4.90	0.000
S2	-0.2579	0.476	0.054	0.280	0.013	-4.79	0.000
S3	-0.2492	0.468	0.053	0.291	0.010	-4.70	0.000
S4	-0.2494	0.467	0.053	0.292	0.009	-4.72	0.000
S5	-0.2483	0.467	0.053	0.291	0.010	-4.69	0.000
S6	-0.2765	0.490	0.055	0.261	0.021	-4.99	0.000

Random Walk/Profit

S1	0.0159	0.112	0.013	0.949	0.000	1.26	0.213
S2	0.0212	0.119	0.013	0.941	0.000	1.57	0.121
S3	0.0276	0.133	0.015	0.926	0.000	1.83	0.071
S4	0.0281	0.133	0.015	0.926	0.000	1.86	0.067
S5	0.0221	0.130	0.015	0.931	0.000	1.50	0.137
S6	0.0068	0.115	0.013	0.946	0.000	0.52	0.602

Turnover/Profit

S1	0.2854	0.482	0.055	0.254	0.025	5.23	0.000
S2	0.2791	0.467	0.053	0.279	0.013	5.28	0.000
S3	0.2768	0.449	0.051	0.306	0.006	5.45	0.000
S4	0.2775	0.448	0.051	0.308	0.006	5.47	0.000
S5	0.2703	0.456	0.052	0.297	0.008	5.24	0.000
S6	0.2833	0.493	0.056	0.235	0.039	5.07	0.000

1983

MAPE/ACTUAL

Random Walk/Turnover

S1	-0.3045	0.419	0.047	0.243	0.032	-6.41	0.000
S2	-0.3060	0.418	0.047	0.262	0.020	-6.46	0.000
S3	-0.3101	0.414	0.047	0.275	0.015	-6.62	0.000
S4	-0.3099	0.414	0.047	0.275	0.015	-6.62	0.000
S5	-0.3055	0.419	0.047	0.252	0.026	-6.44	0.000
S6	-0.2972	0.418	0.047	0.166	0.146	-6.28	0.000

Random Walk/Profit

S1	-0.0043	0.091	0.010	0.958	0.000	-0.42	0.675
S2	0.0112	0.104	0.012	0.948	0.000	0.95	0.345
S3	0.0163	0.115	0.013	0.938	0.000	1.25	0.214
S4	0.0158	0.114	0.013	0.939	0.000	1.23	0.224
S5	0.0024	0.095	0.011	0.955	0.000	0.23	0.821
S6	-0.0536	0.107	0.012	0.936	0.000	-4.43	0.000

Turnover/Profit

S1	0.3001	0.432	0.049	0.222	0.051	6.13	0.000
S2	0.3171	0.432	0.049	0.252	0.026	6.48	0.000
S3	0.3265	0.427	0.048	0.280	0.013	6.76	0.000
S4	0.3257	0.427	0.048	0.279	0.014	6.74	0.000
S5	0.3079	0.432	0.049	0.238	0.036	6.30	0.000
S6	0.2436	0.422	0.048	0.104	0.363	5.10	0.000

MSE/ACTUAL

Random Walk/Turnover

S1	-0.3533	0.476	0.054	0.213	0.062	-6.55	0.000
S2	-0.3593	0.471	0.053	0.244	0.032	-6.74	0.000
S3	-0.3638	0.466	0.053	0.259	0.022	-6.90	0.000
S4	-0.3634	0.466	0.053	0.259	0.022	-6.89	0.000
S5	-0.3567	0.474	0.054	0.228	0.044	-6.65	0.000
S6	-0.3227	0.487	0.055	0.124	0.278	-5.86	0.000

Random Walk/Profit

S1	-0.0114	0.109	0.012	0.948	0.000	-0.92	0.361
S2	-0.0058	0.114	0.013	0.944	0.000	-0.45	0.653
S3	-0.0070	0.123	0.014	0.938	0.000	-0.50	0.618
S4	-0.0070	0.122	0.014	0.939	0.000	-0.51	0.614
S5	-0.0086	0.111	0.013	0.947	0.000	-0.69	0.495
S6	-0.0298	0.119	0.013	0.933	0.000	-2.21	0.030

Turnover/Profit

S1	0.3419	0.494	0.056	0.178	0.120	6.11	0.000
S2	0.3535	0.488	0.055	0.217	0.056	6.39	0.000
S3	0.3569	0.486	0.055	0.237	0.037	6.48	0.000
S4	0.3564	0.487	0.055	0.235	0.039	6.46	0.000
S5	0.3481	0.492	0.056	0.199	0.081	6.25	0.000
S6	0.2929	0.503	0.057	0.059	0.606	5.15	0.000

MAPE/FORECAST

Random Walk/Turnover

S1	-0.0949	0.470	0.053	0.138	0.228	-1.79	0.078
S2	-0.0897	0.470	0.053	0.143	0.211	-1.69	0.096
S3	-0.0905	0.468	0.053	0.147	0.200	-1.71	0.092
S4	-0.0905	0.468	0.053	0.147	0.198	-1.71	0.092
S5	-0.0924	0.470	0.053	0.140	0.221	-1.74	0.086
S6	-0.1215	0.472	0.053	0.106	0.354	-2.27	0.026

Random Walk/Profit

S1	0.0166	0.034	0.004	0.995	0.000	4.34	0.000
S2	0.0481	0.064	0.007	0.982	0.000	6.66	0.000
S3	0.0619	0.081	0.009	0.971	0.000	6.78	0.000
S4	0.0606	0.079	0.009	0.972	0.000	6.81	0.000
S5	0.0309	0.046	0.005	0.990	0.000	5.96	0.000
S6	-0.0875	0.093	0.011	0.958	0.000	-8.28	0.000

Turnover/Profit

S1	0.1115	0.469	0.053	0.149	0.193	2.10	0.039
S2	0.1379	0.469	0.053	0.164	0.152	2.60	0.011
S3	0.1523	0.466	0.053	0.175	0.126	2.89	0.005
S4	0.1511	0.466	0.053	0.174	0.127	2.86	0.005
S5	0.1232	0.470	0.053	0.151	0.186	2.32	0.023
S6	0.0340	0.471	0.053	0.097	0.396	0.64	0.526

MSE/FORECAST

Random Walk/Turnover

S1	-0.1301	0.534	0.060	0.044	0.700	-2.15	0.034
S2	-0.1267	0.533	0.060	0.051	0.659	-2.10	0.039
S3	-0.1265	0.532	0.060	0.055	0.634	-2.10	0.039
S4	-0.1265	0.532	0.060	0.055	0.634	-2.10	0.039
S5	-0.1282	0.534	0.060	0.046	0.688	-2.12	0.037
S6	-0.1518	0.543	0.061	0.021	0.855	-2.47	0.016

Random Walk/Profit

S1	0.0105	0.016	0.002	0.999	0.000	5.73	0.000
S2	0.0328	0.051	0.006	0.990	0.000	5.66	0.000
S3	0.0414	0.066	0.007	0.983	0.000	5.56	0.000
S4	0.0407	0.065	0.007	0.983	0.000	5.56	0.000
S5	0.0214	0.033	0.004	0.996	0.000	5.74	0.000
S6	-0.0766	0.102	0.012	0.961	0.000	-6.62	0.000

Turnover/Profit

S1	0.1406	0.532	0.060	0.048	0.674	2.33	0.022
S2	0.1595	0.530	0.060	0.062	0.591	2.66	0.010
S3	0.1679	0.528	0.060	0.069	0.548	2.81	0.006
S4	0.1672	0.528	0.060	0.069	0.549	2.80	0.007
S5	0.1496	0.532	0.060	0.051	0.655	2.48	0.015
S6	0.0752	0.545	0.062	0.047	0.682	1.22	0.227