The Information Content of Interim Financial Reports - U.K. Evidence

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DEDICATION

This study is dedicated to those whose sweat and toil have contributed to make me what I am.

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ABSTRACT

The aim of this study is to investigate as to whether the public release of interim financial reports in the United Kingdom conveys information that affects share prices. The major objective for reporting the financial affairs of business enterprises is assumed to be the provision of information to help investors make investment decisions. Interim reports fulfil an important role as a source of frequent information regarding the events in the business enterprise which could give investors some indication about the risks and uncertainties attached to a particular firm's cash flows. Accounting data, therefore, is assumed to be part of the broad market information set that is utilised in establishing prices.

The study is carried out in the context of a semi-strong form market efficiency since the announcement of interim earnings puts the information in the announcement in the public domain. An efficient securities market impounds price relevant information into prices instantaneously and without bias. Changes in security prices therefore reflect the flow of information to the market information set utilised in establishing prices. The information in interim earnings can therefore be established if security prices change on the public release of the earnings data barring any other price sensitive information at the same time period.

The major finding in the study is that interim accounting reports have information content which affect price activity on the day of release. It is argued that accounting policy makers have incentive to provide economic benefits by recommending the preparation of quarterly reports by firms.

TABLE OF CONTENTS

CHAPTER ONE

CHAPTER TWO

HISTORICAL DEVELOPMENT OF INTERIM REPORTING

CHAPTER THREE

INFORMATION THEORY

CHAPTER FOUR

THE EFFICIENT MARKET HYPOTHESIS

CHAPTER FIVE

ACCOUNTING INFORMATION AND SECURITY PRICES - REVIEW OF EMPIRICAL WORK

CHAPTER SIX

METHODOLOGY

CHAPTER SEVEN

RESEARCH DESIGN

CHAPTER EIGHT

CHAPTER NINE

LIST OF TABLES

LIST OF FIGURES

CHAPTER ONE

1.0.0 INTRODUCTION

The annual financial report is the major instrument whereby organisations provide information to those who are interested in their financial affairs. A recent phenomenon in the provision of information to those interested in the business enterprise is interim financial reports. Interim reports are designed to satisfy the need for frequent reporting of events in the business enterprise.

In the United Kingdom (U.K.), the chairman of the Stock Exchange recommended the preparation of interim reports by listed companies in 1964,(Lunt 1982). This recommendation became a rule in 1973 in the admission of securities to listing. Interim reporting issues have been recognised in the United States (U.S.) as a problem for a long time, and guidelines for the preparation of these reports have been issued by the Accounting Principles Board (APB) as far back as 1973. In U.K. however, interim reporting issues have received very little professional or academic attention.

The past three decades have witnessed a great volume of research in capital market theory. Most of these studies lend support to the proposition that the securities market is efficient. What is implied by efficiency of the securities market is that any information that is relevant in the establishment of security prices will be instantaneously and in an unbiased manner, reflected in security prices. Information in this sense means any event that could cause a change in the probabilistic distribution of an outcome of an event ie security returns. In the context of an efficient market, therefore, no one other than a few highly skilled information processors can consistently make significant abnormal gains. If prices of securities do adjust rapidly to new information as and when they become available, then, changes in security prices will indicate the flow of information to the market information set utilised in establishing equilibrium prices.

1.2.0 THE RESEARCH PROBLEM

The Financial Accounting Standards Board (FASB 1985) statement of financial accounting objectives state the objective of financial reporting as the provision of information to facilitate investors' investment decision-making. The Accounting Standards Steering Committee [ASSC (1975)], and the Canadian Institute of Chartered Accountants, (CICA 1982) shared a similar view as that of FASB.

A considerable amount of accounting data is directed towards investors who are presumed to use these data in their buy-hold-sell decisions (Friend 1977). Blume and

Friend (1978) have indicated that many of investors investment decisions are based mainly on accounting data. They found that 42.5% of their sample use accounting earnings variability as a measure of risk in their investment evaluation and only 17.3% use published "betas" as risk measure. Barlev and Levy (1981) used accounting data for portfolio investment decision in order to determine whether the use of accounting rather than market data for risk measurement results in a loss to the investor. The rationale for the study is that the use of accounting data in investment decision making is inconsistent with portfolio theory which asserts that optimal portfolio selection should be based on market data. Barlev and Levy conclude that one should not automatically reject accounting data for investment management as the use of accounting data may lead to nearly optimal investment decisions.

Accounting data is assumed to form part of the broad market information set utilised in the price formation process. The information signals contained in accounting data can therefore be established if security prices change on the release of particular data. If interim financial reports have information content, security prices should react on their release. This study therefore examines the information contained in interim accounting reports in the context of an efficient securities market. The security market itself has three different levels of efficiency (Roberts 1967). The first level of efficiency is where security prices reflect all past price information. This level is the weak form of market efficiency. The second level of efficiency, which is the semi-strong form, is when security prices contain not only information about past prices but also all other publicly available information. The third level of efficiency, which is the strong form, security prices are deemed to reflect all information whether publicly available or not. This study is conducted in the context of the semi-strong form of security market efficiency where interim accounting information is publicly available.

1.2.1 METHODOLOGY

The methodology used in the study involves the examination of abnormal price variances of 100 randomly selected industrial and commercial firms listed on the London Stock Exchange. This methodology was first used by Beaver (1968). A variation of Beaver's methodology used by May (1971), and another by Patell (1976) are both used in this study. The behaviour of abnormal residuals are analysed to find out the effect, if any, that the release of interim reports have on the prices of the firms studied. A detailed discussion of the methodology is made in chapter six.

1.2.2 SIGNIFICANCE OF THE STUDY

It is assumed that the main objective for providing financial statements is to help investors make investment decisions. If investors do use these interim reports in their buy-hold-sell decisions, accounting policy-makers will have the potential to provide economic benefits by improving their reliability.

It does not however necessarily follow that if interim reports are not used, they are not useful. If the investors for whom they are primarily intended do not appear to use them, it will give rise to the need for a major research as to why they are not used. If it appears that investors do not use interim reports, then, Keane´s (1985) assertion that the firm concentrates its disclosure efforts on events over which it has a comparative informational advantage vis-a-vis the market, might be appropriate. The rationale for this is that investors are able to get more timely assessment of the information in the financial reports from somewhere else.

1.2.3 CONTRIBUTION TO KNOWLEDGE

The study will contribute to existing knowledge by providing evidence regarding the price effect of the information contained in interim earning announcements around the day of release. Firth (1981) reports that interim reports contain information in the week of their release. The current study however adjusts for the design defects in Firth's study by using daily rather than weekly data. A limitation in Firth's study is that prices may completely adjust to information in the interim earning reports within a day or two after they are released. A significant abnormal rate of return will, however, be observed in the week of announcement if the interim earnings contain information unanticipated by the market. The use of weekly or monthly price data in event studies also increases the chance of introducing other variables which could affect the share price in the research design besides the interim earnings announcement since it is impossible to isolate completely all other non-earnings related variables. The use of daily data reduces the chance of this happening and provides precise evidence on the price effect of the information in the event immediately after it has been made public. This study therefore investigates the behaviour of share prices with respect to interim earnings announcements around the day of release using daily data thereby providing a much more precise evidence on the impact that the information in interim earnings announcement, if any, has on investors' buy-hold-sell decisions. The second contribution of the study is that, it will add to the small but growing amount of literature on the relationship between accounting data and security prices in the U.K.

OVERVIEW OF CHAPTERS

Chapter one introduces the study and establishes the objectives of the research. The research problem is identified and its significance and contribution to the existing body of knowledge is discussed. Chapter two traces out briefly the historical development of interim reports and considers the objectives of reporting the financial affairs of business enterprises. Views regarding financial reporting objectives and the effect of financial reports on the resource allocation process in an economy are discussed. The chapter also briefly examines functional fixation in the context of investor decisions.

Chapter three is devoted to a discussion of Information Theory. Given that the study is about how information i.e. interim accounting information affects investors' buy-hold-sell decisions, a discussion of the nature of information and some of the properties involved is appropriate. The chapter therefore discusses the nature of information, the environment for information production, its measurement and how decision-makers might approach and evaluate the signals contained in an item of information. The chapter also considers the concept of entropy which for a decision maker who depends on aggregated accounting information could lead to a loss in the amount of information available. The nature of semantic information is also discussed since the ability to attach meaning to the information signals is very important for proper decision making. Finally the issues of information overload and of the relationship between accounting information and decision making are briefly examined.

Chapter four is devoted to a discussion of the Efficient Market Hypothesis and reviews some of the empirical studies on market efficiency. The rationale for such a discussion is that the study is being undertaken in the context of semi-strong form market efficiency. The study basically involves examination of the behaviour of share prices on the London Stock Exchange on the public release of interim accounting reports. The existing evidence regarding the securities market's ability in impounding new information into prices are discussed. The various levels of the market's pricing efficiency is discussed together with a review of the available evidence. The chapter also considers briefly Portfolio Theory and the Capital Asset Pricing Model (CAPM), which have played a major role in the price generation model of some of the market efficiency tests. A more detailed discussion of CAPM is however undertaken in the methodology in chapter 6.

Chapter five provides extensive review of the literature on accounting information and its impact on security prices. The major aim of the chapter is to find out what has been done in the research area to date and to identify gaps, if any, in the methodology and design of earlier studies.

Chapter six provides a detailed discussion of the methodology used in the study. The chapter begins with a discussion of research methods in general and considers other research methods that could be used to answer the research question posed in this study. The reason for the choice of the methodology adopted is provided. A detailed discussion of the price generation models generally available for research in event studies is made and reasons for the selection of the model used in the current study are discussed. A detailed discussion of the statistical procedures used in the study is included.

Chapter seven is concerned with research design issues and discusses the role of research designs in the research process. Specific research designs are discussed and the choice for the selection of the design used in the study is given.

Chapter eight is mainly concerned with a discussion of the research results. A summary and a consideration of the policy implications and limitations of the study are provided in chapter nine.

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CHAPTER TWO

HISTORICAL DEVELOPMENT OF INTERIM REPORTING

2.0.1 INTRODUCTION

This chapter will focus attention on the historical development of interim reporting and financial reporting objectives of business enterprises. Such a discussion is necessary since the financial reporting process is generally viewed as a means of providing investors with the information they need to make investment decisions, which is the main interest of this study.

2.0.2 EARLY DEVELOPMENT

Interim financial reports are statements covering the major activities of companies usually prepared half yearly. These statements are typically highly summarised. The need for some form of reports shorter than the normal statutory annual reporting cycle has been recognised for a long time. Unfortunately,in this respect, the U.K. is far behind the United States and Canada, each of which has developed guidelines for preparing these reports.

The major developments in the provision of interim financial reports have taken place in the U.S, with the New York Stock Exchange being the dominant influence on the issuing of these reports. The New York Stock Exchange for instance has advocated the preparation of interim reports by its listed companies since 1910 (Taylor 1965).

It has been the Stock Exchange and financial analysts in the US who have been the major advocates for companies to provide these short term reports.

Taylor (1965), asserts that professional accountants and their associations did not look favourably on the demands by the Stock Exchanges and financial analysts in the US for the issuance of these reports. The Securities Exchange Act of 1934 had however required listed companies to produce such quarterly reports as the Securities and Exchange Commission might prescribe. This situation in the US put the Securities Exchange Commission in a very awkward situation, being caught in the middle between the interests of the Stock Exchanges and financial analysts on one hand and the accounting professional association and practising accountants on the other .

The Securities Exchange Commission (SEC) faced very stiff opposition when in 1946 it requested companies to provide quarterly sales data and later added quarterly income statements. The strong opposition to the demands led to the withdrawal of the preparation of quarterly sales data in 1953. No sooner had this withdrawal taken place than security analysts began putting pressure on the SEC, resulting in the reinstatement of interim reporting income (Taylor 1965). This requirement remains until the present moment. The SEC has therefore been caught in the middle of the struggle of these interest groups, while shifting support from one group to the other at various points in time.

The Accounting Principles Board Opinion No 28 on Interim Financial Reporting issued in May 1973 is the most authoritative statement in the US designed to clarify the application of accounting principles and reporting practices in general to interim financial information. APB Opinion No 28 views each interim period as an integral part of the annual period and requires its preparation to be in accordance with accepted accounting principles

Unlike the US however, there is no legal or professional requirement in the preparation of interim financial statements in the U.K. However, like the US, the London Stock Exchange has been the main proponent of interim reporting by firms. The chairman of the London Stock Exchange recommended the preparation of interim reports by listed companies in 1964 (Lunt 1982) In 1973 this recommendation became a rule for the admission of securities to listing on the Stock Exchange. The Stock Exchange therefore required firms to file with the exchange certain financial information including a half yearly interim report.

The only instance where there is a legal requirement for the preparation of interim accounts in the U.K. is where a company wishes to pay dividends but is uncertain about the amount of distributable profits. The 1980 Companies Act discusses interim reports in the definition of what constitutes distributable profits. Where a company wishes to distribute profits, the amount of the distribution, and whether or not the distribution can be made, is determined by reference to the company's accounts. The law requires that interim accounts be prepared to justify a interim dividend where the most recent annual accounts of a firm disclose no-distributable situation or where trading results since the last accounts were prepared have reduced the level of accumulated profits. Where there are no previous annual accounts because a company has been in trading for less than an accounting period and directors propose to declare dividends, the law again requires interim accounts to be prepared to justify the dividend payment.

The law requires the preparation of such interim accounts to be in accordance with the usual rules underlying the preparation of annual accounts. As stated already, there is no professional guidance in the U.K. on the preparation of interim financial statements. All the debate that has gone on regarding the preparation,presentation and disclosure in financial reporting has centred mainly on the annual report. Interim reports have largely been ignored in the U.K. by both the academic and professional accountants.

While there have been exhaustive academic debates and research into interim reporting issues in the US, very little has been done in the U.K. context. This may be due to the fact that interim financial statements have very little intrinsic value or that their potential for enhancing economic efficiency and facilitating the allocation of resources in the economy have not been realised. There is the need for extensive debate and research on interim accounting issues. It is only the accumulation of research knowledge that can resolve some of the issues associated with interim reporting and this study is aimed at contributing to such knowledge in the U.K. context.

2.1.0 FINANCIAL REPORTING OBJECTIVES

The preceding section has been concerned with a brief historical development of interim reporting in the US and the U.K. and also briefly described the present state of interim reporting in both countries. The following section will focus attention on the objectives of financial reporting since interim financial reporting objectives need to be viewed in the context of current thinking on the objectives of financial reporting. Although most of the published views on financial reporting objectives are written mainly in the context of annual financial reporting, their relevance applies substantially to interim financial reporting.

Considerable efforts have been directed towards the establishment of reporting standards of business enterprises over the past few years, especially in the United States, U.K., Canada and Australia. In the US, the Financial Accounting Standards Board (FASB) (1985) states that:

> "Financial reporting should provide information that is useful to present and potential investors and creditors and other users in making rational investment, credit and similar decisions." p17

The major conclusion is that the chief common interest of users of financial reports is the assessment of a business's ability to generate favourable cash flows. Financial statements therefore serve as inputs into users' cash flow generation models.

The Corporate Report published by the British Accounting Standards Steering Committee (ASSC) also echoed the view that the objective of reporting the results of business enterprises is

> "...to communicate economic measurement of and information about the resources and performance of the reporting entity useful to those having reasonable rights to such information." P28

The objective of financial reporting as stated by the Corporate Report is clearly not very much different from the view taken by the U.S. Those with reasonable rights to information need it presumably as inputs to their decision models.

In Corporate Reporting : Its Future Evolution, by the Canadian Institute of Chartered Accountants, the objective of Corporate reporting is stated as

> "... to assist in the efficient allocation of scarce resources by the provision of information useful to those responsible for making investment decisions." P32

The view that permeates the various views of the objectives of financial reports stated above is the desirability of more information. The basis for such a view point lies in the assumption of uncertainty regarding the choices with which decision makers are confronted. To reduce the uncertainties therefore they need financial information to help them make better decisions. The primary objective of financial reporting then is the provision of information for the making of better economic and investment decisions.

The provision of accounting information as inputs into user decision models has also been advocated by many writers including Beaver, Kennelly and Voss (1968), and Sterling (1973). The decision models school views the role of accounting information as inputs into individual decision models. The fundamental assumption regarding the image of the subject matter of accounting is that accounting information output should correspond to:

(a) The requisite input of ideal formal decision models for various decisions which should be used ie the best models for pricing, investment etc. or

(b) The real decision processing activities likely to be involved in the actual decision models of users.

The decision model school views the problem of accounting information output as the absence of knowing the ideal accounting information input to user decision models and for various kinds of decisions. It is assumed that if there is observed correspondence between accounting information output and the required inputs of users' optimal decision models, then, decisions with good consequences will be made. Similarly, if there is correspondence between the accounting information output and the required properties of assumed user processor activities, then, useful predictions will result. The decision model school aims at a normative accounting theory in terms of accounting information being relevant to prediction and decision models.

Other writers advocate that the accounting information output should focus on decision makers. The Decision Makers School can be classified into two broad areas, namely individual or market level depending on where the decision maker is being observed. Among the exemplars at the individual decision making level are Birnberg and Nath (1967), Hofsted and Kinard (1970). The Decision Makers School image of the subject matter of accounting is that accounting information output should be tailored to actual decision making and other human behaviour towards attaining correspondence between the actual and desired properties of decision and information induced behaviour. The focus here is not the ideal but rather the actual and desired decisions of accounting information users. They view the concrete problem in accounting as the lack of knowledge about how accounting information impacts upon user decisions and other behaviour. The empirical domain of interest is real decisions and other information induced behaviour and its attendant consequences.

Under the "Decision Makers" school of thought, the individual can be observed either at the individual or the aggregate market level. Among the early researchers at this level were Ball and Brown (1968), May (1971), Gonedes (1974). Under the aggregate market level, a particular concrete problem regarding the subject matter of accounting information output for which understanding must be sought is the items of information used by the market in establishing prices. Researchers at this level are concerned about the pragmatic effects of accounting information output on prices ie the reaction of the market to messages in the accounting reports. The empirical domains are market prices and accounting information output. Accounting information is perceived as part of the market information set utilised in establishing prices. The current research falls within this school of thought.

2.2.0 INFORMATION ECONOMICS AND ACCOUNTING INFORMATION

Information economists in accounting can be classified into two, depending on which level the decision maker is operating. The two classifications are the individual and the multi-individual levels. Among the exemplars are are Marschak and Radner (1972), Demski (1972), Feltham (1972) and Demski and Feltham (1976). At the individual level of analysis, the emphasis is on the particular accounting information which maximises the individual's subjective utility. The empirical domain here is the theoretical choices the individual faces, and the focus is on the choices and their expected outcomes. To the information economist therefore, one information system is preferred to another if and only if its expected utility measure exceeds that of the other. The information economist's basic assumption is that the individual behaves in a rational and consistent manner in making choices from the available alternatives.

The focus on financial reports as providing information for decision making represents a change in attitude from the traditional view of financial reporting as accounting for management`s exercise of its stewardship function on behalf of shareholders. They are intended to provide useful information to enable better economic and business decisions pertaining to the alternative use of scarce resources to be made. To enhance the efficiency of the resource allocation process therefore requires financial information about the performance of business enterprises. This view point explains the role that has been taken by the Stock Exchanges in the US and U.K. in advocating the preparation of interim reports by firms.

Stock Exchanges have economic functions to discharge. Their primary role in an economy is to act as the intermediary in the flow of funds between savings surplus units and savings deficient units. The Stock Exchanges therefore are the major resource allocation mechanisms in an economy. For the Stock Exchange to discharge its role efficiently and effectively , it requires information on productive units for investors to decide how much to allocate to a particular unit based on their own assessment of the available information.

Seven user groups were identified in the Corporate Report as those having reasonable rights to financial information. There is however no general purpose financial report that will suit all the needs of the various users. The financial reports in their present form are mainly tailored to the needs of the investor group. The objective of financial reporting emanates from the need for information by these external users who usually lack the authority to prescribe the information they need.

Arising out of the need to provide information for the making of economic and investment decisions, financial reports have other sub-objectives. Among these as stated by FASB (1985) in the Statement of Financial Accounting Concepts No1 (SFAC No 1) are that:

> "Financial reporting should provide information about the economic resources of an enterprise, the claims of those resources (obligation of the enterprise to transfer resources to other entities and owners equity), and the effects of transactions, events and circumstances that change resources and claims to those resources." p21

Financial reports therefore provide information about an enterprise's cash flow potential as well as its economic resources and obligations. The financial information helps in identifying the enterprise's financial strengths and weaknesses, liquidity and solvency.

2.2.1 AGENCY THEORY AND FINANCIAL REPORTING

Recent developments in agency theory also underlie the rationale for the provision of financial reports. Agency theory is concerned with the modelling of the relationship between the decision maker (agent) and the person who has hired him (the principal) and for whom the agent is assumed to be making the decision. In firms that are owner managed, the agency relationship is between the employees and the owner. Employees contract of employment and schedule of duty would specify the responsibilities that have been entrusted to them. Where the firm is not owner managed, additional agency relationships will develop. Managers (Directors) will be engaged to manage the firm on behalf of the owners (principal)

Directors as agents may themselves be part owners or simply professional managers with little or no equity ownership in the firms they manage. The separation of ownership from control of modern day business enterprises has implications for the principal as investor. Copeland and Weston (1983) assert that where the ownership is different from control, there is no reason to believe that the manager who serves as the agent will always act in the best interest of the shareholders due to conflicting interests. Both directors as agents and shareholders as principals attempt to maximise their own "profits" or utility with utility being a measure of satisfaction (Fox 1984). Directors and shareholders therefore attempt to pursue their own interest. If therefore some cost is incurred to monitor the agent`s activities, the agent will not always act in the best interests of the principal (Jensen and Meckling 1976).

If management is devolved from ownership, the interest of management may not always coincide with that of the owner. There are several decisions that management can take which may not be in the interests of the firm´s owners or debt instrument holders who might have a charge over certain assets. Where management receive bonuses that are linked with earnings, projects with short term favourable cash flows will be selected rather than those that have unfavourable short term cash flows but large long term cash inflows, even though both projects have positive net present value cash flows. On the other hand if management compensation includes some free share schemes it is probable they could pursue policies that will maximise the value of the firms shares. Therefore, a manager will only pursue policies that will maximise shareholders wealth where his interest and that of the shareholders are congruent. Again where managers have share compensation schemes, they might on one hand invest the asset of the firm in highly risky projects that will redistribute wealth from debt-holders to equity holders.

This comes about because where projects are highly risky, debt holders will share in the large losses that may occur but not in the large gains which could also occur. An avenue for monitoring the actions of managers in this regard is through the financial statements as well as the labour market. High quality management have incentives to institute measures that will distinguish them from low quality managers since high quality managers will command higher prices in the labour market. As a result managers have incentives to provide information that reflects management performance. Managers have incentives to signal to the labour market that actions detrimental to shareholders and debt-holders interest may not be undertaken by accepting contracts that put constraints on their behaviour or includes mechanisms to monitor their actions.

A mechanism for ensuring that agents steer the affairs of the enterprise they manage in a way the principal would want them to is the provision of financial reports. Financial reports therefore provide the information on how management of an enterprise has discharged its stewardship responsibility to the shareholders. The stewardship responsibility involves the custody and safekeeping of the enterprise`s resources, their efficient and profitable use and their protection from unfavourable economic and technological changes.

Shareholders as investors derive no utility by simply getting hold of financial reports. The information is only useful if it leads to changes in investors consumption and investment behaviour ie the information derived from the financial reports serves as a means to an end. In the decision context therefore, investors require financial information to enable them to assess the future prospects of the firm which will impact on their decision to divest or invest in the firm.

If investors require the financial information to enable them to make better decisions, financial information becomes valuable to the extent that it alters investors' beliefs, thereby altering their actions. This is the context in which the present study is being undertaken. If investors use financial information in changing their consumption and investment behaviour, and if investment activity changes on the publication of the financial reports barring any other investment sensitive information we may assume that the investment level has been affected by the information contained in the financial reports. This assumption rests on the objective of financial reports as helping investors to make investment decisions.

The objective of providing interim reports should not differ materially from that of the annual report, and there is reason to believe that interim financial statements should be of comparable interest to investors as the annual report. The major reason for this is that if investors need financial information as inputs in their consumption-investment decision-models in an uncertain environment, then, the more frequent the decision inputs are available, the greater the reduction in the uncertainty associated with the decision making process. The ultimate result is therefore a better decision.

Timeliness of information is therefore a major attribute of interim financial statements unlike annual reports. Interim reporting demands are growing due to the need to report frequently events that may occur in the period between annual reports that could affect investors assessment of the fortunes of the firm. The assumption here is that investors cannot obtain such information from any superior source and that the firm perhaps has a cost advantage in providing such information to potential and current investors. It may also be seen as a price the firm has to pay as one of its societal obligations.

Interim reports could be viewed also as an indication of how the firm is progressing within the yearly reporting cycle and should therefore aid in predicting the outcome for the year. This is of interest to investors concerned with forecasting annual results. They therefore help to estimate future results. The important role of the interim report in the investment decision process as an avenue for providing frequent updates of the firms' changing fortunes perhaps explains the reason why the chief advocates of these reports have been the Stock Exchange and financial analysts. Accountants have generally not been very keen on interim reporting due in part to the accounting problems associated with such statements.

The argument can be made that interim reporting could be treated as a commodity subject to the laws of supply and demand. Firms as suppliers will have the incentive to supply this informational demand of investors. If they fail to do this their shares will not be appropriately priced. It must be noted that failure to provide this information might mean that the market cannot properly distinguish between efficient and less efficient firms. Such an argument therefore does not account for the fact that the firm operates in a social milieu. If shares are not appropriately priced it becomes extremely difficult to discriminate between efficient and less efficient firms, and efficient allocation of resources in the economy is not achieved. The whole society therefore loose out. The social cost might therefore be high. The resolution of such an issue is an empirical one requiring some evidence on the use of financial reports by investors

2.3.0 FINANCIAL DISCLOSURE AND FINANCIAL REPORTING

An important issue regarding accounting information is about the disclosure that should exist in financial statements to facilitate investors' decision making. This importance stems from the fact that financial disclosure is very much inter-twined with financial reporting, and separation is impossible. The problem of financial disclosure has assumed importance in financial reporting because of certain views that adequate financial disclosure is a necessary precondition for capital formation. Mautz and May (1978) write:

> "... a viable capital market is essential to resource allocation within the

> economy. It is the capital market that a major portion of the nation's resources are allocated to those companies which serve customers effectively, and capital is refused to those companies who do not serve customers effectively. One of the major bases on which such allocations rest is the track record of the various companies vying for capital, a track record that is found in their financial statements" p28

The implication of such a view is that, without adequate financial disclosure, significant amounts of capital formation and allocation will not be efficiently achieved. It is the potential effect of financial reporting on the resource allocation in an economy that has led some people to advocate a total economy approach to the problem of information production and disclosure [Fama and Laffer (1971), Mautz and May (1978)] etc. The total economy approach involves disclosure of information that assists the economy in achieving optimum capital formation. One reason for adopting such a view is the problem of individual investment horizon. The individual investor is assumed to be interested only in short term trading gains while the long term functioning of the economy affects everyone and therefore must override any other consideration. A second issue in financial disclosure pertains to the problem of separation of ownership from control. The importance of the capital market for companies that are seeking capital provides the avenue for sanctions against non-disclosure.

2.3.1 MARKET FORCES AS INCENTIVE FOR FINANCIAL DISCLOSURE

If firms' financial operating data provide important information for prospective investors to select from several investment opportunities, then, the market will distinguish between firms that are perceived to disclose adequate information from those firms that do not. Firms are in constant competition with each other for capital in the market place to exploit investment opportunities available to them.

In the decision to subscribe to the new issues of shares or bonds, investors require certain information about the firm's progress and condition in order to judge whether it is desirable to invest in a particular company. If investors perceive a company's progress and condition favourably, it can be assumed that such a company will attract more funds and a lower cost of capital. The reason for this is that if there is significant uncertainty attached to the firms progress, holders of debt instruments will perceive themselves as taking on higher risk and will therefore require higher compensation. A company that inspires more confidence about future prospects can in theory raise funds directly via the capital market by issuing new shares at a price that will be higher than a similar company with poor future prospects.

The value of the outstanding shares that are traded on the stock market indirectly indicates the market's assessment of a firm's future. Though the buying and selling of shares does not affect the firm directly, in that no funds are channelled to the firm via the day to day trading, the effect is indirect via the share price which will have implications for the firms' capacity to issue new shares and the cost of debt. Even in economies without a capital market, providers of investment funds would require information relating to the firm's progress and condition on which to base decisions regarding funding. The ease with which a firm raises capital therefore depends to some extent on the financial information it provides and the general operating and economic conditions of the firm. Firms therefore have incentive to provide information that will facilitate the provision of investment funds.

The cost of not providing relevant information to investors includes the payment of higher interest rates on bank loans or very strict conditions being placed on the loan, or an unsuccessful equity issue. The point is well illustrated by Standard and Poor's Corporation (1980) survey of municipal accounting. The report indicates that:

> "Results show that the market may already be imposing penalties in the form of

> higher interest costs where accounting and financial reporting are sub-standard...Based on views obtained from market makers who set interest cost on new issues, research shows penalties may average 0.125 to 0.25 percentage points"p3

If mis-representations are made in the information provided, there are still penalties attached since a firm's market credibility may suffer very badly from mis-representation. Management have the incentive not to make mis-representation since their marketability in the labour market will suffer as a result of any such mis-representation. Some mis-representations could even give rise to legal liabilities. Lastly, external party certification in the form of auditing of the firm's financial report is an important check on a firm's propensity to provide misleading and inaccurate information. The external auditor certifying the representations made in the account also has a reputation to protect and therefore has the incentive to do a good job.

2.4.0 FINANCIAL REPORTING AND FUNCTIONAL FIXATION

One psychological concept that has come into increasing use in accounting is functional fixation. Ijiri, Jaedicke and Knight (1966) suggest that decision makers using accounting data suffer from functional fixation. This condition is the situation where the decision maker is unable to adjust his decision process to account for the fact that there has occurred a change in the accounting process that supplies him with the information.

Duncker (1945) popularised the functional fixation hypothesis. The hypothesis states that the function for which an individual uses an object is more or less always fixed in his mind and therefore when faced with a new situation the object use cannot be adapted for the new situation. The individual is therefore fixated on only one function for the object and is inhibited from discovering a new appropriate use. Duncker's experimental results confirmed his hypothesis. Adamson (1952) in his box experiment confirmed that the experimental group was functionally fixated on using boxes as containers and could not find the new appropriate use for them as platforms.

Ijiri et al suggest that:

> "If the output from different accounting methods are called by the same name, such as profit, cost, etc people who do not understand accounting well tend to neglect the fact that alternative methods may have been used to prepare the outputs. In such cases, a change in the accounting process clearly influences the decisions"p194.

Though Ijiri et al looked at functional fixation from a management decision perspective, the concept has relevance to the investment decision context. If a firm decides to change the method of inventory valuation, an investor whose investment decision depends on whether the firm reports an increase, decrease or unchanged profit figure might not be able to adjust his decision to account for the fact that there is a change in the underlying process that has given rise to the new income figure. Ashton (1976) reports that decision makers´ experience cognitive change from accounting change and that the cognitive change was not differentially affected by the amount of information concerning the accounting change that was communicated to decision makers. Ashton conclude that

> "... the data suggest that a large proportion of the subjects in the experimental groups failed to adjust significantly their decision processes in response to an accounting change thereby providing evidence of the existence of functional fixation in an accounting context"p16.

For investors´ to make effective decisions, it is important that they attach the right meaning to the accounting information.

2.5.0 CONCLUSION

From the foregoing discussion, it is clear that a major objective of financial reporting is the provision of information to help investors in their investment decision-making. It was also pointed out that interim reporting should be of interest to investors since it serves the purpose of providing constant update of events in the business enterprise prior to the publication of the annual report. What must be stressed is that this study is not concerned with whether investors make the right decisions with regards to the accounting information. As a result, the direction that investors decision will take cannot be specified ex-ante. Whether or not investors are functionally fixated in an accounting context is not a concern of this study. The study is concerned about the use that investors make of the information contained in interim reports as reflected in share prices. In other words, the study's sole concern is investors behaviour induced by the information in the interim reports.

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CHAPTER THREE

INFORMATION THEORY

INTRODUCTION

This chapter will be concerned with some discussion of information theory. The rationale for such a discussion lies in the fact that this study is about how information, ie interim accounting information impacts on share prices. Accounting information output therefore is basically information production and transmission. Such a discussion will give some idea of how market makers might approach and analyse the signals in the interim accounting information in the price formation process. The accounting information output is not an end in itself to users but a means to an end. Users need the accounting information as inputs to their decisions models. Investors who are the main user group of concerned in this study, presumably need the accounting information to help them in their buy-hold-sell decisions. In a study of the information content of interim financial reports, some discussion of the issues involved in information theory will aid understanding of the nature of information and the decision-making process to which financial statements can contribute. If interim financial reports possess the characteristics of information, then, it helps one to understand why investors would want to use them for investment decision-making.

3.1.0 INFORMATION DEFINED

Information is knowledge gained about some situation for which we had no prior knowledge. The amount of information obtained by any communicative process has no relevance to whether the information is correct or incorrect, useful or useless. The only concern is how much knowledge or information has been obtained but not whether such knowledge or information is valuable or not.

3.1.1 INFORMATION AS REDUCTION IN UNCERTAINTY

A communicative act provides information if it reduces a condition of ignorance or uncertainty about the state of something which is under consideration.

Consider an investor whose investment decision is based on the reported earnings per share figure of firms in which he/she has some investment. Assume that such an investor's buy-sell-hold decisions depend on whether that particular firm reports increase, decrease or the same amount of earnings per share figure as against that of the previous period. The only avenue where the investor gets information on the reported earnings per share figure is assumed to be when the firm publishes such information in the financial report. In such a situation the investor might have a priori uncertainty as to whether the firm's reported earnings per share number will be an increase, a decrease or same with respect to the prior period's figure. So long as there is uncertainty in such an investor's mind as to what the current earnings per share figure will be in the report, the publication of the financial report will give such an investor information which can be used as input into his decision model.

The process of uncertainty reduction involves information transmission. As the message is received there will be some reduction in uncertainty. If there is no uncertainty remaining after a message is sent and received, then, the amount of information sent is the amount of uncertainty that existed initially.

3.2.0 INFORMATION AS REFLECTION OF FUTURE STATES OF NATURE

For information to fulfil its role as a reduction in uncertainty, it presupposes that the decision maker is faced with a problem of choice in a decision-making situation. In the context of the current discussion, the decision maker is the investor. The choice problem that the investor faces is the decision to buy, sell, or hold on to the shares of a particular firm on the basis of the signals contained in the published financial reports. In a situation where only one course of action is available, then, information will be redundant if the decision-maker has no alternative but to undertake the only available decision.

An essential feature of information in decision making is that it must be capable of indicating the existence of future possible states of nature. Since direct perception of reality is not possible, the signals contained in an information becomes an indirect way of perceiving reality. If the signals contained in the information are unable to fulfil the above objective, it cannot fulfil the role of reducing uncertainty.

If accounting information is to play a role as a major input into user decision models, then, it must have the ability to contain signals that are decision relevant to users. If a user is interested for instance in the future cash flows that will accrue to a firm, then, for such a user to use accounting information for decision purposes presupposes that the accounting information is able to capture the future cash flow distributions of the firm. By providing some indication of the future probable states of nature therefore, which in the present discussion is the probable distribution of the firm's future cash flows, the decision-maker is enabled to make a better decision.

3.3.0 INFORMATION PRODUCTION ENVIRONMENT

Information about the past is useful and desirable, but from the point of view of an investor, external accounting information which is concerned only with the past is useful only to the extent that one could abstract from the past some future possible states of nature. The reason for this is that the investor is faced with a current decision problem regarding the distribution of the future risks and returns of the firm. If accounting information enables the investor to gain some knowledge of the future possible states of nature, a critical issue is the sort of environment that will ensure optimal production of information.

Information economists continue to argue about the environment that will ensure optimal information production. Under the individual level in information economics, the decision maker is assumed to be faced with a number of choices for which information or knowledge about the competing alternatives is needed to enable the decision-maker to maximise his/her subjective utility. At the aggregate level however, the concern is not about the maximisation of individual subjective utility but about the optimum allocation of resources in the economy. Some information economists argue that a laissez faire solution to the problem of information production is non-optimal, Arrow (1962).

In an accounting sense, if investors use accounting information in their buy-hold-sell decisions, then, accounting information has an important impact on the allocation of resources in an economy. Investors are assumed to be interested only in the risk and return on their investment. They will therefore be attracted to firms whose perceived risk and return distributions as abstracted from the published financial statements seem acceptable to them. In theory, therefore, investment funds may be more readily available to those firms with perceived favourable risk and return characteristics, ie low risk and high return --- assuming such an investor behaves rationally.

The resource allocation process is achieved via the Stock Exchange. Even in an economy without a Stock Exchange, if accounting information possesses the characteristics which investors require, it can still contribute to the resource allocation process. If accounting information output affect resource allocation in an economy, every member of society is affected by the accounting information output.

Some information economists, notably Arrow (1962), argue that free enterprise does not result in an ideal allocation of resources for information production. Arrow therefore draws the general conclusion that optimal allocation of resources for information production require the involvement of the government or some non-profit agency. Arrow treats information as any other economic commodity. He argues therefore that a free enterprise solution to the problem of information production will lead to under investment and therefore less information.

This view is echoed by a committee of the American Accounting Association (1977) in ASOBAT which states:

> "financial accounting information shares much in common with more traditional examples of externalities...without intervention, too little information will be produced. This is one of the standard arguments for...disclosure policies."p24

The reasons given for the under-investment in information production are that firstly if a piece of information is made available to someone for use, it does not necessarily preclude its subsequent enjoyment by others. Again the value of a published financial report may be specific to the individual who possesses it. Information production is by nature a risky, activity since as discussed previously, uncertainty is a necessary condition for information to be valuable.

Demsetz (1969) has criticised Arrow for his nirvana approach and the logical fallacies that induced him into the pessimistic view regarding a competitive approach to the problem of information production. Demsetz argue that words such as ´government´ and ´non-profit body´ are without analytical content in the sense that these words that Arrow substitutes for free enterprise are not analysed and the outcomes compared to the market solution before drawing his conclusions. Fama and Laffer (1971), Hirshleifer (1971) argue that competitive production of information for trading purposes is socially sub-optimal under conditions of a perfect market for information. Fama and Laffer therefore favour the regulation of financial information output by legislation.

The nirvana approach to the problem of information production by Arrow, Fama et al and Hirshleifer is inappropriate. The nirvana view should be rejected on the grounds that it is false to reject an existing institutional arrangement simply because it falls short when compared with an ideal system. The solution that Arrow and others advocate cannot be cost free and this led them to commit the "free lunch fallacy".

Those who argue against the laissez-faire solution to the problem of information make a fundamental assumption of a perfect information market. In the real world however the opposite is the case. To argue that the laissez faire solution to information production is socially sub-optimal disregard the fact that any governmental involvement will lead to redistribution of resources from one group to another. A further increase in one group's well-being can only be achieved at the expense of another. If a social choice criterion of pareto optimality is to be adopted, then, any governmental intervention should ensure that a reallocation of resources for information production will not leave any one group worse off than before.

3.4.0 INFORMATION EVALUATION

Research concerning human understanding of accounting information has used two main models namely the Lens Model and the Information Economics Model.

3.4.1 THE LENS MODEL

The Lens Model summarises the basic principles of probabilistic functionalism developed by Egon Brunswick (1952, 1955) as a framework for psychological research. The basic tenets of probabilistic functionalism are that:

(a) The nature of the environment determines the way one behaves.

(b) The numerous cues that the individual perceives are usually imperfect and redundant in predicting environmental states and
(c) The individuals response to these unpredictable and redundant cues is to develop a range of substitable processes for the purpose of achieving the task ahead.

For an illustrative commonplace application of the Lens Model in an accounting context, consider an investor who is interested in predicting say next year's income figure of a particular firm from a set of financial reports in the current year. A number of different perceptual cues emanate from the financial statements (the initial vocal variable) about such things as growth in sales, cost items, management view of the distant future etc which must be taken into account. Such stray causes as the presentation of the accounting items should also be taken into account. As an example, assume a figure appears in the accounts that relates to an extraordinary loss. Assume that this relates to the destruction of an uninsured asset which was expected to generate a certain amount of revenue over the next five years. In such a situation the asset's destruction will affect subsequent years earnings despite the definition of extraordinary items as things or events that do not recur. The effect of the loss will be experienced over a number of years.

On the response side, the investor needs to mobilise his knowledge of the firm and its management and how the firm has performed over the past years as well as his education and experience in the prediction of that particular firm's income over the years. Stray effects would be exemplified by economy-wide factors like interest rates movement and the effect on the firm's financial charges which could affect the accuracy of the forecast. The ultimate instrumental achievement of predicting the firm's earnings for the year ahead is therefore dependent upon the successful co-ordination of a variety of 'process details' on both the perceptual and response sides. The lens model has been used extensively in research work in user's processing of financial statements and most of the studies are documented in Libby and Lewis (1982).

3.4.2 INFORMATION ECONOMICS MODEL

The information economics model of information evaluation is based on Marschak (1969) research in information economics. The basic building blocks for the model are derived from statistical decision theory and economic notions of choice and utility. The term information economics denotes all analyses that apply decision theory to the evaluation of information. The decision-maker under information economics is assumed to be faced with a choice situation. The main concern of the decision-maker when faced with choices, is to maximise his/her utility. Whatever choice is selected is dependent on the states of nature for which the decision maker has no control.

In the context of our present discussion, the decision-maker is faced with the problem of abstracting from a given set of financial statements the messages that will enable him/her to decide whether to buy, sell or hold the shares of a particular firm. The way the investor arrives at his/her buy-hold-sell decision depends on how such an investor approaches and evaluates the information he/she possesses.

One possible information set that is available to the investor is the financial report. The financial report contains signals about the future operating conditions and hence the future performance of the firm. The investor must therefore determine the relationships among the various elements in the information evaluation process. He must move from the specification of the information system (θ) to signal generation (y), to the future states on the world (s) and to the choice (a). A closer examination of the information economics model of information evaluation reveals an implicit Bayesian information rule. Given the level of experience and the information, the decision-maker specifies what he/she perceives to be the relevant action alternatives, conditional returns, events and probabilities in his specific choice situation.

The decision-maker is assumed to have preference over the states that may occur and the action with the highest payoff which is his utility measure given by (u). The information economist assume an expected value of information in the above analysis. If the decision maker has two potential conditional probability distributions over the elements of (s), he will always prefer the situation which will result in the conditional distribution that will maximise his utility. From the above relationship, the expected utility from a particular act is given by

$$E(u) = f(s,a) \qquad [1]$$

The above relationship simply shows that the expected utility of the decision-maker is a function of the states of the world and the action selected conditioned by the signals from the underlying information system.

The two models of information evaluation are concerned with the same problem ie the evaluation of information in decision making. They however adopt different approaches. The Information Economics model is primarily a normative ex-ante model which requires the specification of the various alternatives regarding future states and information systems, the decision rules and utility functions. The lens model, by contrast, is primarily descriptive which emphasises the stochastic relationship between event-related messages or cues apparent to the decision-maker and the resultant decisions. The information economics model concerns itself with the states of the world, the lens model is concerned with the status of the environment ie distal variables.

3.5.0 INFORMATION MEASUREMENT

The objective of information measurement is an attempt to quantify the content of a reliable and definite message and most of the discussion in this area draws on the work of Theil (1967). The measurement is the function of the probability that the event in question will take place before the message comes in. Assume that the probability (x) that some event will occur is given by

$$p(x) = 0 < x < 1$$

Assume again that the probability of the occurrence of event (x) is determined to be 0.999. If a message is received later that event (x) has indeed occurred, there would not be much surprise in the sense that it was practically certain that event (x) would occur. The occurrence of the event (x) has therefore very little information content as it is close to one. When the occurrence of an event is close to zero, say 0.001, its occurrence is a great surprise since it is almost certain it would not occur. The occurrence of an event that is close to zero will therefore have a large information content.

It is clear therefore that the information content h(x) of a message is a decreasing function of its probability of occurrence. The more unlikely that an event will occur, the greater the information content when such an event actually occurs. In general the choice of the decreasing function of the probability of the occurrence of an event is the logarithm of the reciprocal of the probability of the event (x) given by

$$h(x) = \log_b(1/x) = -\log_b(x) \qquad [2]$$

The logarithmic function is preferred to other decreasing functions due to its additive property in the case of independent events. Secondly it is monotonically related to the number of possible outcomes. Consider e_1 and e_2 to be events with probabilities x_1 and x_2 respectively and that e_1 and e_2 are stochastically independent. Thus the probability that e1 and e2 both occur is given by

$$p(e_1 \text{ and } e_2) = x_1 x_2 \qquad [3]$$

The information content of e_1 and e_2 is therefore given by

$$\begin{aligned} h(x_1 x_2) &= \log 1/x_1 x_2 = \log 1/x_1 + \log 1/x_2 \\ &= h(x_1) + h(x_2) \quad [4] \end{aligned}$$

The additive property is thus satisfied.

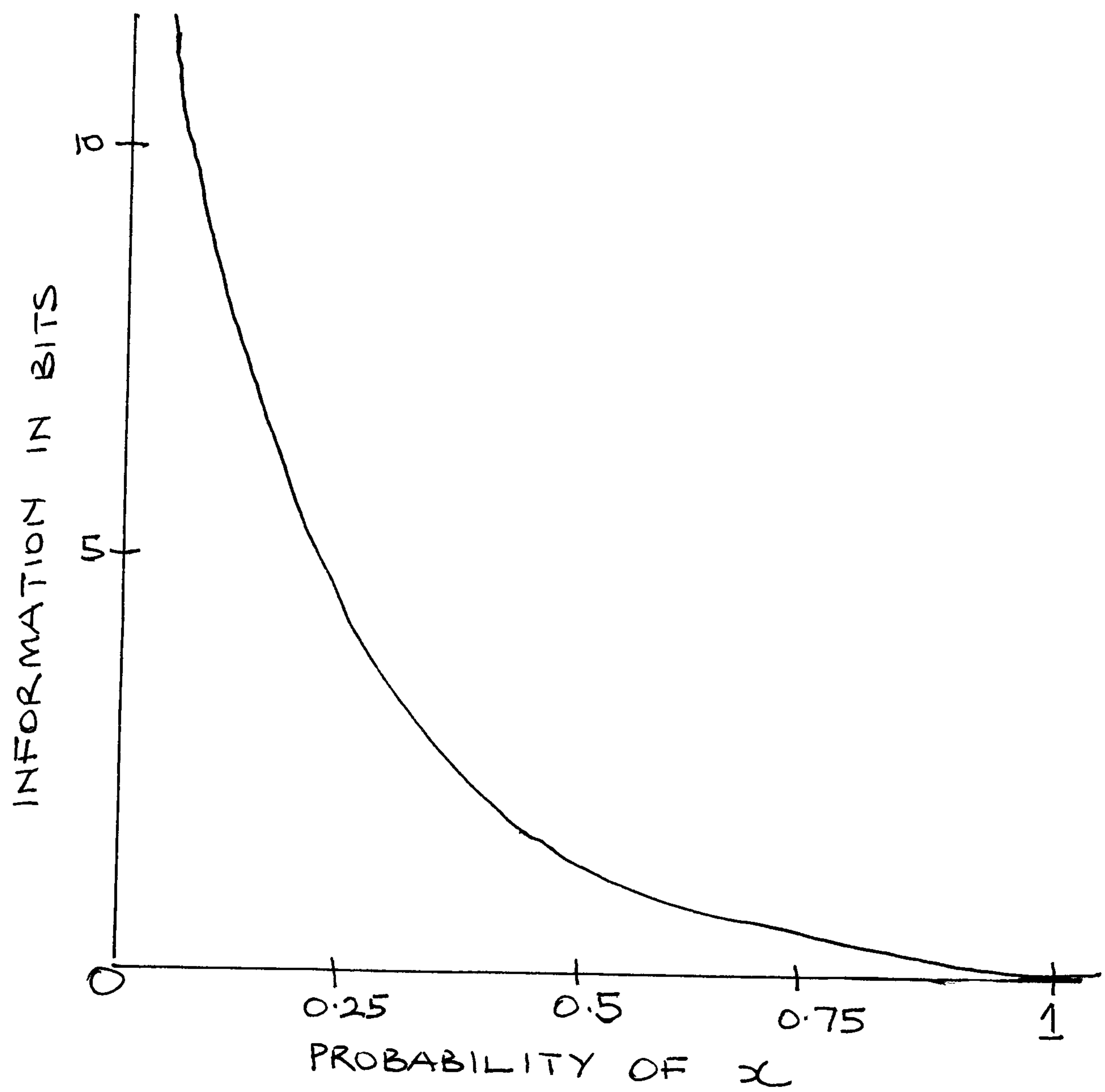
The logarithmic measure also ensures that each successive event adds the same amount of uncertainty and thus makes available the same amount of information. Any logarithmic measure will ensure the additive property. The logarithmic measure in common use is base two due to its advantage that doubling or halving possible outcomes increases or decreases uncertainty by only one unit. The unit of measurement of information in the binary system is bit. Information contained in an event (x) is therefore,

$$h(x) = 1/\log_2 (x) = -\log_2 (x) \qquad [5]$$

The information content is illustrated in fig 3.1.

FIGURE 3.1

THE INFORMATION CONTENT OF H(X)



3.5.1 CONCEPT OF EXPECTED INFORMATION (ENTROPY)

Given a set of events $e_1, e_2, e_3, e_4, \ldots en$ with probabilities $x_1, x_2, x_3, \ldots x_n$, then

$$Ex_i = 1 \quad x_i > 0 \quad i = 1, \ldots, N \qquad [6]$$

The information content of any event e_i is given by

$$h(x_i) = -\log_2 x_i \qquad [7]$$

when a definite message is received that e_i has indeed occurred.

Since any of the events e_1 to e_n is equally likely to occur, how large the information content will be cannot be determined since all categories of x are equally likely to occur. However, the average or expected information content can be computed before the actual message is received about the occurrence of a particular event. The expected information content is therefore given by

$$E[h(x)] = Ex_i h(x_i) = Ex_i \log_2 1/x_i$$

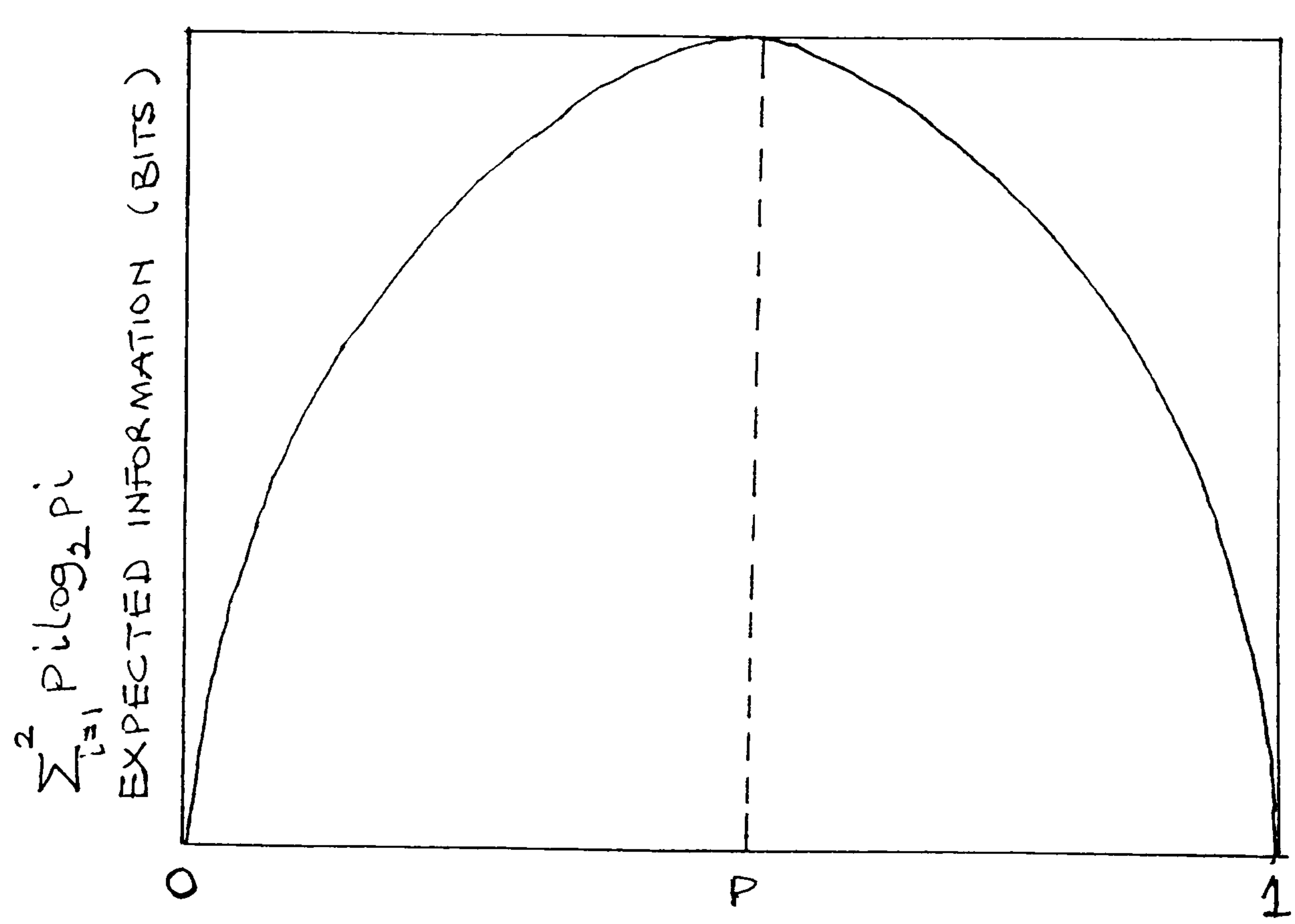
$$= - Ex_i \log_2 x_i \qquad [8]$$

The concept of average or expected information [8] is called entropy which is a term that originated in physics in the second law of thermodynamics. In a special case where n=2, x_i =p and $x_2 = 1 - p$, the properties of expected information function is shown in figure 2. There is maximum uncertainty as to whether e_1 or e_2 will occur when p = 0.5.

From figure 2, when p = 0 or p = 1, the occurrence of the event h(0) and h(1) are both zero ie they provide no information. The concept of entropy has been suggested for use in research into aggregation of financial statement items, Lev (1968). The major objective is to ascertain the amount of information loss that result from aggregation of a large number of small items. The assumption is that financial statement users would prefer detailed rather than aggregate figures in their decision-making.

FIG 3.2

EXPECTED INFORMATION h(x) FOR N = 2



Under this assumption therefore, aggregation result in loss of information to users. Lev argues that:

"A financial statement may be interpreted as a probabilistic message ie a message which informs one about the probabilities (fractions) of a set of items. As the probabilities of two items are combined, the information content of the message(financial statement) decreases. The loss of information is the difference between the two entropies before and after aggregation"p 253-4

In operational terms, suppose the composition of assets in the balance sheet is made up of four categories of items, A, B, C and D. Assume also that the fractions associated with these items in relation to the total assets are 0.5, 0.25, 0.125 and 0.125 respectively. The average information content of the assets is given by:

$h(x) = E\ x_i \log_2 x_i$, x_i=probabilities, i= A,B,C and D

The values are shown in table 2

TABLE 3.1

AN ILLUSTRATION OF AVERAGE INFORMATION IN ASSET COMPOSITION

Category	x	$-\log_2 x$	$-x\log_2 x$
A	.500	1.00	.500
B	.250	2.00	.500
C	.125	3.00	.375
D	.125	3.00	.375
		$-\ E\ x\log_2 x$	1.75 bits

From table 2, the information content of the assets is 1.75 bits. It must be clear from the discussion so far that if the asset composition had been equal, the expected information would have been 2 bits provided logarithm to base two is used in the measurement. Assume again that it is decided to aggregate C and D in table 2. One reason for the aggregation might be the argument that C represents the amount of liquid cash and D represents say investments of ordinary shares in a certain firm quoted on the stock exchange. It could be argued that since the ordinary shares are highly liquid, they are as good as cash. Table 3 gives the values after the aggregation.

TABLE 3.3

ILLUSTRATION OF AVERAGE INFORMATION IN ASSET COMPOSITION

Category	x	$-\log_2 x$	$-x\log_2 x$
A	.500	1.00	.500
B	.250	2.00	.500
C	.250	2.00	.500
		$-\Sigma x\log_2 x$	1.500

After the aggregation therefore the average information is now 1.54 bits. The aggregation has therefore resulted in information loss of 0.25 bits. Entropy can therefore be useful research tool in quantifying the information contained in financial reports.

3.5.0 INFORMATION AND VALUE (PRAGMATIC INFORMATION)

The motivation for collecting information is to achieve a specified goal or objective. Kharkevitch (1960) suggests the measurement of the value of information by ascertaining the degree to which it facilitates the attainment of a set goal. The degree of such a goal attainment can also be measured in terms of the probability revisions that result from the receipt of a given message.

If prior to obtaining specific information, the probability of achieving a goal was x_θ and after obtaining specific information, the probability of achieving the goal is now x_1, the value of the information received h(v) is given by

$$h(v) = \log_2 x_1 - \log_2 x_\theta \qquad [9]$$

If x_θ and x_1 are set to $1/x_\theta$ and $1/x_1$ respectively, then

$$h(v) = \log_2 1/x_1 - \log_2 x_\theta \qquad [10]$$

The measurement of the value of information in terms of the statistical quantity of information is justified on the grounds that information is a measure of reduction in uncertainty and uncertainty reduction also plays an important role in the goal achievement process.

If a message is sent prior to the achievement of a certain goal and after the message the goal is completely achieved as a result of the use of the signals in the message, then, the value of the information sent is comparable to the uncertainty that existed before the message was received. Assume an investor depends on financial reports in his/her portfolio balancing decision. Assume again that such an investor has initial doubt as to the degree to which the portfolio balancing decision should be carried out and he/she has no prior knowledge of the contents of the financial reports before they are released. The value of the information contained in the financial reports therefore will determine the degree to which such an investor will re-balance the portfolio. The quantity of information and the value of that information are therefore related when the achievement of a goal is enhanced by the information received.

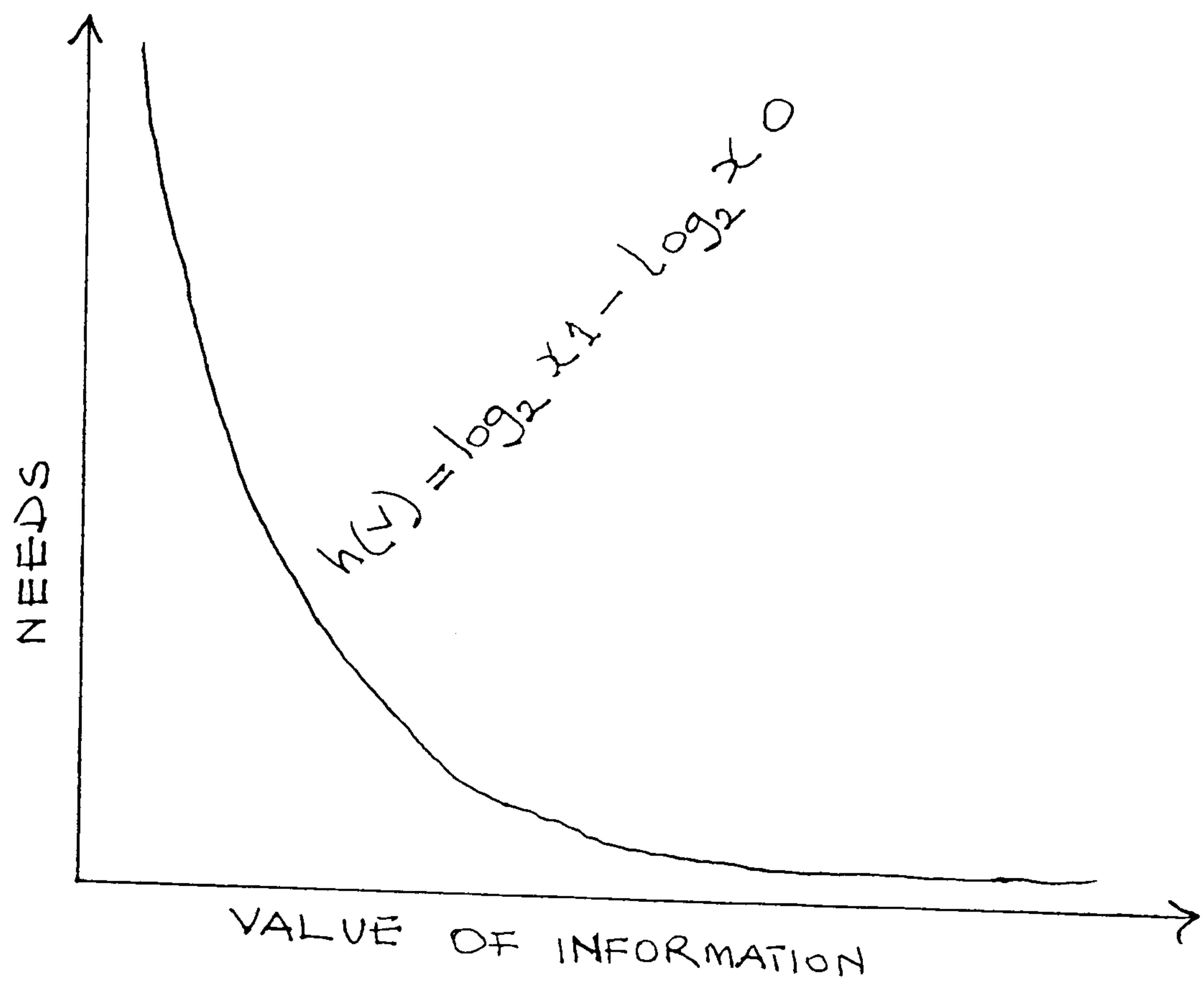
Marschak and Radner (1972) suggest the value of information as:

> "...that cost which would equate the maximum net expected utility for the given information structure to the maximum net expected utility obtained with no information"p85

The above suggestion is deeply rooted in the theories of statistical decision and economic utility. The two measurements of the value of information assume that information has value only if it leads to the attainment of some specified needs and goals. As needs and goals are satisfied therefore, the value of information can be driven to zero in the case of attainable needs and goals. However, where ideal goals are concerned or where needs and goals recur constantly, then, the value of an information will always be positive and asymptotic. Figure 3 illustrates the relationship between needs and value of information.

FIGURE 3.3

RELATIONSHIP BETWEEN NEEDS AND VALUE OF INFORMATION



3.5.3 SEMANTIC INFORMATION

The value of a piece of information deals with the pragmatic aspect of that information. However for information to have value, the receiver of that piece of information must be able to attach a meaning to the information signals. The semantic aspect of information is very important and without it communication cannot take place. Feltham (1972) defines information as:

"...the meaning derived from data provided the knowledge of the person receiving those data is changed. Hence, whether certain data provide information depends on the state of the receiver at the time the data are received. In a decision theoretic context, knowledge is represented by the person's probability distribution over the events that may have occurred in the past and those that may occur in the future --- data are information if their receipt results in a change in the receiver's probability distribution."p9

The importance of the above definition is that for information to change behaviour, the receiver must abstract some meaning from it. This is important because he wants to make a better selection out of a number of possible choices. A wrong meaning will lead to a wrong selection.

Shreider (1965, 1966) has proposed the measurement of semantic information by reference to changes in the knowledge bank of a given receiver as represented by his total experience. Conceptually to measure semantic information in sign (data, messages) the knowledge of the receiver before and after a given sign is received is measured. The change in knowledge is the amount of semantic information received. The receiver of a message has at any given time, a certain amount of stored knowledge and this reflects such a receiver's world view. Shreider calls such stored knowledge thesaurus and is denoted by [Θ]. Any amount of semantic information [I] contained in a given message T is a function of the interaction between the thesaurus and the new message ie

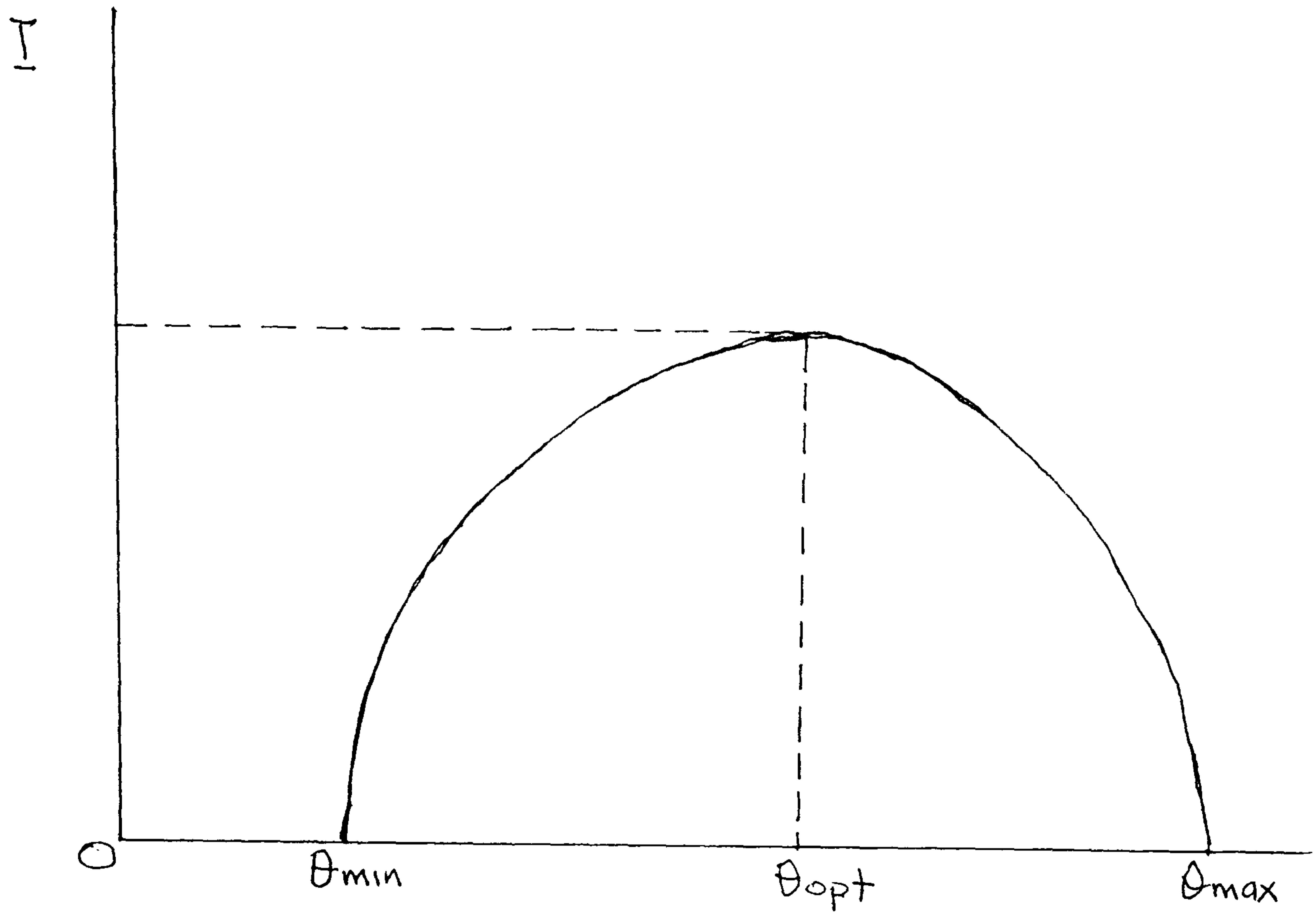
$$I = f(T, \Theta) \qquad [11]$$

The change in the thesaurus will depend on the influence of the new message T. The message receiver under [11] has some previous knowledge in memory. On the receipt of a new message, the receiver calls on the thesaurus to evaluate it and the understanding of the new message will depend on the state of the receivers thesaurus Θ. An increase in knowledge under Shreider's model can lead to an increase or decrease in information need unlike a statistical decision where an increase in knowledge actually reduces the need for more information.

The relationship of a priori knowledge to the quantity of semantic information that can be extracted from a message T is shown in figure 4. Θmin is the minimum amount of prior knowledge that is required to enable a receiver to understand a given message T. Θopt represents the optimal amount of prior knowledge which will permit the receiver to extract all the information in a given message while Θmax is the required amount of prior knowledge beyond which the receiver of a message will extract nothing new. The thesaurus at this level knows everything. In terms of decision-making, interim accounting information can enhance investment decision-making if it conveys something new to investors' knowledge bank.

FIG 3.4

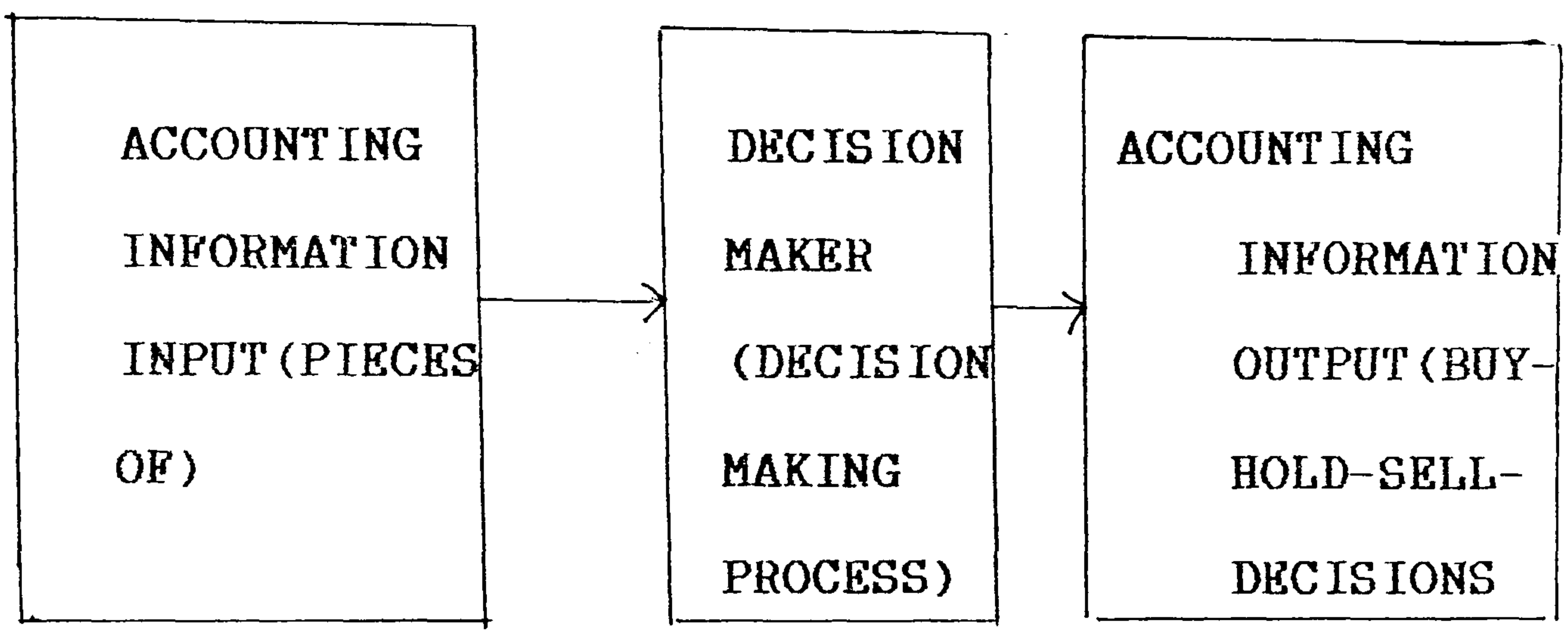
RELATIONSHIP OF PRIOR KNOWLEDGE TO SEMANTIC INFORMATION IN A MESSAGE



3.5.4 INFORMATION RECEPTION CAPACITY

The external accounting function is primarily concerned with information production and transmission. In the context of the present research, what is transmitted is basically decision relevant data to investors. The communication system is made up of the accounting information at one end and the resulting decisions of the users on the other end with the decision maker/investor in the middle. This is illustrated below

3.5.5 ACCOUNTING_INFORMATION_AND_DECISION-MAKING



Miller (1960) asserts that if information input increases beyond some limit, it could result in a bad output decision being made. As information input rises, output will rise as a linear function of input up to a certain point, levelling out at a channel capacity which cannot be exceeded. After some period at the capacity level, output decreases swiftly if the input increases. There exist therefore a level at which a receiver of information can effectively absorb the quantity of information that is made available. Beyond a certain quantity of information input therefore, the receiver cannot effectively handle the signal decoding processes involved and this information input overload can result in sub-optimal decision-making.

3.6.0 CONCLUSION

This chapter has been concerned with aspects of information theory which is deemed to be important in understanding the relevance of corporate financial reports to investors. Information theory itself is a wide ranging literature and the discussion has concentrated only on limited aspects of the subject. If interim financial reporting is viewed as a continuous process of making information available to investors, information theory has the potential to explain why investors might demand more frequent reporting to aid their investment decision-making task.

The major objective of financial reporting discussed earlier was pointed out as the provision of information for investment decision-making. Information reduces uncertainty about the outcome of some event of which prior knowledge is limited. The extent of investors' reaction to the public release of interim financial reports therefore, will depend to a large extent on the degree of uncertainty existing before the public release of the earnings information. The pre-disclosure information environment will determine the degree of surprise in the financial reports when they are made public.

Where a pre-disclosure information environment permits regular flow of information between a firm and the investment community about the firm's activities, the market's expectation of the information in the interim reports will closely reflect the actual information contained in the interim financial reports on their public release. Studies by Atiase (1980) and McNichols and Manegold (1983) appear to confirm such a proposition. The issue in the current study however, is not the degree of investors reaction to the public release of interim financial reports caused by the pre-disclosure information environment. The issue that is investigated is whether any reaction takes place at all, and therefore whether interim financial reports can be shown to contribute to the investment-decision process. To establish the potential relevance of interim reports, it is not necessary that they rank closely to annual reports or other sources of information.

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CHAPTER FOUR

THE EFFICIENT MARKET HYPOTHESIS

4.4.0 INTRODUCTION

This chapter will be concerned with a discussion of The Efficient Market Hypothesis. The rationale for such a discussion lies in the fact that this study is being undertaken in the context of an efficient securities market. It is therefore important that the nature of an efficient market be considered. In the study of the information content of interim accounting reports, the chief methodology is the examination of the behaviour of security prices of the firms issuing such interim reports. The assumption is made of the fact that the securities market is efficient in its pricing of the securities that are traded. It is also assumed that the process of price formation corresponds to the existing theory on how the market arrives at equilibrium price levels. It is therefore very important that some discussion is made of existing evidence and issues involved in the notion of market efficiency.

EMH - DEFINITION

Fama (1970) defines an efficient market as a market where prices "fully reflect" all available information. A market is said to be efficient therefore if at any period in time the prevailing prices are reflections of all relevant available information. In effect then, all price sensitive information that the market possesses is discounted into the prices of assets.

This notion of efficiency relates to the speed of price formation in the market. What is implied therefore is that when any information becomes available and that information is price sensitive, it will without bias, and in an instantaneous manner, be impounded in the price of an asset.

It should be noted that when one talks of an efficient market, the notion is not restricted to the capital markets. The notion of an efficient market embraces the markets for commodities as well as the capital market. Indeed the pioneering studies in the area of market efficiency began with the commodities market.

Fama (1970) notes that to test for market efficiency, there is the need to specify testable implications of the model of efficient markets. He states:

> "The definitional statement that in an efficient market prices "fully reflect" available information is so general that it has no empirically testable implications. To make the model testable, the process of price formation must be specified in more detail. In essence we must define somewhat more exactly what is meant by the the term "fully reflect." p384

He developed an exact definition of market efficiency expressed in terms of equilibrium return on the basis of an available information set at a particular time period. He describes notationally expected return as follows:

$$E(\tilde{P}_{j,t+1} \mid \phi_t) = [1 + E(\tilde{r}_{j,t+1} \mid P_{j,t})] \qquad [1]$$

where E is the expected value operator;

$P_{j,t}$ is the price of security j at time period t;

$P_{j,t+1}$ is the price of security j at time t+1 (where intermediate cash is reinvested;

$\tilde{r}_{j,t+1}$ is the one-period return given by $(P_{j,t+1} - P_{j,t})/P_{j,t}$

and

ϕ_t is the set of information impounded in the price of the asset at time t.

Fama pointed out that if market equilibrium can be stated in terms of expected return based on the information set (ϕ), the empirical implication is that any trading based on the information set (ϕ) can yield no profit or return greater than equilibrium profit or return. Fama stated the expected return in terms of "fair game" variables thus:

Let $x_{j,t+1}$ and $z_{j,t+1}$ be defined as follows

$$x_{j,\ t+1} = P_{j,\ t+1} - E(\tilde{P}_{j,\ t+1} \mid \phi_t)$$

and

$$z_{j,t+1} = r_{j,t+1} - E(\tilde{r}_{j,t+1} \mid \emptyset_t) \qquad [3]$$

then

$$E(\tilde{x}_{j,t+1} \mid \emptyset_t) = E(\tilde{r}_{j,t+1} \mid \emptyset_t) = 0 \qquad [4]$$

LeRoy (1976) criticised Fama`s description of the theory of efficient capital market in terms of "fair game" model as tautological. Fama (1976) concedes that his presentation of the efficient market theory as described above could be misleading and reformulates it as follows:

Let

$\emptyset_{t-1}$ = the set of information that is available at time t-1

and

$\emptyset^M_{t-1}$ =the set of information the market utilises in setting security prices at time period t-1,

market efficiency requires that in setting prices at t-1, the market uses all the information in $\emptyset_{t-1}$ correctly ie

$$\emptyset^M_{t-1} = \emptyset_{t-1} \qquad [5]$$

It means the market information set used in assessing security prices includes all the available information. In effect then, there is no price sensitive information that the market ignores in setting prices and it does so correctly thus:

$$f^{M}(P_{1t}, P_{2t}, P_{3t} \ldots P_{nt} | \phi^{m}_{t-1}) = f(P_{1t}, P_{2t}, P_{3t} \ldots P_{nt} | \phi_{t-1}) \quad [6]$$

where

$f^{M}(P_{1t}, P_{2t}, P_{3t} \ldots P_{nt} | \phi^{m}_{t-1})$ is the probability density function for security prices at time t assessed by the market at time t-1 on the basis of the information set ϕ^{m}_{t-1} and

$f(P_{1t}, P_{2t}, P_{3t} \ldots P_{nt})$ is the true probability density function of security prices at time t implied by the information set

The above relationship implies that the market assessment of prices on the basis of the market information set is equal to prices implied by available information set.

Fama distinguishes three levels of market efficiency based on the suggestions of Roberts (1959). Each level pertains to a particular information sub-set that is reflected in the price of a security. The first level of market efficiency is the weak form where security prices at any time period is said to reflect all past price information. The information set (ϕ t-1) becomes the history of past prices thus:

$$\phi_{t-1} = (P_{t-1}, P_{t-2}, P_{t-3}, \ldots)$$

The second level of market efficiency is the "semi-strong" form which is concerned with whether prices reflect all publicly available information. With the third level of market efficiency which is the "strong form", the relevant information set (ϕ_{t-1}) is all price sensitive information whether publicly available or not.

Fama states two testable implications for market efficiency on the assumption that prices formed on the basis of the available information set are equal to the prices determined on the basis of the market information set. Therefore in an efficient market,

(1) there can be no trading rule that can yield a return higher than the market`s assessment of expected return of a security

(2) there can be no way in which the information set ϕ_{t-1} available in t-1 can be used correctly to assess the expected return of a security which will be different from the equilibrium expected value which is the market assessed value.

Fama (1976) however points out in his reply to LeRoy that market efficiency says nothing specific on how $Em(\tilde{R}_{j,t} \mid \phi^{m}_{t-1})$, the equilibrium expected return is determined by the characteristics of $fm(Pt \mid \phi^{m}_{t-1})$, the market assessed density function of Pt, which is the vector of security prices at time t. He points out that a model on how equilibrium expected return is related to the characteristics of the market assessed density function of vector of security prices is needed. This will make it possible to test the hypothesis that the true expected return on any security is equal to the equilibrium expected value in an efficient market. Fama makes it clear however that the absence of such a model does not restrict his definition. What is required is the assumption that market equilibrium can be stated somehow in terms of expected returns. Such model of expected return states that given the information set ϕ_{t-1} at t-1, the only correct assessment of security j is its equilibrium expected value, which is the market assessed expected value.

To describe the market as being efficient requires that trading in securities be costless and that all market participants have free assess to all pertinent information about a security. Market participants should also have common agreement on how and to what extent information should affect current and future distributions of prices of each security. These are however the sufficient but not the necessary conditions for market efficiency since they do not imply a specific equilibrium model by which prices are determined. What the conditions state is that whatever the equilibrium price that is obtained in the market, it is a correct reflection of all the available price sensitive information.

Fama (1970) states that capital markets will still be efficient even if the sufficient conditions do not hold so long as

(1) transactors take cognisance of all the available information

(2) a "sufficient number" of investors have ready access to the available information and

(3) there are no investors who can consistently make better evaluations of all the available information than the market.

This section has been concerned with the notion of market efficiency and its testable implications developed by Fama. It has also concerned itself with the sufficient and necessary conditions for market efficiency. The question of whether the capital markets are really efficient is an empirical and debatable one. The issue of market efficiency has occupied the attention of researchers for a considerable time now and it is this that the next section will consider.

4.1.0 EMPIRICAL_STUDIES_OF_MARKET_EFFICIENCY

4.1.1 U.K. WEAK-FORM TESTS

Kendall (1953) was the first to examine the temporal dependence of U.K. industrial share prices. He used weekly data for 18 industrials and one composite U.K. Stock Market indices over the period 1928 - 1938. Kendall found that the serial correlation present in the series was so weak that they were of little investment value for predictive purposes and that investors cannot make money on the stock exchange by watching price movement unless they possess some extraneous information.

Brealey (1970) also examined the distribution and serial correlation of the daily changes in the Financial Times All Share Index (FTA Index) over the 1665 day period between 10th April, 1962 and 28th October , 1968. Brealey found a first order serial correlation coefficient of 0.219 . He noted however that the correlation coefficient could be biased upwards as a result of the fact that prices used in calculating the FTA Index do not occur simultaneously. A second order correlation co-efficient of 0.018 was found by Brealey.

The FTA Index in effect become a measure of the average level of prices that has occurred. As a result, correlation not present in the original data could appear in it even if the original data were a random chain. The reason for this is that the correlation is of first order differences of averages (Working 1960)

In order to ascertain the effect of such a problem, Brealey constructed a new index made up of button quotations obtained at approximately 2pm each day. The use of the new index provided a serial correlation of 0.19 which was significantly different from zero at 95% level for the year 1968. Using the FTA Index for the same period resulted in a correlation coefficient of 0.32 which was 40% more than the use of the new index. Even though using the new index resulted to a significant reduction in the serial correlation coefficient. The results show a slight dependence between market returns on successive days. Brealey however cautions that the observed persistence in the market movement was weak and insufficient to yield any profits to one who wanted to exploit it. As a result, the random walk hypothesis is not seriously violated or infringed.

Dryden (1970) also examined the temporal dependence and filter tests of daily prices of three series of price indexes namely, FTA 500 Share Index, FTA Capital Goods Index and the Daily Mail Industrial Share Price Index. Daily data of over 1000 prices were collected for each series. The results of the study of the serial correlation of the prices were on the whole not statistically significant though each of the index series had a statistically significant first order serial correlation coefficient

In another study of the time series properties and run tests of daily prices of 15 shares, Dryden (1970) found that the serial correlation coefficient of differencing intervals were not significantly different from his earlier studies. His run tests also provided little evidence for rejecting the random walk hypothesis. Dryden therefore concluded that the behaviour of shares studied were consistent with the random walk theory. He however sounded a cautious note that a slight qualification for the evidence of a very short temporal dependence of share prices should be allowed but a stronger case cannot be made. Dryden`s studies therefore support the efficiency of the U.K. securities market in its weak form. This efficiency is however less than that of the US as studies there appear to indicate.

Kemp and Reid (1971) examined the Random Walk Hypothesis using a random sample of shares quoted on the London Stock Exchange. Their study covered the period October 28th to

January 10th, 1969. 52 daily price observations were used in the study. Their conclusion was that "share price movements were conspicuously non-random over the period considered." This conclusion was on the basis of non-parametric tests of runs and computed serial correlation coefficients. Most of the shares that exhibited the non-randomness were the small and and less known firms. These firms might not have received much attention from analysts. Again one should be cautious in interpreting their conclusions as a serious indictment of the Random Walk Theory because the period the study covered was relatively short.

Solnik (1973) made a comparative study of European share prices and found a mean daily serial correlation coefficient of the 40 U.K. shares studied of 0.072. The mean monthly serial correlation coefficient of the 40 shares was 0.02. This confirms Dryden`s findings of a very short term temporal dependence of share prices. This dependence was however not significant enough to yield a profitable trading strategy. An examination of the stability of the serial correlation coefficient over time indicated that it was not stable and therefore further supports the Random Walk Theory.

Guy (1975) examined the temporal dependence of monthly returns of shares quoted on the London Stock Exchange. The reported results showed that the mean serial correlation coefficient for 90 shares over the period 1960 - 1970 was -0.04. Guy`s conclusion was that the result could indicate market inefficiency. He however accepts that no strong case could be made for market inefficiency due to timing and measurement problems associated with the study

Another study of the temporal properties of U.K. share prices was by Girmes and Benjamin (1975) using a sample of 543 share prices covering a period of 600 days from October 1968 to April 1971. They found that 20% of the shares studied behaved in a non-random manner. Like the Kemp and Reid`s study, the period covered was too short and the firms showing some evidence of non-randomness were the small ones. Marsh (1977) has also criticised Grimes and Benjamin for failing to design their study to take into account the fact that their technique is valid only if share price changes are continuous and symmetric. The superior vertices and index of maximum distance tests employed by them also disregarded the effects of "no-change" observations.

All the studies above involve the examination of the statistical independence of share prices with a view to accepting or rejecting the random walk hypothesis. A second group of studies also involve an examination of a trading strategy which if share prices follow a random-walk will be expected to achieve no greater capital return than a buy and hold strategy. These studies involve the examination of the profitability of trading rules.

Dryden, as noted earlier, found that there were no pattern of rates of return which supports the rejection of the theory that subsequent prices changes on the stock market are random. Though Dryden found a higher rate of return with small filters which was above the buy-and-hold returns, no adjustment was made for transaction costs. The conclusion of Dryden was that a trading strategy such as the filter rule did not seriously infringe the weak form of The Efficient Market Hypothesis.

Brealey (1970) also tested the hypothesis that:

> "If by the end of the day the market has risen, purchase any share whose price has remained unchanged. Conversely, if the market has fallen, sell short the shares whose price has not changed. In either case close the position at the end of the subsequent day."p38

Brealey`s rationale for this strategy was due to the presence of some slight positive dependence between successive daily rates of return. He argued that jobbers may not adjust quotations of shares that have shown little activity. The price of such shares will therefore lag behind that of the rest of the market. A sample of 29 shares were used to test this strategy. The reported result was that in 15 out of the 29 cases the shares provided a lower rate of return after they were purchased than after they were sold. The average return was marginally higher in the case of purchases than sales, however the median return was lower. Brealey concludes that

> "...delayed response is not sufficient to offer the opportunity for any significant profit after allowance for dealing costs."p38

Cunningham (1973) asserts however that "the degree of dependence in a series of Financial Times Industrial Ordinary Share Index for 1935 to 1969 (1800 weekly observations) and a much more comprehensive index for 1965 to 1971 show significant degree of predictability". Cunningham asserts further from the results of his study that an investment strategy could be developed based on the knowledge of past prices. This seems to be a serious contradiction of the efficiency of the U.K. Stock Market in its weak form. In his analysis of 1800 one, two, three, and up to eight weekly changes in the Financial Times Index from mid 1935 to the end of 1969, Cunningham reports a clear degree of dependence of changes in the FT Index on previous changes.

In an unpublished reply to Cunningham's study, Dimson (1974) points out that no profitable trading strategy could be developed from a knowledge of the sequence of past prices as Cunningham alleges. Dimson's main arguments are that Cunningham's study is subject to the problems of non-trading and selection bias and therefore his "profits" are spurious.

Girmes and Damant (1975) in their analysis of 484 shares over 1304 days in the period 1969 to 1973 conclude that a significant "head and shoulder" patterns in their simulated data indicate that a trading strategy could be developed from the knowledge of the series of past prices. However, as Girmes and Damant admit that the period covered by the study showed a marked head and shoulder movement of the market index itself. This could therefore has led to a selection bias. Marsh (1977) has also accused them of "data mining" in their choice of smoothing technique and in their definition of "head and shoulders".

Griffiths (1970) used relative strength rules an weekly data in a study of 200 shares. He reports that the top 10% shares outperformed the market during the year by 3%. The bottom 10% also underperformed the market by 3% with the rest performing more or less in line with the market. The magnitude of the reported profit was however insufficient to cover dealing costs and therefore the study is not an indictment of the efficient market hypothesis.

The above studies on the efficiency of the market in the weak form generally appear to indicate a support for the EMH

4.1.2 U.K.-SEMI-STRONG FORM TESTS

Market efficiency in the semi-strong form is concerned with that subset of the market information set that is publicly available. This obviously includes weak form information set and all published price sensitive information such as earnings reports, information about dividend,stock split, new security issues, etc. The objective of studies in the semi-strong market efficiency is to ascertain whether particular pieces of information concerning the business enterprise have been captured in the prevailing market prices such that no avenues exist for abnormal profits to be made. In effect the broader objective is to establish whether prices at any point in time reflect all relevant public information utilised by the market in setting prices.

The question of what information is relevant becomes an important one in any discussion of market efficiency. The question of information relevancy and whether it affects the firm's share price should be of direct interest to those who have been charged with the responsibility of reporting on a periodic basis an enterprise's performance.

Likewise, auditors who audit the reports by company officials as well as regulatory bodies concerned with information about securities all have an interest in determining what information is price sensitive. Studies in semi-strong form market efficiency therefore involve an investigation into the adjustment of security prices to different pieces of information which are deemed relevant or price sensitive. Any piece of event that could directly or indirectly have cash flow consequences upon the firm could therefore be viewed as relevant. The semi-strong form studies therefore generally attempt to measure the reaction of the market to particular pieces of information or events.

In the U.K. context, the first major study into the semi-strong form of the efficient market hypothesis was the work of Brealey (1970). Brealey examined the reaction of the Financial Times Actuaries All Share Index to the publication of the monthly trade figures between 1962 and 1969. The classification adopted was that if the net balance figure reported was below the the long term average it was termed a pleasant surprise. Brealey reports that on the day before the announcement and the following two days, the market rose if the trade balance was above the long- term average and vice-versa. Brealey concludes from the results that the market takes more than a day to adjust to new information. He concedes, however, that a number of observations could not be correctly classified and this might have biased the market movement figure downwards. This mis-classification could not have been more than one half while the market movements over the three day period were -4% and 3% respectively for below average and above average balance figures. The movement is thus very small to significantly affect the validity of EMH in its semi-strong form. Brealey concludes from his findings however that share prices in general do not discount instantaneously the implications of new information.

Firth (1974) examined 441 scrip issues made by U.K. companies over the period 1968 to 1970. Among the findings was that on the whole companies made script issues only if they have performed well in the period leading to the issue date. This collaborates earlier finding made by Fama, Fisher, Jensen and Roll (1968) in the US. Firth concluded that no profitable trading strategy could be developed from the announcement of scrip issues since the scrip issues had no impact on share prices. However, he found out that share prices did react to the news about dividends and earnings that accompanied the scrip issue. The reaction of the market to the news of dividends and earnings was quite rapid and seemed to be completed by the end of the announcement day. Firth's conclusion then was that his study provided evidence of market efficiency in the semi-strong form.

Firth (1976b) made another study on the effect of earnings announcements on the share prices of similar type firms. It was the first study made on the effects of company earnings announcements on share prices in the U.K. Firth's sample consisted of 87 firms classified into four groups namely breweries, retailers, shipping and banks. The impact of earnings announcement of each firm on the share prices of the other members of the group were examined. Firth found out that on the day of the announcement of positive results, firms in the industry as a whole made abnormal gains of 2.1%, ie average price of securities of similar type firms rose by 2.1%. Similarly where the results announced were less than than predicted by the market, the industry as a whole experienced abnormal loss of 3.7%---a poor reception by the market. Firth concludes therefore that financial reports have information content and this information is used by the market in evaluating the firm making this particular announcement as well as similar type firms. He concludes also from the study that the market reaction to the announcements of earnings is fairly rapid and lasts about two days but no profitable mechanical trading strategy can be evolved from the announcement of earnings.

Morris (1975) examined the reaction of share prices to inflation- adjusted earnings figures. The computed abnormal returns he reported were too low to even cover transaction costs when industry effects were taken into account. Morris study in effect lends support to the efficiency of the securities market in its semi-strong form.

Firth (1976a) examined how the shares of firms engaged in take-overs behave in the period immediately around the bid period ie 30 days prior and subsequent to the bid. The sample consisted of 190 take-overs made in the years 1973 and 1974. The results of Firth`s study showed that on the average the firms acquired made abnormal gains of 10% in the period before the bid. On the announcement of the bid there was an additional gain of 23% and a further gain of 2% in the month following the bid period. The return after the bid is announced is so small that it cannot cover transaction costs if one were to act on the basis of the announcement of the bid. Firth also examined the shares of biddee firms to see if a profitable trading strategy could be developed from the announcement of take-overs. The investment strategies examined were

a) Invest in all biddees which are subject to counter bid or where the terms are revised. The rationale being that firms subject to counter bid show a superior performance

b) Invest in all biddees as soon as the bid announcement is made.

Firth reports that in both strategies the results were poor and
actually led to a loss in investor wealth. The first strategy led to an average net return of -0.54%and the second an average net return of -1.4%. Firth concludes from his findings that the stock market is reasonably efficient in its pricing of the securities of biddee firms.

Firth (1975) examined the impact that the announcement by investors of the acquisition of 10% or more of the shares of a firm has. This was in response to Section 33 of the Companies Act of 1967 requiring an investor owning 10% or more of the equity shares of a company to notify the company of that fact within fourteen days starting with the day following the occurrence. The study examined all announcements made during 1973 of an investment holding of 10% or more in a quoted company. The reported findings of Firth were that there has been a return build-up of 5% in excess of the expected return from 30 days to the day of the announcement. On the day of the announcement, there is an average rise in share prices over those expected of 3.3% with 94% of firms making positive gains. Firth concludes that price is influenced by investing companies rapidly increasing their stake as take-over conclusions is usually drawn from the announcement.

Ten of the eighty-five companies invested in were bid for. The average bid premium over the price prior to the day of announcement was 15%. Since there is no way of knowing which announcement will be followed by a bid, Firth concluded that no profitable investment rule can be derived from such announcement since all shares would have to be purchased while the average excess return reported in the study is not very much different from zero even without transaction costs. In Firth's view therefore, his study is a further indication of the efficiency of the securities market in the semi-strong form.

In a study on whether investors following recommendations from papers and journals could increase their starting capital and outperformed the market, Firth (1972) reports that his results could not provide any evidence against the efficient market hypothesis. He concludes that the information contained in newspaper recommendations are fully impounded by the market in the prices almost immediately.

Fitzgerald (1974) carried out an extensive examination of 635 recommendations made by brokers along the lines of Firth (1972). Fitzgerald's results show that the average abnormal return from the day before the recommendation up to a week later was 1%. The cumulative abnormal return one month after the recommendation was 0.5%. Using factor and cluster analysis, Fitzgerald classified the brokerage firms into seven groups. This classification was based upon replies to questionnaires and interviews. In the seven groups were two notable groups. One group appeared to be sophisticated and research oriented and the other 'unethical' in the sense that they were quite ready to engage in pre-recommendation dealings. Fitzgerald's reported results indicated that the cumulative abnormal returns for the 220 recommendations made by the sophisticated and research oriented group increased over time after the recommendation. There has been a total abnormal return of 6.5% one month after the recommendation.

With the unethical group, the cumulative residual first rose and then fell sharply. By the end of the month after the recommendation, there was an abnormal loss of 6.5%. Fitzgerald concludes from his findings that the market is inefficient in the pricing of securities. One should however be a little cautious in accepting or rejecting his findings. There were a number of infrequently traded securities in the sample of firms studied. As later studies show, infrequently traded securities are subject to measurement errors,[Marsh (1977)]. Marsh also points out that some of Fitzggerald`s share recommendation related to periods before the brokerage firms volunteered to be investigated which could undoubtedly have resulted in selection bias. However it was clear from Fitzgerald`s results that sophisticated brokerage firms have some forecast ability. Firth`s (1972) results also showed that some forecasters at least two tipsters appeared to have significantly outperformed the market. Firth`s period of study was however too short to be seen as a concrete evidence against the EMH. There appears to be a further need for research along the lines of Fitzgerald and Firth into the semi-strong form of the EMH since the evidence is not conclusive.

Sunders and Woodward (1976) investigated the effects of U.K. money supply variables on the FT all share index in the period 1971 to 1975. The publication of money supply figures is clearly an event conveying information about the economy and hence may influence share prices. Sunders and Woodward investigated the speed at which the market impounds the information contained the the announcement. They conclude from their results that the U.K. stock market is efficient.

4.1.3 U.K. STRONG FORM TESTS

Market efficiency in the strong form requires that all price sensitive information be impounded into security prices whether this information is publicly available or not. The efficiency of the market in the strong form will render any investment rule other than a buy-and-hold strategy a waste of time. If the market is therefore efficient in the strong form, then, as Lorie and Hamilton (1973) put it,

> "...the search for investment strategies aimed at achieving consistently superior performance other than a buy-and-hold strategy is a game worthy of winning but which is not worth playing" p98

Strong form market pricing efficiency implies that no one has a monopoly to any price sensitive information which could be used to achieve higher than normal profit. Unlike semi-strong form tests, strong form market efficiency tests are not numerous and also present greater difficulties in testing. It is the stimulation provided by the actions of investors that create the market's equilibrium conditions. The market on its own can therefore not act as its "life" is provided market participants. Equilibrium conditions are therefore generated by the actions of those investors who act on price sensitive information in their possession. Prices should therefore not be expected to react if those in possession of some pertinent information have taken no action. It will be absurd to expect for instance that if one decides all alone by himself that he is going to mount a take-over bid for a firm without disclosing this to anyone this information will be reflected in the price of the firm even if no action has been taken.

What market efficiency in the strong form is concerned with is to examine whether the market information transmission system is so efficient that even those with privileged information cannot consistently earn abnormal profits. The moment therefore that those with privileged information begin to act, the market is able to swiftly and without bias, discount the information contained in their actions into prices.

There have been a number of studies aimed at examining the EMH in its strongest form . These studies have involved analysis of professionally managed funds to see if they have consistently outperformed the market. The rational behind this as stated by Jensen (1969) is that professional managers of funds

(a) are participants in the securities market on constant basis

(b) have significant proportion of shares in and are often in close touch with management of firms whose securities they hold and

(c) are in close contact and association with business and financial communities

Due to the above reasons it should be possible for these managers to gain access to information before such information is publicly available.

Samuels (1968) examined the performance of 36 randomly selected unit trusts over the three year period 1964 to 1966. Samuels compared the performance of the units selected against ten randomly constructed portfolios from the investment portfolios of ten unit trusts as at the beginning of 1964. His results indicate that the unit trusts selected performed on the average no better than a portfolio of random investments in the same industries in which the trusts themselves invested.

Money Which (1974) examined 223 unit trusts from over the period 1969-74. The findings reported indicated that the performance of a trust seemed to be independent of the size of its fund, the type of trust, the investment adviser involved or the management company. The overall conclusion was that there is no evidence of any superior investment performance.

Ward and Sunders (1976) examined U.K. unit trusts performance from 1964 to 1974 and conclude from their results that the U.K. stock market is efficient in the sense that a linear relationship exist between risk and return and that the sample of unit trusts examined performed relatively very poorly compared to the market.

Firth (1976c) using the Capital Asset Pricing Model assessed the performance of unit trusts in the period 1965-75. Firth's reported results indicated a significant inferior performances by the unit trusts given the level of risk borne by them. Firth's conclusion was that the unit trusts performances in the U.K. were generally poorer than that reported in the US.

4.2.0 U.S. STUDIES OF SEMI-STRONG FORM MARKET EFFICIENCY

Market efficiency studies in the US have been discussed extensively by Fama (1970). The present review will therefore focus on market efficiency studies in the semi-strong and strong forms that have appeared since Fama.

The pioneering work in the analysis of an information generating event's effect on share prices was the work of Fama, Fisher, Jensen and Roll (1969). Fama et al were also the first to use the market model in testing market efficiency. Their particular interest was the relationship between stock splits and price behaviour. Their study was based on 622 stock splits over the period

1927 to 1960. Using the market model, Fama et al computed the cross-sectional residuals for 29 months prior to and 30 months after a stock split. The reported results showed that positive abnormal returns are observed before a stock split with abnormal returns averaging zero in the period after the announcement of split. Fama et al note therefore that investors could not have used the announcement of a stock split to increase returns beyond that which could be obtained by a buy-and-hold strategy. The study, however, suffer from selection bias which explains the pre-announcement positive abnormal returns. This bias is that stocks split due to the fact that their prices have risen prior to the time of the split. It should therefore not be surprising that pre-announcement positive abnormal returns are observed.

Fama et al also investigated whether splits that were followed with increased dividend announcements behaved differently from those with no increase in dividends. For purposes of the study, a dividend increase was defined as the percentage increase in dividends in excess of the market average and vice versa. The cumulative average residuals for the two types of dividend paying firms showed that for those firms that announce a dividend increase there are small positive abnormal returns after the drift with pre-announcement abnormal returns rising faster than the dividend decreasing group. In contrast to the dividends increase firms, those firms classified as reporting decrease in dividends showed a sharp post announcement decline in the abnormal returns. Fama et al asserts that stock splits convey information about positive dividend changes which provides the market with the signal that future earnings can support higher dividends payout. Since most of the stock that split were accompanied by dividend increases in excess of the market average, the pre-announcement abnormal returns of all stocks tended to be positive. The positive price drift associated with the dividend increased firms is a reflection of the price changes conditioned by the market`s certainty of dividend increase following the split. With the dividend decrease group, the abnormal returns decreased until a year later which they interpret as reflecting the selling pressure investors bring to bear on those stocks when they realise that their expectations have not materialised.

The combined effects of dividend increases and decreases show that without inside information on the dividend policy a firm is going to adopt, information regarding a stock split cannot be used by an investor to achieve abnormal returns. The reported results are consistent with market efficiency in the semi-strong form and show that prices reflect information on the cash flow consequences of a stock split

Scholes (1972) also employed the Fama et al (1969) methodology to study the impact of secondary distribution of ordinary shares on prices. Scholes study was based on 345 secondary distributions of New York Stock Exchange (NYSE) listed ordinary shares over the period July 1961 to December, 1965. To ascertain the impact of the secondary distributions on prices, Scholes examined the behaviour of cumulative error terms and the Abnormal Performance Index (API). This Abnormal Performance Index could be viewed as the value at a particular time of an investment in an equally weighted portfolio that comprise the firms being studied. At the start of the period under study, the value of the index is 1.00. The value of the index changes over time to reflect the changes in abnormal returns.

Schole's reported results indicate that the API falls from an initial value of one to a permanent value of 0.979 within fourteen days after the distribution. An abnormal return of about -0.6 per cent was earned on the portfolio of shares made up of firms in the study that made secondary distributions. Scholes observed no systematic relationship between the size of a secondary distribution and the size of abnormal security returns. He observed also that prices did not return to pre-distribution levels and led him to conclude that prices respond to the information contained in secondary distributions but not to the short-term imbalance in supply and demand. Scholes investigated API further in relation to the type of distribution. He found that price declines were largest when the seller was a corporation or corporate officer. Secondary offerings by estates and trusts experienced the least negative abnormal returns. The implication is that the market seems to interpret secondary distribution caused by sales of companies as a sign of bad times for the enterprise. The fact that the negative abnormal returns were smallest for estates and trusts could imply that the market view sellers in this category as likely to have little negative inside information.

Scholes findings support the efficiency of the securities market in its semi-strong form as new information is impounded into prices quickly and on the average in an unbiased manner.

Kraus and Stoll (1972) examined the effect on prices of secondary distributions made up of 10,000 or more shares on the NYSE over the period from July 1st, 1968 to September 30th , 1969. Their results were consistent with the findings of Scholes. Their results also indicate a price-pressure or distribution effect. The average price just before trading in the secondary distribution showed a decline of 0.723% from the previous day's closing price. The closing price declined further from the day's opening price to the subscription price of the secondary distribution. By the end of the day however, prices have recovered by an average of 0.713% of the subscription price. Kraus and Stoll`s also report of permanent price decline from the previous day`s closing price to a new level at the end of the day the secondary distribution was made.

Spangler (1973) studied the effects of the announcement of dividend increases or decreases on share prices. His sample was made up of 4117 dividend announcements representing 1150 companies over the period July 1962 to June 1972. Analysis of the 21 trading -day period around and including the day of the announcement showed that the stock market reaction was most marked on the day subsequent to and the day of the dividend announcement. The sign and size of dividends change was also positively associated with the sign and size of security return. This indicates that the market is able to impound information about dividends into prices swiftly and in an unbiased manner.

Ibbotson (1975) also studied the impact of new issues on prices. Ibbotson had to overcome the problem of the absence of any time series data on pre-issue prices since issues are only priced when they go public. Such a time series data is needed in the computation of beta estimates. Ibbotson overcame this problem by the formation of portfolios of new issues with identical number of months since issue. The returns of an issue for a particular month was matched against the market return for that period. Ibbotson collected a number of returns for new issues that differed in the time issued but which have the same trading time since issue to form a portfolio of new issues. All the new issues in his portfolio had had two months trading since issue. Ibbotson randomly selected one new issue for each of the 120 calendar months between 1960 and 1969 from a sample of 2650. The returns of each new issue were then matched against the market return for that period. He then computed beta estimates and abnormal performance indices using the empirical market line. The reported results showed that there were abnormal returns with new issues in the month of issue even when transactions cost were taken into account. He interprets this to indicate either that the offer price for new issues are too low or that investors systematically overvalue new issues during the first month of trading. Analysis of new issues performance from the first market price onwards indicate that abnormal returns cannot be made . Ibbotson concludes that one cannot reject the hypothesis that aftermarkets are efficient. Weinstein (1978) in a similar study of newly issued corporate bonds found also that the offering price of bonds were below the market equilibrium price but that the aftermarket is efficient.

Dann, Mayers and Raab (1977) examined further the intra-day price pressure effects of secondary distribution reported buy Kraus and Stoll with a view to ascertaining if a profitable trading strategy could be developed from the knowledge of a secondary distribution. They collected intra-day prices during the day of a secondary distribution for 298 shares over the period July 1968 to December 1969. Their sample was restricted to shares whose prices declined by at least 4.56% from the opening price to the price of the secondary distribution subscription. The rationale for using shares with large price declines was to provide very strong evidence regarding market efficiency. Since prices recover from declines when secondary distributions are traded, if any investor can buy a share with a large decline based on a certain rule and sell it at a higher price at the end of the day and earn abnormal profit, it gives some indication of market inefficiency.

The trading rule adopted by Dann et al (1977) was that as soon as information became available that the subscription price of the secondary distribution was 4.56% below the previous day`s closing price of the share , buy the share and sell it at the close of the day. The reported results indicated that to earn a positive return one has to act in less than two and a half minutes when the news of the secondary distribution becomes available to the general public. The time required is so small that it seems impossible for practical purposes. Dann, Mayers and Rabb show that 15 minutes after a secondary distribution, pries have adjusted to unbiased estimates of closing prices.

The study gives further support to the efficiency of the securities market in its semi-strong form.

An issue that arises from the study of Dann et al (1977) is whether those who can transact at the price of the secondary distribution cannot earn abnormal returns. These people are usually the members of the Stock Exchange and favoured customers of brokers. Their reported results showed that even after adjusting for risk such favourably placed people could earn abnormal returns. This casts some doubt on the efficiency of the market in the strongest form but Dann et al caution that it is hard to gain some insight into the full costs that such buyers face in a secondary distribution. One example might be that to accept part of a secondary distribution might force the buyer away from his utility maximising portfolio for which he will demand a high premium in rendering the service of providing liquidity to the seller.

The relationship between accounting information and security prices have also been a subject of considerable research. The research work in this area take several forms. Some of the studies provide evidence of how fast the securities market react to new information while others have sought to determine the relevancy of some accounting information. Those concerned with the relevancy of an accounting information seek to determine the cash flow consequences of a particular piece of accounting information. They seek to determine whether the expected cash flow implications have any impact on a firm's share price. There have also been a number of studies that have attempted to measure the extent to which the market reacts to accounting numbers in terms of either price or volume or both.

Ball and Brown (1968)provide evidence that most of the information contained in annual reports are captured from other sources by the market. About 85% to 90% of the contents of annual reports are reflected in market prices before their release. The study supports the efficiency of the market in its semi-strong form and indicates that security prices adjust to reflect the information flowing onto the market and that there is no bias in the prices set.

Beaver (1968) also made a study of the market reaction to annual earnings announcements by examining the volume of trading and price activity on the release of earnings information. His results indicate that the market's reaction to the annual earnings report is swift. May (1971) using Beaver's methodology examined the price reaction of quarterly earnings of firms listed on the American Stock Exchange. The reported results indicate that the price reaction to the announcement of earnings was swift. Price change accompanies announcement of earnings but this settles quickly leaving no room for post announcement abnormal returns. Kiger (1972) also examined the market's volume and price reaction to the announcement of quarterly earnings. His results were also consistent with earlier studies regarding the market's information processing efficiency.

In a study of the Accounting Principles Board's pronouncement in October 1971 concerning the cost centre used by oil companies as the basis for accumulating certain material costs, Patz and Boatsman (1972) reported results indicate no significant market reaction to the announcement. This is consistent with the notion of market efficiency in that the proposed changes were mere bookkeeping changes with virtually very little economic impact.

Apart from the market reaction studies, there have also been studies involving accounting procedure changes and their effects on security prices. A number of the accounting procedure changes may not affect the firm's actual cash flow. External reporting changes that have no cash flow consequences should therefore have no effect on the firm's share price in an efficient market. Examples of such changes may be a change from accelerated depreciation to straight line depreciation, or a change from one inventory valuation to another. Such changes are only book-keeping changes with no economic impact and therefore in an efficient market there should be no price reaction.

Contrary to the efficient market hypothesis, there is the view by some writers that investors do react to accounting income numbers in a naive manner because they have been conditioned to do so. Sterling (1970) asserts that:

> "Accounting reports have been issued for a long time, and their issuance have been accompanied by a rather impressive ceremony performed by the managers and accountants who issue them. The receivers are likely to have gained the impression that they ought to react and have noted that others react and thereby have becomed conditioned to react"(p453)

Fortunately, as Fama (1970) points out in conditions necessary for market efficiency, the presence of a few sophisticated investors having access to large amounts of capital can make the market efficient. Some individuals may therefore react naively yet the market on the whole may still be efficient. If the market exhibits naivety, then, price changes should occur with changes in accounting procedures.

Archibald (1972) studied the price effects that a change from accelerated to straight line depreciation method had on firms. Since the change will have the effect of increasing reported earnings, if the market cannot read behind the figures and acts naively, it will cause the share price to rise. Archibald`s reported results show that the patterns of observed prices after the change were not significantly different from zero. He could therefore not reject the hypothesis that the observed patterns were the results of random behaviour. This shows that the market perceives these accounting changes as having no economic impact and being merely a book-keeping change which lends support to the EMH.

Kaplan and Roll (1972) examined the effects of two types of accounting changes on the share price of firms. Those were the effect of the method opted for accounting for investment credit and depreciation method. In 1964 firms could report as income the whole amount of an investment tax credit in the year the investment was made or they could continue to take into income the tax saving by spreading it over the life of the asset. 332 companies who opted for the former method reported increase earnings per share with no change in cash flow. Kaplan and Roll examined the share prices of these firms. The Cumulated Average Price Residuals (CAPR) after the announcement of the change behaved in a way that was very difficult to interpret. The CAPR five weeks just before the announcement was about -3% and rose to about 3% seven weeks after the announcement before settling to around zero 25 weeks later. What one should note however is that the price rise after the announcement could be wiped out by transaction costs.

The second issue Kaplan and Roll examined related to the price reaction of firms that changed their method of accounting for depreciation from accelerated method to straight line method. The sample consisted of 71 firms. Their reported results indicate that though the change had the effect of increasing earnings per share it had no positive effect on the firm's share prices. The cumulated average price residual was negative 25 weeks prior to the change and this persisted through to 25 week after the the change. This is an indication that the market can read the economic meaning behind reported figures.

Sunder (1973, 1975) examined the share price reaction of firms switching inventory valuation method between FIFO and LIFO. His sample was made up 155 firms and covered the period 1946 to 1966. 110 of the firms in the sample switched from FIFO to LIFO while 22 firms switched from LIFO to FIFO. The reported results show that there is very little abnormal returns in the months subsequent to the accounting change which the market seems to view as having no economic impact.

The accounting treatment of mergers and acquisition have also been examined. The two accounting treatments generally possible are pooling where the financial position statements and the income statements are simply added and purchase where the difference between the book value and the purchase price of the acquired firm is accounted in goodwill. Goodwill is usually written off against profits over a legal number of years. Regulations require goodwill to be written off against profits after taxes and therefore has the effect of decreasing earnings per share. The cash flow effects are the same whichever the method adopted. Hong, Kaplan and Mandelker (1978) examined the effect of pooling and purchase on the stock prices of acquiring firms. The period of study covered 1954 to 1964 and was made up of 122 firms using pooling to account for merger and 37 using purchase. Their reported results show that the cumulated average price residuals exhibited no significant departures from zero for firms using pooling around the time of the merger. The market was therefore not fooled by higher earnings per share figures resulting from the accounting technique.

Patell and Wolfson (1984) provide further evidence of the efficiency of the stock market in the semi-strong form when they examined the intraday speed adjustment of share prices to earnings and dividends announcement. The results indicate strongly that the price reaction to earnings and dividends announcement begins very quickly. The largest response occurs in the first five to fifteen minutes after the announcement. The results also show that trading profits largely disappear in five to ten minutes after the announcement. Patell and Wolfson conclude therefore that the stock market impound publicly available information very quickly.

Jennings and Starks (1985) extend Patell and Wolfson study by grouping firms into portfolios according to whether they had high or low information content. Their reported results indicate that the market was able to anticipate those firms with high information content in that the price adjustment process had high association with high information announcements and that such announcements were anticipated by the market.

Woodruff and Senchack (1988) examined further the intraday price-volume adjustments of NYSE stocks to unexpected earnings announcements. They report that the average reaction time of the market in response to the announcement of earnings was quick with the first trade taking place on the average within fourteen minutes.

All the above studies appear to indicate that the securities market is efficient in the semi-strong form.

4.2.1 STRONG FORM U.S. MARKET EFFICIENCY STUDIES

Lorie and Niederhoffer (1968) considered the predictive and statistical properties of insider trading. Insider is defined as an officer, director or an owner of ten percent or more of the shares of a listed company. The rationale for the study is that corporate insiders could gain access to some price sensitive information before their public release. Lorie and Niederhoffer found that on the average insiders increased their holdings prior to large price increases and vice versa. Their reported results indicate that proper and prompt analysis of data on insider trading can be profitable. They conclude that when insiders accumulate a share intensively the shares can be expected to outperform the market during the next six months. This clearly indicates that insiders can predict the direction of price movement and contradicts market efficiency.

Jaffe (1974) re-examines the issue of information and insider trading and concludes that insiders do possess special information. Even after adjusting for transaction costs, there were a group of insiders in the intensive trading sample in the study that could still earn abnormal returns. His study also indicates that a small section of outsiders in the intensive trading sample in the study could earn abnormal returns by trading on the publicly available information of insider transactions. Returns in the order of 2.5 per cent could be earned after transaction costs.

Fennerty (1976) presents empirical evidence that collaborates the earlier findings that corporate insiders can and do earn abnormal profits. He concludes from his study that:

> "Insiders are able to outperform the market. Insiders can and do identify profitable as well as unprofitable situations within their corporations. This finding tends to refute the strong-form of the efficient market hypothesis" p1148.

The above studies are clearly a contradiction of the efficient market hypothesis in the strong form which assumes that no individual can have higher expected trading profits than others because of monopolistic access to information. Jaffe's study also contradict market efficiency in the semi-strong form as well as it appears to indicate that trading on publicly available insider information can be profitable.

Seyhun (1986) provides empirical evidence that shows that insiders can predict future abnormal share changes. He concludes however that outsiders cannot earn abnormal profits net of trading costs on the basis of publicly available information about insiders' transactions.

The majority of studies in strong form market efficiency concentrate on the examination of the performance of managed funds. Friend and Blume (1962) examined the performance of 189 mutual funds covering the period 1954 to 1963. Their reported results indicate that the funds could not have done better than an individual adopting a buy-and-hold policy of a portfolio of similar risk. A number of studies of managed funds that have reported similar results include Treynor (1965) Sharpe (1966), and Jensen (1968). Of the above studies, Jensen`s work was much more comprehensive. His results indicate that the funds were even not able to forecast security prices well enough to even cover brokerage commissions let alone management expenses. The funds could not do better than someone who randomly selects securities and holds on to it.

Mains (1977) has however criticised Jensen´s findings on the grounds that his rates of return were underestimated due to:

1. The assumption of the re-investment of dividends at year ends instead of when they are received.

2. Expenses were not added back continuously throughout the year as they occur but rather at year end and

3. The assumption of stationarity of betas over long time period may not hold.

Mains used monthly data to estimate betas and came out with lower estimates than that of Jensen. He argues therefore that Jensen`s estimates of risk were too high. Mains abnormal performance index results for 70 mutual funds show that the returns of 80% of the funds before operating expenses and transaction costs were well above that of the market. On net return basis for the group as a whole however, they could not outperform the market. The results indicate that managed funds are able to gain a return high enough to at least cover their expenses. Though the managed funds gross returns are higher than a random selection of portfolios with similar risk, given the costs of searching for information, their net performance is the same as one adopting a naive investment strategy.

4.3.0 MARKET EFFICIENCY --- CONTRARY EVIDENCE

Despite the large number of studies that appear to indicate that the securities market of the advanced economies are efficient, there has been a number of studies that provide evidence to the contrary. The studies that appear to indicate market inefficiency are however few but nevertheless can give cause for concern if price formation is biased in some consistent manner. The following section will therefore discuss some of the studies that appear to indicate market inefficiency as well as their implications.

Basu (1977) examined the investment performance of common stocks in relation to their price/earnings ratios. Basu ranked the P/E ratios of the firms studied and formed 5 portfolios out of the ranked firms. The monthly returns of each of the portfolios were computed beginning April 1st for the following twelve months. The Capital Asset Pricing Model was used in the computation of security returns. Basu's reported results indicate that the two lowest P/E portfolios earned on the average 13.5% and 16.3% per annum over the 14-year study period whereas the two highest P/E portfolios earned 9.3% and 9.5% per annum respectively. Basu's results suggest therefore a violation of the asset pricing model or that the security price behaviour is not consistent with the efficient market hypothesis or both. He concludes that:

> "The results...are consistent with the view that P/E ratio information was not 'fully reflected' in security prices in as rapid a manner as postulated by the semi-strong form of the efficient market hypothesis. Instead, it seems that disequilibria persisted in capital markets during the period studied. Securities trading at different multiples of earnings on average, seem to have been inappropriately priced vis-a-vis one another and opportunities for earning abnormal returns were afforded to investors." p 680

Basu, however, draws a caveat that transaction and search costs as well as tax effects could hinder traders or speculators form exploiting any inefficiency and thereby earning returns significantly different form zero.

Banz (1981) provide evidence that small New York Stock

Exchange (NYSE) firms over the 40 year period 1936 - 1975 had significantly large risk adjusted returns than large NYSE firms.

Reinganum (1981) threw more light on the performance of stocks relative to their P/E ratios. He investigated particularly the non-linear relationship between aggregate market value of a firms shares and that firms mean return. Reinganum's interest was to explore whether the value anomaly and E/P anomaly identified by Basu and Banz are two independent effects or whether both anomalies proxy for the same missing factors in the returns generation process. After controlling for size, Reinganum reports that the apparent P/E ratios effects associate with earnings had more to do with firm size rather than the P/E ratios themselves. He reports that:

> "An analysis of E/P sample firms revealed that within this sample, small firms systematically experience average rates of return significantly greater than those of large firms with equivalent beta risk...After controlling returns for any E/P effect, a strong firm size effect still emerged. But after controlling returns for any market value effect, a separate E/P effect was not found." p 45

These studies appear to suggest that either the equilibrium asset pricing model is misspecified or there are additional factors affecting prices and rates of return that are omitted from the equilibrium model.

Oppenheimer and Schlarbaum (1981) explore the issue of market efficiency further in their study of ex-ante test of the Efficient Market Hypothesis. Their reported results indicate that positive risk-adjusted returns were available to investors who used a common stock selection rule proposed by Graham (1949, 1954, 1965, 1973). Their finding and their rather strong conclusion is a bit disturbing. They assert that:

> "In sum, we find that common stocks selected using a readily available widely disseminated set of rules which requires only publicly available information for decision-making purposes, earn, on average, positive abnormal returns. We interpret this finding as strong contradictory evidence regarding the semi-strong form of the efficient market hypothesis." p 358.

Such findings as reported by Oppenheimer and Schlarbaum could, like the earlier studies, have been due to missing variables in the return generating process or an inefficient price formation by the market or both. The studies have therefore given rise to a number of studies seeking explanation to such 'inefficiencies' in the pricing of securities.

Roll (1981) has suggested that the apparent large returns experienced by small firms could be due to the problem of thin trading experienced by small firms. The problem of thin trading has the potential of biasing beta estimates of these small firms downwards thereby overstating abnormal returns. Reinganum (1982) tested Roll's assertion by adjusting for the non-synchronous trading in small companies shares and conclude that the small firm effect is a significant economic empirical anomaly (p 35)

Keim (1983) provided a startling piece of evidence regarding the relationship between size and return. He analysed the time series differences between the small and large firms returns and discovered a strong seasonal pattern. Keim´s reported results indicate clearly that the size effect is more pronounced in January than in any other month. A significant proportion of the size effect is due to returns premia during the first trading days in January which explains about 50% of the average size anomaly over the test period. The obvious question that readily comes to one´s mind is why risk taking appears to be rewarded more in January than in other month with respect to small firms shares and this has led to a number of hypotheses aimed at explaining the anomaly.

One such hypothesis put forward to explain the ´January Effect´ of share price behaviour is the tax-loss selling hypothesis. The tax-loss selling hypothesis maintains that tax laws affect investors portfolios decisions by encouraging them to sell securities that have experienced recent price declines so that short term capital loss can be offset against taxable income. Since small firms shares have higher variances of price changes and therefore larger probabilities of price declines, they possess the potential for being used for tax-loss selling.

There have been empirical evidence that appear to support the above hypothesis indicating a disproportionate large January returns of the shares of firms that have declined in value over the previous year.

For instance, Branch (1977) reports that abnormal profits can be earned if one purchases the shares of companies whose prices show yearly lows during the last week of December and sell them in January. Dyl (1977) also reports abnormally heavy trading volume at year end for shares with previous twelve-month price declines and he interprets the results as evidence of tax-loss selling. The eagerness to realise capital losses before the new tax year may dictate sale of securities showing yearly all time lows at the end of the tax year and Gultekin and Gultekin (1983) provide international evidence of this. At the end of the tax year, the pressure on prices disappears and prices return to equilibrium levels.

Reinganum (1983) reports evidence that appear to be consistent with tax-loss selling hypothesis. However Brown et al (1983) find no such evidence in Australia. De Bondt and Thaler (1985) provide evidence which makes it difficult to accept the tax-loss selling hypothesis. They provide evidence indicating that portfolios that show all time capital losses seem to outperform the market and that selling pressure disappears in early January and the price rebound persists in the subsequent second, third and fourth January in their test period. They also provide evidence indicating that the price rebound in January is larger in magnitude than the selling pressure that 'causes' it in the first place. There appears to be a lot more that we need to know about the factors affecting returns of shares in January.

One problem with this tax-loss selling hypothesis is that it is difficult to understand why investors selling activity for tax reasons should lead to price declines if there is no underlying economic change in the fortunes of the firm. This point is stressed by Roll (1983). Investors demand functions for shares need not therefore be shifted by the realisation of capital gains and losses without any economic change in the fortunes of the firm. As Keane (1983) points out, any downwards pressure exerted on prices that are unwarranted by economic conditions will be exploited by perceptive investors leading to rapid restoration of equilibrium levels. The 'January effect' is therefore an anomaly for which there is no clear understanding at the moment.

Tinic and West (1984) also provide evidence questioning the linear relationship between risk and return. Their study appears to indicate that investors are only rewarded in January as the risk-return relationship is only statistically significant in the month of January.

Shiller (1981a, 1981b) provides empirical evidence that appears to indicate that price changes in the securities market is much more volatile than can be justified by standard asset pricing models. By implication, such evidence imply that the securities market pricing ability is inadequate or that the model of price formation is inappropriate. However, the evidence regarding excess volatility in the financial markets has been questioned by Flavin (1983). Flavin provide further evidence in his reassessment of the statistical issues in the empirical tests of market volatility and argues that the volatility tests tend to be biased very severely towards the acceptance of the alternate hypothesis of market inefficiency. He argues further that the apparent violation of market efficiency may be a reflection of the sampling properties of the volatility measures rather than a failure of the market efficiency hypothesis itself.

De Bondt and Thaler (1985) also investigated whether the stock market over-reacts to information. They basically assessed the extent to which systematic non-zero residual return profile in the period after a portfolio is formed is associated with systematic residual returns in the period prior to the portfolio formation months. Their focus were on shares that have experienced large capital gains or losses rather than some firm generated piece of information. They termed those firms experiencing extreme capital gains as 'winners' and those that have experienced extreme capital losses as 'losers'. They then formed two portfolios based on winners and losers. Their reported results indicate that over the last 50 years, loser portfolio outperformed the market on the average by about 19.6% thirty six months after the portfolio formation while the 'winner' portfolio underperformed the market on the average by about 5%. They interpret their result as being consistent with the overreaction hypothesis. Essentially, the overreaction hypothesis postulate that extreme movements in share prices is followed by opposite reversal movement that adjusts for the initial movement. If the initial movement is very extreme, the adjustment process will be very large. If prices behave in such a manner , it clearly implies a weak-form market inefficiency. The results reported by De Bondt and Thaler also show that large and persistent positive excess returns are earned by loser portfolios in January while winner portfolios do not earn abnormal returns.

De Bondt and Thaler (1987) provide further evidence on market overreaction and stock market seasonality in response to the criticism that the market's overreaction and the seasonality in share prices could be due to the market's response to the changing risk characteristics of firms Rogalski and Tinic (1986), Vermaelen and Verstringe (1986). De Bondt and Thaler conclude from their study that the winner-loser effect cannot be attributable to risk changes. They also conclude that excess returns still accrue to small firms even if the loser effects are removed and that earnings of winning and losing firms show reversal patterns that are consistent with overreaction hypothesis. Brown and Harlow (1988) provide evidence consistent with that of De Bondt and Thaler indicating the tendency for the stock market to overreact.

Various other studies have examined the distribution of share prices over the various days of the week. Fama (1965) compared the variance of stock returns for Monday's with the variance for other days of the week and finds Mondays variance to be about twenty percent greater than that of the other days. Cross (1973) also presents evidence of negative share price returns for Mondays. Cross reports that the mean return for Monday from 1953 through 1970 to be -0.18 percent. French (1980) provides evidence consistent with earlier work that shows share price returns on Mondays to be negative and discusses the implications for market efficiency. French reports that if transaction costs are ignored and one were to buy the Standard and Poor's composite portfolio every Monday afternoon and sell the investment on Friday afternoon and hold cash over the weekend, such trading strategy would have generated an average annual return of 13.4 percent from 1953 to 1977 while a buy and hold policy would have yielded a 5.5 percent annual return. French concludes however that his results does not invalidate the efficiency of the securities market.

Gibbons and Hess (1981) also provide evidence of strong and persistent negative mean return for Mondays.

The studies referred to above and the issues they raise appear to cast some serious doubt on the pricing efficiency of the securities market. As noted earlier however, the issues involved could be a straight forward case of either the securities market is inefficient or the model of price generation being misspecified. As regards the relationship between risk and return, there appears to be the need for more collaborative evidence, especially in research work using the market model for which there is no evidence. Similarly, the evidence is clear regarding the anomalies that exist on small firms returns in January the cause of which clear understanding is lacking at the moment.

However, against this background must be weighed the overwhelming evidence that also indicate that the securities market is efficient in its pricing ability. The important issue that needs to be stressed is not whether or not abnormal profits can be earned by the adoption of a particular trading strategy. The issue is whether these abnormal returns can be earned over and above that of the market consistently after taking into account all the costs of transacting. In this regard, the studies that appear to indicate market inefficiency do not incorporate all the transaction costs of market traders. It is however worth having at the back of ones mind the the implications that the anomaly studies could have in interpreting research results in the area of market efficiency.

4.4.0 PORTFOLIO THEORY

The previous section has been concerned with market efficiency and some of the empirical evidence in the three levels of market efficiency has been discussed. In the following section, attention will we addressed to a brief discussion of portfolio theory since it has an important bearing on the current study with respect to its implications for security price equilibrium. As noted earlier at the beginning of this chapter, this study is being undertaken in the context of an efficient market. Most of the studies in market efficiency assume a security price equilibrium corresponding to the Capital Asset Pricing Model (CAPM). Since the theoretical foundations of CAPM is derived from portfolio theory it is appropriate that some discussion of portfolio theory be made.

A collection of stocks and bonds held by an individual is known as a portfolio. Portfolio theory deals with the selection of optimal portfolios ie portfolio that provide the highest possible return for any degree level of risk. Though portfolio theory was originally developed for financial assets ie stocks and bonds, it is equally applicable to long term capital investment projects. Future returns from portfolio will be surrounded by some risk. The standard statistical measures of spread --- variance and standard deviation are used to measure portfolio risk.

Every investment is associated with some risk. The risk can be classified into two. The first is the risk that relates to the type of investment itself called unique or unsystematic risk and the second is the risk that results from the economy-wide perils arising from uncertainties in the market called systematic or market risk. The central message in portfolio theory is that the only risk that need to be taken account by investors is the market risk. Unique risk can be diversified away by holding a combination of portfolios. No matter how well a firm diversify, market risk cannot be done away with. Wagner and Lau (1971) demonstrate that diversification reduces risk rapidly at first and then more slowly. Most of these benefits can be obtained with relatively few stocks at first but the improvement is slight when the number of securities is increased beyond 10.

The degree of risk reduction is however a function of the correlation between the portfolio returns. If portfolio returns are perfectly negatively correlated, then, diversification can completely eliminate risk. If uncorrelated, diversification can

DIVERSIFICATION AND ITS EFFECTS ON RISK

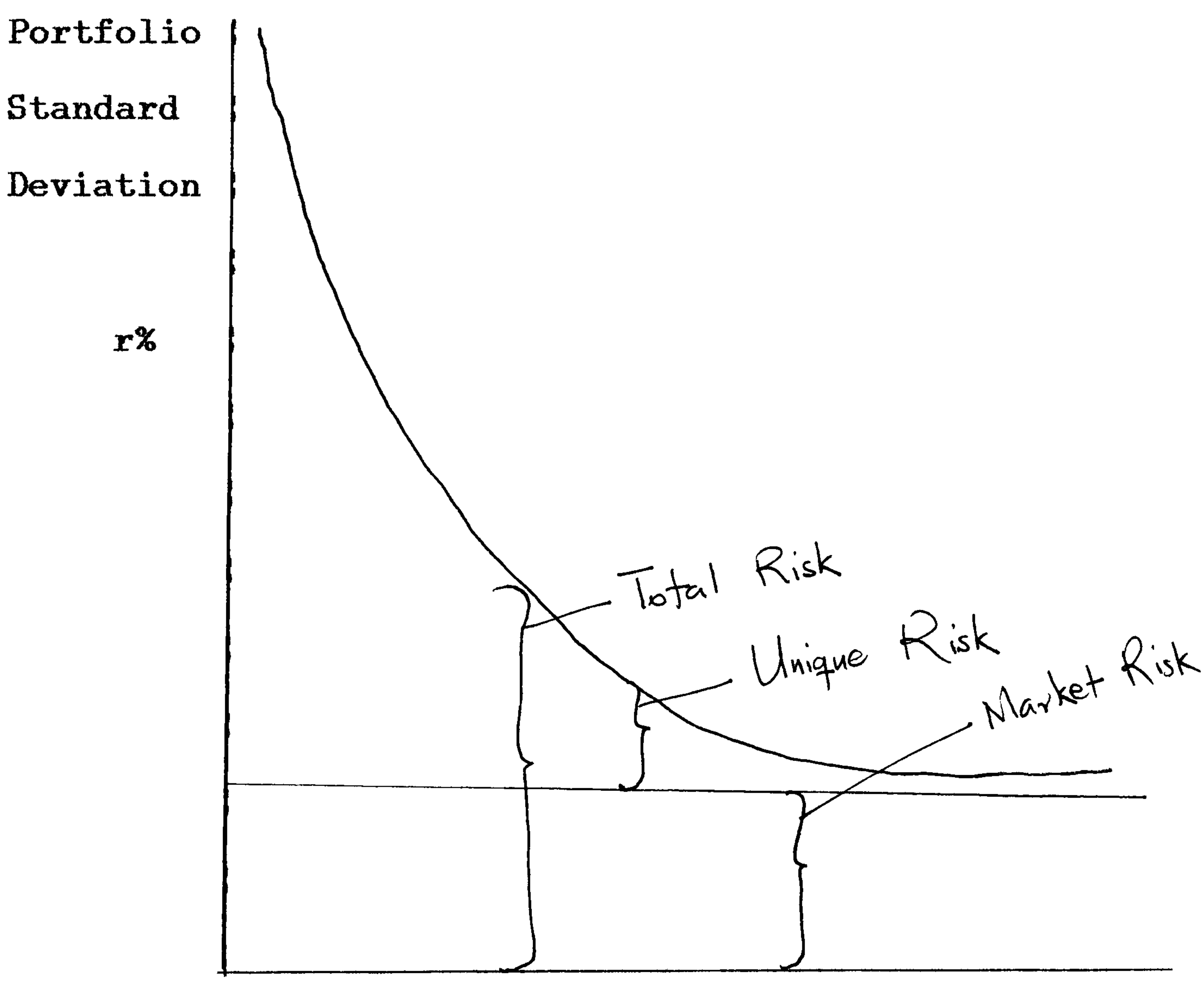


FIG 4.1 Number of Securities

SOURCE: WAGNER AND LAU (1971)

reduce risk significantly to nil at the limit and if positively correlated, diversification does not reduce risk at all. Most investment returns are however positively correlated but not perfectly and this explains why share prices seem to move together.

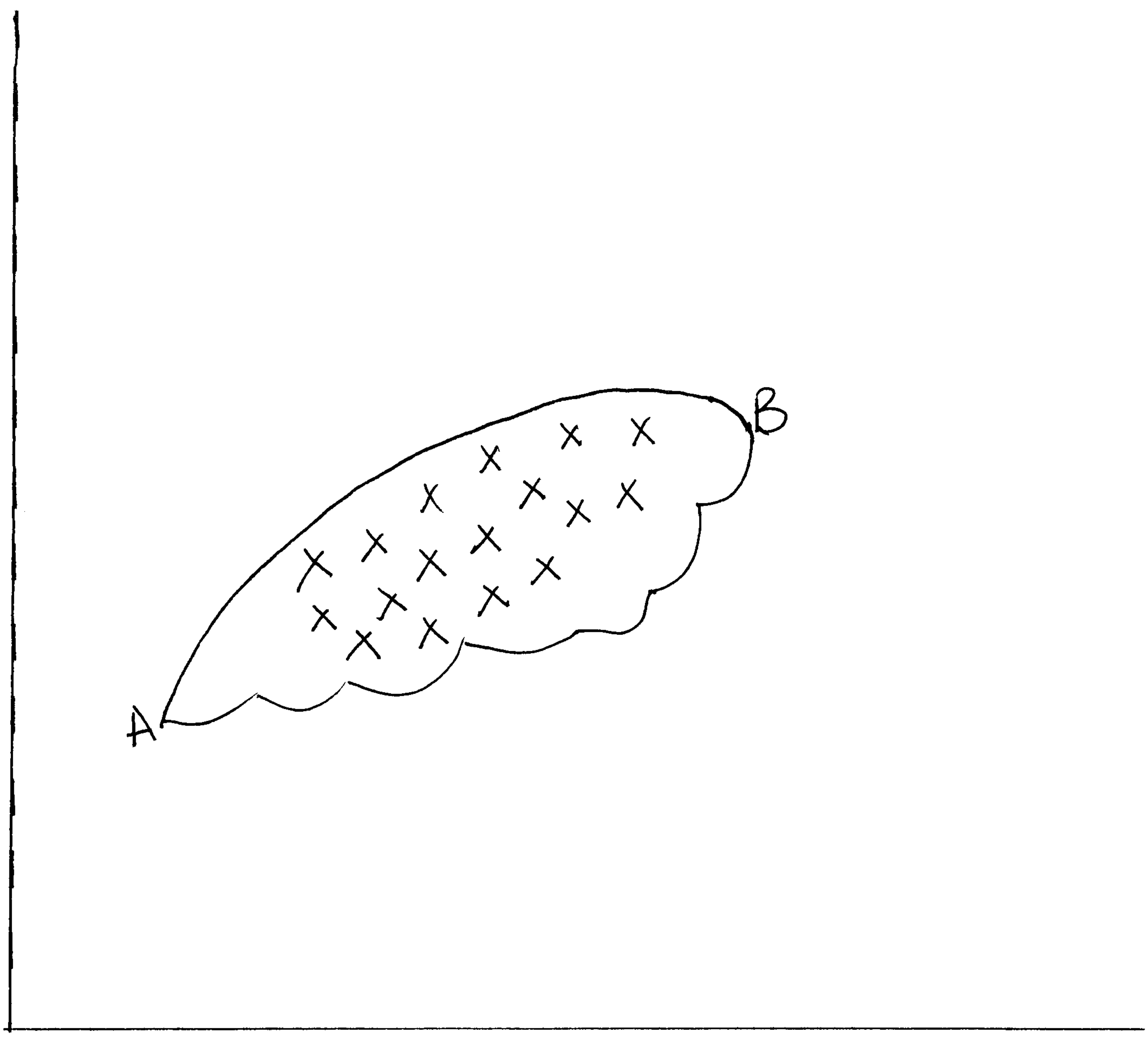
To the extent that rates of return from different securities are not positively and perfectly correlated, risk averse investors who diversify their total holdings can reduce their total risk. Portfolio theory assumes that all investors are risk averse and therefore would prefer the highest return or the lowest risk given returns and risk. A security will therefore dominate another if it offers less risk with equal returns or higher return with the same risk. The range of attainable portfolio might be represented as in figure 4.2 below. The solid line AB is what Markowitz (1952), the pioneer of portfolio theory called efficient portfolio. The line AB shows portfolios with the highest possible attainable combinations of risk and return. Mathematically, the risk of a two asset portfolio can be computed by the following equation

$$\sigma_p = \sqrt{\{x^2\sigma^2_x + y^2\sigma^2_y + 2xyCov(x,y)\}} \quad [2]$$

where Cov(x,y) is the covariance between securities x and y and σ_x and σ_y are the standard deviation of the returns of securities x and y.

Expected

Return%



σ%

FIG 4.2 Standard Deviation

By quantifying risk, portfolio theory helps in the valuation of assets leading to a better allocation of resources. It is also possible to determine the attainable set of portfolio, determine the efficient set in the attainable set and select the best from the efficient set. Portfolio theory gives the theoretical framework underlying the decision to diversify by individuals and firms. Financial managers are therefore equipped with the knowledge that the effective risk of any security cannot be judged by examination of the security alone but in a portfolio context.

A natural development of portfolio theory is the Capital Asset Pricing Model (CAPM) of which more will be said in the chapter on methodology and security price generation model. Given a risk free market for funds and the individual or firm's indifference curve, a link can be drawn with the efficient portfolio for optimum portfolio selection as shown in figure 4.3 The optimum portfolio is found at the point of tangency M between the efficient set of portfolio BME and the indifference curve 2. This point marks the highest level of satisfaction an investor can obtain

By diluting his portfolio with an element of risk free and risky assets an investor can reach a higher indifference curve. If an investor invests all his funds in risk free assets, the return will be r_f. By diluting his assets with some risky assets at M which is the optimum combination the return the investor gets is rm. A premium of $(r_m - r_f)$ is obtained for the extra risk taken. In a well diversified portfolio, the risk premium will depend on the risk of the portfolio's return with the market returns called beta. If the portfolio's beta is half that of the market portfolio, then, the premium obtained will be half that of the market. If the beta of the portfolio is twice that of the market, the premium will be twice that of the market premium.

COMBINATION OF PORTFOLIO AND RISK FREE INVESTMENT

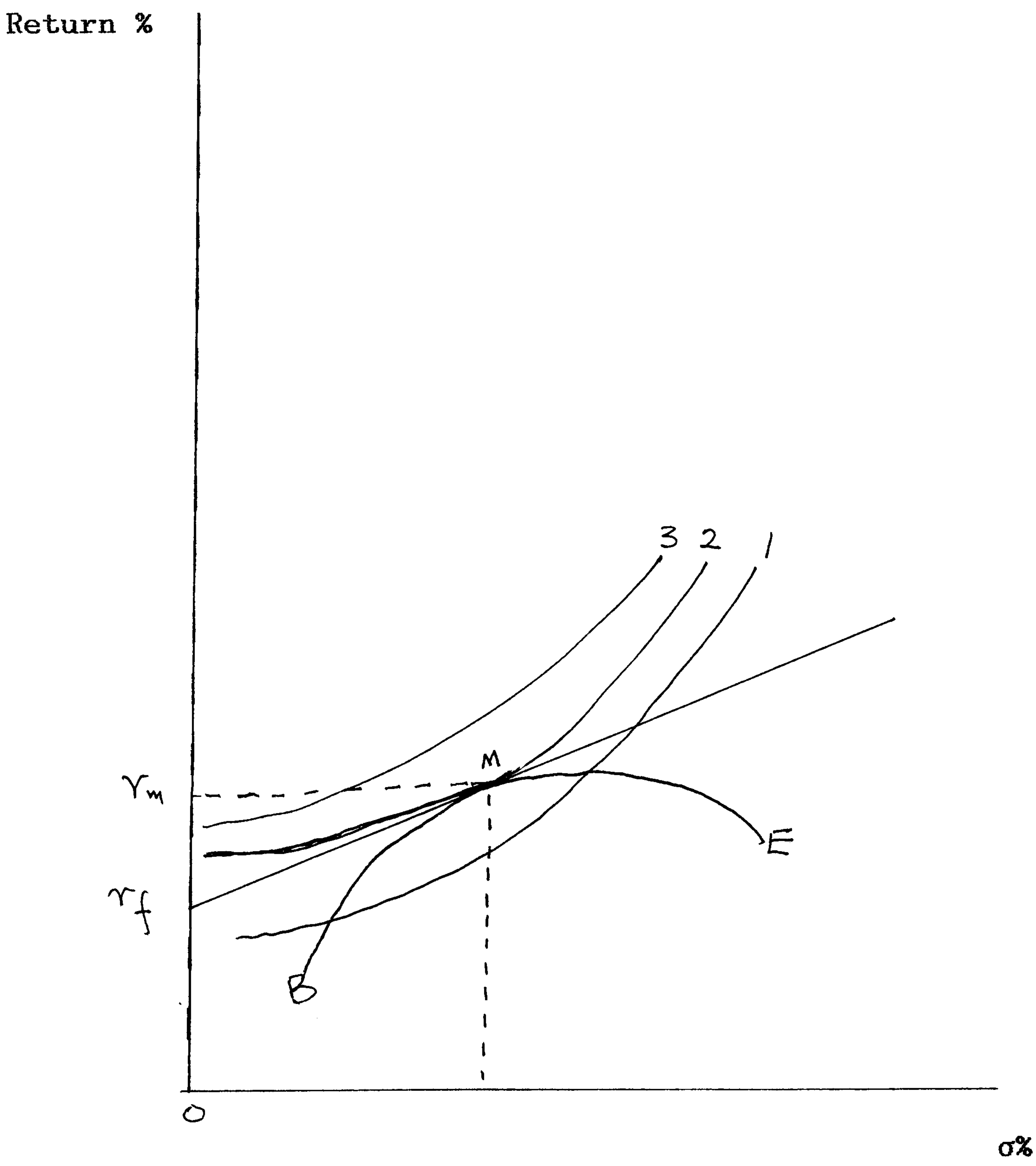


FIGURE 4.3

The return on a portfolio (p) is given by

$$R_p = r_f + (r_m - r_f)\sigma_p/\sigma_m \qquad [3\ ]$$

Where R_p is the return on the portfolio p, σ_p and σ_m are the standard deviation of the portfolio and market returns respectively. All other terms are as defined before. For an individual security, beta is the proportion that the covariance of returns of the security and the returns of the market bears with the market risk. This is given by

$$\beta = \frac{Cov(r_j r_m)}{\sigma^2{}_m} \qquad [4]$$

The returns on a security j is therefore given by

$$R_j = r_f + (r_m - r_f)\beta_j$$

At equilibrium, the market portfolio should comprise of all assets in exact proportion of that asset's fraction of the total market value of all assets. In effect, if security j is x% of the total market value of all assets, then x% if the total market portfolio M will consist of security j. In reality however it is impossible to have an index comprising of all securities in the market. Again the assumption that assets are completely divisible does not hold in practice as it may not be possible to hold half or a quarter of a security in real life situation. The assumption that all investors will choose among alternative portfolios on the basis of mean and variance of returns has been shown by Blume and Friend (1975) not to be so in practice. Majority of individuals in practice hold imperfectly diversified portfolios despite the advantages of diversification. In the Wharton Survey (1975), the median number of stocks held was found to be fewer than 4 with 34% of investors holding no more than 2 stocks. Blume and Friend's analysis of income tax returns in the US for 1971 indicated that of the investors sampled, 34% held only one stock. 51% held no more than 2 stocks and only 11% held 10 or more.

Diversification has the positive aspect of reducing risk but at the same time it may reduce returns since expected return is the weighted average of the percentage invested. If a% is invested in x and b% (100-a%) is invested in y, then return on portfolio p is given by

$$R_p = ax + by \qquad [5]$$

separating terms

$$E(R_p) = E(ax) + E(by)$$

$$= aE(x) + bE(y)$$

A major implication of portfolio theory for practical financial management is that in evaluating a proposed addition to a portfolio, the financial manager should consider the portfolio effect of the addition not just the project risk in isolation. In investment selection, consideration must be given to the project with negative correlation to the existing portfolio cash flows. Best results are achieved from the point of view of trade off between risk and return when a new project's cash flows is negatively correlated with existing projects cash flows. In project selection, the nature of the risk of the project beta should be taken into account and a discount rate suitable to the risk applied to the project's cash flows even if this differs from the firm's estimated cost of capital. If this is not done, there is the danger that a high risk project may be favoured in place of a low risk one.

Another major implication of portfolio theory is that diversification by the firm is unnecessary since there is nothing that can be achieved by the firm in diversifying that shareholders cannot achieve by personal portfolio selection. It may however be argued that some diversification by the firm is necessary to reduce the variability of the firm's cash flows. From employees and management point of view, stable cash flow distribution makes continuity and survival much more secure thereby ensuring job security.

THE MARKET MODEL

Sharpe (1963) proposed another security return model given by:

$$R_{j,t} = \alpha + \beta_j R_{m,t} \qquad [6]$$

where $R_{j,t}$ is the return on security j in time period t, and $R_{m,t}$ is the return on the market portfolio in time period t. The degree of the linear relationship between the individual firm's return and the market portfolio is given by β_j which is also the risk measure.

Unlike the CAPM, the Market Model has no underlying theory. It is simply based on the rather strong assumption of a linear relationship between a particular firm's return and the market portfolio. Detailed discussion of the Market Model and CAPM are provided in chapter six.

4.5.0 CONCLUSION

This chapter has been concerned with a discussion of the Efficient Market Hypothesis as well as Portfolio Theory. Some of the issues implied in the notion of market efficiency has been examined at the various levels of market efficiency. Some of the studies providing contrary evidence to the notion of market efficiency have also been discussed. Similarly, a limited discussion of Portfolio Theory has also been made since investment decisions are assumed to take place in a portfolio context. As far as the issue of market efficiency is concerned, it is likely that the controversy will continue for some time especially if CAPM is used as a model of security price generation in the light of Roll's (1976) critique showing that one cannot prove whether CAPM is right or wrong. Since any test of market efficiency is also a test of the model of price generation, it is difficult to describe the securities market as inefficient. Any anomalies might be due to mis-specification of the model of price generation. The significant anomalies identified in the chapter include the size effect and the day of the week effect which have potential significance for the present study. These issues will be addressed again in chapter 6.

As far as this study is concerned, the price generation model being adopted is the Market Model which lacks any theoretical foundations. It is based on the rather strong assumption of linear relationship between the returns of firm's shares and that of the market portfolio. Most of the criticisms of CAPM therefore do not apply to the market model. Secondly, there are no substantial evidence to date regarding inefficiency of the London Stock Market.

In the light of current evidence in the U.K. therefore, it seems reasonable to assume that the market is efficient in the pricing of securities for the purpose of this study.

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CHAPTER FIVE

ACCOUNTING INFORMATION AND SECURITY PRICES - REVIEW OF EMPIRICAL WORK

5.0.1 INTRODUCTION

This chapter is concerned with a review of some of the empirical works undertaken in the area of accounting information and its impact of security prices. Such a review is necessary in order to establish clearly the rationale for the current study and to identify gaps in previous studies.

Studies involving accounting information and share prices assume the existence of some relationship between the two. A number of studies have examined the information content of accounting information and its consequences, especially its impact on investor decisions, Ball and Brown (1968), Beaver (1968), May (1971) etc. The ideal way of examining the information content of accounting information and its attendant consequences on investor decisions is to observe or predict in probabilistic terms the effect of accounting information on investor decisions. The real decision-making models of investors also need specified. Testing the significance of accounting information to the above extent cannot be done in the real world. The main difficulty is that neither the decision models of investors nor their information processing techniques specified.

The only way of measuring and analysing the impact of accounting information on investors decisions therefore, is to make certain assumptions about how accounting information may affect investor decisions. This procedure underlies virtually all the methodologies in studies conducted into the association between accounting data and security prices.

5.1.0 EMPIRICAL STUDIES

Amoung the earliest known research into accounting data and security prices was the work of Ashley (1962) who examined the impact of earnings and dividends changes on share prices of firms listed on the New York and American Stock Exchanges. Ashley's reported results indicate that changes in earnings and/or dividends significantly affect investor's expectations about future events and that share prices respond significantly to the changes in earnings and dividends. Ashley's testing procedure involved grouping firms into good news and bad news on the basis of the magnitude of earnings change from prior years and whether dividends are increased, resumed, decreased or omitted.

Ashley classified firms into six groups and computed for each group the mean percentage change in stock prices between a base date and eight subsequent dates. He then tested for differences between the means of the good news and bad news samples. Ashley's research design could be criticised on the grounds that non-earnings and non-dividends related variables which could have affected the share price were not isolated. Secondly, the portion of the share price movement unrelated to factors due to firm specific events being the systematic risk was not removed.

Benston (1967) studied the relationship between accounting data and share prices. He hypothesised a relationship between the changes in stock prices and the measured rate of change in accounting variables given by:

$$P_{jt} = (AR_{t}, QR_{t}, D, I, V)$$

P_{jt} is the market adjusted price change of a particular firm at time t. AR_{jt} is the rate of change of an annual accounting variable while QR_{jt} is the rate of change in the same accounting variable but measured for the first three quarters of the current past year. D is the rate of change of dividend, I is a dummy variable indicating industry effects and V is the residual factor which has a zero expectation.

Benston used the model to test the significance of the variables using multiple regression techniques. The reported results of Benston show annual accounting data to be weakly associated with price changes. The quarterly variable that was significantly associated with price changes was that of 'sales'. Benston therefore concluded that the published accounting data have no significant impact on prices. He however cautioned on the possibility of his quarterly data being a misspecification of the process that generate the quarterly data. This caution has been justified by later research, Watts (1975) Foster (1977), Brown and Rozeff (1979) and Lorek and

Bathke (1984). This later evidence on the time series properties of quarterly earnings data makes it unreasonable to accept Benston's conclusion of the lack of market reaction to quarterly accounting data.

A pioneer study that has had a large methodololgical impact on subsequent research work has been the work of Ball and Brown (1968). Ball and Brown were interested to find out whether the annual report of a firm has any impact on its share price. They predicted that unexpected increases in accounting earnings will be accompanied by positive abnormal rates of return and vice- versa. They therefore went on to examine the relationship between the sign of unexpected earnings and mean abnormal rates of return.

The major assumption here are that (1) accounting earnings could be used as surrogates for cash flows attributable to the firm,(2) that the efficient market hypothesis is valid and (3) a multiperiod capital asset pricing model (CAPM) can adequately describe how securities are valued. The fact that accounting information might have cash flow consequences should in itself not affect the share price of firms under the EMH. The share price is only affected to the extent that the cash flow consequences in the accounting information was unanticipated by the market. To investigate this, Ball and Brown collected monthly returns and annual earnings data for a sample of 261 firms between 1946 and 1965 as a basis for assessing the usefulness of the information contained in annual reports. Separating firms into those that have had positive earnings change as against negative earnings change by using naive time series models to predict earnings, Ball and Brown examined the behaviour of the cumulative abnormal returns using the market model to compute expected returns.

Their reported results indicate that when earnings results are higher than the predicted, abnormal returns are positive. However, by the time of the publication of an earnings report, returns seem to have been fully adjusted to reflect whether the income figure reported is higher or lower than that predicted. Positive earnings changes show gradual rise in abnormal returns until the time of the publication of the earnings report. There seems to be no significant rise in abnormal earnings after earnings publication

A gradual fall seems to precede negative earnings changes until the release of earnings after which there appears to be no significant price reaction. Ball and Brown`s results indicate that if an investor has information about the sign of earnings change 12 months in advance of its release to the general public, he could achieve 8.3% abnormal return if he invests long in firms that will report higher than predicted earnings and sells short those reporting lower than predicted earnings. The reported results of Ball and Brown indicate that most of the information contained in annual reports are captured from other sources by the market. About 85% to 90% of the contents of annual reports are reflected in market prices before their release.

Beaver (1968) also made a study of the market reaction to annual earnings announcements by examining the volume of trading on the release of earnings information. Beaver`s sample was made up of 143 firms and covered the period 1961 to 1965. To avoid the problem of misspecification due to tax induced trading volume, firms with fiscal years ending in 31st December were dropped from the sample. This therefore solved the problem of December-January tax-induced trading. Those firms that had dividends being announced in the week of the release of earnings were also eliminated from the study to minimise the effects of non-earnings induced trading. Beaver`s reported results indicate that investors significantly trade in shares in the week of the earnings announcement. He concludes from his results therefore that:

> "Investors do shift portfolio positions at the time of the earnings announcement and this shift is consistent with the contention that earnings reports have information content (p74)"

Beaver`s observation seems to contrast that of Ball and Brown who conclude from their results that there is no significant market reaction to annual income numbers. Beaver also examined the price reaction to the announcement of earnings and his results were similar to that obtained for the volume reaction. Beaver`s results also indicate that the market`s reaction to the annual earnings report is swift.

Beaver, Clarke and Wright (1979) extended the issue of the relationship between accounting information and share prices further by examining the relationship between the magnitude of unexpected earnings and and the magnitude of the abnormal rate of return. Hitherto, previous studies have concentrated on the relation between the sign of unexpected earnings and the sign of abnormal rate of return. Beaver et al reasoned that if earnings could be used as a surrogate for cash flows, the above relationship ought to exist. Using 276 annual earnings observation covering the period 1965 to 1974, they formed 25 portfolios on the basis of the magnitude of each observation's percentage unexpected earnings. Beaver et al found that the rank correlation between the unexpected earnings change and abnormal rate of returns is significant at any reasonable probability level. Their study indicate a positive association between unexpected earnings change and abnormal returns.

Jones and Litzenberger (1970) examined the association between quarterly earning reports and the movement in share prices. They postulate that prices adjust gradually over time since the beliefs of market professionals regarding the intrinsic worth of a security upon the release of price sensitive information will not be instantaneous. They hypothesise that where quarterly earnings reported exceed that expected by market professionals, it will have a positive impact on the underlying security and the price will be adjusted upwards and vice versa.

Using a straight line extrapolation to compute expected returns, Jones and Litzenberger results indicate that firms reporting higher than expected profits outperform the market significantly. They also report the lack of any significant downward revision of prices of firms reporting smaller than expected earnings figures. They sum up their results thus:

> "... our empirical results lend support to the hypothesis that the stock market is not as perfect as some proponents of random walk theory have claimed. That is the market may not adjust instantaneously and correctly for every item of information...If it were, stock selection techniques based on available quarterly earning reports should not produce on the average and over time, results significantly different than the market." p147

Jones and Litzenberger do not question the fact that the quarterly earnings data do contain information that is used by investors. Their concern was the way the market adjusted to the information. They can be criticised on the grounds that their study was not exhaustive enough and they also failed to take adequate account of risk. Their results may also be reflection of the income generation model used and shows clearly that a straight line extrapolation is a mis-specification of the process generating quarterly income series as later studies have shown, Foster (1977).

May (1971) using Beaver`s methodology examined the price reaction of quarterly earnings of firms listed on the American Stock Exchange. The sample included 105 firms and covered the period June 1966 to April 1968. May´s reported results indicate that weekly price changes at the time of the release of quarterly earnings reports are higher than the average weekly price changes for other times of the year. The reported results indicate also that the price reaction to the announcement of earnings was swift. Price change accompanies announcement of earnings but this settles quickly leaving no room for post announcement abnormal returns.

Comiskey (1971) examined the price/earnings ratios of some steel firms that had changed their method of accounting for depreciation from accelerated basis to straight line. He compared the price earnings ratios of these firms with that of a control group who made no change over the period. The results indicate that those firms who made the change experienced a generally declining P/E ratios while the P/E ratio of the control group generally increased. The higher earnings associated with the change therefore did not cause higher P/E ratios. This indicates that the market was able to read behind the reported earnings change. A major defect of Comiskey`s study is that he failed to take into account risk which might affect the results.

Brown and Kennelly (1972) examined the information content of quarterly earnings using Ball and Brown's methodology. The fact that Ball and Brown found no significant price reaction to annual earnings announcements may not look very surprising due to the existence of interim financial information. If these interims provide a continuous information of the firm's fortune, by the time of the release of the annual report, the information contained in the annual income numbers would substantially have been made public. The market's expectation of the annual accounting numbers would therefore be changing constantly as the interim data are made available. Brown and Kennelly reasoned that if asset prices are instantaneously adjusted as price sensitive information flows to the market, then, changes in prices reflect a flow of relevant information pertinent to price formation. The information contained in quarterly earnings numbers is therefore deemed to be the difference between the actual number reported and that predicted for the same period.

Brown and Kennelly formed portfolios based on the firms reporting positive or negative earnings change. Following the research design of Ball and Brown (1968), they classified as good news where the earnings change is positive and bad news where the earnings change is negative, They then examined the investment strategy of buying long shares of firms with positive earnings change and selling short those with negative earnings change. B-K conclude from their results that quarterly accounting numbers have information content and that disaggregating annual earnings per share into quarterly component improves the prediction of the annual series by about thirty to forty percent.

Archibald (1972) studied the price effects that a change from accelerated to straight line depreciation method had on firms. Since the change will have the effect of increasing reported earnings, if the market cannot read behind the figures and acts naively, it will cause the share price to rise. Archibald`s reported results show that the patterns of observed prices after the change were not significantly different from zero. He could therefore not reject the hypothesis that the observed patterns were the results of random behaviour. This shows that the market perceives these accounting changes as having no economic impact and being merely a book-keeping change which lends support to the EMH.

Kaplan and Roll (1972) examined the information content of two types of accounting changes on the share price of firms. Those were the effect of the method opted for accounting for investment credit and depreciation method. In 1964 firms could report as income the whole amount of an investment tax credit in the year the investment was made or they could continue to take into income the tax saving by spreading it over the life of the asset. 332 companies who opted for the former method reported increase earnings per share with no change in cash flow. Kaplan and Roll examined the share prices of these firms. The cumulated average price residuals after the announcement of the change behaved in a way that was very difficult to interpret. The CAR five weeks just before the announcement was about -3% and rose to about 3% seven weeks after the announcement before settling to around zero 25 weeks later.

The second issue Kaplan and Roll examined related to the price reaction of firms that changed their method of accounting for depreciation from accelerated method to straight line method. The sample consisted of 71 firms. Their reported results indicate that though the change had the effect of increasing earnings per share it had no positive effect on the firms share prices. The CAR was negative 25 weeks prior to the change and this persisted through to 25 week after the the change. This is an indication that the market can read the economic meaning behind reported figures.

Ball (1972) examined the market reaction to 267 accounting changes over the period 1947 to 1960. Of the 267 accounting changes, 85 involved changes in the method of valuing stock, 75 were changes in the method of accounting for depreciation and 52 involved method of accounting for subsidiaries. All these changes had no cash flow impact and were therefore mere book-keeping changes. Ball`s interest was to find out if the market can distinguish real from accounting effects on the reported income numbers. His reported results indicate that in the month of the accounting change, the average residual of the firms in the sample was .0012%. He states:

> "The year of the accounting change does not appear to exhibit any unusual behaviour for the average firm ....there is little market adjustment of a consistent sign associated with the release of the income report....In short, changes in accounting techniques do not appear to be associated with market adjustments in a consistent direction for the average firm" p22

Kiger (1972) also examined the market´s volume and price reaction to the announcement of quarterly earnings. His sample consisted of firms listed on the NYSE who met the criteria that there were no price or volume sensitive information about any firm in the sample around the time of the study. Such market sensitive information includes dividends announcements, secondary distribution or dividends announcements. Kiger used as a control in the study a five day period during which no information about the shares in the study was released to the market. The time period of interest in the study was the five days around the time of the announcement of quarterly earnings in the Wall Street Journal. Kiger`s reported results indicate that the market reacts to quarterly earnings.

In a study of the Accounting Principles Board's pronouncement in October 1971 concerning the cost centre used by oil companies as the basis for accumulating certain material costs, Patz and Boatsman (1972) reported results indicating no significant market reaction to the announcement. This is consistent with the notion that the proposed changes were mere bookkeeping changes with virtually very little economic impact.

Beaver and Dukes (1972) also addressed themselves to the issue of whether unexpected earnings or unexpected cash flows are more highly associated with abnormal security returns. They added back to operating cash flows depreciation, depletion and amortization charges and the change in deferred tax in the balance sheet as a surrogate for total cash flows. Their reported results indicate unexpected cash flows to be less highly associated with abnormal security returns than unexpected earnings. Their results therefore confirm the earlier findings of Ball and Brown.

Hangerman (1973) applied Beaver's methodology to the quarterly and annual earnings announcement of 97 bank shares listed on the over-the-counter market covering the period 1961 to 1967. His reported results indicated that there was significant price reaction during the week that earnings were announced as well as above normal price reaction in the week before the announcement.

Sunder (1973, 1975) examined the share price reaction of firms switching inventory valuation method between FIFO and LIFO. His sample was made up 155 firms and covered the period 1946 to 1966. 110 of the firms in the sample switched from FIFO to LIFO while 22 firms switched from LIFO to FIFO. The reported results show that there is very little abnormal returns in the months subsequent to the accounting change which the market seems to view as having no economic impact.

Foster (1973) also examined the trading volume and price reaction of the market to the estimates of earnings per share by company officials after the fiscal year has ended but before the announcement of preliminary earnings. The study covered the period 1968 to 1970 and the sample was made up of 68 estimates made over the study period. Foster`s results indicate that there was a 47% increase in trading volume during the week that preliminary earnings were announced relative to the average of the 16 weeks surrounding that announcement. In relation to the week that an estimate of earnings per share was made by company officials, the increase in trading volume was 51% above the average for the 16 weeks surrounding the period the estimate was made. Foster concludes therefore that investors react to the information contained in earnings. During the week of the announcement, volume of trading rose significantly but quickly settled down to preannouncement levels.

Jordan (1973) also applied Beaver`s methodology to a sample of firms from Forbe`s 21st Annual Report on American industry using daily data and likewise obtained similar results to that of Beaver and May. Hangerman (1973), also using Beaver`s methodology, examined quarterly and annual earnings announcements of 97 bank shares listed on the over-the -counter market covering the period 1961 to 1967. His reported results indicated that there was significant price reaction during the week that earnings are announced as well as above normal price reaction in the week before the announcement. This seems to indicate that the market is able to anticipate and impound into prices information contained in earnings announcement.

Foster (1975a) examined the association between accounting earnings and share prices of insurance firms listed on the over-the-counter market. The reported results indicate that the highest abnormal returns occurred in the month that earnings were released. The result was also consistent with prior studies in that where earnings change was positive in relation to that of the previous year, the abnormal return was positive and where the change was negative the abnormal return was negative.

Foster (1975b) investigated whether sub-earnings disclosure by insurance firms have any effect on their share prices. The results indicate that a partition of earnings that is finer than that based only on the sign of the aggregate earnings number provides a higher association between abnormal price changes and changes in accounting earnings.

Morris (1975) examined the reaction of shares on the London Stock Exchange to inflation adjusted earnings figures. The sample consisted of 136 companies. Morris's finding was that the market did not react to any significant extent on the publication of the inflation adjusted figures. The computed abnormal returns were too low to cover the transaction costs of an investor wanting to trade on such information. His conclusion was that inflation adjusted accounts have very little information content for trading purposes.

Firth (1976b) studied the effect of earnings announcement on the share prices of similar type firms. It was the first study made on the effect of annual earnings announcements on the share prices of firms listed on the London Stock Exchange. Firth's sample consisted of 87 firms classified into four groups namely breweries, retailers, shipping and banks. The impact of earnings announcement of each firm on the share prices of the other members of the group were examined. Firth found that on the day of the announcement of positive results firms in the industry as a whole made abnormal gains of 2.1 per cent ie average price of securities of similar type firms rose by 2.1 per cent. Similarly where the results announced was less than that predicted by the market, the industry as a whole experienced abnormal loss of 3.7 percent. Firth therefore concludes that financial reports have information content and this information is used by the market in evaluating both the firm making the particular announcement and other similar firms.

Patell (1976) made an extensive analysis of forecasts released by company officials of annual earnings per share over the years 1963 to 1967. Using Beaver`s methodology, Patell`s reported results indicate that there is on the average a significant price reaction in the week that the forecast was made. Patell concludes therefore that annual earnings forecast by company officials is a price sensitive information.

Oppong (1976) investigated the relationship between the amount of interim information and the information content of the annual report using Beaver´s methodology. Oppong used five variables namely company size, industry grouping, number of shareholders, frequency of external financing and the degree of concentration of the firm´s primary industry to explain the amount of information content in the annual earnings announcements. He was unable to detect differences in information content in the month of the annual report as compared with other months in the year irrespective of the five surrogate variables. However, the major design defect with Oppong's study as with all studies that use monthly data is that month-end prices might fail to reveal variability which could have existed immediately surrounding the announcement date.

Using total funds from operations as a surrogate for operating cash flows, Kaplan and Patell (1977) tested as to whether operating cash flows give any more information beyond that provided by annual earnings. Their conclusion was that cash flows provide no additional information beyond that provided by annual earnings.

One issue worth noting is the fact that the lack of precise measure of the net cash flow attributable to the firm might have affected the results. All the cash flow surrogates might therefore not be adequate representations of the present and potential cash flows attributable to the firm. All the studies however appear to indicate that earnings can adequately predict future cash flows.

Foster (1977) addressed himself to the question of the possible overstatement of accounting earnings that could result from Ball and Brown's research design. He reasoned that if the stock market adjusts completely to the unexpected earnings say one week before the public announcement, a significant association may be observed between the rate of return in that month and the unexpected earnings. He therefore uses daily rates of return instead of monthly rates of return as a means of reducing this overstatement. Foster's results show that the composite CAR for the 60 trading days up to and including the day that earnings were announced was 2.53 percent over the four quarters. Foster's results show an increase over the ten to fifteen percent obtained by Ball and Brown. The study also show that accounting earnings do contain information for investment decision making.

Joy, Litzenberger and McEnally (1977) re-examined the issue of the adjustment of stock prices to the announcements of presumed unanticipated changes in quarterly accounting earnings. A major objective of this study was to address the several sources of bias in the prior study of Jones and Litzenberger (1970). They identified two main potential biases which could have affected the results of Jones and Litzenberger (1970). First was the self selection bias. This bias results from the fact that the Compustat tapes from which the sample for the study was drawn contain firms that are popular and successful at the time a tape is constructed and this type of firms may have demonstrated above average ex-post risk adjusted performance. Secondly, the quarterly earnings that are reported by the news media often differ from that found on the compustat tapes. Since the earnings figures on the tapes are often revised versions of that appearing in the news media, their use could bias risk adjusted performance upwards.

Joy et al employ two naive models of quarterly earnings. The first model assumes that quarterly earnings follow a martingale process and the second a martingale with drift. They however use Bayesian procedures to adjust for the ordinary least squares regression estimate of beta. Using Capital Asset Pricing Model to compute expected returns, they classified firms into portfolios on the basis of the deviation of actual earnings from the expected. The results indicate that price adjustments to the information contained in unexpected 'highly favourable' quarterly earnings reports are gradual rather than instantaneous and they interpret this as the existence of opportunity costs of search associated with monitoring and evaluating quarterly earnings signals. There must be caution however in accepting this result due to the fact that the earnings models used were not adequate description of the time series properties of quarterly earnings, Watts (1975), Griffin (1976), Foster (1977).

Beaver, Clarke and Wright (1979) extended the issue of the relationship between accounting information and share prices further by examining the relationship between the magnitude of unexpected earnings and the magnitude of abnormal rate of return. Hitherto, previous studies have concentrated on the relation between the sign of unexpected earnings and the sign of abnormal rate of return. They reasoned that if earnings could be used as a surrogate for cash flows, the above relationship ought to exist. Using 276 annual earnings observations covering the period 1965-1974, they formed 25 portfolios on the basis of the magnitude of each observation's percentage unexpected earnings. Beaver, Clarke and Wright found the rank correlation between the unexpected earnings change and abnormal rate of return significant at any reasonable probability level. Their study indicated a positive association between unexpected earnings change and abnormal returns.

The results of Beaver, Clarke and Wright also show that the relationship between abnormal rate of return and unexpected change in earnings is not perfectly positive. The absolute value of the abnormal rate of return is less than the absolute value of the percentage unexpected earnings.

Beaver, Lambert and Morse (1980) invert the traditional earnings-price relationship and test for the information content of prices in the prediction of earnings. Their study infers from prices the earnings process and the expected future earnings as perceived by market participants. In their analysis, price changes are viewed as surrogates for additional informational flow to the market information set used in establishing equilibrium prices which is not captured in past earnings series. Beaver et al regress percentage change in price on the percentage change in earnings per share across firms. The period of study covered the 19 years from 1958 to 1976. Their results indicate that the average slope coefficient which measures the sensitivity of the percentage change price to the percentage change in earnings is 0.12. Grouping the firms in the study into portfolios on the basis of percentage price change and then re-running the regressions gave higher average slope coefficient. Their results indicate that security prices behave as if earnings are perceived to follow a compound process quite different from the simple random walk specification which has descriptive validity for the annual accounting earnings series identified by Ball and Watts (1972).

Atiase (1980) examined the issue of the information content of earnings and whether the information can be explained in terms of firms capitalisation. He postulates that the amount of predisclosure information would be higher for large firms than for small firms and this might affect the information in the earnings report when released. His reported results indicate that the information content of an earnings announcement is inversely related to size. Other studies by Atiase (1985), Freeman (1982), Ro (1984), Zeghal(1984) and

Anderson (1987) all provide empirical results to support the proposition that the information content of a firms earnings has an inverse function with the size of the firm as measured by the capitalised market value.

Grant (1980) assessed the differences in the information content of annual earnings announcements between a sample of Over-the-Counter (OCT) and NYSE firms. He uses weekly returns data to give much more specific evidence to the problems raised by Oppong (1976). Grant´s reported results indicate that annual earnings announcements of OCT firms possess more information content than those of NYSE firms. The basic explanation for the observed differences between the two markets is that OCT investors have fewer alternative sources from which to acquire information on firms prior to the release of the annual earnings number. However, NYSE firms release more interim information prior to the release of the annual earnings and therefore investors are able to anticipate better the information in the annual report.

Oppong (1980) examined the information content of annual earnings announcement of NYSE firms. The sample was limited to firms whose accounting year ended on 31st December. The rationale for this was to investigate the problem of the clustering of earnings which led Beaver (1968) to leave out of his sample firms that had their accounting year ending on the 31st of December. Oppong´s results indicate that the earnings announcement of the majority of the type of firms sampled had no information content. It must be noted however that the majority of firms in the sample were large firms and the amount of predisclosure information could have affected the results.

Morse (1981) added much more precise evidence to Beaver (1968) study by using daily data to examine the information content of annual accounting announcements made on the NYSE and American Stock Exchange. His reported results indicate that most significant price changes and excess trading volume occurred on the day prior to and on the day of the announcement of earnings. The results were consistent with Beaver's results except for the important finding that the reaction period was highest on the day before the public announcement of the earnings.

Ohtsuka (1981) applied the the Beaver methodology to annual and semi-annual accounting announcements on the Tokyo Stock Exchange during the five year period from September 1974. The evidence indicated that price changes were significantly larger in report weeks of both annual and semi-annual accounting announcements than in nonreport weeks. The evidence also indicate that significant price changes occurred several weeks before the announcement and that price changes were larger in the annual announcement week than in the semi-annual. This study of annual accounting numbers having a higher information content than the Semi-annual numbers differ from the US evidence.

Firth (1982) examined the information content of the release of a company's annual announcement in its different stages in the U.K. The selection of the firms was constrained to ensure that the preliminary announcements were evenly distributed throughout the calendar year to reduce the potential bias in the cross sectional residuals. Only two or three firms in each calendar week of 1978 reporting preliminary results were selected and firms selected had to have market capitalisation of 10 million pounds. Firth investigated the various stages of the announcement namely preliminary announcement, annual earnings announcement, and annual general meeting and accounts to ascertain the information content.

In the course of the study, Firth also investigated the interim earnings announcement made in that period to ascertain whether they contain any information. Firth used weekly return data in the study and the result indicate that substantial information is conveyed to the stock market by the release of earnings reports of firms and that the release is confined to the week that the announcements are made. Firth's sample by being constrained therefore has descriptive validity for only preliminary announcements and it is an attempt to provide a much more precise evidence of the information content of interim reports that daily data will be used in this study.

Givoly and Palmon (1982) examined the information content of firms listed of on the NYSE using Patell's (1976) methodology. They were particularly interested in finding out whether timeliness in reporting has any effect on the firm's share price. Their reported results indicate a statistically significant price reaction in the week during which earnings are announced. Givoly and Palmon grouped firms into portfolios according to those that report "early" and those that report "late"

Givoly and Palmon then compared the magnitude of price movement of the "early" and "late" portfolios. The results indicate that price movements in the announcement week and in the adjacent weeks are more pronounced for early announcements. Their results also indicate that bad news tends to be delayed and good news is earlier or on time. By implication therefore a delay in reporting is fully discounted by the market as bad news. In interpreting their results however, it must be borne in mind that the magnitude of the price movements of the two groups is only meaningful if the announcements grouped under each portfolio are proportional in terms of their expected good or bad news and that few extreme values have no effect on the reported results.

Patell and Wolfson (1982) provided further evidence on the timing of corporate releases of earnings and dividends by some NYSE and AMEX firms in 1976-1979. The sample of firms was 96 and comprised 1000 announcements of dividends and earnings during the study period. The reported results of Patell and Wolfson were consistent with the conjecture that bad news is more likely to be released after trading is closed. The results also indicate that bad news announced after trading is closed did not exhibit any abnormal pre-release price activity while that of good news did. They conclude that management attempt to provide no trading period for the dissemination and evaluation of bad news releases when they have less favourable news to report.

Rendleman, Jones and Latane (1982) examined the information content of quarterly earnings. They add a methodological refinement by using Scholes-William (1976) methodology to adjust for risk to account for the problem of thin trading that the earlier studies might have suffered. They found quarterly earnings announcement to be associated with significant price activity and this price activity persisted for several days after the announcement.

Pincus (1983) examined some characteristics of information announcement which might explain the differential market response to the announcement of accounting earnings reported by Grant (1980). Using the results of studies by Joy, Litzenberger and McEnally (1977) and Beaver, Clark and Wright (1979) which indicate that differences in earnings forecast errors are associated with differences in unexpected movements in share returns, he investigated as to whether the differential market response could be explained by the "precision of earnings announcements". Pincus´s results indicate that differences in both duration and unexpected returns variability of the market reaction to earnings announcements are affected by whether there exists a greater or lesser degree of earnings predictability.

Patell and Wolfson (1984) examined the effects of earnings and dividend announcements on the intraday behaviour of stock prices. Their reported results provide further evidence of the information content of earnings and dividends. They report however that dividends announcement induced weaker response than earnings announcement and that unchanged dividends have practically no effect on prices.

Kross and Schroeder (1984) examined the information content of the effect of the timing of quarterly earnings announcements. The research examined basically the association between quarterly announcements timing (early or late) and the type of news (good or bad) that is reported and the relation with share prices. The rationale for the study was that earlier studies of announcement timing and their effects on share prices related to annual accounting data. The study was therefore the first to consider the reporting lag issue with respect to quarterly accounting data. Firms were classified as reporting early or late based on a comparison of the actual time of the announcement with the expected time of announcement. The expected time of announcement was formulated via a time series analysis of each firm's reporting history. The reported results indicate that quarterly earnings announcements were associated with abnormal stock returns and that the abnormal returns of firms that announced early were significantly higher than those that announced late. The results also show that the 'timing effects' persisted whether or not the announcement (1) contained good news or bad news, (2) was annual or interim announcement, (3) was made by small or large firm (4) contained moderately good or moderately bad news.

Chambers and Penman (1984) also examined the issue of the information content of earnings reports with respect to their timeliness. The sample was made up of NYSE firms and restricted to large firms. They report that the information content of the earnings announcement has an inverse relationship with the size of the firm and that timely interim reports of small firms which have good news are associated with higher price reactions than those with longer time lags and bad news. Late announcements are interpreted by the market as a sign of bad news and that abnormal post-report price variability is associated with unexpectedly early reports which convey good news but not with those which convey bad news.

Foster, Olsen and Shevlin (1984) examined further the behaviour of security returns on the announcement of earnings. Their interest was mainly to attempt to find some explanation for the abnormal price activity that appears to persist over time on the announcement of earnings. The study was quite exhaustive and comprised of all firms on the compustat tape in 1981 and who have daily share price data available on the tape of the Centre for Research into Security Prices (CRSP). The sample selection also required that firms had a quarterly earnings file covering the second quarter of 1970 to the fourth quarter of the 1981 period. The final sample was made up of 2053 firms with 56,000 observations.

Foster et al developed four unexpected earnings models for the firms with two of the models based on the univariate time-series model of expected earnings and the other two based on an earnings expectation model using security prices. Firms were then assigned into portfolios on the basis of ranking of their forecast errors and using the deciles of the rankings as cut off point for each portfolio. The cumulative abnormal return over a hundred day period surrounding the day of the announcement of the quarterly earnings were then examined. The study provide evidence that the systematic post-announcement drifts in security returns are dependent upon the particular earnings generation model specified. They found no post announcement drift with the price-based model unlike the models based on earnings.

Maingot (1984) also examined the information content of U.K. annual earnings announcement using Beaver's methodology. His results indicate that the reactions of investors to the annual earnings announcement did manifest themselves at the time of the release.

Jennings and Stark (1985) examined the information content and the speed of stock price adjustments to quarterly earnings announcements. They studied the association between the share price adjustments process and low/high information content of earnings announcements. They operationalise low/high information content by reference to the absolute percentage change in the mean and standard deviation of analysts' forecasts against their median changes. It was basically an extention of Patell and Wolfson study. The results indicate that those announcements that had high information content had high association with the price adjustment process and that the duration of price adjustments to the quarterly reports increased with the magnitude of analysts´ revision of forecast. The study is an attempt at explaining the dynamics of the process of adjustments to earnings announcements similar to the study of Pincus (1983) who show that the duration of price adjustment was affected by the degree to which earnings are predictable.

Defeo (1986) provides further evidence on the dynamics of price adjustments to earnings announcement across firms relative to size, reporting time lag and report type as to whether annual or quarterly. The reported result was in line with earlier studies on information content and firm size as well as report lag and report type.

Rayburn (1986) examined the issue of the association between operating cash flows and accruals and security return. She argue that any information that earnings provide about operating activities that is incremental to the information provided by cash flows is a function of the accrual adjustment process that transforms cash flows to earnings. The interest in the study was in knowing whether accruals provide information to aid investors estimation of future cash flows over and above the cash flow information contained in financial statements. The reported result support an existence of association of both operating cash flow and aggregate accruals with abnormal returns.

Lipe (1986) examined the information content of earnings components namely gross profits, general and administrative expenses, depreciation expense, interest expense, income taxes and other items. Lipe wanted to know if the decomposition of earnings provide additional information beyond that provided by the aggregation of the earnings components. Annual return data was used in the analysis on the grounds that some of the movements in the market index may represent economy wide factors which affects the earnings components as well. By his procedure therefore, he argued, that both signal and noise will be removed from the raw returns. Lipe conclude from his study that components explain more of the variation in returns than is explained by earnings alone.

Beaver, Lambert and Ryan (1986) re-examined the information content of prices with respect to earnings by Beaver, Lambert and Morse (1980) by reversing the regression model ie they treat the percentage change in earnings as the dependent variable and percentage change in price as the explanatory variable. BLR report that the regression coefficient produce essentially the same inferences ie prices contain information with respect to future earnings.

Sakurai (1987) also provide evidence of the information content of earnings announcement on the Tokyo Stock

Exchange using Morse's methodology. The study is an attempt to provide much more precise evidence to the study of Ohtsuka (1981) which was based on weekly data. Sakurai's result adds evidence to the fact that reaction to the announcement of earnings on the Tokyo Stock Exchange takes place on the announcement day of all the days in the week of announcement.

Collins, Kothari and Rayburn (1987) inverted the traditional price-earnings relationship similar to Beaver, Lambert and Morse (1980) and test for the information content of prices with respect to future earnings by focussing of firm size. Their major interest was therefore to examine whether prices can be used to predict the earnings of firms and whether such a prediction is affected by the size of the firm. Their reported results indicate that for small firms, simple univariate time series model of earnings generation performs just as well as price based models. For larger firms however, the price based models perform better than either the random walk or random walk with drift.

CONCLUSION

This section has reviewed some of the studies that have been undertaken in the the area of accounting information and security prices. The overwhelming evidence that accounting information affects security prices can be found in the US. In the US and Japan, much more precise evidence exists regarding the information content of interim financial statements. It is for the purpose of providing much more precise evidence in the U.K. context that this study is being undertaken by the use of daily data. This review has also shown the need for more empirical work on market based accounting research.

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CHAPTER SIX

METHODOLOGY

6.0.1 INTRODUCTION

This section will discuss in detail the methodology that is utilised in the research and the methodological issues involved in the study. Before a detailed discussion of the issues, there is the need to evaluate some of the research methods that could have been utilised in the current study.

6.1.0 RESEARCH METHODS EVALUATION

There are a variety of methods that are available for carrying out research in business generally, and particularly those studies on the information content of accounting income numbers as reflected in security prices. Research in itself is any enquiry undertaken to secure information for the solution of problems. Any study therefore that seek to describe the present state of knowledge, identify and clarify problems or establish testable hypotheses constitute research. Research therefore seeks to describe, explain or improve a problem thereby making more information available for its solution.

Howard and Sharp (1983) define research as any study that seeks through methodological processes to add to one's own body of knowledge and hopefully to that of others by discovering non-trival facts and insights. In a more rigorous form, Kerlinger (1973), defines research as controlled, empirical and critical investigation of hypothetical propositions about the presumed relation among phenomena. The limitation in Kerlinger's definition is that it tends to view research as being always empirical which need not be so. A less rigorous conceptual definition definition of research is that it may be viewed as a systematic investigation carried out towards increasing knowledge.

A variety of methods are available in answering research questions. Research methods are usually problem specific. Sterling (1972) echoes this clearly. He states that:

> "...since the research methods depend upon the questions and since I am unwilling to place restrictions on questions, it follows that I am unwilling to place restrictions on methods...although the research methods of all the scientific discipline have some general properties in common, the more striking feature is their diversity."

The availability of options is a pointer to the fact that some methods are better than others in a given situation in the research process. This provides the basis for evaluating the way in which a given research was conducted. The rich context of methods available for research therefore creates both opportunities and pitfalls. While it affords the researcher a wide choice in the selection of a methodology for accomplishing the job at hand, it undoubtedly imposes on him a responsibility. The researcher is required not only to select a rational choice but also to give evidence that a particular method was selected with a full understanding of the alternatives that were available.

Buckley, Buckley and Chiang [BBC] (1976) defined research methodology as consisting of strategies, domains and techniques utilised in accomplishing a research objective. Strategy refers to the essential nature of the data to be used in the research and the process by which it is found and analysed. Domain refers to the data source and the environmental situation in which a given research is carried out. Techniques refer to the instrument which is used to find and analyse data. BBC suggest four broad possible techniques in finding and analysing data in any given research situation. These are :

(a) Opinion Research

(b) Empirical Research

(c) Analytical Research

(d) Archival Research

OPINION RESEARCH

Opinion research involves the researcher seeking the views, judgement or appraisals of other persons with respect to a particular problem. It also involves research into the attitudes and perceptions of others.

The variety of techniques appropriate to opinion include survey research which solicits the opinions of individuals. Projects that rely on questionnaires or interviews falls within this category of research.

There has been several examples of opinion research in accounting especially in studies that focus on individuals. This technique is also suited to studies on the information content of interim accounting data as is reflected in observed changes in share prices. Since opinion research is able to capture peoples' impression of about themselves, their environment and their response to changing conditions, it could be well suited for the current study's that attempt to measure the information content of interim financial reports. It is a fact of life that a person's beliefs and expectations influence his behaviour. The beliefs and expectations of market participants would therefore be reflected in their actions as they go about their buy-hold-sell decisions in the securities market. There has been over-domination of the use of archival research in the attempt to explain market participants behaviour. These studies have focused on the association between accounting income numbers and risk adjusted security returns. Phenomenological based approach which also falls under opinion research could be of immense benefits in seeking insights into the behaviour and perceptions of market participants. Huczynski and Mmobuosi (1975) define phenomenology as the study of how any object "is" in a person's consciousness as a basis for explaining behaviour. This may provide further insights and add to our understanding of problems that have been researched using the positive approach where human behaviour is seen to be directly correlated with objects in the world. This is the dominant view in all the researches that have been undertaken in the relationship between accounting information and share prices. This is clearly demonstrated in the attempt to explain market participant's behaviour by conducting association tests between accounting data and unexpected risk adjusted returns.

The advantage that is very apparent from opinion based research in that it is able to capture peoples' impressions. It has the secondary advantage of simplicity and relative ease of administration, ability to sample large populations and the opportunity to analyse data through a variety of standard statistical procedures.

Cronbach (1964) has provided an excellent criticism of questionnaires and interviews. Their major defect is the bias which is introduced in the design of survey instruments, i.e. the researcher defines the questions, the response sets, decides who will participate and under what conditions they will participate. Sletto (1937) has shown that respondents will more frequently endorse a favourable statement and disagree with its opposite.

There is usually a preference for strong statements rather than weak ones.

Campbell, Schwartz and Sechrest (1971), Buckley, Buckley and Chaing (1976) quote Lana's study on the familiarity and order of presentation of persuasive communications that controversial questions tend toward primacy (the first question in a series has more influence than later questions) while unfamiliar questions tend towards recency (i.e the last item in the series tends to be selected). The intrusion of the interviewer could cause behavioural changes. Other things like race of the interviewer as well as his age, religion, social class or sex could affect the interviewee. The subject too could have biases like aversion to interviews and certainty illusions where one honestly believes in something being true while the opposite may be the case in reality.

Perhaps the absence of the use of opinion research in studies in accounting numbers and security prices may be that a market participant under pressure from other market forces may act contrary to what he normally does. Unless opinion research focuses on this aspect, it may not capture fully people's behaviour regarding their perceptions of the effect of accounting numbers and security prices. It is mainly due to this problem that the current study does not utilise opinion research to investigate the problem at hand.

EMPIRICAL RESEARCH

The next major research method is empirical research. The ordinary dictionary definition of empirical research provides a useful basis for distinguishing this type of research from the others. The dictionary defines empirical as something which originates in or is based on observation or experience. The term empirical research has unfortunately assumed a meaning contrary to the dictionary definition as most archival based studies have been regarded as empirical research. Empirical research therefore require the researcher to observe and/or experience things for himself rather than through others. In other words, the researcher must be an eye-witness or experience the phenomena of interest. The data source or domain for empirical research could be:

(a) a field study

(b) a laboratory study

(c) a case study.

The principal technique in empirical research is observation. Buckley, Buckley and Chaing sum this up well when they state that:

> "The purpose of observation is to witness factual situations and perceive reality without intermediation. A good observer is a highly-skilled individual who sees

> order in what appears to be a confused environment...he has the ability to separate the relevant from the irrelevant, to see causal relationships, and to derive theories capable of further testing."

Observation in empiricism occurs under one of four modes where the researcher could be

(a) a participant

(b) non-participant

(c) obstrusive

(c) non-obstrusive

A participant observer becomes part of the research environment. He could for instance be a member of a committee and take part in such a committee's deliberations. A non-participant observer is detached from the environment in which he is observing. He could be obstrusive ie make his presence and purpose known or non-obtrusive where he enter without the knowledge of those he is studying. Empirical research has been used quite often in accounting. In the area of accounting income numbers and share prices, empirical methods could be used by observing market participants' use of accounting data in their buy-hold-sell decisions. The strength of empirical research lies in its contact with the real world phenomena. It stresses on behaviour rather than opinion and examines what actually happens as opposed to what people say has happened, is happening or may happen.

Murdick (1969) notes that observations may be deficient due to one or more of the following factors

(1) sensory errors due to illusions or lack of discriminatory ability

(2) Psychological interpretations which may vary

(3) Constant error due to lack of precision of the instruments used.

(4) Errors in recording data

(5) Lack of recognition and control of the influencing factors.

In addition to the above factors, the ability of the observer may be suspect and his intrusion into the environmental setting may cause spurious effects. A major defect the of case study approach is that it may provide a deep insight in just a fragment of a whole system which may not aid an understanding of the system as a whole. For instance, an in depth observation of a financial analyst in his use of accounting income numbers may not provide an understanding of how financial analysts as a whole use accounting income numbers.

There is lack of design and control and the required time to understand a system may be difficult to determine. Field studies suffer from the same defect. The only exception is that experimental design could be used in the case of field studies. In the attempt to eliminate extraneous variables in the laboratory setting, the researcher may excise away the essentials of the problem. Observation requires personal and physical involvement over extended time periods of which only a small number of situations could be studied in detail. A second major defect is that it lacks historical setting and requires the activity being studied to be on-going at the time of the research. It is restricted to the present. To give the study some future or historical touch, it must rely on surrogate situations as can be achieved through role-playing and simulation.

ARCHIVAL RESEARCH

The third major type of research is archival research. Archival research has often been interpreted as empirical research in a number of studies in the accounting literature. This is the light in which studies in accounting income numbers and share prices are often seen by a number of researchers e.g. Ball and Brown (1968) empirical evaluation of accounting income numbers. Ball and Brown's study was essentially archival in nature. The nature of archival research lies in the fact that the researcher observes records of phenomena ie "data bases" as opposed to directly observing the phenomena of research interest or gathering opinions regarding that phenomena.

The primary data source or domain of archival research are written records, tapes which are original documents or official files and records. It could be cheques, purchase orders, bank statements or industry and government statistics, reported share prices as per Financial Times, Datastream, Extel or Wall Street Journal. These observations are basically disaggregated and unsummarised. They are "not-interfered-with" data whose analysis and interpretation is maximally left in the hands of the researcher.

With secondary archive, sources of observations are written records of the results of data gathered by other investigators. In accounting sense they could be (a) journals, ledgers,annual financial reports etc (b) tapes of company data e.g. share prices and other financial records. The opinions, concepts and ideas of others via library research when these are more or less treated explicitly as data are also included. It must be noted however that in the strict sense, other researchers' views once expressed and recorded are 'real world' observable data. The distinction however helps in distinguishing research strategies ie analytic versus empirical or archival as to whether the data is used more or less as sample evidence or appealed to in a logical exercise.

Though these observations have been interfered with through summarisation and condensation, secondary archives do allow for analysis on often much reduced quantities of data. A review and analysis of prior procedures which were in the hands of others is generally called for to assess the acceptability or reasonableness of those procedures. This study falls under this area of research. The data source is principally share price data of firms from the Datastream share price data base. The date of interim earnings announcement is taken from the Financial Times and the Stock Exchange Quotations Department.

There is also physical archives where sources of observations are stored pieces of physical evidence of the occurrence of phenomena which are ad hoc or non-systematised ie they require reasoned interruption to link them with the phenomena of interest. This type of research is not easily found or imagined in accounting. Perhaps, observations of the amount of dust on inventory items in a warehouse as indicating turnover of stock or obsolescence could be so classified. Care needs to be exercised here as the amount of dust could also be an indication that the warehouse has poor roofing or ceiling or both.

The major strengths of archival research are that (a) it is well suited to historical analysis and the extrapolation of past trends into the future (b) It is well suited to efficiently calling upon authoritative and documented opinion. (c) It is the least obtrusive in researching phenomena involving the interaction of others.

(d) Much archival data is amendable to a wide range of statistical methods and lastly (e) Large samples are often possible and obtainable at relatively low cost and effort. This enhance the ability to generalise from research findings.

The major weaknesses are that archives may contain non-researcher source bias or error. There could be selective depositing particularly the depositing of good news over bad news and the phraseology and interpretation of both. Those who deposit may commit errors, or bias archives towards particular moralities or points of view, particularly types of events, political systems, economic systems etc through what is included and how it is included. Archives may be retrieved by the researcher with error or bias. The researcher may seize upon certain evidence and ignore others particularly those not supporting pre-conceived notions or hypothesis. The researcher may editorialise or otherwise fill in gaps in order to complete a data base with missing observations.

ANALYTIC RESEARCH

Analytic research methods are essentially techniques for rendering inductive and deductive logic systematically in the construction of theoretical models. With analytical research, no explicit reference to external data sources is necessary and research problems may be solved logically or philosophically. Analytical research methods are all directed towards the construction of or verification of inductive and deductive models. The context of enquiry here is conceptual or unreal as opposed to empirical or real. Analytical research could involve both formal and informal techniques and this is discussed by Patz (1984). The formal end involves mathematical logic and modelling. Mathematical modelling involves exact reasoning concerning non-numerical relations using mathematical symbols to facilitate calculation and generality. Mathematical modelling concerns the construction of series of equations which forms systems of analysis and embody precise specification of relationships, parameters and constants.

At the informal level lie methods of conducting verbal argument. These methods involve

(a) Scenario which is analysis and argument by way of logical and plausible set of events, both serial and simultaneous with careful attention to timing and correlations.

(b) The dialectic methods in theory construction involves analysis and argument by way of a fully developed and articulated argument and counter argument.

(c) The dichotomous method involves analysis and argument consisting of breaking the overall question down into series of more focused yes/no questions and answering these.

(d) The teratological method also involves analysis and argument drawing upon hypotheses and solutions regarding the future states of nature to reach conclusions with respect to an existing problem.

(e) There is also the appeal to analogy where there is argument and analysis from notions of similarity between the present problem/situation and another, typically drawing upon accepted solutions regarding the later in order to deal with the former.

(f) The appeal to authority or authoritative literature where there is argument and analysis form notions provided by respected works of others

All the foregoing methods are vehicles for implementing the construction of theoretical models. A major distinguishing feature of analytical research is that all observations are conceptual as opposed to perceptual in empirical or archival research. The role that analytical research can play in accounting lies in the area of the development of accounting theories on which the practice of accounting would be soundly based. It is difficult to imagine how analytical research methods could be used in the present study.

A major advantage of analytical research is that it provides the most scope for imagination and creativity. Not requiring existing data nor in some cases even referencing data or ideas of others, it can lead to theory construction and interpretation well beyond current thinking and present perceiable reality. Since the data used comes mainly from conceptual observations, it can be low in cost in terms of time and effort relative to its potential benefits.

Its major weakness is that it requires a first-rate mental equipment as it is wholly conceptual and relies on logic for its validity. Again it relies heavily on the use of everyday language which is in itself imprecise and open to considerable misuse. More often than not, and especially in broader theory construction, a broad knowledge base is required. It is difficult to acquire the necessary skills as well as breadth of knowledge which is typically needed for a rigorous and internally valid theory to be constructed. It would not therefore necessarily be low in cost.

Having discussed in general terms some of the methodologies available for research, attention now will be focused on the detailed methodological issues involved in this study.

6.1.1 MODEL OF SECURITY PRICE GENERATION

The price generation models that are available for use in research in the relationship between accounting data and security prices have been mainly the Capital Asset Pricing Model (CAPM) and the Market Model.

THE CAPITAL ASSET PRICING MODEL

The Capital Asset Pricing Model was a development from the pioneering study of Markowitz (1952) on Portfolio Theory. Markowitz viewed the problem of investor portfolio selection as dependent upon the mean and variance of that portfolio´s return in condition of uncertainty. His approach to the problem of portfolio selection was purely normative and the implications of the theory for general market equilibrium were explored by Treynor (1961), Sharpe (1965) Lintner (1965a,b) and Mossin (1966) leading to the development of CAPM. Each of the four investigators were concerned with the implication of the Markowitz´s model for the equilibrium structure of the prices of assets.

Jensen (1972) points out in his review article on capital market theory that all the investigators implicitly or explicitly make the following assumptions:

(i) All investors are single period expected utility of terminal wealth maximisers who choose among alternative portfolios on the basis of mean and variance of return.

(ii) All investors can borrow or lend an unlimited amount at an exogenously given risk free rate of interest and that there are no restrictions on short sales of any asset.

(iii) All investors have identical subjective estimate of the means, variance and covariances of return among all assets ie investors have homogeneous expectations of asset means and variances of returns.

(iv) All assets are perfectly divisible and perfectly liquid (ie all assets are marketable with no transaction costs)

(v) There are no taxes.

(vi) All investors are price takers.

(vii) The quantities of all assets are given.

Given the above assumptions, the CAPM states the equilibrium expected return $E(\tilde{R}_j)$ on any asset j to be equal to

$$E(\tilde{R}_j) = R_f + b_j(E(\tilde{R}_m) - R_f) \quad [1]$$

where $E(R_m)$ is the expected return on the market portfolio and bj is given by

$$b_j = \frac{Cov(\tilde{R}_j \tilde{R}_m)}{Var(\tilde{R}_m)}$$

where $Cov(\tilde{R}_j, \tilde{R}_m)$ is the covariance of the returns of asset j with the return on the market portfolio and $Var(R_m)$ is the variance of the market portfolio.

The model has an essential feature in the sense that it views as the appropriate measure of asset j's risk to be

b_j and not the variance of asset j's returns ie ($Var(\tilde{R}_j)$). Though investors are assumed to measure risk in terms of the variance of their portfolio's returns, diversification reduces the contribution of individual asset's variance to the variance of the portfolio to virtually zero. This shows that unsystematic risk can be reduced to zero by diversification. The systematic risk being the covariance of the asset's return to the return on all other assets in the portfolio cannot be eliminated be diversification. Investors therefore receive no reward for risks that can be diversified away.

The original Sharpe-Lintner version of CAPM was extended by Black (1972). Black investigated a general market equilibrium under the assumption that there is no riskless asset and therefore no opportunities for borrowing or lending at a risk-free rate. Black demonstrates that under conditions of unrestricted short-selling, the equilibrium portfolio of all investors will consist of a linear combination of the market portfolio and a second portfolio which although risky, has a zero covariance with the market portfolio. Black called this the zero-beta portfolio and this portfolio takes the place of the risk free rate in the model given in [1]. Black's model under equilibrium is given by

$$E(\tilde{R}_j) = E(R_z) + b_j(E(\tilde{R}_m) - R_f) \qquad [2]$$

The empirical validity of Black's model has been suggested by Jensen (1972) and Black, Jensen and Scholes (1972). There have been various other extensions of the CAPM. Vasicek (1971) dealt with the case where investors cannot borrow at a risk free rate though a riskless asset is available for investment. Mayer (1972) also considered the case where there are non-marketable assets while Brennan (1970) extended the model to allow for differential tax rates on dividends an capital gains. Lintner (1969) and Rubistein (1973) have demonstrated that the assumption of homogeneous expectations can be relaxed. Solnik (1974) developed asset pricing model in an international context. Fama (1970) examined the multi-period consumption-investment decision and demonstrated conditions under which the single-period utility consumption and terminal wealth model can be justified. Bogue and Roll (1974), Stapleton and Subrahmanyam (1976) etc have used Fama's conclusions to develop multiperiod equilibrium asset pricing models.

6.1.3 EMPIRICAL TESTS OF CAPM

Although the CAPM is stated in terms of expected returns, all of the empirical tests of the theory transform it from ex-ante into ex-post realised returns. This is done by assuming that expected returns are on the average realised ie the rate of return on an asset is a fair game. The empirical testing is given in the form

$$R'_{p,t} = y_0 + y_1\beta_p + e_{p,t} \qquad [3]$$

where $y_1 = R_{m,t} - R_{f,t}$ and $R'_{p,t}$ is the excess return on portfolio p given by $(R_{p,t} - R_{,ft})$. The only difference with [1] is the addition of the constant term y_0.

Copeland and Weston (1983) list the predictions that any testing of CAPM should meet as:

(1) The intercept term of the model $y0$ should not be significantly different from zero. If the intercept term is significantly different from zero then, there may be some omission from the CAPM which is captured in the empirically estimated term.

(2) Beta should be the only factor which explains the rate of return on a risky asset. Any other factor eg dividend yield, price-earnings ratios etc if included in the model should have no explanatory power.

(3) The relationship should be linear in beta.

(4) The coefficient of beta, y_1 should be equal to $(R_{m,t}-R_{f,t})$.

(5) The return on the market portfolio should be greater than the risk free rate over long periods of estimation since the market portfolio is riskier.

Among the studies testing the above relationship include Blume and Friend (1970,1973), Black, Jensen and

Scholes(1972), Miller and Scholes (1972), Litzenberger and Ramaswamy (1979), Fama and Macbeth (1973). The empirical evidence on the validity of the model is summed up by Copeland and Weston as:

(1) The intercept term, y_0, is significantly different from zero and the slope coefficient, y1, is less than the difference between the return on the market portfolio minus the risk free rate. The empirical studies use a 90-day treasury bill as a proxy for the risk free rate and labouriously calculate as well the return on the zero-beta portfolio. The implication of the finding of a significantly different from zero intercept term in the model imply that low beta securities earn more than the CAPM would predict and high beta securities earn less.
(2) Versions of the model that include a squared beta term or unsystematic risk find that at best these explanatory factors are useful only in a small number of the time-periods sampled. Beta dominates as a measure of risk.
(3) The simple linear empirical model [3] fits the data best. It is linear in beta. Over long periods of time, the rate of return on the market portfolio is greater than the risk-free rate ie y1 is greater than zero.
(4) Factors other than beta are successful in explaining that portion of security returns not captured by beta eg Basu (1977) found that low price/earnings portfolios have rates of return higher than could be explained by CAPM. Banz (1981) and Reinganum (1981) found size to be

important as smaller firms tend to have higher rates of abnormal returns and Litzenberger and Ramaswamy (1979) found that the market requires higher rates of return on equities with high dividend yields.

All the studies referred to above were carried out in the US with American data. The only UK study is that of Guy (1974). Following the methodology of Blume and Friend, Guy tested the CAPM over five and a half year period from June 1965 to December 1970 using quarterly data for 100 largest securities divided up into 10 portfolios of 10 shares each. The result indicate that the cross sectional estimate of the intercept differed significantly from the risk free rate. He however found that the relationship between ex-post mean return and beta is linear. For a later sample of 50 shares selected at random using ten portfolios of five securities each, Guy found no relationship at all between risk and return.

One must stress however that Guy's results could have been affected by measurement error arising from small sample size of the portfolios and the problems of non-trading. However in the absence of further empirical evidence, it is not very assuring relying on CAPM as a model of price generation in a UK study of share prices.

6.1.4 ROLL'S CRITIQUE

A fundamental criticism levelled against all the studies that have tested CAPM has been made by Roll (1977). Roll asserts that no valid test of the two parameter asset pricing model has ever been accomplished because its underlying theory is defective as a scientific hypothesis. Roll reaches his conclusions from a careful study of the efficient set mathematics and demonstrates that with the two parameter CAPM,

(1) The only legitimate test of CAPM is whether or not the market portfolio (which includes all assets) is ex-post mean variance efficient.

(2) If a proxy is used for the market portfolio and this proxy is ex-post efficient, then, it follows that betas calculated using this proxy will be linearly related to the individual sample mean returns. He demonstrates that in any sample of observations on individual returns, regardless of the generating process, there will always be an infinite number of ex-post mean variance efficient portfolios. The linearlity of individual returns and beta implies nothing at all about the mean/variance efficiency of the market portfolio. In short therefore, the only test for CAPM require that the efficient tangent portfolio is the market portfolio of all assets.

6.2.0 THE MARKET MODEL

The second model of security price generation that has been extensively used in research is the Market Model. Unlike CAPM, the market model has no underlying theory and is therefore not subject to Roll´s critique. It was developed by Sharpe (1963). The model assumes a linear relationship between the return of a security and the market return and is given by

$$R_{j,t} = \alpha_j + \beta_j R_{m,t} + e_{j,t} \qquad [4]$$

where $R_{j,t}$ is the return on security j at time period t, and α_j and β_j are ordinary least squares regression estimates and ejt a random error term with zero expectation and constant variance.

6.3.0 TWO STAGE TIME SERIES ESTIMATION

Most of the studies that have investigated the relationship between accounting information and share prices have examined the behaviour of abnormal security returns. The studies assume that the stock market is efficient in the semi-strong form. The "information content" studies are stated in terms of security return distribution conditional upon the accounting information signals versus the unconditional security return distribution. The information contained in an event is specified as

$$f(R_{j,t} \mid y_{j,t}) \neq f(R_{j,t}) \qquad [5]$$

where $f(R_{j,t})$ is the unconditional distribution of the return of firm j, $f(R_{j,t} \mid y_{i,t})$ is the conditional distribution of the return of firm j over period t conditioned by the signal $y_{j,t}$ about firm j over the period t, $y_{j,t}$ is generated from an information system $n_{j,t}$ where $n_{j,t}$ represents the information set available after the announcement of the accounting information.

For [5] to be testable, it is necessary to define the return generating process. The return generating model that has been adopted in most of the research into accounting information and share prices has been the market model and the computational procedure has mainly followed that adopted by Fama, Fisher, Jensen and Roll (1969). The procedure is as follows:

(1) A sample is chosen from the population of firms that are affected by the event of interest.
(2) For each firm, the period around the event of interest is isolated for study. Since time series analysis of each firm's event of interest might not generate enough observations, data for different firms are combined. To facilitate the combination of data for different firms

engaged in the same event at different points in time, the date (day/week/month) of the event for each firm is defined as time zero and the time period prior to and subsequent to the date are numbered as

$$N \ldots, -3, -2, -1, 0, 1, 2, 3, 4, \ldots, N$$

where N is the number of days/weeks/months in the test period and 0 is the day the event took place eg announcement of earnings.

(3) The first stage of the two-stage process is the estimation of the parameters of the return generating process. The first stage is estimated with each particular firm's time series data but excluding the period around the event of interest in order to avoid specification error and hence biased estimates. Following Fama et al, most of the studies use the market model in the first stage estimation process given by

$$R_{j,t} = \alpha_j + \beta_j R_{m,t} + u_{j,t} \qquad [6]$$

where $R_{j,t}$ is the observed return on security j at time period t, $R_{m,t}$ is the return on the market portfolio in time period t and $u_{j,t}$ is a random error term with zero expectation, α_j and β_j are the parameters estimated using the Ordinary Least Squares Regression (OLS).

Other studies have also employed the two factor Capital

Asset Pricing Model in the first stage estimation eg Kaplan and Roll (1972) and this is given by

$$R_{j,t} = k_j + a_j R_{f,t} + b_j R_{m,t} + e_{j,t} \qquad [7]$$

where $R_{j,t}$ is the rate of return for firm j in period t, $R_{f,t}$ is the risk free rate of return for week t and $R_{m,t}$ is the market rate of return for period t, k_j and a_j are additional parameters to be estimated using OLS regression. Kaplan and Roll actually supressed the constant term k_j and estimated the parameters using the form

$$R_{j,t} = a_j R_{f,t} + b_j R_{m,t} + e_{j,t} \qquad [8]$$

Black's version of CAPM has also been used by Ball (1972) and Jaffe (1975) given by

$$R_{j,t} = a_{0,t} + \beta_j a_{1,t} + e_{j,t} \qquad [9]$$

where $a_{0,t}$ and $a_{1,t}$ are market determined variables representing the ex-post relationship between risk and return in each period t computed via elaborate portfolio building techniques. The β_j estimate is computed using [6]. This model is a stochastic analog of Black's asset pricing model [2]. The parameters $a_{0,t}$ and $a_{1,t}$ are analogous to the riskless rate and risk premium respectively.

The second stage of the estimation process involves the computation of abnormal returns around the event of interest for each firm in the sample. The abnormal returns are then cumulated over the same time period and averaged across securities. Abnormal returns are give by the difference between actual security return and expected return computed using the parameters in the first stage computation. The following computation of abnormal returns have all been used in earlier studies:

$$AR_{j,t} = R_{j,t} - R_{m,t} \quad [10]$$

$$AR_{j,t} = R_{j,t} - (\hat{a} + \hat{b}_j R_{m,t}) \quad [11]$$

$$AR_{j,t} = R_{j,t} - (\hat{a} R_{f,t} + \hat{b}_j R_{m,t}) \quad [12]$$

$$AR_{j,t} = R_{j,t} - (\hat{a}_{0,t} + \hat{a}_{1,t} \beta_j) \quad [13]$$

Model [10] is the naive model which assumes that all betas are one. Its use therefore requires no first stage estimation and assumes that the expected return on a security is equal to the market return. Model [11] is the market model. With model [12], [6] is used to compute a and bj and model [13] is a two factor ex-post model of the market's relationship between risk and return. Ball (1972) refers to this model as the cross sectional model. An interpretation of $\hat{a}_{0,t}$ and $\hat{a}_{1,t}$ is provided by Fama and Macbeth (1973). They state that since $\hat{a}_{0,t}$ is the OLS regression intercept from [9], and $\hat{a}_{1,t}$ is the minimum variance estimate, provided the assumptions underlying the

Gauss-Markov theorem are met by the data, it follows that $\hat{a}_{0,t}$ provides the estimate of the ex-post return on Black's zero-beta minimum variance portfolio. The return on the minimum variance portfolio is therefore given by $\hat{a}_{0,t}$. An ex-post simple version of Sharpe-Lintner CAPM is given by

$$AR_{j,t} = R_{j,t} - (1-\hat{\beta})\hat{a}_{0,t} + \hat{\beta}_j R_{m,t} \quad [14]$$

where the expost market factor estimate a_0 replaces the risk free rate.

Most of the studies carried out so far trace out over the period of interest the behaviour of the abnormal returns. To achieve this, Abnormal Performance Index is usually constructed. Two major versions of the Abnormal Performance Index have been used in studies. One is given by

$$API = \frac{1}{N}\{\sum_{j=1}^{N} \prod_{t=1}^{T}(1 + AR_{j,t})\} \quad [15]$$

where N is the sample size. The above index assumes a particular investment strategy on the part of the investor. This investment strategy involves the holding of equal amounts of each security in a portfolio at the start of the period t_1. Over the period t_1 to T, the index traces out the abnormal return after adjusting for risk and market movements on the portfolio. The holdings in the portfolio is not readjusted over the investment time span. The above index was used by Ball and Brown (1968).

The second version of the Abnormal Performance Index used by Fama, Fisher, Jensen and Roll(1969) is given by

$$API = \prod_{t=1}^{T} \{ 1 + \frac{1}{N} (\Sigma_{j=1}^{N} AR_{j,t}) \} \quad [16]$$

The above index involves a periodic re-weighting of the portfolio rather than a buy-and-hold policy implied by [15]. [16] corresponds to an investment strategy on the part of an investor who contracted at the beginning of the period to receive the difference between expected and realised returns and who re-allocate gains and losses over the securities held into the subsequent sub-period eg a week or month. In addition to the API's other studies also trace the time path of the cumulative abnormal residuals over the test period.

In addition to the tracing of the time path of the residuals around the event of interest, other studies provide significant tests for the abnormal residual in terms on their significant departures from their expected values around the event date. Under market efficiency, share prices follow a martingale process given by

$$E(AR_{j,t+1} \mid \phi_{jt}) = 0 \quad [17]$$

where $AR_{j,t+1}$ is the abnormal return on share j in period t+1 and $\phi_{j,t}$ is the information set available in time t about security j. The date of event of interest eg earnings announcement of firm j is the information set available immediately after the event. For a particular announcement, the abnormal return could be greater or less than zero but for a large sample across firms and the same time periods, the expected abnormal return is zero. Like the API measures, the main interest is to examine whether any significant price activity occurs during the period of the event of interest relative to other time periods. Various statistical tests are then performed to ascertain the significance of the computed residuals.

6.4.0 SELECTION OF PRICE GENERATION MODEL

Having discussed the security return generation models and their use in the computation of expected returns, reasons must be given for the selection of the price generation model to be used in the study. However, before the specification of the model to be utilised, it will clearly be of interest to establish whether any one of the models discussed so far is superior to the others. The importance of the model specification lies in the fact that the use of an incorrect model when correct alternatives are available leads to omission of important variables. If for instance the CAPM is valid then there are theoretical grounds for believing that the use of the simple market model is a mis-specification. Given however Roll's critique, it is not possible to test the validity of the two factor CAPM and therefore if it is not testable one cannot say whether it is right or wrong.

In the absence of a direct test of the two factor model, the only recourse is to ascertain whether the model is able to offer some explanation of real world phenomena. One must note that it is the assumptions underlying the two factor model that cannot be fully tested since the quantities of all assets are not given nor can be constructed. As far as the two factor model is concerned, there are grounds to be worried in the absence of further empirical evidence, about its use in the UK. The reason for the flagging faith in the two factor model is due to the work of Guy (1974). One could however infer from Guy's study that the two factor model might be appropriate if the study comprise of a sample made up of the largest firms quoted on the stock exchange.

The empirical evidence on the US market provided by Brenner (1974) found not much difference between the price generating models in terms of the empirical distribution of their beta estimates. The result was consistent with the earlier findings of Ball and Brown 1968 and Kaplan and Roll (1972). Since there are no apriori reasons why the simple market model should not be used, and the fact that the simple model has had extensive use in both UK and US studies, the current study follow the example of others and use the simple market model in the computation of expected returns. Brown and Warner (1985) found the simple market model to be well specified in research work that uses daily data.

6.4.1 ERRORS IN VARIABLES

The possible errors in the security returns and its effects on the study are discussed below:

6.4.2 Collection Errors

The share price data used in this study were collected form Datastream International. The correctness of the prices therefore is dependent on the correctness of the original data source from which the time series price data base has been constructed. There is no reason to believe however that the Datastream share price data base are fraught with errors.

6.4.3 Noise In The Price Observations

The Datastream historical prices are based on the average between the buy and sell prices. One important point is that the spread can be rather large for small and infrequently traded securities. The noise introduced by movements across the buy-and-sell spread for a large number of small and infrequently traded shares can therefore be substantial. Such noise however should not bias the alpha and beta estimates. The bias caused by the large buy/sell spread can come about if the direction of the movement across the buy/sell spread is correlated with the market returns. This however does not seem a plausible possibility and therefore the noise in the price observation caused by the buy/sell spread can be ignored.

6.4.4 Market Index

The index used in the study is the FT All Share Index that comprises all the shares quoted on the London Stock Exchange. It is a market value weighted arithmetic index of price relatives and is representative of UK quoted and registered companies.

6.4.5 The Problem Of Non-Trading

Fisher (1966) first pointed out the problems that are caused by asynchronous prices in the calculation of returns which has become known as the Fisher Effect. The importance of this problem becomes amplified with a shorter differencing interval and infrequently traded securities. This problem is therefore severe as far as this study is concerned due to daily data being used and also a large number of infrequently traded shares in the sample.

The problems associated with non-synchronous data arises from the fact that all share price databanks contain security prices collected and recorded at discrete points in time eg a day, week or month-end or year-end. The prices that are recorded on the other hand are associated with trades that were undertaken sometime before the end of the period when the prices were actually recorded. As a result, the return on a share of a given time period could therefore be due to some different period which both begins before the start and ends before the actual end of the period of interest. The market returns are similarly the returns of the period in which we are interested. The paired returns of the market might therefore not be associated with the actual return of the firm in exactly the same time period. As a result, the covariance estimates could be biased downwards if OLS regression is used in the computation of betas.

Two methods have been suggested for solving this problem by Scholes and Williams (1977) and Dimsom (1979). The Scholes and Williams procedure involves the computation of the beta estimate using lag, matched, and leading observations. The three beta estimates obtained by the three separate regressions are summed and the result divided by one plus twice the first order correlation coefficient of the market returns. This is given by

$$AR_{jt} = R_{j,t} - \hat{a}^{*}_{j} - \hat{\beta}^{*}_{j} R_{mt} \quad [18]$$

where $\hat{a}^{*}_{j} = 1/N \quad \Sigma R_{jt} - \hat{\beta}^{*}_{j} \; 1/N \; \Sigma^{T} R_{mt} \quad [19]$

$$\hat{\beta}^{*}_{j} = (b^{-}_{j} + b_{j} + b^{+}_{j})/(1+ 2\rho m) \quad [20]$$

and β^{-}_{j}, β_{j} and β^{+}_{j} represent betas calculated using lagged, matched and leading market returns.

The first order correlation coefficient in the market returns is given by ρ,m

Dimson's aggregated coefficient method involves a single multiple regression involving three predictors of the lagged, matched and leading market returns. This is given by

$$AR_{j,t} = R_{jt} - \hat{a}^{**}_j - \hat{\beta}^{**}_j R_{mt} \quad [21]$$

where $$\hat{a}^{**}_j = 1/N \; \Sigma \; R_{j,t} - \hat{\beta}^{**}_j \; 1/N \; \Sigma \; R_{mt} \quad [22]$$

$$\hat{\beta}^{**}_j = \sum_{k=-1}^{+1} \hat{\beta}_{j,k}$$

N in each case is the number of observation used in the computation. Dimson's methodology places no limit on the number of lagged and lead observations that can be used. It could be two leads and two lagged. In the current study, Dimson's method is selected and the only reason for its selection is its economy in terms of the computation since it involves only one multiple regression. Brown and Warner (1985), provide evidence that there is no clear cut benefit in using any of the two methods in place of OLS model.

6.4.6 TESTING INTERVAL

The testing interval is 11 days made up of 5 days prior to and subsequent to the earnings announcement. A major objective of the study is to examine the price activity during the days surrounding the announcement date. Given the assumption that the securities market is efficient in the semi-strong form, the information content, if any, should be impounded into prices immediately an interim earnings announcement is made. The choice of the testing interval is therefore reasonable.

6.4.7 THE DAY-OF-THE WEEK-EFFECT

Studies by Fama(1965), Cross(1973), French(1980), Gibbons and Hess(1981) Lakonishok and Levi (1982), Prince(1982), and Harris(1986) appear to show that daily security returns depend on the day of the week. The empirical evidence indicates persistent negative returns on Mondays. Fama (1965) reports that the variance of Monday's return is about 20% greater than that of the other days in the week while Prince (1982) reports of systematically high Friday closing prices. One explanation for a higher return variance on Monday is that Mondays's return is calculated over three instead of one calendar day, [Gibbons and Hess (1981)]. The studies mentioned examined the behaviour of market returns as well as returns of firms that have not been adjusted for market effects. The obvious implication is that there is some factor that affects market returns on Mondays and Fridays relative to other days of the week. Since this study uses abnormal returns that are firm-specific, the day of the week effect should have no impact on the results, unless it is assumed that abnormal returns are likely to vary with normal returns. The design of the current research is such that if the announcement of interim earnings (which is day zero in the study), happened to fall consistently say on

Mondays, the implications of the day of the week effect can be tested since day -5 and day +5 would also be Mondays. A simultaneous confidence interval test of differences in the test period days with respect to the announcement day will therefore be performed.

6.4.8 THE FIRM SIZE EFFECT

In the discussion of the Efficient Market Hypothesis and studies on the relationship between accounting information and security prices, some anomalies relating to the security return generating process were noted. One significant anomaly is the tendency for small capitalised stocks to outperform larger ones. Event study methodologies therefore, should adjust for firm size in the individual firm's returns. Dimson and Marsh (1986) present evidence that where the measurement interval is short, the impact of the size effect on event study methodology is not significant. In the current study, the measurement interval is five days around the release of interim financial reports and therefore the potential problem of size can be ignored.

6.5.0 Other Regression Assumptions

6.5.1 Normality:

To facilitate tests of statistical significance, the daily returns are assumed to be normally distributed and independent. Evidence by Fama (1976) show that daily stock returns are not normally distributed. The normal distribution can only be met therefore if the abnormal returns in the cross section of firms in the study are independent and identically distributed and the sample is large. Brown and Warner (1985) provide further evidence of the distributional properties of cross-sectional daily share price data. Brown and Warner note that under the Central Limit Theorem, departures from normality are less pronounced for cross-sectional data. with a sample size of 50, the distributional properties of cross-sectional mean excess returns seem close to normal. With a sample size of 100 in the current study, an assumption of normality in the distribution of cross-sectional residuals is not unreasonable.

When Brown and Warner investigated further the relation between sample size and normality, they conclude that in samples comprising of only five securities, and even when event days are clustered, the standard parametric tests have the appropriate probability of Type 1 error. In this study unsystematic returns rather than raw returns are used. The motivation for this in addition to Brown and Warner's findings is that (1) It facilitates the transformation of the raw returns such that a common expected value of the abnormal returns exists over time and across securities. (2) The abnormal returns have a smaller variance than the raw returns and this permits more powerful statistical tests and much more efficient estimates of the effects that the release of interim reports have on the share prices of firms concerned. (3) The use of abnormal returns result in a smaller correlations among the observations. Since the abnormal returns in the report period were computed using observations which were not used in the estimation of the market model parameters, the abnormal returns are not residuals in the strict sense of linear regression. It is however assumed that the underlying assumptions of linear regression pertaining to residual hold during the period as well as the assumption of their cross-sectional indepencence thus

$$E(AR_{j,t}) = 0$$

$$Cov(AR_{j,t}; AR_{j,t}) = 0, \quad i \neq j$$

$$Cov(AR_{j,t}; R_{m,t}) = 0$$

Thus, the residuals are assumed to have a zero expectation and a constant variance and that the residuals are uncorrelated with the market returns.

To facilitate the performance of significance tests, the abnormal returns is transformed into t-statistic and f-statistic Mood, Graybill and Boes (1985).

6.5.2 Homoscedasticity

Empirical evidence exists of substantantial increases in the variance of a security's return for the days around some type of event Beaver (1968), Patell and Wolfson (1979) and Kalay and Lowestein (1983). The obvious implication of the variance increase around the event period is that it may lead to large number of rejections of the null hypothesis that the mean abnormal return around the event date equals zero. The large number of rejections of the null hypothesis come about because of the standard procedure of using time series data outside the estimation period to compute the abnormal returns in the test period. To reduce the severity of the problem of increase variance due to prediction outside the estimation period, a correction factor suggested by Theil (1971) will be used. This is given by

$$C_{i,t} = 1 + 1/T + (R_{mt} - \bar{R}_m)^2 / \Sigma^T (R_{m\tau} - \bar{R}_m)^2 \quad [23]$$

$$\bar{R}_m = 1/T \ (\Sigma^T R_{m\tau})$$

where τ is observation in the estimation period.

The correction factor for the increase in variance during the test period is a function of how past market returns deviate from the average and the number of observations in the estimation period. It is hoped that this procedure may reduce the amount of heteroscedasticity in the study. It must be noted that such a procedure may not still be adequate in introducing homoscedasticity and therefore could still result in a large number of rejections of the null hypothesis in the study. As a result of this, statistical tests based on the variance of the abnormal returns may not be very appropriate as they will lead to upwards bias in the estimation of the information content in the test period. As a consequence, tests based on non-parametric methods are designed in addition to the parametric tests. The tests are basically based on the computation of simultaneous confidence intervals based on the frequency distribution of the highest abnormal residuals over the test period.

6.6.0 EVENT STUDY METHODOLOGIES

Two major methodologies are available for research in event studies like the investigation of the information content of interim financial reports. The first of the methodologies approaches the problem by estimating the unexpected part of a particular piece of information and its effect on the security price. Ball and Brown (1968) were the pioneers in this methodology. The second methodology investigates the information content of the event from the point of view of the variance of abnormal returns. The second method was the brain child of Beaver (1968). This study uses the variance method and a discussion of two methods is given below.

6.6.1 BALL AND BROWN METHODOLOGY

This methodology has been extensively used in research involving accounting data and security prices especially on the information content of earnings announcements. The methodology basically involves the examination of the association between the sign of unexpected earnings and the abnormal security returns.

In an efficient market, prices are assumed to reflect all price sensitive information. Prices are therefore revised as information flows to the information set utilised in setting prices. If prices are observed to change, it reflect the fact that a new information relevant to price formation has bee released to the market. If therefore prices are observed to change on the release of earnings information, it is a reflection of the fact that a new information relevant to price formation is contained in the announcement of the earnings and this has changed investors beliefs and actions. The changes in the prices of shares therefore indicate the process that the unanticipated part of the earnings information is impounded in prices when the information becomes known.

It is important to stress that an observed association between a firm's earnings and its share price does not necessarily indicate that the earnings convey information to the market. What is important is that the market must not have had prior knowledge of the information signals in the accounting data released for such signals to have something new that the market does not already know.

To study the information in the earnings, therefore, require a model of earnings formation to help estimate the earnings that the market expects. Many models of earnings generation have been adopted in previous studies. Ball and Brown (1968) assume that a firm's reported income for the year has a linear relationship with the mean income of all other firms other than the firm j in the period. Ball and Brown therefore first estimate by OLS the coefficients (a1jt, a2jt) from the linear regression, the change in average income of all firms (other than firm j) in the market using data up to the end of the previous year. The model they used is given by

$$\Delta I_{j,t-\tau} = a_{1,jt} + a_{2,jt} \Delta M_{t-\tau} \qquad [24]$$

where $\Delta I_{j,t-\tau}$ is the change in firm j's income in the estimation period and $\Delta M_{t-\tau}$ is the mean income change of all firms for the estimation period, a1 and a2 are the regression parameters. The expected income change for firm j in year t is then given by the regression prediction using the parameters computed in [24] given by

$$\Delta \hat{I}_{j,t} = \hat{a}_{1,jt} + \hat{a}_{2,jt} \Delta M_{jt} \qquad [25]$$

The unexpected income change or forecast error (ujt) is given by the difference between the actual income change minus the expected change in income given by

$$\hat{U}_{jt} = \Delta I_{jt} - \Delta \hat{I}_{jt} \qquad [26]$$

The forecast error ($\hat{u}jt$) is deemed to be the new information conveyed by the firm's present reported income. The effect of this new information on that particular firm's share price is then examined.

If the unexpected earnings are positive, the assumption is that it is an indication of favourable conditions and prices will be revised upwards. A negative unexpected earnings should convey bad news with prices prices being revised downwards. The methodology involves the examination of abnormal returns of firms reporting positive earnings change and those reporting negative earnings change around the time of the release of the earnings. The abnormal returns are computed using any of the models specified in [10] to [13]. If earnings have information, then, a portfolio of firms with positive earnings change should experience significant positive abnormal returns and those with negative earnings change should experience significant negative abnormal returns.

The subsequent studies adopting Ball and Brown's methodology have used various types of models of income generation. In the absence of a theory on how earnings are expected to behave over time, it is difficult to evaluate these models. There have been numerous studies that attempt to ascertain the time series properties of accounting earnings to facilitate the specification of appropriate models of income generation eg Ball and Watts (1972), Watts (1975), Foster (1977), Brown and Rozeff (1979). Among the models of income generation that have been used in past studies include classical naive models that predict earnings in the current period to be the same as the prior period ie earnings follow a martingale process. Brown and Kennelly (1972) use such model given by

$$E(\tilde{EPS}_t) = EPS_{,t-1} \qquad [27]$$

where E is an expected value operator, $\tilde{EPS}_t$ is the expected earnings per share in period t and EPS_{t-1} is the earnings per share in period t-1. Brown and Kennelly used a second model that assumed that earnings follow a martingale process with drift given by

$$E(\tilde{EPS}_{,t}) = EPS_{,t-1} + 1/T \{\Sigma^T (EPS_{,t-j} - EPS_{,t-j-1})\}$$
[28]

Beaver, Clarke and Wright (1979) used a combination of [25] and [28] in their investigation into the association between unsystematic security returns and the magnitude of earnings forecast errors. The income generating models with respect to quarterly earnings present more problems as the time series properties have been shown not to follow a martingale process nor has a linear relation as assumed by Jones and Litzenberger (1970) given by

$$Y_t = \hat{a} + \hat{b}X \quad [29]$$

where $\hat{a}$ and $\hat{b}$ are trend parameters estimated using time series data and X is the time period being forecast and Yt is the projected earnings for a particular time period. The specification of a wrong model could lead to a wrong inference being drawn regarding the association between earnings and abnormal security returns. The need for a model of income generation that take into account the time series properties of accounting income has occupied the attention of researchers in recent times. The main emphasis has been the attempt to statistically model the process that generate the income series of firms. The approach adopted is the one developed by Box and Jenkins (1970). The Box-Jenkins methodology is a systematic way of modelling and forecasting discrete time series. It provides a formal and structured approach to building and analysing time series. Box-Jenkins methodology has been adopted in various studies that analyse the time series properties of quarterly income series in the US.

Box and Jenkins advocate the use of simple auto-regressive moving average models (ARMA) and related models in the analysis of time series data. They develop useful techniques in helping to identify the order of a model and to estimate the parameters involved. They then suggest certain ways of checking whether or not the model selected for forecasting purposes is appropriate. Box and Jenkins deal with a more general model called an autoregressive integrated moving average process (ARIMA). A non-seasonal ARIMA model can be used to represent a wide class of non-stationary series containing non-deterministic/stochastic trends. They can describe a series with constant changing level, slope or a series which is constantly being adapted by random shocks that creep into the system.

If the original series is Xt, appropriate differencing yields a series

$$W_t = (1 - B)^d X_t \quad [30]$$

where B is the backshift operator such that BXt = X,t-1. Assume that a non-stationary time series is subjected to some form of data transformation and non-seasonal differencing d times. The new time series wt that results will be stationary. If no differencing is applied ie d equals zero, an autoregressive moving average model for wt enables a wide class of stationary series in statistical equilibrium about a fixed mean to be described. If however, the differencing exceeds zero, the newly transformed and differenced series wt is known as an ARIMA model.

A seasonal operation is applied to handle seasonal patterns. This operation is

$$Y_t = (1 - B)^d (1 - B^s)^{dl} X_t \quad [31]$$

where s is the length of a season and dl represents the amount of differencing to take into account the seasonality. The generalised model developed by Box and Jenkins is therefore given by

$$R(B)\ (1 - B)^d (1 - B^s)^{dl}\ X_t = RU + Rq(B) a_t \quad [32]$$

The model is deemed to be of order p,d,q. By the appropriate selection of levels of p, d, and q, it is possible to get a straight foward autoregressive model, a simple moving average model or an exponential smoothing model or some combination of these. This generalised model offers a powerful means of achieving parsimony in parameterisation in the analysis of time series data. The ARIMA process of the order (p,d,q) is therefore capable of providing a wide class of models to represent time series, both stationary or non-stationary.

Box and Jenkins suggest three stage in the model building process. They consider model building to be an iterative process that basically involves identification, estimation and diagonistic checking (p171). The identification process involves using the data as well as any other information about the generation of the time series to select the type of model(s) likely to be entertained. Estimation involves making inferences about the parameters conditional on the models so selected. The final phase of diagonistic checking involves the study of the fitted model in relation to the data to find out any inadequacies. Basically it involves making certain that the residuals of the series are uncorrelated. If the residuals are correlated it means the model selected can still be improved and that there is still something in the error terms that can be exploited for forecasting purposes.

Even though the Box-Jenkins technique is a powerful forecasting tool, it requires a large amount of data for its appropriate use. It requires a minimum of 50 observations. It is also not capable of handling structual changes which can affect the factors that generate a series and a large amount of investment in time is required for its use. In the present study, the Box-Jenkins technique cannot be adopted given data availability problems.

It could be seen therefore that the use of the methodology above requires a model of income that takes full account of the properties that generate generate the income numbers. Anything short of this could lead to a wrong inference being drawn about the information content of accounting earnings. The methodology however has the major advantage of giving some insight into the direction of investors' expectations that is caused by the earnings information signals. Despite this advantage, the methodology is not adopted in the current study because of problems of data availability with regard to interim earnings numbers as well as the lack of knowledge on the time series properties of of interim accounting earnings numbers.

6.6.2 THE VARIANCE METHODOLOGY

The variance methodology which is adopted in this study has been used in a number of studies as the measure of information contained in accounting data Beaver (1968), May (1971), Hangerman (1973), Patell 1976), Oppong (1980), Atiase (1980), Maingot (1984). The main thrust of the variance methodology is that if accounting earnings contain any cash flow implications, then, the release of such information will cause a change in the estimate of investors' probability distributions of the firms's share price. If earnings are therefore price sensitive, their effect is to change the firms share price when the earnings information is released to the market.

The variance methodology involves comparing the variance of abnormal rates of return during the period when the accounting information is released with that period when no earnings are announced. The factors affecting the share price of firms during the period when no earnings are announced is assumed to be random which on the average equals zero. As a result the variance of abnormal returns during the period when no earnings are announced is expected to be constant. However, this is not the case in the period when accounting earnings report is released. If earnings contain information that change investor beliefs and actions, at the time of the release of every interim earnings information, there will be sustained price changes caused by the information in the earnings report. In an efficient market however, the expected abnormal rate of return on the release of earnings report is expected to be zero. The sustained and larger price increase caused by the information in earnings will result in a larger price variance at the time of earnings release than at a time when no earnings are released. The information content measure is given by

$$U_{it} = (u_{it})^2 / S_i^2 \quad [33]$$

where U_{it} is the information measure, (u^2_{it}) is the square of the abnormal residual in the test period t and Si is the sample variance of abnormal returns in the non-report period. [27] is the ratio used by Beaver (1968). May (1971) used the ratio below

$$V_{it} = |u_{it}| / |\bar{u}_i| \quad [34]$$

where $|u_{it}|$ is the absolute value of the abnormal residual in the test period on day t and $|\bar{u}_i|$ is the mean of $|uit|$ during the non-report (estimation) period.

Both ratios are used in the study. The rational for the use of [34] is to ensure that disproportionate weight is not given to few large abnormal returns when the price reaction to the release of the interim reports is averaged across announcements. [33] is essentially an F-statistic and if its square root is taken, the result is a T-statistic given by

$$V_{it} = (u_{it})/(S_i\sqrt{C_{it}}) \sim t\ (T-2) \quad [35]$$

where (u_{it}) is the abnormal return in test period day t, S_i is the standard deviation of abnormal returns in the estimation period where

$$S^2_i = \Sigma^T u^2_{it}/(T-2) \quad [36]$$

and T is the number of days in the estimation period which is 106. The correction factor for the increase in variance due to prediction outside the estimation period is given by Cit. Each Vit statistic has an expected value of zero and since the number of observations is the same for each firm, the variance for each statistic is (T-2/T-4) Mood, Graybill and Boes (1985).

If x is a random variable having a student´s t distribution with k degrees of freedom, then,

$$E(x) = 0 \text{ if } k > 1 \quad [37]$$

$$Var(x) = k/(k-2) \text{ for } k > 2 \quad [38]$$

Since k = (T-2) in the study, then,

$$Var(x) = (T-2)/(T-2-2)$$

$$= (T-2)/(T-4) \quad [39]$$

Squaring a t-distribution with (T-2) degrees of freedom gives an F-distribution with (1, T-2) degrees of freedom. If x is a random variable having an F-distribution, with m and n degrees of freedom, then,

$$E(x) = n/n-2 \quad \text{for } n > 2 \quad [40]$$

$$Var(x) = \frac{2(m+n-2)}{m(n-4)} * \frac{n^2}{(n-2)^2} \quad [41]$$

but $n/(n-2) > 1$

standardising the F statistic to produce an expected value of 1, the F statistic is divided by its expected value given by

$$E[X/E(X)] = 1 \quad [42]$$

$$Var[x/E(x)] = [1/E(x)^2]Var(x)$$

$$= \frac{1}{n^2/(n-2)^2} * \frac{2(m+n-2)}{m(n-4)} * \frac{n^2}{(n-2)^2} \quad [43]$$

$$= \frac{(n-2)^2}{n^2} \times \frac{2(m+n-2)}{m(n-4)} \times \frac{n^2}{(n-2)^2}$$

$$= \frac{2(m+n-2)}{m(n-4)} \quad [44]$$

But m = 1 and n = (T-2) since squaring a t - distribution with n degrees of freedom gives an F distribution with 1 and n degrees of freedom. Therefore,

$$\mathrm{Var}\ \frac{x}{E(x)} = \frac{2(1+T-2-2)}{(T-2-4)}$$

$$= \frac{2(T-3)}{(T-6)} \quad [45]$$

The common expected values and variances will be used to perform significance tests on the abnormal returns.

6.6.3 DATA AND DATA SOURCE

The data for the study are the share price observations of commercial and industrial firms listed on the London Stock Exchange that met the following criteria.

(1) The day of the interim earnings announcement should be available

(2) The firm has continuous listing on the exchange from the period January 2nd 1983 to January 2nd 1987.

(3) The firm has no news announcement other than the release of interim earnings in the five days before and five days after the earnings announcement eg merger, rights issues stock splits etc.

The first criterion is to enable accurate pin-pointing of the announcement date which is a critical factor in the study while the second ensures data comparability across firms. Earnings announcements were taken from the stock exchange micro-fische initially. Sixty interim earnings announcements taken initially from the stock exchange were cross checked with interim dividends announcement days in the Financial Times and found to be 100% accurate in terms of dividend announcement dates being surrogates for interim earnings announcement days. This however is not surprising since in the UK dividends and earnings are announced on the same day. As a result therefore, the rest of the earnings announcement dates were taken from the financial times and where that is not available from the Hambro Companies Guide. The last selection criterion is to reduce the likely effects of non-earnings related variables that might affect the study. The Financial Times and The Investors Chronicle were scanned for the non-earnings related variables around the time of the release of the interim earnings. Daily share price data were taken from Datastream share price data base.

The firms that met the sample selection criteria totalled 734 and a random selection of 100 out of the 734 commercial and industrial firms were selected for the study.

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CHAPTER SEVEN

RESEARCH DESIGN

7.0.0 INTRODUCTION

As it was pointed out earlier on in the discussion of research methods, the selection of a particular research method requires a full understanding on the part of the researcher as to the alternatives that are available and the reasons for choosing a particular method. Similarly more than one research designs are available and therefore there is the need for some discussion of these designs in order to throw more light on the reasons for selecting the design for this study.

7.0.1 ROLE OF RESEARCH DESIGNS

Research design provide the plan and structure enabling the researcher to answer research questions as validly, objectively, accurately and economically as possible, Kerlinger (1973). Proper problem identification and definition then become a prelude to a good research design. It is important to identify the variables of which understanding is being sought ie the dependent variable. Secondly, the variables affecting the dependent variable should be identified. In any research design, there could be many variables that may affect the dependent variable but which may not be of immediate interest in the study. Such extraneous variables which could cause variations in the dependent variable and confound the interpretation of the results should be eliminated.

The objective of a good research design summed up by Abdel Khalik and Ajinkya (1979) are

(1) to be able to determine the extent to which varying the independent variable(s) causes variation in the dependent variable.

(2) to minimise the variation in the dependent variable attributable to variables not included in the experiment or design and

(3) to control or minimise random error.

Detailed specifications of observations, the time they are to be made and statistical analysis to be made are all part of the research design. A convenient way of distinguishing between the two major processes that underlie the generation of data by the researcher is

(a) Experimental Research Design.

(b) Quasi-experimental Research Design.

Whenever a researcher uses data from an environment which existed or events that occurred without his direct intervention, he is said to be using quasi-experimental design. On the other hand, a true experiment is conducted if the following two major attributes identified by Abdel-khalik and Ajinkya exist:

(a) the researcher is able to manipulate explicitly one or more independent variables

(b) the researcher is able to assign (if not select and assign) subjects to control or experimental groups

(basically to achieve randomisation.)

Whenever the design veers away from the above attributes, it tends towards the quasi-experimental type. There are of course tradeoffs of true experiment as against quasi-experiment. The first major attribute of the true experiment means that the experimenter has direct manipulative control over the variables. This makes it easier to more fully satisfy the conditions of causality which is very important in ensuring internal validity. It is difficult to achieve this in quasi-experimental design. Secondly, a greater degree of control over extraneous variables which could have an impact on the dependent variable but which is not of immediate interest is possible in a true experiment than the quasi-experimental type.

In order to minimise (or eliminate) the influence of extraneous variables, a thorough randomisation of experimental units/subjects to experimental conditions needs to be undertaken. Experimental subjects need to to be randomly selected from the general population of interest. Where the sample is large enough, a thorough randomisation could render the experimental group or sample similar to the control sample in terms of all known or unknown extraneous variables (except the independent variable of interest.) The points raised above are taken account of in the current study and a random selection of firms was utilised since the study, a quasi-experimental in nature presents limited opportunities to physically control extraneous factors. In an effort to control some of the extraneous factors, all non-earnings related variables such as stock splits, rights issues, or any other major company announcement that occurred in the test period were excluded from the observations.

For the purpose of evaluating causality between the dependent and independent variables, triangulation and reproducibility should be undertaken in conjunction with adequate randomisation. Triangulation refers to the process of looking at the same problem with different data and methods or looking at the same data with different methods. The current study therefore looks at the same problem using different data and methods in the sense that the issue of the information content of interim reports were explored to some limited extent by Firth (1982) when he examined the information content of UK annual earnings announcement through its various stages of release.

In accounting, however, and especially in financial reporting, neutralising extraneous variables by completely having manipulative control of the independent variables is difficult to achieve. Most, if not all, of the research problems are concerned with variables in real environment that can be observed but which cannot be manipulated eg published financial reports, share prices etc. There are generally two methods that could be used to neutralise extraneous variables to some extent. The first of the methods is pair matching. This is the process of matching each subject eg company in the experimental sample (say companies that change inventory valuation method) with another company different as regards the independent variable (ie companies that do not change inventory valuation method). Both the subjects in the experiment and those outside it (ie paired ones) should be similar in all other important respects for an example in terms of industry membership, size, growth rate etc.

The effect of the independent variable on the dependent variable (eg the effect on say share prices) could then be studied. Kerlinger (1973) sounds a cautious note that matching is only useful if the correlation between the matched variable and the dependent variable is substantial. It must be noted that matching may not even be enough to control for unknown variables which could still have some impact on the dependent variable in the research design. Many studies, however, identify the matching variables on the basis of presumed correlation.

The second method used in quasi-experimental research is some type of randomisation. Since in most cases the independent variable has already occurred, the researcher has no influence over it. For example, either a company has changed its valuation method or has not, has made earnings announcement or has not. The only option left to the researcher is to randomly select the sample for the experiment or study from the sub-population of firms that have, for instance, either changed or not changed their system of inventory valuation. Extraneous variables are hard to be controlled with such limited randomisation. The problem is that if there exists some bias across the sub-population, then, random selection from within each sub-population cannot compensate for such biases. An example is industry effects with regards to earnings announcements.

In situations where limited randomisation and exact pair matching are of little value, the only option left to the experimenter might possibly be to include the extraneous variables that could be identified as part of the independent variables. Causality could then be studied using statistical tools.

Any research design has to cope with the problems of internal and external validity. As mentioned earlier, internal validity is the measure of the extent of causality between the dependent and independent variable. It is a measure of the variation in the dependent variable that is really caused by variation in the independent variable. External validity on the other hand seeks to ascertain the extent to which the results of a particular study is generalisable to other samples, time periods, events etc. Campbell and Stanley (1963) have asserted that the most important factor in any research design is internal validity and the most ideal design should be relatively strong on both internal and external validities. Due to the rather high stress on transferability of research results to other people, programs and situations, the need for the existence of both internal and external validities in applied field such as accountancy is of great importance. However, any kind of design that could be adopted is problem specific. A design that possesses both internal and external validities in their strongest forms is idealistic. A design that is strong in one is likely to be weak in the other and there is always a tradeoff between the two.

Campbell and Stanley (1963) have listed the threats to internal validity in research design as

7.0.2 History

There could be events occurring between the pretest and posttest dates other than the experimental treatment. In such a situation, alternative explanation of effects could be explained by such intervening events making inferences of causality between the dependent and independent variable difficult to establish. In effect therefore, the frequent lack of stability or neutrality of conditions before and after the occurence of the experimental event make causality assertions difficult to state.

7.0.3 Maturation

Processes within the respondents or socio-economic unit under study may produce changes as function of time eg growth, fatigue, secular trends, learning etc. This instability of processes taking place within the experimental setting does not permit strong tests of causal hypotheses. The instability of processes could provide alternative interpretations of causality between the dependent variable and the independent variable while the maturation effect is not of research interest.

7.0.4 Instrumentation

Changes in the reliability of the measurements and the measurement ability of the instruments used in the study could affect the result. An effect might therefore be due to a change in the measuring instrument between the pretest and posttest periods.

7.0.5 Testing

An effect might be the result of repeated tests. Familiarity with tests can enhance performance or cause changes in the way subjects behave or respond (eg obstrusive study of the way board members take decisions might cause members to behave differently to what they normally do)

7.0.6 Statistical Regression

When subjects have been selected upon the basis of their pretest scores, high pretest scorers might score low at the posttest and vice versa. In such a situation, it would be wrong to attribute changes in scores to any treatment as the pretest measure could be unreliable.

7.0.7 Selection

This threat arises as a result of possible differences between the subjects of one experimental group as opposed to another. An effect could therefore result from biases from differential recruitment of comparison groups or self-selected groups producing different levels of measured effect.

7.0.8 Morality

This threat concerns changes in experimental subjects in the course of the experiment. This results in experimental subjects being composed of different kinds of persons at the posttest date. This threat comes about where there is free and easy communication between experimental and control group and the treatment to be given is of the information type. The information intended for one group may be obtained by the other group.

The major threats to external validity in research identified by Abdel-khalik and Ajinkya include:

(1) changes in the representativeness of the sample due to performing pretest

(2) biases stemming from self-selection

(3) irrelevance of the independent variables or of treatments or of their applications.

All the above threats limit the generalisability of research results.

7.1.0 SPECIFIC RESEARCH DESIGNS

There are a number of specific research designs among which are the following:

7.1.1 (1) THE ONE GROUP-POSTTEST ONLY DESIGN

This design involves observations made on persons or events that have undergone some treatment. Cook and Campbell (1979) have rightly pointed out that this type of research design is uninformative. The nature of the design is illustrated below

EXPERIMENT	POSTTEST OBSERVATION
X	0

FIG. 7.1

where (X) = Exposure to the experimental manipulation or experimental stimulus or independent variable. (0) is the observations or measurement. The basic flaw in this design is the lack of pretest observations of the subjects receiving the treatment. The absence of a comparable group that has not received the treatment makes it difficult to precisely identify and measure the relevant threats. The design does not therefore cope with the problems of maturation and history and therefore does not help draw any inferrence of what the posttest results would have been had there been no treatment. The design is however useful in a setting where past knowledge is very rich and intelligent assertions could be made on what the observations made would have been in the absence of treatment X. An example of this type of design might be the one short case study. Archival records however could often be used to establish what the pretest observations had been. A research based on this design therefore does not necessarily mean that there is no pretest observation.

7.1.2 (2) THE POSTTEST ONLY DESIGN WITH NON-EQUIVALENT GROUPS

In this design, a single non-equivalent group is added to the experimental group. Diagramatically, it appears as below

EXPERIMENT	POSTTEST OBSERVATION
X	O
	O

FIG. 7.2

This design has all the attributes of the one-group pottest design. This design could lead to the possibility of attributing differences between the two groups to either the treatment of X or to the selection differences between the two groups. It is difficult to interprete the results due to differences of the experimental and non-experimental group.

7.1.3 (3) <u>THE ONE-GROUP PRETEST-POSTTEST DESIGN</u>

With this design, pretest observations are on a single group of subjects/units after which posttest observations are made. This design is illustrated below

PRETEST OBSERVATION	EXPERIMENT	POSTTEST OBSERVATION
O_1	X	O_2

FIG. 7.3

This design is particularly weak in minimising threats of history, maturation and statistical regression. The posttest observations could have been caused by events happening between the pretest and posttest dates. The pretest observations could have been unreliable and in such a case could lead to wrong inferences being made based on posttest observations. a problem of statistical regression.

7.1.4 (4) <u>THE PRETEST-POSTTEST CONTROL GROUP DESIGN</u>

In this design, the dependent variable is observed both prior and subsequent to experimental treatment of the independent variable. The experimental group is then compared with a control or comparison group. Since the dependent variable of the control group is also observed at periods corresponding to the observations made on the experimental group, most of the threats to internal validity are controlled. Thus history and maturation are not a threat to internal validity since the experimental and control groups are equally affected by these factors. Randomisation of experimental and control subjects considerably strengthens internal validity by neutralising the effects of extraneous factors. It must be noted however that the existence of the pretest observations could have an unfavourable effect by sensitising subjects to the nature of the task and hence reduce the validity of the results. Diagramatically, the pretest posttest control group design is as follows

		PRETEST OBSERVATION	EXPERIMENTAL MANIPULATION	POSTTEST OBSERVATION
EXPERREMENTAL GROUP	R	O_a	X	O_b
CONTROL GROUP	R	O_a		O_b

FIG.7.4 R = RANDOM ALLOCATION OF SUBJECTS

7.1.5 (5) THE SOLOMON FOUR GROUP DESIGN

This is essentially a combination of the designs discussed earlier. It has more controls and avoids many of the problems discussed earlier on. Though it looks attractive it is expensive and time consuming to implement. It is illustrated below and has the advantage of strong external validity.

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effect to be determined, all the parameters that could affect the trend should be known in order to avoid spurious inferences. This is the most extensively used design in accounting and finance research especially information content studies. Diagramatically, it appears as below

		PRETEST OBSERVATION	POSTTEST OBSERVATION
EXPERMENTAL GROUP	R	$O_{a(t-n)} \cdots, O_{a(t)}$	$O_{b(t)} \cdots, O_{b(t+n)}$
CONTROL GROUP	R	$O_{a(t-n)} \cdots, O_{a(t)}$	$O_{b(t)} \cdots, O_{b(t+n)}$

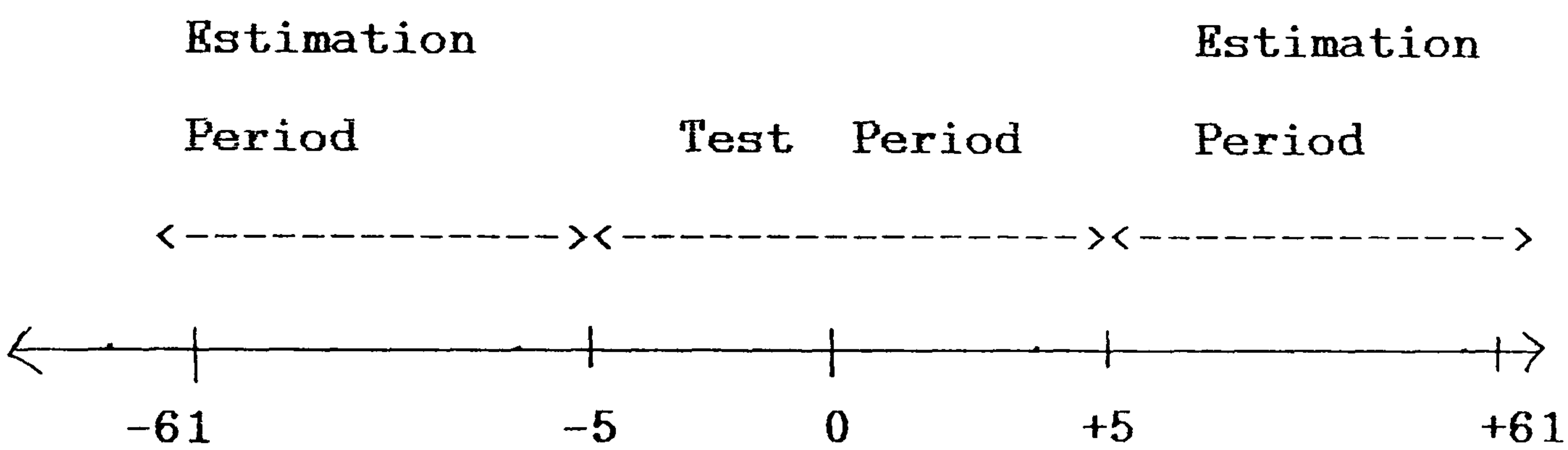
FIG 7.6

The present study uses this design. Since formation of a control group is difficult to achieve, the theoretical expected values of the transformed values of the independent variable is used in place of the control group.

It must be noted that there is no one research design that is ideal for all types of research. The type of problem and the surrounding circumstances will determine the design to be adopted.

7.2.0 SUMMARY MODEL SPECIFICATION AND TESTING PROCEDURES

Each firm is analysed in two time periods namely a report period covering five days prior to and five days subsequent to the release of the interim earnings report. The non-report period will cover a period of 106 days of 53 days each surrounding the report period.



The market model developed by Sharpe (1964) and Litner (1965) which specifies a linear ex-ante relation between the return on the shares of firm i and the market portfolio is used to eliminate market influences on price given by

$$R_{i\tau} = \alpha_i + \beta R_{m\tau}$$

$i = 1\ldots,N$

$\tau = 1\ldots,T$, day index, non-report period.

where $R_{i\tau}$ is the natural logarithm of the return relative for firm i in day τ and RM_{τ} is the natural logarithm of the return relative for the market portfolio in day τ.

The changes in log price is used in the study rather than simple price changes for the three main reasons stated by Fama (1965)

(1) change in log price is the yield with continuous compounding for holding the security for that day.

(2) The variability of simple price changes for a given stock is an increasing function of the price level of the stock. Taking logarithms has the effect of neutralising most of this price level variablility.

(3) For changes less than ±15%, the change in log price is very close to the percentage price change and for many purposes, it is convenient to look at the data in terms of percentage price changes. Dimsons´s aggregated coefficient method for an unbiased estimate of beta is used to obtain estimates of $\hat{a}_i$ and $\hat{b}_i$ of α_i and β_i respectively. The estimated coefficients are used to compute uit, the abnormal return during the report period given by

$$u_{it} = R_{it} - (\hat{a}_i + \hat{b}_i R_{mt})$$

Since the abnormal returns in the report period were computed using observations which were not used in the estimation of âi and $\hat{b}_i$, the uit values are not residuals in the strict sense of Linear Regression. However it is assumed that the underlying assumptions of Linear Regression pertaining to residuals hold during the report period as well as the assumption of their cross sectional independence thus

$$E(u_{it}) = 0$$

$$Cov(u_{i,\tau}, u_{i,k}) = \begin{cases} 0, & \tau \neq k \\ \sigma^2{}_i, & \tau = k \end{cases}$$

$$Cov\ (u_{i\tau}, R_{m\tau}) = 0$$

$$\tau = 1...,T$$

$$i = 1...,N$$

The variance of the residuals during the estimation (non-report) period is given by the time series regression which is

$$s^2{}_i = \Sigma u^2{}_{i\tau}/(T-2)$$

T is the number of days in the estimation period which is 106 days. To account for the increase in variance due to prediction outside the estimation period, Theil (1971), argues that a correction factor is necessary. The increase in variance C_{it} is given by

$$C_{i}t = [1 + 1/T + (R_{mt}-\bar{R}_m)^2]/\ \Sigma^T\ (R_{m\tau}-\bar{R}_m)^2$$

$$\bar{R}_m = 1/T\ \Sigma^T\ R_{m\tau}$$

The increase in the variance is a function of how past market returns deviate from the average and the number of observation that are used in the study. Under the hypothesis that the Linear Regression assumption holds during the report period, the u_{it}'s are distributed such that

$$E(u_{it}) = 0$$

$$Cov(u_{i,t}, u_{i,s}) = \begin{cases} 0, & s \neq t \\ c_{i,t}\sigma^2, & s = t \end{cases}$$

$$Cov(u_{it}, R_{mt}) = 0, \quad t = -5,-4,\ldots,+5 \quad i = 1\ldots,N$$

A more restrictive assumption that the return distributions are normal is made to allow the application of significance tests. It is also assumed that the distribution of the unsystematic returns are cross sectionally independent. Intra industry information transfers noted by King (1966) are therefore ignored. Under the assumption of Linear Regression, the standardised prediction error is given by

$$SPE = u_{it}/\sigma\sqrt{C_{it}}$$

where σ^2 is the variance of the error term (residuals) of firm i during the estimation period. When the sample estimate s_i is used in place of σ_i, the resulting variable is distributed according to the t distribution thus

$$V_{it} = u_{it}/s_i\sqrt{C_{it}} \qquad \sim t\ (T-2)$$

$$\text{where } \sigma^2 = S^2_i = \Sigma^T u^2_{it}/(T-2)$$

Each V_it has an expected value of zero and a variance of (T-2/T-4). Since no assumption is made regarding the direction of prices caused by the changes in investor beliefs due to the announcement of interim earnings the impact of the information as to whether negative or positive cannot be specified ex-ante. By squaring the abnormal return on the day of the release of the interim earnings therefore gives an estimate of the variance of the unexpected earnings for that day. The variance on the day of an earnings report is then compared with the variance of abnormal returns in the non-report day. By squaring the t-statistic therefore, gives and F statistic given by

$$V^2_{it} = u^2_{it}/s^2C_{it} \qquad \sim F\ (1,\ (T-2))$$

where u^2_{it} is the variance of abnormal return on report day t of firm i and $C_{it}s^2$ is the variance of abnormal return in the non-report period. The expected value of the F statistic is given by

$$E(u^2_{it}/C_{it}s^2) = E(V^2_{it}) = (T-2)/(T-4) > 1$$

Since the expected value of the F statistic is greater than one, it can be standardised to produce an expected value of 1. This is achieved by dividing the F statistic by its expected value. The resulting statistic is utilised as the measure of investors' response to the information contained in the interim earnings report by comparing the actual ratios with its expected value of one. The actual t statistic will also be compared with its expected value of zero to establish as to whether the prediction errors associated with earnings release averages out to be zero. The variance of investors response which is the variance of the F statistic is given by

$$E(U_{it}) = E(V^2{}_{it}) = V^2{}_{it}/[(T-2/T-4)] = 1$$

$$Var\ (U_{it}) = [2(T-3)]/(T-6)$$

In the semi-strong form market efficiency in which context this study is being undertaken, there will be no abnormal return after the release of an interim earnings report. It is expected that if the released interim reports contain information that had not been anticipated by the market, on the day such infomation is made public, they will cause some price changes. Abnormal returns on earnings release days should therefore be significantly different from zero if there has been no seepage prior to their release. If interim accounting data contain information therefore, it is expected that the v_{it} values will be significantly different from zero and the F statistic will be significantly different from one.

The t and F statistics can be accumulated across securities for the report period to obtain the following normalised sum which in accordance with the Lindenberg Central Limit Theorem is distributed as a unit normal for large N. An essential condition also for the Lindenberg condition to be satisfied is that each security's contribution to the total variance is small. Since the variance in this case depends on the number of observations and the observations are equal for each security, the condition is satisfied. Thus

$$Z_{vt} \quad = \quad \Sigma^{T} \text{ vit}/[N*(T-2)/(T-4)]^{\frac{1}{2}}$$

$$Z_{ut} \quad = \Sigma^{N}(U_{it} - 1)/\Sigma^{N}\{2*(T-3)\}/(T-6)]^{\frac{1}{2}}$$

where N is the is the number of sample firms Significance tests are then performed on the hypotheses to find out whether the release of earnings is associated with a prediction error which is not expected to average out to zero for V_{it} values and one for the U_{it} values. The hypotheses being:

H0 : The expected value of Vit = 0.

H1: The expected value of Vit $\neq$ 0.

H3: The mean of the ratio Uit for the report period is equal to 1.

H4: The mean of the ratio Uit for the report period is not equal to 1.

Even though the sample size in the study is large, there are reasons for adopting some tests that are not based on parametric methods. Firstly, it must be noted that the V_{it} and U_{it} values could be disproportionately influenced by a small number of very large values of the abnormal residuals. It becomes desirable therefore to find some other means of analysing the results that gives direct effect to the hypothesis in the study but which limits the effects that an extreme value of an individual firm can have on the study.

Secondly, since the variance of a firm's share price increases around the time of an event as discussed earlier, it is possible that the null hypothesis could be rejected as the correction factor may not be fully adequate to take account of the increase in variance during the estimation period. A test based solely on the variance therefore may not be reliable. To take account of the above issues, another test has been devised and described below.

For each announcement, the remarkableness of response ratio is determined by ranking of the ratios in the test period. A ratio is considered remarkable if it is the largest in the eleven day test period around the announcement day. The assumption of the test is that the highest ratio can occur in any of the days around the the test period and therefore if ranks were assigned to the 11 days on a uniformly random basis, the probability of any of any firm's zero week receiving the highest rank would be 1/11. A frequency table can be constructed on the basis of the highest values for U_{it} and M_{it}. Simultaneous confidence interval for the 11 day profile around the announcement date is then estimated. A description of the method is given below.

7.3.0 STATISTICAL INFERENCE FOR THE PARAMETERS OF A MULTINOMIAL PROBABILITY MODEL

Suppose that X^T is a random vector having k components ie

$$X^T = [X_1, X_2, X_3, \ldots, X_k]$$

and also that X^T follows a multinomial probability model Mu (n;0) where

$$\theta^T = [\theta_1, \theta_2, 0_3, \ldots, \theta_k]$$

and $\Sigma\theta_i = 1,\ 0 < \theta_i < 1 \quad (i=1,2,3\ldots,k)$

ie X^T has probability density f where X_t

$$f(x,\ \theta) = n!/X_1!*X_2!*\ldots X_n![\theta^{x1}{}_1*\theta^{x2}{}_2\ldots\theta^{xn}{}_k]$$

where $\Sigma\theta_i = 1$, $\Sigma x_i = n$ and where X^T is a vector containing the observed values of X^T in the data. Such a distribution is appropriate when a number of observations are placed into k mutually exclusive and exhaustive categories ie each observation belong to one and only one of the categories. In such a distribution, the probability that an individual observation randomly selected from the population will fall into category i is θi. Given data X^T, we wish to make inferences about the population parameter θ.

7.3.1 INTERVAL ESTIMATES BASED ON LIKELIHOOD

We may compare two components, say θ_1 , θ_2, this will be a range of values which will contain the true value of $\theta_1 - \theta_2$ with probability 0.95. Such an interval is said to have confidence 0.95. Using the data X^T, we estimate θ^T by the method of maximum likelihood to find $\hat{\theta}^T$ which is

$$\hat{\theta}^T = [x_1/n,\ x_2/n, \ldots, x_k/n]$$

A set of simultaneous interval estimates for p pairwise differences of the components of the θ is given by

$$\theta_i - \theta_j \pm N\left(0,1;1-\frac{[1-c]}{2p}\right)\sqrt{\frac{\theta_i(1-\theta_i)}{n}+\frac{\theta_j(1-\theta_j)}{n}+\frac{2\theta_i\theta_j}{n^3}}$$

where $N(0,1;\alpha)$ denotes the αth percentage point of the $N(0,1)$ distribution and $\theta_i = x_i/n$ is the proportion of the sample falling into category i. These intervals have an approximate joint confidence of c ie the probability that all the intervals contain their true parameter values is at least c. Note that the constant used, N(0,1;1-[1-c]/2p), is larger than it would be in the calculation of a single interval. This uses Bonferoni's (Koopman 1981) Method for Multiple Comparisons.

With the above test, we are interested in comparing the significance of the U_{it} and M_{it} values around the day of the release of the interim earnings. The test period is made up of 11 days surrounding the date of the release of the interim earnings. The number of interval estimates that need to be estimated are therefore 10. P is therefore 10. If the day interim earnings are released is denoted by θ_0, then, the confidence interval for $\theta_0 - \theta_j$ is given by

$$\hat{\theta}_0-\hat{\theta}_j \pm c \sqrt{\left\{\frac{\hat{\theta}_0(1-\hat{\theta}_0)}{n} + \frac{\hat{\theta}_j(1-\hat{\theta}_j)}{n} + \frac{2\hat{\theta}_0\hat{\theta}_j}{n^3}\right\}}$$

The above will be used to compute confidence intervals for the frequency distribution of highest values of u_{it} values over the test period.

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CHAPTER EIGHT

8.0.0 RESULTS OF STUDY

The results of the research is reported below. The distribution of interim earnings announcement over the months is shown in table 8.1. With the exception of the month of July, there was some announcement of interim earnings in each month with the highest announcement occurring in the month of September. The nature of the distribution should not however affect the results of the study as has been shown by Brown and Warner (1985). The results of price movement based on a variation of Beaver's methodology used in the study is presented in table 8.2.

Essentially the table gives the mean values of Vit and Uit and these are denoted by $\bar{V}T$ and $\bar{U}T$ for the sample of 235 interim earnings announcements. The probabilities computed using the Lindenberg Z statistic is given in the columns labelled P(Zvt) and P(zut) respectively. The probabilities given are two sided tests of the hypothesis in the study. The P(zvt) and P(zut) values represent the probability of observing values as large in magnitude as the mean values of Vit and Uit or values more extreme. Once the p-value of the test statistic, z, is known, the result of a test at any significance level, α, can be determined. If the p-value is less than the significance level,

TABLE 8.1

DISTRIBUTION OF INTERIM EARNINGS ANNOUNCEMENTS OVER THE MONTHS

MONTH	1984	1985	1986	TOTAL
JANUARY	4	5	7	16
FEBRUARY	4	3	2	9
MARCH	6	7	6	19
APRIL	1	5	6	12
MAY	2	4	4	10
JUNE	4	3	2	9
JULY	0	0	0	0
AUGUST	5	3	3	11
SEPTEMBER	28	26	28	82
OCTOBER	17	12	15	44
NOVEMBER	6	4	4	14
DECEMBER	5	2	2	9
TOTAL	82	74	79	235

α, that is specified, the null hypothesis is rejected.

TABLE 8.2A

MEAN ABNORMAL PRICE BEHAVIOUR IN REPORT DAYS AROUND THE ANNOUNCEMENT DATE

DAY	Cit	$\bar{V}T$	P(ZVT)
-5	1.0205	0.1117	0.0449*
-4	1.0196	0.2718	0.0001**
-3	1.0210	0.2092	0.0007**
-2	1.0199	0.1331	0.0216*
-1	1.0202	-0.0086	0.8952
0	1.0194	-0.1322	0.0446*
1	1.0179	-0.5720	0.0001**
2	1.0191	-0.1754	0.0078**
3	1.0176	-0.1314	0.0450*
4	1.0210	-0.1805	0.0062**
5	1.0212	-0.1145	0.0822

* SIGNIFICANT AT 0.05 LEVEL

** SIGNIFICANT AT 0.01 LEVEL

If the p-value is greater than the significance level specified, we do not reject the null hypothesis and the alternate hypothesis is accepted.

With regard to the information content of interim reports in the U.K., the figures in the table show remarkably significant information content of the interim earnings that are released to the stock exchange during the test period.

TABLE 8.2B

MEAN ABNORMAL PRICE BEHAVIOUR IN REPORT DAYS AROUND THE ANNOUNCEMENT DATE

DAY	$\bar{U}T$	P(ZUT)
-5	1.3479	0.0001**
-4	1.5667	0.0001**
-3	1.9433	0.0001**
-2	1.2173	0.0102*
-1	2.3730	0.0001**
0	14.3870	0.0001**
1	5.5902	0.0001**
2	1.4333	0.0001**
3	1.4985	0.0001**
4	1.6152	0.0001**
5	2.6440	0.0001**

* SIGNIFICANT AT 0.05 LEVEL

** SIGNIFICANT AT 0.01 LEVEL

The mean value for $\bar{U}T$ is equal to 14.387 which is the highest for the test period with the second highest value of 5.5902 occurring on the day after the release of the interim earnings reports. All the $\bar{U}T$ values are greater than the theoretical value of 1 and the hypothesis that interim earnings reports do not contain information which affect investors in their investment decision making is rejected on all test period days at 0.01 significance level except days -2 which can only be rejected at 0.05 significance level.

The observed $\bar{V}T$ values show a preponderance of negative values during the test period. The average standardised prediction error was largest in absolute terms on the day after the announcement of the interim earnings. The null hypothesis that the release of earnings is associated with a prediction error which averages out to be zero is rejected at 0.01 significance level for test period days -4, -3 and 1. At 0.05 significance level, the null hypothesis is accepted for days -1 and 5.

The correction factor denoted by Cit for the change in variance due to prediction outside the estimation period account for only about two percent on the average of the increase in variance and its omission will not have seriously affected the results. On the other hand, an upwards bias appears to have been exerted on the information content measure due to the large number of rejection of the null hypothesis. It appears therefore that the adjustment for the increase in variance due to the nature of the research design is inadequate. Hence the need for some form of measuring the information content of the earnings that is not dependent on variance estimation.

TABLE 8.3

DISTRIBUTION OF HIGHEST UT VALUES OVER THE 235 ANNOUNCEMENTS.

DAY/YEAR	1984	1985	1986	TOTAL
-5	4	4	1	9
-4	3	4	2	9
-3	7	6	4	17
-2	4	2	5	11
-1	7	3	9	19
0	27	31	34	92
1	16	13	10	39
2	5	5	2	12
3	3	0	4	7
4	2	3	5	10
5	5	2	3	10

As already noted, the results indicate a very remarkable information content in interim earnings reports and this information content is significant at any reasonable probability level. A closer look at the abnormal residuals indicates very extreme values for a small number of the observations. It appears from the results therefore that the mean abnormal price activity has been influenced disproportionately by very large price changes of relatively few firms in the sample. To test for the effect of the large values on the results, a test based on a binomial approximation to the hypergeometric distribution is used.

For each announcement, the remarkableness of 'zero-day' (announcement day) price changes is determined by rankings relative to the surrounding days. The eleven days including the day of the announcement is compared according to the size of the ratios of the information content measure. A ratio is considered remarkable if it is the largest ie highest ranking in the eleven days. If ranks were assigned to the eleven days in a uniform random basis, the probability of any announcement day in the test period receiving the highest rank will be equal to 1/11 ie 0.091. The null hypothesis is therefore that the probability of a significant price change in any day is

$$H0 : P(x) = 0.091$$

$$H1 : P(x) \neq 0.091$$

The distribution of the highest values of $\bar{U}T$ and the distribution of the highest $\bar{M}T$ computed based on the absolute mean abnormal residual used by May (1971) is presented in table 8.4A and 8.4B. The tables clearly indicate that the highest rankings of the announcements studied occurred on the days the interim earnings were released followed by the day after the release.

TABLE 8.4A

DISTRIBUTION OF HIGHEST V_{it} VALUES OVER THE 235 ANNOUNCEMENTS

DAY	1984	1985	1986	TOTAL
-5	4	4	1	9
-4	3	4	2	9
-3	7	6	4	17
-2	4	2	5	11
-1	7	3	9	19
0	27	31	34	92
1	16	13	10	39
2	5	5	2	12
3	3	0	4	7
4	2	3	5	10
5	5	2	3	10
	---	---	---	---
	83	73	79	235
	---	---	---	---

TABLE 8.4B

DISTRIBUTION OF HIGHEST ABSOLUTE MEAN RATIO (M_{it}) OVER THE 235 ANNOUNCEMENTS

DAY	1984	1985	1986	TOTAL
-5	4	4	2	10
-4	6	3	3	12
-3	5	6	3	14
-2	2	2	4	8
-1	7	4	8	19
0	27	29	34	90
1	16	13	10	39
2	5	5	2	12
3	3	1	4	8
4	2	3	5	10
5	6	3	4	13
	83	73	79	235

A closer examination of the mean and median values of the information content statistic indicate the extent that the mean values have been influenced by small number of extreme values. Tables 8.5, 8.6 and 7 show the mean and median values for the various statistics used in the study.

TABLE 8.5A

MEAN AND MEDIAN VALUES FOR Cit

DAY	MEAN	MEDIAN
-5	1.0205	1.0146
-4	1.0196	1.0132
-3	1.0210	1.0142
-2	1.0199	1.0146
-1	1.0202	1.0148
0	1.0194	1.0141
1	1.0179	1.0132
2	1.0191	1.0141
3	1.0176	1.0133
4	1.0210	1.0164
5	1.0212	1.1047

TABLE 8.5B

MEAN AND MEDIAN VALUES FOR V_{it}

DAY	MEAN	MEDIAN
-5	0.1117	-0.0490
-4	0.2718	0.0279
-3	0.2092	-0.0047
-2	0.1331	0.0280
-1	-0.0087	-0.0141
0	-0.1322	-0.0604
1	-0.5702	-0.1967
2	-0.1754	-0.0791
3	-0.1315	-0.1223
4	-0.1805	-0.0836
5	-0.1145	-0.0362

TABLE 8.6

MEAN AND MEDIAN VALUES FOR U_{it}

DAY	MEAN	MEDIAN
-5	1.3479	0.1296
-4	1.5567	0.1359
-3	1.9433	0.0861
-2	1.2173	0.1000
-1	2.3730	0.1353
0	14.3870	2.2794
1	5.5902	0.8455
2	1.4333	0.1453
3	1.4985	0.1487
4	1.6152	0.1600
5	2.6440	0.1853

TABLE 8.7

MEAN AND MEDIAN VALUES FOR M_{it}

DAY	MEAN	MEDIAN	P(ZMT)
-5	1.1378	0.5938	0.0002**
-4	1.2864	0.6251	0.0002**
-3	1.3476	0.5512	0.0002**
-2	1.1033	0.5290	0.0002**
-1	1.5003	0.6180	0.0002**
0	4.3109	2.4844	0.0001**
1	2.4580	1.4355	0.0001**
2	1.3065	0.6205	0.0002**
3	1.3591	0.6369	0.0002**
4	1.2627	0.6807	0.0002**
5	1.4712	0.6993	0.0002**

** SIGNIFICANT AT 0.01 LEVEL

A literal interpretation of the results in tables 6 and 7 in the context of the information content hypothesis would suggest that on average, interim accounting reports have information content and that the information is reflected in prices around the time when they are made public. A closer examination of the U_{it} and M_{it} measures indicate that a majority of the sample firms have medians of U_{it} and M_{it} values which are less than 1. The median values for the Uit is greater than 1.0 only on the day the earnings were released which is 2.2794. With regards to the Mit values, the median values are greater than 1.0 only on the earnings release date and the day after that. The highest median value for the M_{it} measure occurred on day 0 which is 2.4844.

The median values for the U_{it} are quite low and with the exception of report days 0 and 1 the rest of the median values are less than 0.2. The median values of the M_{it} are also less than their mean values but much higher that the U_{it} values since unlike the U_{it} measures which are derived from squared values, they are not very sensitive to few large price reactions which may occur in the report period.

The distribution of the highest M_{it} values over the test period for each earnings announcement shown in table 8.4b is not very much different from the distribution obtained using the U_{it} values. Essentially the same conclusions are arrived at using either the U_{it} measure or the Mit measure. From tables 8.4, 8.6 and 8.7, it is clearly desirable that some testing procedure that is not unduly influenced by the small number of extreme values that the parametric methods used so far appear desirable as a supplement to the testing procedures used so far. Using the binomial approximation to the hypergeometric distribution, the probability of observing the frequencies obtained in table 8.4a and 8.4b is presented in table 8A and 8B.

TABLE 8.8A

PROBABILITY OF OBSERVING FREQUENCY (n) IN A UNIFORM DISTRIBUTION OF 235 EARNINGS ANNOUNCEMENTS : $\bar{U}T$

DAY	FREQUENCY	PROBABILITY($X \geq n$)
-5	9	0.9985
-4	9	0.9985
-3	17	0.8079
-2	11	0.9918
-1	19	0.6543
0	92	0.0001
1	39	0.0002
2	12	0.9835
3	7	0.9998
4	10	0.9963
5	10	0.9963

TABLE 8.8B

PROBABILITY OF OBSERVING FREQUENCY (n) IN A UNIFORM DISTRIBUTION OF 235 EARNINGS ANNOUNCEMENTS : $\bar{M}T$

DAY	FREQUENCY	PROBABILITY $P(X \geq n)$
-5	10	0.9963
-4	12	0.9835
-3	14	0.9470
-2	8	0.9994
-1	19	0.6543
0	90	0.0001
1	39	0.0002
2	12	0.9835
3	8	0.9994
4	10	0.9963
5	13	0.9695

Tables 8.8a and 8.8b indicate that with the exception of report day 0 and 1, the probability of obtaining the reported frequencies or values higher than those reported in each of the earnings announcement days out of 235 earnings announcement is very high. One can therefore conclude that the apparent remarkable price activity around the interim earnings reported in tables 8.2b and 8.7 were the result of a small number of extreme price changes except for report days 0 and 1. Since the

probability of obtaining a frequency of 39 or more out of 235 interim earnings announcement is very small, one cannot reject the hypothesis that interim earnings reports have information content that affect price formation on the day they are released which appear to persist into the following day.

To examine whether there are real differences in investors´ response to the release of interim earnings around the day of release, simultaneous confidence intervals on the day earnings are released with respect to the other days were computed and reported in table 8.9. If no differences exist on the day of interim earnings release compared to other days, the interval estimate should be zero. The figures in table 10 are computed at 0.05 significance level. The figures suggest that the day that the interim earnings reports are released is the single dominant period in which share price activity is quite remarkable. This suggest therefore that interim earnings reports have information and the effect of this information is experienced on the day that the report is released. The results are consistent with those obtained by Firth (1981) showing that interim reports affect price activity in the week of their release. This study however, provides much more precise evidence on the time that the release of interim reports has its greatest impact on investor activity. The results are also in line with other studies elsewhere that show that interim accounting reports have above average information content.

TABLE 8.9A

SIMULTANEOUS CONFIDENCE INTERVAL OF FREQUENCY DISTRIBUTION OF $\bar{M}T$ VALUES

DAY	FREQUENCY	S C INTERVAL		
-5	10	0.2520	;	0.4424
-4	12	0.2277	;	0.4363
-3	14	0.2168	;	0.4300
-2	8	0.2494	;	0.4487
-1	19	0.1900	;	0.4139
0	90			
1	39	0.2149	;	0.3469
2	12	0.2277	;	0.4363
3	8	0.2494	;	0.4487
4	10	0.2384	;	0.4424
5	13	0.2223	;	0.4331

TABLE 8.9B

SIMULTANEOUS CONFIDENCE INTERVAL : UT

DAY	FREQUENCY	SC INTERVAL	
-5	9	0.2520 ;	0.4544
-4	9	0.2520 ;	0.4544
-3	17	0.2087 ;	0.4293
-2	11	0.2413 ;	0.4486
-1	19	0.1986 ;	0.4234
0	92		
1	39	0.0955 ;	0.3565
2	12	0.2352 ;	0.4448
3	7	0.2632 ;	0.4608
4	10	0.2466 ;	0.4514
5	10	0.2466 ;	0.4514

TABLE 8.10

DISTRIBUTION OF INTERIM EARNINGS ANNOUNCEMENT OVER DAYS OF THE WEEK

	1984	1985	1986	TOTAL
MONDAY	10	14	10	34
TUESDAY	18	13	17	48
WEDNESDAY	13	20	18	51
THURSDAY	29	17	26	72
FRIDAY	13	10	8	31
TOTAL	83	74	79	236

N = 236

MEAN AND MEDIAN VALUES OF $\bar{U}_T$

TABLE 8.11

DAY	$\bar{U}_T$	MEDIAN
-5	1.3807	0.2529
-4	1.3770	0.2128
-3	1.8649	0.2428
-2	1.0470	0.1610
-1	2.2170	0.2764
0	10.5620	1.9164
1	4.2683	0.7313
2	1.3697	0.2207
3	1.2652	0.2618
4	1.2854	0.3045
5	1.8847	0.2528

TABLE 8.12

DISTRIBUTION OF HIGHEST U_{it} VALUES OVER TEST PERIOD

DAY	1984	1985	1986	TOTAL
-5	3	4	5	12
-4	6	3	4	13
-3	7	5	4	16
-2	4	3	3	10
-1	4	6	10	20
0	27	33	31	91
1	17	12	8	37
2	6	5	2	13
3	3	0	2	5
4	3	2	5	10
5	3	1	5	9
	83	74	79	236

N = 236

TABLE 8.13

PROBABILITY OF OBSERVING FREQUENCY (n) IN A UNIFORM DISTRIBUTION OF 236 EARNINGS ANNOUNCEMENTS : $\bar{U}$T

DAY	FREQUENCY	$P(X \geq n)$
-5	12	0.9922
-4	13	0.9842
-3	16	0.9160
-2	10	0.9985
-1	20	0.6616
0	91	0.0001
1	37	0.0008
2	13	0.9842
3	5	0.9999
4	10	0.9985
5	9	0.9995

Table 8.10 gives the distribution of the interim earnings announcements over the days of the week. The announcement of interim earnings was distributed over the week days with Thursday having the highest number of announcements. The proportion of announcements occurring on Mondays and

Fridays was about 14% and 13% respectively and therefore they could not have unduly affected the results. The test for differences in the test period days reported in Tables 8.9A and 8.9B also show significant differences between the interim report day with respect to the other days surrounding announcement.

Results of a second test which assumes that normal returns are synonymous with market returns is reported in tables 8.11 to 8.14. This method takes into account market-wide movements which occurred at the same time that the firms in the sample experienced the earnings announcement. The method assumes that normal returns vary directly with market returns and abnormal return is the difference between the return on a sample security and the corresponding return on the market index. Essentially the same conclusions are drawn as those using the market model to compute normal earnings. The $\bar{U}_t$ values in table 8.11 are all greater than one with the highest value of 10.562 occurring on the day of the interim earnings announcement. The second highest value occurs on the day after the earnings announcement. Table 8.11, however, indicates that with the exception of the announcement day, all the median values are less than one. It appears that the $\bar{U}_T$ values have been influenced by a few large values.

Following the procedure reported in table 8.8A and 8.8B, the effect that a small number of large values have had on the results is investigated. Table 8.12 gives the distribution of the highest U_{it} values over the 236 announcements. The announcement day contained the highest number of 91 followed by the day after earnings were announced with a value of 37. The distribution appears to be similar to that obtained in 235 earnings announcements using the market model and reported in table 8.3 in which the announcement day had the highest number of 92 with the second highest of 39 occurring on the day following the announcement.

A test based on the binomial approximation to the hypergeometric distribution is reported in table 8.13 and the results look remarkably similar to those reported in tables 8.8a and 8.8B. The results in table 8.13 show that the probability of obtaining a frequency of 91 or more in a uniform distribution of 236 earnings announcements is 0.0001, which is rather small. Similarly, the probability of obtaining a frequency of 37 or more in a uniform distribution of 236 earnings announcements is 0.0008. The observed frequencies of the highest U_{it} on these days are therefore unusual. Table 8.13 indicates that with the exception of announcement day and the day following the announcement, the $\bar{U}_T$ values in table 8.11 appear to have been influenced by extreme values of a small number of observations as the frequency of highest U_{it} values occurring on these days are quite small. The probability of the reported frequencies occurring in a uniform distribution of 236 earnings announcements on all days except the announcement day and the day after announcement is rather high and therefore not strange.

Table 8.14 shows the results of the computed simultaneous confidence intervals similar to tables 8.9A and 8.9B. If no differences exist in investors´ response on the day of interim earnings release compared to other days in the test period, the interval estimate should be zero. The results are remarkably similar to those obtained in tables 8.9A and 8.9B and indicate that significant differences exist between announcement day and the other days in the test period, and that interim earnings have a significant impact on investors´ behaviour on the day such reports are released.

TABLE 8.14

SIMULTANEOUS CONFIDENCE INTERVAL : UT

DAY	FREQUENCY	SC INTERVAL
-5	12	0.2306 ; 0.4389
-4	13	0.2252 ; 0.4358
-3	16	0.2092 ; 0.4263
-2	10	0.2414 ; 0.4451
-1	20	0.1881 ; 0.4136
0	91	
1	37	0.1008 ; 0.3569
2	13	0.2252 ; 0.4358
3	5	0.2687 ; 0.4602
4	10	0.2414 ; 0.4451
5	9	0.2468 ; 0.4481

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CHAPTER NINE

9.0.0 CONCLUSION AND SUMMARY

The objective of this study was to examine whether the release of interim financial reports contain information that affects investors in their investment decisions. In chapter one, the research problem was identified and its significance and potential contribution to existing knowledge was discussed. The study's principal contribution is to provide evidence of the precise time that the information contained in U.K interim financial reports has the most dominant effect. The study also adds to the existing number of information content studies.

Chapter two traced the historical development of interim reporting and examined the objectives for reporting the financial affairs of business enterprises. A major objective of financial reporting was assumed to be to provide information to investors for making investment decisions. The basis for such a view is that investors are faced with uncertainties that can only be reduced by the provision of information about the future states of the world, and this information can partially be abstracted from published financial statements. If the future distribution of a firm's cash flow is viewed as a row vector of probable outcomes depending on future states of nature, interim reports serve the function of providing information on the probabilistic distribution of such cash flows and hence provides an input into the determination of the firms' share price. Such a view was expressed by the Accounting Standards Steering Committee (1975), Canadian Institute of Certified Accountants (1980) and the Financial Accounting Standards Board (1985) in their attempts at establishing the objectives for reporting the financial information of business enterprises.

Information in the financial reports is only useful if it leads to changes in investors' consumption and investment behaviour. The focus on financial reports as providing information for decision making is a change from earlier views where financial reporting was perceived as the means whereby management gives account of its stewardship function to shareholders. Since investors face an uncertain environment, interim financial reports should be of interest to them, on the assumption that investors need frequent inputs into their consumption-investment decision-models. Timeliness of information is therefore a major attribute of interim financial reports.

For financial reports to achieve the objective of helping investors make better investment-consumption decisions, then, the disclosure in such reports should be related to what investors need in making their buy-hold-sell decisions. Capital market participants could bring pressure to bear upon firms to disclose financial information and provide sanctions against non-disclosure.

Chapter three discusses Information Theory. The rationale this is that the study is concerned about how information i.e. interim accounting information affects share share prices. The major objective of financial reporting is assumed to be the provision of information to investors to enable them to make better investment decisions. The nature of information is therefore an important issue. The nature of information which is knowledge gained about some situation or event for which there is no prior knowledge is discussed. Financial reporting as a communicative act provides information if it reduces uncertainty about the investor decision process.

To facilitate investor decision making, the financial reporting process must be capable of indicating the existence of future possible states of nature. In effect, financial reports must be an indirect way of perceiving reality. If financial reports are incapable of fulfilling such a role, then, they cannot reduce the uncertainty attached to the investor decision process.

Some of the issues regarding information production environment were also discussed. If investors use interim accounting information in their buy-hold-sell decisions, then, the interim accounting information has an important impact on the allocation of resources in the economy thereby affecting the prices of assets. The potential of accounting information affecting the resource allocation process is the standard argument for disclosure policies on the grounds that, without intervention, too little information will be produced (American Accounting Association, 1977). Others argue that competitive production of information for trading purposes is socially sub-optimal and argue for the regulation of financial information output (Arrow 1962), Fama and Lafer (1971) and Hirshleifer (1971). The dangers in such a view is pointed out by Demsetz (1969). To argue however, that the laissez faire solution to information production is socially sub-optimal disregards the fact that governmental involvement could lead to redistribution of resources from one group to another. The Corporate Report (1975) identified other user groups of financial statements besides the investor group who are the main concern of this study. If a social choice criterion of pareto optimality is to be adopted, then, any governmental intervention in resources for accounting information production should ensure that no group of users is worse off than before.

An essential characteristic of accounting information, if it is to change investor behaviour, is that the receiver must be able to abstract some meaning from the signal conveyed by the reports. In this sense, therefore, the message that the information contains must be clear and unambiguous. It is not likely that the financial reporting process could be tailored to the understanding of all investors. It may be necessary therefore for some type of investors to delegate the function of decoding the information signals in financial reports to the professional.

In chapter four, the notion of Efficient Capital Markets and Portfolio Theory were discussed. The relevance of a chapter on efficient capital markets is that the methodology used to investigate the research problem involves the examination of the behaviour of security prices of firms around the day that the firms publicly release interim reports. Some of the studies discussed indicate that the securities market is efficient in the pricing of securities that are traded on the market. Others provide contrary evidence. The controversy regarding the issue of market efficiency is not likely to abate in the near future. The important issue in the market efficiency debate is not whether or not abnormal returns can be earned by the adoption of a particular trading strategy. The issue is whether such abnormal returns can be earned consistently after taking into account all transaction costs.

The studies that appear to indicate that the market is inefficient in its pricing of securities frequently do not take account of the full costs of trading. In the light of Roll's (1977) critique, any test of market efficiency is also a test of the model of price generation. Market efficiency tests using the Capital Asset Pricing Model (CAPM) is difficult to interpret in the sense that it is impossible to test the validity of CAPM and therefore one cannot say whether it is right or wrong. Any perceived market anomalies might therefore be due to mis-specification of the model of price generation or the market not being efficient in its pricing of securities or both.

A point worth noting is that most of the market anomalies relates to the U.S. securities market. No such substantial evidence exist to date on the London Stock Exchange. It is reasonable to assume for the purpose of this study therefore that the London Stock Exchange is reasonably efficient in its pricing of the securities that are traded on it. As far as the debate on the issue of market efficiency is concerned, arguably, the burden is on those who advocate expending resources on exploitable inefficiencies to provide convincing evidence.

Chapter five provides a detailed review of prior studies in the relationship between accounting information and security prices. Most of these provide evidence that accounting reports contain information affecting investor decisions. The majority of the studies on accounting information and security prices have been carried out in the United States. The current study therefore adds to the few but growing number of studies carried out in the United Kingdom. The only study in the U.K. involving interim earnings is the work of Firth (1981) who investigated the information content of such reports in the course of his study of the information content of annual reports through its various stages i.e. from preliminary announcement to the Stock Exchange and the financial media to the annual general meeting. Firth's main concern was the incremental information content in the second stage of the annual report process where the audited annual results are released compared to the information in the preliminary announcement stage. There was therefore the need for a study that does not constrain the sample to large firms as Firth did but which adjusts for the problem of infrequent trading associated with small firms. This study also used daily rather than weekly data to correct for the design defects in Firth's study thereby providing precise evidence regarding the information content of interim financial reports in the U.K.

In chapter six, a detailed discussion of the methodology used and the issues involved are provided. The price generation model used in the study is the Market Model which lacks any theoretical foundations and which is based on the rather strong assumption of a linear relationship between the returns of a firm and that of the market. Its use however avoids most of the criticisms of CAPM in the light of the critique of Roll (1976). Among the major methodological issues is the question of non-trading since some of the firms in the sample are small. Two methods generally available for handling such a problem are those proposed by Scholes and William (1977) and Dimson (1979). In this study Dimsons's methodology was selected due to its computational efficiency. To facilitate tests of statistical significance, the daily returns are assumed to be normally distributed and independent. Though Fama (1965) shows that daily stock returns are not normally distributed, Brown and Warner (1985) provide evidence that under the Central Limit Theorem, departures from normality are less pronounced for cross-sectional data. With a sample size of 50 or more, the distributional properties of cross-sectional mean excess returns seem close to normal. Since the sample comprises of 100 randomly selected firm with a total of 235 interim earnings observations, an assumption of normality in the distribution of the cross-sectional residuals is not unreasonable.

Another major issue discussed in the methodology is the problem of homoscedasticity. There is some evidence of substantial increase in the variance of a security's return for the days around some type of events, (Beaver 1968), Patell and Wolfson (1979). The implication of this for the study is that it could lead to a large number of rejections of the null hypothesis of no information content in the interim earnings reports. This comes about because of the standard procedure of using time series data outside the test period to compute the abnormal returns in the test period. The severity of the problem is reduced by the use of the correction factor suggested by Theil (1971). The results of the study reported in chapter eight suggest that the use of the correction factor did not adequately account for the increase in variance and there appears to have been an upwards bias in the information content measure. The problem is overcome by devising other tests not based on the variance measure. For this reason, care needs to be exercised in the interpretation of tests that are based solely on variance changes.

One problem regarding information content studies in the U.K. is the issue of dividends. Since dividend information is contained in the interim earning reports, one should bear this in mind in any discussion of the information content of either annual or interim earning reports. There appears to be the need for improvement in research design that might decompose financial statements into earnings information and dividend information.

Chapter seven discusses research design issues. Research design is problem specific and the interrupted time series design is selected as the most appropriate with regards to the nature of the research problem. However, in place of a control group, the theoretical expected value of abnormal returns around the time of the release of interim earnings is used in common with prior studies.

In chapter eight, the results of the study are reported. The results indicate that interim accounting reports have information content which affects investors buy-hold-sell decisions. The results also indicate that the most significant impact is on the day they are released. Chapter nine provides a summary of the study.

9.0.1 POLICY IMPLICATIONS AND SUGGESTIONS FOR FUTURE RESEARCH

The results of this study indicate that interim accounting reports have information which is used by investors in their investment decisions. In the U.K. however, accounting policy makers have as yet not made available any guidelines for the preparation of such reports even though interim accounting reports have been identified as an area needing attention. This is borne out by the fact that the Institute of Chartered Accountants of England and Wales (ICAE&W) commissioned a study to identify the reporting problems involved, (Lunt 1982). Since investors appear to use these reports, they have the potential to affect resource allocation process in the economy. Accounting policy makers therefore have the potential to provide economic benefits by recommending to firms to provide quarterly reports to investors. It would be beneficial to ascertain from the investor community as well the sort of information that they might find useful in the interim reports. There is also the need for studies on investors' actual use of accounting information as well as research design improvements with regards to earnings information and dividend information.

LIMITATION OF THE STUDY

The limitations in this study mainly relate to aspects of the research design. Any interpretation of the results should also take into account the extent to which the price generation model is a valid description of the process of price formation.

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APPENDIX

LIST OF FIRMS STUDIED

CODE	NAME
001-241	AAH HLDGS PLC
057-705	AGB RESEARCH PLC
001-467	ABERDEEN CONSTRUCTION GROUP PLC
052-807	ASH AND LACY PLC
056-003	ASSOCIATED BRITISH ENGINEERING PLC
068-428	BABCOCK INTERNATIONAL PLC
070-605	BAILEY (BEN) CONSTRUCTION PLC
070-519	BAILEY (CH) PLC
081-180	BARRATT DEVELOPMENTS PLC
085-182	BAYNES (CHARLES) PLC
085-609	BEALES (JOHN) PLC
086-260	BEATSON CLARK PLC
085-728	BEATTIE (JAMES) PLC
087-285	BEAZER (CH) HLDGS PLC
087-508	BECKMAN (A) PLC
088-006	BEECHAM GROUP PLC
088-460	BEJAM GROUP PLC
090-465	BELLWAY PLC
090-669	BEMROSE CORP PLC
097-109	BILLIAM (J) PLC
099-826	BIRMINGHAM MINT GROUP PLC
103-006	BLACKWOOD HODGE PLC
108-539	BODYCOTE INTERNATIONAL PLC
110-705	BOOSEY & HAWKES PLC

114-105	BOULTON (WILLIAM) GROUP PLC
115-829	BOWATER INDUSTRIES PLC
119-467	BRAMAL (CD) PLC
121-309	BREEDON & CLOUD HILL LIME WORKS PLC
121-600	BREMNER PLC
123-703	BRIDON PLC
127-158	BRITISH AEROSPACE PLC
129-121	BRITISH BUILD. & ENG. APPLIANCES PLC
129-660	BRITISH CAR AUCTION GROUP PLC
142-162	BRITISH VITA PLC
156-129	BURNETT & HALLAMSHIRE HLDGS PLC
156-301	BURTON GROUP PLC
167-411	CAMPARI INTERNATIONAL PLC
499-749	CAPARO INDUSTRIES PLC
203-207	CLIFFORD`S DAIRIES PLC
215-309	CONCENTRIC PLC
237-778	CROWN HOUSE PLC
241-337	CUSSINS PROPERTY GROUP PLC
256-609	DAVIES & METCALFE PLC
261-506	DELTA GROUP PLC
278-108	DOUGLAS (ROBERT. M) HLDGS PLC
307-369	ELBAR INDUSTRIES PLC
312-802	ELYS (WIMBLEDON) PLC
312-805	EMPIRE STORES (BRADFORD) PLC
322-511	EUROPEAN FERRIES GROUP PLC
324-807	EXCALIBAR JEWELLERY PLC
333-104	FEB INTERNATIONAL PLC
334-107	FEEDEX AGRICULTURAL INDUSTRIES PLC
371-706	GLAXO HLDGS PLC
404-226	HALL ENGINEERING (HLDGS) PLC

415-314	HAWDER SIDDELEY GROUP PLC
422-529	HERRBURGER BROOKS PLC
424-105	HEWDEN-STUART PLANT PLC
433-640	HOLT LLOYD INTERNATIONAL PLC
457-305	ILLINGWORTH, MORRIS PLC
473-709	JESSUPS PLC
478-209	JONES, STROUD (HLDGS) PLC
536-464	LOW (WILLIAM) & CO. PLC
537-401	LUCAS INDUSTRIES PLC
550-408	M.L. HLDGS PLC
569-226	MARTIN (ALBERT) HLDGS PLC
593-306	MILLER (STANLEY) HLDGS PLC
605-609	MOSS BROS PLC
634-700	NEWBOLD & BURTON HLDGS PLC
646-880	NORTHERN ENGINEERING INDUSTRIES PLC
650-609	NOTTINGHAM BRICK PLC
688-747	PENTOS PLC
690-520	PITTARD GROUP PLC
691-341	PLATIGNUM PLC
691-404	PLAXTONS (GB) PLC
704-324	PRITCHARD SERVICES GROUP PLC
719-102	RACAL ELECTRONICS PLC
728-700	REDLAND PLC
731-708	RELYON GROUP PLC
737-386	RICHARDS (LEICESTER) PLC
758-707	RUGBY PORTLAND CEMENT PLC
774-402	SANDHURST MARKETING PLC
800-222	SHARNA WARE PLC
813-004	SKETCHLEY PLC
815-301	SMART (J) & CO (CONTRACTORS) PLC

834-704	SPIRAX-SARCO ENGINEERING PLC
859-503	SUMRIE CLOTHES PLC
865-607	SUTER PLC
869-007	SYMONDS ENGINEERING PLC
878-100	TAYLOR WOODROW PLC
881-603	TELEPHONE RENTALS PLC
892-401	TIME PRODUCTS
896-306	TOMKINSONS PLC
897-707	TOWLES PLC
932-200	WADE POTTERIES PLC
934-808	WALKER (J.O.) & CO PLC
941-808	WASSALL (JW) PLC
944-001	WATTS, BLAKE , BEARNE & CO PLC
988-269	YOUNG (H) HLDGS PLC
989-488	ZETTERS GROUP PLC