Some Aspects of Portfolio Management in a Financial Institution.

The author would like to acknowledge the support, both financial and otherwise, of Ivory & Sime in the writing of this thesis. Thanks are also due to Prof. A. D. Bain, and both past and present members of the Institute.

P. R. Draper

May, 1973

Some Aspects of Portfolio Management in a Financial Institution

Chapter 1

Introduction

This study attempts to set out in detail some of the factors and influences affecting portfolio decisions. In particular it attempts to outline the factors affecting portfolio selection decisions in an investment management organisation. Influences on share selection such as the need for diversification in portfolios, the desire to buy marketable stocks and the use of sector selection - a technique for selecting shares by their industry characteristics - as well as a variety of institutional factors are discussed at some length. Specific factors involved in investment analysis, such as intrinsic value analysis, and methods of portfolio evaluations are also considered. With this basis it is then possible to investigate more fully the value and usefulness of one of the manager's decision rules. The technique investigated - sector selection - was on the one hand, felt by the investment managers to be a central and important part of their portfolio construction techniques contributing significantly to the performance of their portfolios, whilst on the other hand it was believed by the author, on the basis of preliminary observations, to be of rather less consequence. To resolve this conflict a multi-stage analysis (discussed below) was devised to provide empirical evidence as to the theoretical validity and practical usefulness of the technique.

Two objectives may be seen to be behind the study.[1] The first is to provide more information about some of the principles that the investment managers appear to consider. The need for such information is well documented. Thus Lintner{64} writes

> " ... further research will have to build up a much greater store of detailed institutional knowledge than we now have, and it will <u>also</u> have to fill in and build our knowledge of how <u>portfolio choices are made</u> by every major investor group in every market."[2]

---

1. To understand how these objectives arose it is necessary to consider the historical antecedents of the study. It was originally conceived with Clarkson's {16} heuristic approach to portfolio selection in mind. Clarkson investigated the investment of trust funds held by a bank, utilising a heuristic model written as a computer program to simulate the procedures of the trust investment officer in selecting particular portfolios. The model was based on the rules of thumb which guide the decision maker from the original input of information about the client, the securities markets and the economy, to the choice of particular portfolios. The investment officer's preference list of 80 stocks was taken as given. The list was "previously selected" outside the model with few changes to it being made over time. Each stock was associated with an industry, which in turn were allied to particular goals such as growth. Hence the search for appropriate securities was narrowed to a much shorter list. Simple decision rules were then sufficient to ensure selection of suitable portfolios.

   It was hoped that even in a more complex situation many investment decisions might still be made on the basis of similar rules of thumb and that in consequence scope existed for the construction of a positive model of investment behaviour.

   Such aims were unfortunately doomed to failure. It was not found possible to adopt procedures of the same type as Clarkson's in order to narrow down the search process for securities. There was neither a convenient short list of 80 stocks, nor an association of particular industries with specific goals. It was not even clear that one could select securities on the basis of their industry characteristics. It soon became evident that rules which could be stated rigorously and applied mechanically were unlikely to be distilled from a study of the managers' behaviour. The importance and relevance of several of the managers' avowed basic principles were open to argument, and what they actually did appeared at times to bear little relation to what they claimed to do.

2. Underlining corresponds to Lintner's italics.

The second objective is to make some strides towards a positive theory of investment. To this end one of the rules that the investment managers claim to use is examined to see if this assertion may be verified empirically. The validity and usefulness of the rule is also considered. Although it would have been interesting and possibly beneficial to consider several other elements of the managers' doctrine, limitations of time and resources prevented such extensive investigations.[1]

The study divides then into two parts. Part I aims at explaining what the investment managers do and how they are organised to do it. It is based on observation, interview and explanation from the managers. No attempt is made to derive what they should do from normative[2] portfolio theory[3] since the interest here is not in how people ought to behave but in how they do behave.[4] Nor is a positive theory of portfolio selection propounded. Considerably more work relating what they actually do, to what they say they do is necessary before that is possible. It may be that investment managers should adopt the new techniques and ideas of portfolio and capital market theory,[5] but until they do, policies and

---

1. The decision as to which rule to investigate was taken on the basis of the intrinsic interest of that rule to the investment managers. It may not in fact be the least satisfactory of their rules of thumb, but it was the area felt by them to be of particular importance and relevance in their investment decision making.

2. Normative and positive types of analysis are interpreted here as differing due to the "motivation of the search for conclusions, and in the use made of those that are found". In positive analysis what one looks for in a conclusion or prediction, is the possibility of testing. In normative analysis the purpose is to recommend to one or more of the persons or organisations represented in the analysis, a choice or course of action which can be expected to serve his or their objectives better than, or at least as well as alternative actions open to them (Koopmans {

3. See for example Sharpe {84} and Lintner {62,63}.

4. For a discussion of the preoccupation of economics with normative models see H.A. Simon {88}.

5. For a brief sceptical look at the practicalities of portfolio theory, see Granger & Morgenstern {46}. At the present time portfolio theory is still in its infancy as regards some of the central questions of

prescriptions based on detailed studies of existing practices as well as on the precepts derived from normative theory, are likely to be more useful than policies based simply on the latter.

The positive theory of portfolio behaviour envisaged has much in common with the behavioural theories of the firm. A similar controversy as to its usefulness[1] might therefore be expected, although as Loasby {65} has pointed out the behavioural paradigm[2] and the micro-equilibrium paradigms are quite different. Analogously capital market theory of which portfolio theory is one of the elements[3] and a positive theory of portfolio selection belong to quite distinct paradigms between which it is hard to find criteria for judging.

Part I then provides some evidence as to factors a positive theory of investment should consider. Inevitably the description of investment behaviour is not rigorous, given the conflicting views that were sometimes

---

1. The behavioural theories have been attacked particularly on the methodological criticism that it is the predictive power of a theory that is important and not its assumptions. See Milton Friedman {43} for a discussion of this methodological point and Koopmans {54} and Coddington {17} for objections. The latter's critique of Friedman would seem particularly pertinent. "But the existence of rules of thumb and ad hoc generalisations (such as so-called naive models) which yield relatively accurate predictions without providing any explanation of the phenomenon involved, shows that, although predictive accuracy may be a necessary condition it is certainly not a sufficient condition". For specific counter arguments to the criticism relating to the behavioural theories of the firm see Cyert & Grunberg {27} as well as the main text of Cyert & March {28}.

2. "A paradigm ... defines the type of relationships to be investigated and the methods and abstractions regarded as legitimate within a particular problem area".

3. Available empirical evidence supports many of the major implications of the efficient markets model and as such is in some degree consistent with the Sharpe & Lintner model. The results for the "market model" are however likely to be partially consistent with other models of equilibriu expected returns (Fama {37}) so that a model with similar implications and more realistic assumptions might have some advantages. A positive theory of institutional investment behaviour might provide one of the building blocks for such a theory.

expressed and its basis of personal observation.[1]

Part II can be seen as a contribution to a positive theory of investment. Sector selection techniques are evaluated with the aim of discovering both whether the investment managers use sector selection techniques and whether the choice of shares by their sector characteristics is a rational investment strategy. As a first step it seemed desirable to investigate whether sector effects do exist or not.[2] The absence of a significant statistical difference between sectors would automatically have implied that the selection of shares for their sector characteristics was a misguided policy. In fact a significant difference between sectors was found overall.

Since sector effects do seem to exist, the original question as to whether it is possible to say with some confidence that investment managers do use sector selection techniques may be investigated. If the answer is in the affirmative further questions concerning the value of sector selection to the investment managers and the possibilities of predicting successful and unsuccessful sectors invite investigation.[3]

---

1. The first part represents a personal view of how some portfolio investment decisions are made in practice. It is based on first hand experience gained from working for a few months in a firm of investment managers which, although by no means typical of all such organisations, is perhaps representative of some of the faster growing amongst them.

2. In terms of a positive theory it is only necessary for the managers to think or act as if they exist. However since there was some doubt as to whether they did or did not act as if sector effects existed it seemed reasonable to look at this rather fundamental question first. In fact this investigation of behaviour goes further and deeper than strictly necessary to establish a rule which might be used as part of a descriptive theory of portfolio selection. It also serves to indicate the possible usefulness of the rule with consequent implications for present investment behaviour.

3. Successful and unsuccessful sectors and investments are judged in this analysis without regard to risk. If it is, for example, possible to demonstrate the success of sector selection this may simply represent the assumption of a higher degree of risk.

To provide some answers as to the existence of sector effects regression techniques were used to partition changes in share prices into sector, market and residual components. Tests of significance and estimates of the relative contributions made by these factors provided some data on the existence and importance of sector effects.

To investigate more directly whether the managers had actually selected shares on a sector basis for their portfolios, the constituents by sector of an actual portfolio were compared with a distribution that might have been expected to occur by chance, given the distribution of securities between sectors over the market as a whole. A significant difference between the actual portfolio's distribution and the market distribution provided some evidence that the managers do select shares on the basis of sectors, or some correlated technique.

Having established that the managers did choose shares by sector, it may be asked whether the technique was a valuable one and rewarded the managers with above average investment performance. To this end an actual portfolio, its constituents selected as before on the basis of sectors, was broken down into components such as the shares held throughout the holding period, the shares bought during the period and the shares sold during the period. The performance of these components was then compared with equivalent amounts invested in the appropriate sector indices. Performance of the portfolio close to the sector equivalents and substantially better than the market over several periods might have provided prima facie evidence of the success of sector selection as an investment technique.

The results of this part of the study did not support the view that sector selection was a valuable investment technique. Whilst as already indicated sector effects were discernible, particularly for well defined, homogeneous sectors, and whilst the analysis of portfolios did provide evidence that

the managers invested on the basis of sectors, portfolio performance did not appear to have benefited from the use of sector selection as an investment technique.

The poor results achieved from the sectors selected in this fund might of course simply reflect unique events, such as an unusually severe bear market. The investigation of additional portfolios would be one means of providing further evidence on this facet of the study. As an alternative approach, the final chapter considers some studies of attempts to predict share prices, and their implications for forecasting sector performance.

Taken as a whole these investigations help build up a picture of sector selection techniques. They provide some evidence about its value as an investment technique and give tentative answers to questions relating to the advantages of investing by sectors. In terms of steps toward a positive theory of investment behaviour they demonstrate that some investment managers do consider sector factors in making decisions, although in the specific case considered the empirical evidence suggested that their policy was fruitless because they were apparently unable to predict the successful sectors.

In conclusion, the contribution of part I may be seen as the outlining of factors relevant to the construction of a positive theory of investment. By no means all the points brought up are likely to be essential to such a theory, but it does provide a basis for further research and investigation. The investment behaviour of investment managers as well as of a wide range of institutions with similar activities does not appear to have been studied previously in the U.K.

Overall the main contribution of this thesis must be seen in terms of its exploration of sector selection techniques. It finds, as noted above,

evidence that the investment managers do use such techniques, but there was no evidence that their use conferred any advantage to the managers in terms of performance. This finding constitutes additional evidence in favour of the efficient market hypothesis. Selecting shares by their industry characteristics might be expected to be a successful investment technique only in an inefficient market. Inability to detect such success might therefore be interpreted as evidence in favour of the efficiency of the capital market, with consequent implications for resource allocation.

If this conclusion, that little advantage is conferred by the use of sector selection techniques, is accepted certain implications relating to the present organisation of many investment managers may also follow. The most important is that research and share selection on the basis of industries may be inappropriate.

Chapter 2

The Role of the Institution

A prerequisite for understanding the particular investment behaviour and asset selection of an institution is a definition of the role and purpose of the institution within the financial community. With this requirement in mind this chapter sets out to describe the activities and services provided by investment managers. Attention is paid both to the relationship of the institution to the financial markets and to the investment services - notably diversification and management - that may be provided. In line with recent evidence the argument is advanced that successful 'management' requires superior information and that implicitly the organisation of many investment managers reflects this factor.

Investment Managers and Financial Markets

Investment Managers serve primarily to place funds raised from the public[1] into various investment alternatives. In general the preferred media of investment are ordinary shares and bonds, so that interest and activity is mainly centred on the secondary markets.[2] Since the institutions' success in these markets, in terms of capital gains and dividends, affects their ability to raise funds from the public, the selection of shares and bonds

---

1. Funds are raised by the offer of shares (investment trusts) and units (unit trusts). To a lesser extent funds are also raised from private and corporate clients (charities and pension funds).

2. Issues sold in the secondary markets are of course close substitutes for the new issues in primary markets so that the prices of the two do not move far out of line. High prices and low yields in the secondary market make newly issued securities more attractive and hence market conditions are transmitted to the primary markets. The extent to which an exogenous increase in demand for securities results in an increased flow of funds into real investment expenditures or causes higher prices on existing securities, depends on the response of the new issues market to changes in the demand for securities (Smith {91}). In general increased demand for stock causes an increase in price. Increased prices over most of the market in turn induce new primary issues whilst also providing a psychological climate favourable for investment. (Secondary is used to describe the trading market for "seasoned" securities).

and their amalgamation into portfolios with appropriate objectives is of paramount importance. The different portfolios are intended to provide investors with a choice between a wide range of risk/return possibilities in addition to both diversification and management of assets in an easily obtainable form.

To some extent the differences between portfolios are largely illusory. The development of the investment management industry with two main investment vehicles - unit trusts and investment trusts[1] - has tended to obscure the essential affinity between the investment aims and objectives of most portfolios. This similarity allows uniform methods to be employed for both unit and investment trust portfolio selection and permits the investment managers to adopt an integrated portfolio management structure. The legal and institutional distinctions between the investment vehicles naturally involve some differences in organisation and behaviour - for example, investment trust portfolios have longer time horizons than unit trust portfolios - but there remains a substantial area of common ground. In general the same type of information and means of processing it are required, giving rise to obvious economies. The diversity of portfolio types may even be an added advantage, since opportunities for one fund may arise out of research for another and consequently investment sometimes takes place in areas that would not normally have been considered. It becomes clear then that it is unnecessary and probably undesirable to separate physically the different portfolio investment teams.

With this general picture in mind it is useful to consider investment management from a more formal viewpoint. Financial markets in an economy exist to allocate savings efficiently to ultimate users of funds.

---

1. Appendices 1 and 2 outline some of the legal and institutional details of the two investment vehicles.

Decision making units in the economy may be classified into potential surplus and potential deficit units.[1]

In the absence of financial institutions it would be difficult for economic units to achieve their intended surplus or deficit positions. Potential borrowers wishing to spend more than their income would find it difficult to borrow and potential savers wishing to spend less than they receive might not find any acceptable way to lend. Capital would be misallocated and growth depressed.

In this situation opportunities exist for an intermediary to put together savings and loans in a more efficient manner than would otherwise be possible. Intermediation is important because potential deficit units are frequently those which wish to engage in productive investment, whilst prospective savers may not have the desire or expertise to engage in productive investment themselves. By offering their own liabilities as an attractive alternative to immediate consumption or unproductive investment, financial institutions are able to channel the savings of surplus units to borrowers who can put them to good use.

Financial intermediaries transform funds and make them more attractive. The ultimate borrower is able to sell his primary securities to a financial intermediary on more attractive terms than if the securities had to be sold directly to ultimate lenders. The ultimate lender gains because the indirect security is more attractive than a primary security.

The intermediaries provide the following services:{4,91,102}

(a) Economies of scale, since they are continually purchasing primary securities

(b) Divisibility and flexibility - borrowers often want to borrow large sums, while savers frequently want to lend small sums. Intermediaries are able to pool the small savings and transform them into a large loan, so providing a more attractive package to the borrower.

---

1. Potential surplus (deficit) units are those for whom intended income

(c) Diversification and risk - the purchase of different primary securities spreads the risk for the ultimate lender

(d) Maturity - the transformation of primary securities of a certain maturity into indirect securities of different maturities

(e) Expertise and convenience.

A consequence of financial intermediation is that the financial markets are made more efficient. The intermediaries lower the cost to the borrower and provide a security better suited to the lender. When opportunities for profit arise, financial intermediaries enter the market and narrow the differential. Their success in tapping the savings of the public should lower the cost of raising capital. More money flows into the market and there is less need for corporations to pay a high premium to obtain capital. Total investment is increased due to the lower cost of capital.

In so far as the investment managers investigated carry out several of the functions listed above, in particular receiving funds from one group and making them available to another, they perform as financial intermediaries. Indeed to some extent the managers represent a further development of the financial intermediary concept since they specialise by investing in the secondary market for other institutions that directly attract funds from savers.[1] At the same time however as the investment managers are becoming more specialised in their contact with savers they are tending to become less specialised in their dealings in securities. Far from concentrating more and more on seasoned stock market securities as increased specialisation of function would imply, the emphasis is very much on increasing their

---

1. As an example of this divorce of the managers from the savers one may note that where possible the investment of funds is separated from the administration of individual accounts. Thus the unit trust side of the organisation examined had a separate company and organisation handling the administration and marketing of units (the contact with savers). This division of operations enables the investment managers to concentrate on portfolio decision making. It also provides certain administrative savings. The distinction between administration and portfolio management was less marked (due probably to the larger average holdings, fewer transactions

involvement in the primary security markets by bringing companies to market, putting up venture capital and generally embarking on what have in the past been regarded as traditional merchant banking activities. In part this reflects a general trend. The movement of qualified outsiders, such as merchant banks, into the portfolio management field and vice versa. In part it simply reflects the search of an aggressive profit orientated management for new opportunities. In the search for new investment avenues the form of the different types of institutions tend to merge - witness the blurring of the distinction between the merchant banks and investment managers in some of their activities.

This blurring of distinctions is also to be found in portfolio management proper. Virtually all of the transactions (purchase and sale of securities) carried out by investment managers are put through a broker (and a jobber) who acts as agent for the manager and buys and sells on their behalf. In general, brokers and jobbers are financial intermediaries only in a very particular sense, their basic investment objective being simply to provide for the temporary financing of securities in transit from one group to another. Their profits do not arise from interest and dividends on the assets they hold but depend on commission (brokers) and the difference between the price they pay and the price they receive (jobbers). The capacity of these institutions to handle large transactions in securities is an important feature in both the primary and secondary markets. Traditionally brokers have also been involved in the management of small private portfolios. In recent years this side of their activities - the management of portfolios - has been greatly expanded and brokers have become much more important in the portfolio management field.

Services provided by Investment Managers

The discussion so far has considered the role and position of investment managers within the financial community but has said little about the

main services provided by them. Two of those generally provided by intermediaries would seem worth particular consideration - the provision of diversification and management. Diversification allows the investor to reduce his total risk by spreading his capital over different assets. The term encompasses a division between shares and other assets such as property as well as a division within each category. In the cases dealt with here almost all the diversification is between different types of shares. Management involves decisions such as whether to buy or sell, when to buy or sell, what to buy and how much to buy or sell. Both management and diversification are provided for a fee.

Various types of management are possible. In the office under study the management of funds was almost entirely at "full discretion". When changes to a portfolio are necessary the managers are under no obligation to contact their clients or trustees. The power to alter a portfolio rests entirely with the managers although constraints such as trust deeds do affect their choice.

By no means all investment management services are of this nature. One possibility entails simply the provision of custodial and bookkeeping services, with investment decisions left entirely to the client. Another is the provision of advisory services only: the client is advised of the need for changes to the portfolio together with details of suggested sales and purchases. Such systems tend to be unsatisfactory. They cause a time lag between the recognition of opportunities and their exploitation, so that advantages and profits are often lost through inaction. They also presume that the client knows as much about investment as the investment managers. This is unlikely to be the case. Unless the client has consistent access to inside information or some particular talent in investment matters then full discretion is the logical service to offer.

From the client's point of view it is highly desirable that the investment managers should justify their remuneration by making better decisions than the investor would himself. However, scarcity of information and lack of knowledge make the client's task of assessment difficult. In fact the belief that the managers have superior analysts or talents and can do better than a random selection of investments must be viewed with some scepticism - studies so far have found it difficult to identify such managers. Indeed it might well be asked what is meant by good investment management.

In the context of financial intermediation a measure of success of investment management is the efficiency with which money is channelled into stocks with a high rate of return for an equivalent risk, and the consequent transfer of capital into the more profitable investments in productive goods. The evidence is not encouraging. For example, Friend, Blume and Crockett {44} in the United States found that "Mutual funds as a whole . . . . are neither especially good nor especially bad at directing capital into profitable areas of investment". This result is in line with expectations. Given the extensive evidence in support of the efficient markets model that prices "fully reflect" all publicly available information, it would be surprising if institutions other than specialists and corporate insiders with monopolistic access to information were particularly good at securing a high rate of return for an equivalent risk. (see Fama {37} for a general survey of the literature). How then should one judge the success of investment management? One criterion might be the provision of diversification at low cost, since on average, unless they have access to private or inside information, the managers are unlikely to be able to provide more than the expected return commensurate with any given risk. The implications of this conclusion are worth considering. If access to private or inside information is denied then the sensible strategy

for the investment manager is to minimize costs when selecting portfolios and provide diversified portfolios at a lower cost than their competitors.[1]

Failure to implement such a strategy would seem to revolve around three possibilities: lack of information on the research that has taken place into efficient securities markets and on its implications, disagreement with the results of the published research, and the belief that investment managers do have access to private or inside information. This last possibility is worth further consideration. Any share is assumed to have an intrinsic value depending on earnings and other fundamental factors.[2] Since individuals' perception of these factors differ, the market price does not necessarily correspond to this value, (but in general the investors feel that the two tend to converge). New information[3] changes this intrinsic value. On the average however, because there are many astute traders in the market, the full effect of new information on intrinsic values is

---

1. Or in a rate regulated structure or otherwise imperfect market to secure higher profits, growth or some other similar desirable objective.

2. See Granger & Morgenstern {46} for adverse comment on this view.

3. The question as to what constitutes information is an interesting one. "To an investor who contemplates a commitment in IBM the commonplace statement, 'IBM produces computing machines' is not information." (Smith {92}). The argument implies that what constitutes information varies between people. Information is defined here as data that is new and relevant to the firm and analysts. (i.e. any actual or anticipated change in a factor likely to affect a company's prospects). It is the stream of data that represents to an investor the environment and the features of the firms he may invest in. The environment is constantly changing and conveying facts and opinions to the investor. Hence the search for information is a continuing one, and since it involves costs, the level of search is determined on the basis of the relationship between the cost of searching and its expected value.

reflected instantaneously in actual prices.[1]

Since uncertainty surrounds any new information the adjustment of prices to their new intrinsic values implies that actual prices will initially overadjust to the new intrinsic values as often as they will underadjust: moreover, the lag in the complete adjustment of actual prices to successive new intrinsic values is not constant and may even precede the new information which is the basis of the change, for example when information is anticipated by the market.

If price changes are independent technical analysis[2] is no longer profitable. Since new information is always becoming available and intrinsic values are continually changing this is not true of fundamental analysis. People who consistently predict the appearance of new information and successfully evaluate its effects on intrinsic values make larger profits than people who do not have this talent. The existence of people with these talents and sufficient resources is enough to ensure that on the basis of all available information actual market prices are best estimates of intrinsic values, since their activities will restore the price of a share to its intrinsic value if there is any significant discrepancy. The superior

---

1. To explain this, three situations may usefully be described. The first explanation is that successive bits of new information arise independently across time, whilst uncertainty concerning intrinsic values does not follow any consistent pattern. Hence successive price changes in a share are independent. The second situation occurs when the uncertainties in estimating intrinsic values are dependent. In effect, one person comes into the market who thinks the current price of a security is below its intrinsic value. His actions induce further people into the market and the security price rises out of line with its intrinsic value. Sophisticated traders (that is good at estimating intrinsic values) recognising this sell their shares so forcing the price back towards the stock's intrinsic value. Once more price changes are made independent. The third situation is when new information is dependent, that is when a piece of good news is always followed by another piece of good news or some other regular pattern. Sophisticated traders learn that it is profitable to attempt to interpret both the price effects of current new information, and of future information implied by the dependence of information. Hence in this case too price changes will tend to be made independent by the action of traders. Fama {36 }

2. Technical analysis is concerned with the action of the market in particular

analysts make intrinsic value analysis a useless tool for the average analyst. (Fama {36}).

In providing the service of management as opposed simply to diversification, the importance of private information to the investment managers becomes clear. To secure above average performance of portfolios it is necessary to select stocks that are temporarily out of line with their intrinsic value. But what is meant by private information? There would seem to be two main kinds. Private information could be inside information about an event which if all other factors were held constant, would substantially affect the price of a company's share, and the news of which must be capable of physical exploitation in the market by some individuals before the matter becomes public knowledge.[1] The second source involves converting public information into private information by means such as the use of computer analysis of prices and balance sheets.

Since superior portfolio selection decisions generally depend upon securing private or inside information, managers tend to be organised for the maximum assimilation of public information and endeavour to maintain extensive contacts in order to garner private information whenever possible. One might therefore see the purchase of management by fund investors as the purchase of an information collecting network.

---

1. For an interesting view, see H.G. Manne, "Insider Trading and the Stock Market" {67} . Note also his opinion that "Information is not a free good and we should not assume without more information than we now possess that its distribution is generally capricious, arbitrary, random or uncontrolled. Rational individuals will not blithely and willingly allow information of tremendous value to pass freely to individuals who have no valid claim upon it. The safer assumption is that individuals with the power to control the flow of valuable information do so rationally and allocate it in a market like system of exchange".

Chapter 3

Organisation and Structure of the Institution

Discussion of the role of investment managers revealed the need to secure private or inside information if superior investment decisions are to be made. New information must be acted upon quickly if full advantage is to be taken of it. Of necessity this implies a management structure capable of making rapid decisions and sufficiently flexible to take advantage of new opportunities. It is to this that the analysis now turns. Investment decision making is considered to have two main elements. The first involves where investment decisions are made and what affects them. It considers the role both of the various individuals such as fund managers who are connected with the management process and of service departments such as research. The second considers the execution of investment decisions, in particular the role of the dealing function. Up to this point the analysis has said nothing about the managers' motives or objectives even though it is likely that these objectives have played an important part in deciding the form of the organisational structure.[1] With this in mind the final part of the chapter considers the managers most likely objective and indicates some implications for their organisation.

Decision Making

It is worthwhile distinguishing at the outset between the investment managers and their clients - unit and investment trusts. The managers carry out for a fee the task of portfolio selection for their clients. They are responsible for their performance and actions to those clients, or more particularly to the Boards of Directors who represent them.[2]

---

1. For example, there is little point in constructing a flexible and dynamic portfolio management organisation if one's purpose is simply to buy a representative sample of shares and hold them.

2. The regulatory and advisory role in the investment management process of these Boards of Directors is considered in the next chapter.

The managers perform the same task for all their clients - the management of portfolios. As such there is no particular requirement for the separation of portfolios other than perhaps by risk and return. In practice however administrative convenience tends to separate portfolios into groups dependent upon both objectives and clients. In essence the managers are structured so that particular fund managers and dealers are responsible for the portfolios of one client. Figure 3.1 may make the structure somewhat clearer. The managers consist of a partnership to

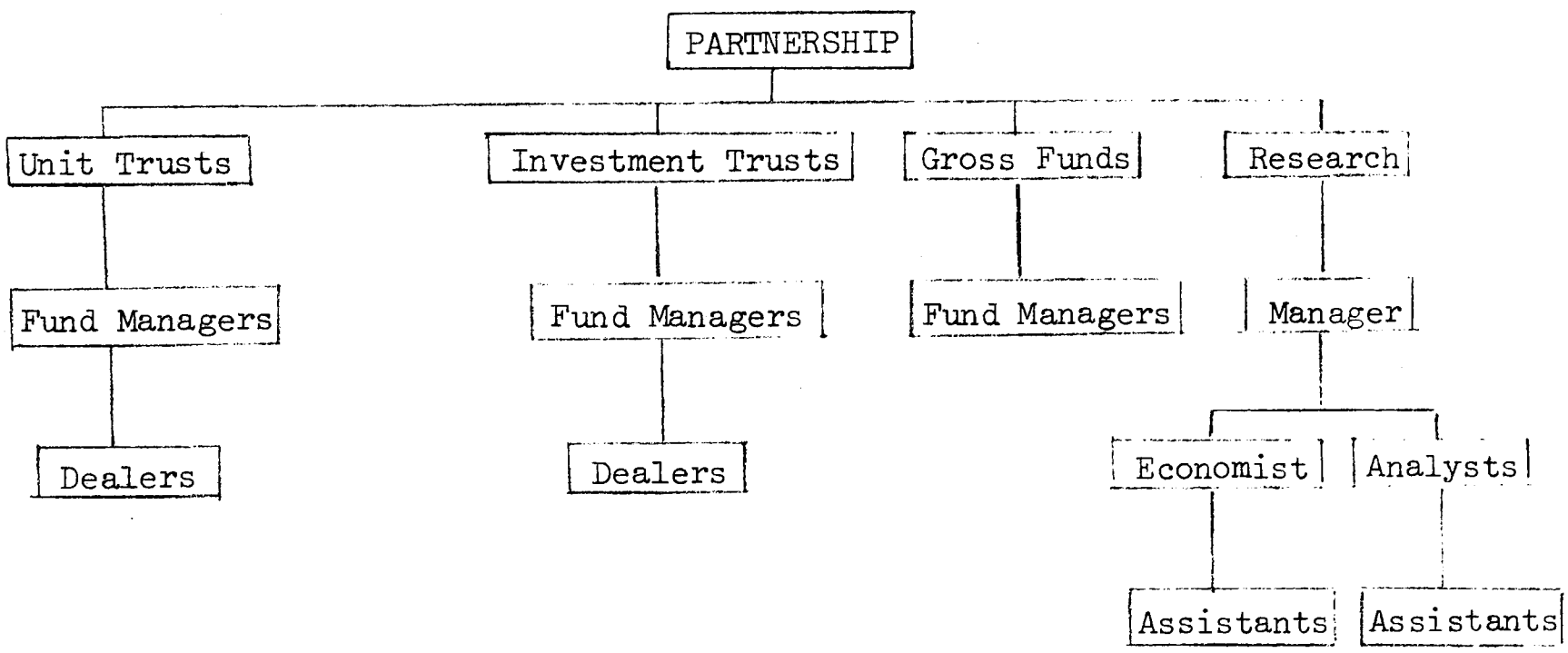


Figure 3.1

whom the fund managers, dealers and research department are all responsible. Within the partnership, fund managers and dealers tend to be allocated to particular investment or unit trust portfolios. The discussion that follows is organised in much the same way. Consideration is given first of all to the role and position of the partnership and then to the role of the fund managers and research in the decision making process. The dealers are considered in the section dealing with the implementation of decisions

There appear to be three legal forms that a firm of investment managers may take - a partnership, an unlimited company, or a company limited by shares.

The comments here are restricted to partnerships since the investment managers investigated are of this form.[1] A partnership is defined as "the relation which subsists between persons carrying on a business in common with a view to profit".[2{19}] To some extent in this particular case the partnership structure is a historical relic reflecting the age and previous small size of the institution. One would expect its form to change over time becoming a limited company with possibly a quoted capital. However a large equity stake would probably continue to be held by the partners themselves.

The partnership form emphasizes the involvement of the partners in the investment process. It is their money and profits that are at risk. The partners are responsible for the policy making decisions taken within the firm. They determine the direction and orientation of the office as a whole, and of the particular funds within it. The growth of the partnership, the desire to increase profits and the search for new avenues for expansion, all seem to be important factors behind partnership decisions.

The status of each of the partners is by no means equal. Each individual's

---

1. Most of the remarks are fairly general however. The partners could equally well be executive directors of a limited company. Given the managers' emphasis on incentives and executive share participation to companies in which they invest, it is likely that, whatever the legal form, ownership and control would still largely rest with the same people and that the objectives of the firm would be substantially the same. The emphasis on equity participation by the executives in the firm would seem to be a characteristic of almost all investment management organisations.

2. A number of advantages arise from this structure - private accounts, fewer formalities and therefore reduced costs, unconstrained business activities (a company is normally limited by its memorandum of association) and no restrictions on capital changes. Certain disadvantages are also apparent. A partnership's debts are borne jointly and severally by each partner with unlimited liability for the debts resting on each partner. One partner is able to bind all the rest to an agreement and furthermore, a share in the partnership cannot be transferred without the consent of all the other partners. A further restriction often occurs in that partners have to find the partnership's working capital out of their own pockets. This places a considerable strain on many partnerships.

share of the profits may differ and their power and position within the organisation vary in consequence. Traditionally the senior partner has a special position and importance although quantification of these powers is difficult. He may be largely responsible for policymaking within the partnership, but clearcut answers on this are not easy.

A useful way to consider investment decisions is to differentiate between strategic and tactical decisions. The overall policy and orientation of the portfolios is considered to be a matter for strategic decisions. These are made at the partner level and involve such factors as gearing, investing more in Wall Street, or changing emphasis between sectors. The day to day management of the portfolio is said to involve tactical decisions. The timing of a relatively small sale or purchase is left to the discretion of the fund manager. The distinction between tactical and strategic decisions is not always clear. For example, the sale of a large line of stock that has been held for some time may, or may not, involve a substantial change in emphasis in a portfolio. Accordingly classification as a strategic or tactical decision varies. Similarly the partners, whilst concerned with policymaking and hence strategic decisions, are also involved in the general management of the funds, acting for example as fund managers and generally supervising and co-ordinating the investment process.

Most of the day to day running of the funds is the responsibility of the fund managers. The precise nature of a fund manager's activities and operations vary according to the funds they are managing[1] but in general

---

1. Investment trusts for example tend to have lower turnover and in consequence longer term portfolios than the unit trusts. In addition a strong N. American influence results in a geographical split with one fund manager managing all the N. American portfolios and another managing all the U.K. portfolios of the investment trusts. On the unit trust side each fund manager is likely to find himself managing three or four portfolios simultaneously each with its own particular objectives. In consequence a piece of information must be reassessed several times in the light of each fund's objectives.

the fund managers are not concerned with the initial construction of a portfolio, a relatively rare event, but with the day to day running of a fund they inherit. It is their job to assess the long term objectives of the fund, and to revise portfolios so that they retain the appropriate characteristics. The fund manager has to choose stocks that fit in with the strategic decisions laid down by the partners. The fund mangers do not however act in isolation. Partners acting as fund managers are responsible for the implementation of their own decisions as well as supervising those of other fund managers. In the light of this experience a feedback and modification process operates with decisions and policy continually being modified and adapted as appropriate for changing circumstances. The speed of reaction is therefore rapid. Theories and decisions that have outlived their usefulness can be quickly discarded and replaced with others.

Is this particular type of organisation with fund managers straddling a large part of the market and little specialisation desirable? The advantages would appear to be the speed of response and the ability to follow a coherent, well thought out portfolio strategy. The disadvantages arise from hurried, ill considered decisions due to lack of knowledge and time to consider a matter in depth so that rational decisions may be taken. An alternative more specialised form of organisation is for the managers to be organised on a sector basis. By this is meant that a partner and several analysts consider one particular area such as Consumer Durables. Any decisions for a portfolio on Consumer Durables stocks are taken by them. The problem with this kind of organisation comes in deciding how much of a particular sector should be included in a portfolio. Few people will argue that their particular speciality should not be included at the moment, since to do so is to remove their decision making power. Time lags in changing the balance and structure of the portfolio are also

It is also important to consider the orientation of fund managers since considerable differences in orientation may exist. Some uniformity within the investment managers is achieved by constant communication among the fund managers and by the office philosophy[1] but evidence of different approaches is still apparent. At one extreme is the Market orientated fund manager; the strong believe in technical factors, rising price trends and market psychology. "Opportunity orientated, chart conscious; dealing in concepts as opposed to price earnings ratios." Close to the market, investment is shifted in and out of the market leaders and 'hot' stocks.[2] A 'good' story is likely to be a signal for buying action and since such fund managers act quickly, heavy reliance is placed on their expertise and their contacts. Rising earnings are discussed as an important factor but equally great weight is attached to what the market is doing. Has it over or under adjusted to good or bad news? The quality of management is paid lip service but is not generally of much significance except in so far as it influences others. Company activities and sector characteristics are accorded little importance. Concentration of holdings is also of little significance.

At the other extreme is the complete fundamentalist. He is only interested in the fundamental factors such as earnings growth, quality of management and an appropriate capitalisation rate for the share and the sector. The 'good' story is of interest only in so far as it conveys information about changes in these fundamental factors. Market rumours are generally discounted and stories verified as objectively as possible with the facts. Portfolio turnover is likely to be considerably lower, and portfolios

---

1. The office philosophy is discussed in some detail in a later chapter. Briefly it is the body of investment knowledge that governs in large part the investment decisions made in the firm.

2. Generally denotes lower quality issues that react strongly in bull or bear markets. Their volatility arises generally from their highly speculative, often cyclical nature.

concentrated so that proper attention can be paid to each stock.[1]

The basis of decisions is information. In consequence consideration must be given to the parts of the organisation that are largely responsible for its dissemination. There seems to be two main mechanisms for conveying information. The first, the shuffling of brokers' reports and newspapers from one fund manager to another, with each fund manager in turn reading those to which his attention has been drawn as well as those of particular interest to himself, requires little comment.[2] The second, more formal mechanism involving the systematic assimilation of news and reports of stockbrokers by the research department must be considered in rather more detail.

The Research Department is a service organisation intended to provide the fund managers with up to date information and opinions.[3] Within the

---

1. The question as to how successful each of these types of fund manager is might reasonably be posed. The presumption in the firm under study is very much in favour of the fundamental approach. A problem in assessing success is the change in market conditions that occur. The investment managers argue that the market orientated do well in a bull market whilst the fundamentalists do better in the bear stages of the market.

2. This is not to say that the less formal methods of information dissemination are not very important. They are. In particular telephoned information and verbal contact may well introduce a sense of urgency and perspective difficult to acquire from the printed word. "Professional money managers often seem to make up their minds in a split second, but what pushes them over the line of decision is an incremental bit of information which, added to all the slumbering bits of information filed in their minds, suddenly makes the picture whole." (Adam Smith {45}).

3. The Research Department's objectives have been described by the firm as being to supply the fund managers with the economic and analytical resea rch that they want, to develop research and fund management control systems for improving fund performance, and to find and train future fund managers. "one of its (Research) most important functions is to try and put a value on inflowing information and opinions. This may involve quite a lot of verification in some cases, whereas in others our accumulated experience may enable us to decide immediately." A well developed research organisation is also likely to add to the prestige of the organisation and is useful to demonstrate to clients the breadth and depth of the firm's expertise.

Research Department the analysts cover the main industrial sectors such as Capital Goods or Consumer Durables, reporting on the companies and sectors as new information becomes available. There is also some international coverage with analysts investigating American stocks, and a more general coverage of the main European, Commonwealth and Japanese companies by individual analysts whose main responsibility lies in some other area. In addition, a good deal of continuous monitoring of performance is carried out, both of brokers and companies, as well as routine information processing intended to present the fund managers with a brief summary of details such as company earnings and brokers' forecasts.[1] Assistance to research and fund management is also provided by the economist and his assistants. The intention is that they should co-ordinate their activities with the analysts where possible and provide economic reports on particular events, companies and industries.

No mention has been made of the role of the analyst in research. Investment managers seem to adopt either of two positions. The first claims that the need is not for the ordinary analyst who works from original sources and monitors a small sector, but for a broad based researcher who is able to integrate ideas from elsewhere, primarily the brokers, and present them in an orderly and unified manner. The aim is to adopt all the good (or right) ideas of other analysts and show why these particular ideas are most appropriate. The analyst is not intended

---

1. An essential part of the department is an extensive library covering most of the U.K. and many U.S. and foreign companies with files on each firm containing brokers' comments, annual reports and other items of interest. The function of the library is to present an immediately available comprehensive collection of information on any company analysts or fund managers are likely to be interested in. In addition a variety of publications, Extel cards and various news services are kept for supplementary information. The library facilities are intended not only as an aid to the research department, but also to be of assistance to the fund managers and partners in making relevant decisions. An efficient information system is important in enabling analysts to detect changes among critical factors affecting an industry, group or individual company, as soon as possible.

to have a detailed knowledge of one particular area but a broad knowledge so that he can apply the particular methods and ideas of the firm to any situation. Broad knowledge is also required because of the requirement to train analysts as fund managers. In house research is thus not only intended to present unbiased opinions but also to prepare analysts for fund management. The second position disputes the need for broad based researchers and claims that it is better to maximise one's total knowledge about a very restricted subset of companies. Exceptional rewards are thought to come from private information which includes information not generally known even if available. Since research is necessarily limited in scope and further knowledge costs time[1] and money, specialisation is the most appropriate strategy.[2]

It is difficult to come down categorically on one side or the other. If for example the managers were always the first investors given access to the research of particular brokers,[3] and if the managers were able to

---

1. The need for speed in decision making and research is obviously important. The life of an idea may be very short. Conditions change and it is essential for reactions to be swift. The process is one of anticipating the reactions of other market participants, establishing and liquidating positions before favourable conditions change. The more time consumed in researching a project or new development, the more assured one is of the conclusions reached. The more positive the course of action required, the less profit potential inherent in the move. It is necessary to trade off the advantages of speedy decisions against the risk of being wrong. (Smith {92}).

2. An interesting unanswered question relevant to the institution studied is "how often does information gathered later in an investigation alter the fund managers' or analysts' views?" Subjectively I would estimate little, but qualifications must be made as to who is doing the research. Some analysts seem prepared to spend time investigating companies and to drop them after considerable effort, as being unrewarding. Others come to a conclusion early and look for evidence to support it. Personality is obviously important.

3. Large commission payments by the investment managers to the brokers do provide a considerable incentive for brokers to give the managers priority in seeing new research and give the managers leverage to dictate the type and nature of much of the research undertaken. Personal contacts would seem to be very important in determining the order in which information is relayed to clients. A few brokers for example are very close to certain fund managers and analysts in the investment managers with the result that information is given to them before other clients. The managers would stress that it is important to encourage reliable brokers to bring research and ideas to the firm as quickly as possible.

judge between good and bad research, then the first strategy might be most appropriate particularly in view of the unfavourable brokerage fee structure[1] which makes it difficult for the investment managers to employ the same range and quality of analysts as the brokers. In fact this latter factor in itself may well make the second possibility impractical.[2]

---

1. A considerable controversy has raged as to whether brokers should be paid commissions as large as at present. Opponents argue that much of brokers' research is duplicated (by other brokers) and of poor quality and that if the fees were halved the larger investment managers could provide much superior research for their own institutions with the money saved. Leaving aside the problem that the commission reduction would not accrue to the managers, but to the unit and investment trust holders, the question would seem to revolve around broader issues than is generally realised. The larger institutions would have an advantage over the smaller ones who could not undertake the same amount of research. Problems of monopoly power might well become apparent. One would expect a significant contraction in the quantity and probably the quality of broker research with effects on the relative perfections of the market since research findings would no longer be available to so widespread a public, and the speed of adjustment consequently slowed. Counterbalancing the reduction in broker research one might expect an increase in institutional research. This research would not be generally available. Problems of research coverage, in particular their ability to consider the whole investment spectrum, would be likely to arise for the smaller institutions and one might expect them to be adversely affected by the change. Competition amongst the large institutions might of course still be sufficient to secure a perfect market and hence optimal allocation of capital and to present the investor with an adequate choice of investing institutions. From the institutional investor's point of view it is also likely that advantages would accrue from the increased impartiality of research effort. It is often difficult to separate out sound advice and knowledge from the broker's desire to generate turnover and commission.

2. One might reasonably ask how good the research provided by the brokerage firms is. The answer briefly is that it varies in both quality and quantity. A few large brokers cover more or less the entire spectrum of research - into stocks, industries, bonds, the economy and fund management - and maintain enviable standards. Most brokers however are forced to concentrate on particular areas and stocks with the standard of research varying enormously. The problem of quality is crucial. How can one differentiate superior from inferior research? Long experience of particular analysts and firms is one main factor, whilst comprehensiveness and breadth of knowledge is another. Reports which contain new information and insights might generally be described as superior although inevitably, the assessment is subjective. Hence brokers research that superficially covers an industry or stock is of little value or interest (at least to the institution investigated). In addition it is argued that most brokers' analysts prefer to report new developments rather than interpreting events, since the effort and knowledge required are usually less. Generality and brevity may be of more interest to smaller institutions without much time for research.

Implicitly it has been assumed that it is worth while for the managers to devote considerable attention to research - either securing brokers' services or carrying it out themselves. It might reasonably be asked whether this is a sensible strategy or not. Given the evidence in favour of the efficient market hypothesis[1] and the sparse contradictory evidence it seems likely that securing private information is very difficult. Diversification at low cost might well be a more desirable objective along with an explicit statement of the risk/return combination that is being aimed for.

Implementation of Decisions

The discussion of decision making processes in the investment management organisation has inevitably also included some consideration of the implementation of decisions. The fund managers for example might be regarded as implementing the partners' decisions in terms of general policy as well as being decision makers in their own right with regard to the constituents of individual portfolios. For this reason this section is confined to the dealing function, the only remaining significant part of the portfolio slection process. The dealers act as the interface of the fund manager with the market, responsible for the purchase and sale of stocks at the best possible prices. The dealer is orientated to the very short term. As one writer has suggested he has a tunnel vision enabling him to see situations from a perspective foreign to a portfolio manager or analysts. A dealer is generally said to rely on 'feel' made up of all relevant information, basically short term, which he applies to

---

1. Fama {37} distinguishes 'strong form' tests - whether individual investors or groups have monopolistic access to any information relevant for price formation - 'semi-strong' form tests where the information subset of interest includes all obviously publicly available information, and 'weak form' tests where the information subset is just historical price or return sequences. In general it is only in the strong form tests that significant deviations from the efficient markets hypothesis have been found. In particular Scholes {81} presents evidence that the value of the information in a secondary offering depends to some extent [illegible]. Corporate insiders at least sometimes seem to have

the sale and purchase of stocks. A good dealer is able to sell large blocks of stock disturbing the market little, and by precise timing and choice of broker pick up stock at attractive prices. The dealer is also a source of information on issues in demand or blocks of stock overhanging the market.[1] Knowledge such as this allows changes in trends to be anticipated. By knowing the contents of the portfolios and current research in the organisation, the dealer is able to keep fund managers informed of the market situation, the stock that is on offer or that for which a ready market exists. The dealer is very much part of the investment team implementing the ideas of the fund managers.[2]

Objectives of the firm

A question that has not so far been raised but which may have important implications for the organisation of the investment managers and for a

---

1. Large sales impending, or waiting for a buyer at a suitable price. Such situations tend to depress the prices of the issues in question.

2. Not all of the investment community subscribe to this viewpoint. To some the gains from good dealing are negligible and indeed it is considered in some respects to have an adverse effect since it encourages short term horizons and viewpoints. It is argued that if an investment is worth making and one's horizons are long term, the odd one percent or so saved by good dealing is irrelevant. Far better, it is argued, to reward the broker who suggests the original idea with commission to encourage him to come to you in the future. This is not necessarily incompatible with the belief in good dealing. With a large volume of business it is still possible to make sure that brokers are rewarded for good ideas and research by giving them business which is perhaps less price responsive. The other possibility is for the institution to ask the stockbroker to split the commission with another broker. Another criticism relates to the question as to whether dealers are essential or not. Some institutions argue that the fund manager can easily deal for himself. However this may not be desirable where several fund managers are expected to follow similar policies. If all transactions are put through a dealer he is able to see if one fund manager is selling and another buying, and to bring this to the fund managers' notice. There may well be opportunities for a trade between them and more important, it may turn out that it is undesirable from the office philosophy point of view that one fund be buying whilst another is selling. Centralisation of dealing also enables easier administration since records can be more easily updated.

positive theory of investment is the objectives of the investment managers, both of the specific firm investigated and of other firms with similar activities.

The theory of the firm abounds with possible objectives such as the maximisation of the money value of sales subject to a profit constraint, maximisation of growth, maximisation of a managerial utility function and so on. It is unlikely however that these are as accurate a description of the objectives of the firm in this particular market situation as the traditional profit maximising objective.[1] As Silbertson{87} points out the initial step in these new ideas has been to differentiate between the conventional entrepreneur as the decision taker in the firm and the separation of ownership and control usual in the large corporation. In the investment management market however, a distinguishing characteristic of the firms is the large equity stake of the management[2] such as the partners in the profits of the business.

Having established the applicability of the profit maximising objective, it is easy to assert that for maximum profit, marginal revenue must equal marginal cost.[3] A number of questions remain. What for example is profit in this context and how are revenues and costs affected by

---

1. In the absence of irregular components of profits and ignoring advertising this is equivalent to maximising the money value of sales in this particular context.
2. Indeed very large bonuses and salaries tied very closely to individual performance for all members of the firms are common and reflect the overriding concern commented upon earlier to give incentives and a stake in the profits.
3. "The most profitable output will be either (1) an output for which MR = MC which is also such that the MR curve is above the MC curve for a slightly lower output and below it for a slightly higher output, or (2) a boundary solution" see Lancaster {55}.

advertising and research? By profit is meant the profit of the partnership as a whole. This is composed of the annual management fees of the funds managed, as well as of more irregular components arising from the launching fees of new trusts and the pricing of units.[1] Costs and revenues are not so easy to define. It is assumed that the managers have one product - investment services - that they provide continuously.[2] The cost of providing these services depends mainly on the amount of research that is provided assuming for the moment that advertising expenditure cannot be influenced by the managers.[3] The quantity of research provided depends on the philosophy of the investment managers. If the managers know that they can acquire private information it will pay to expand their research until the marginal costs of so doing equals the marginal revenue gained.[4] The access to private information will be reflected in the increased value of the funds managed and perhaps in increased sales. Research in this case affects both revenue and costs. If on the other hand the managers accept that it is very difficult to acquire private information the rational policy would be to minimise the extent of their research since in doing so costs will be reduced and revenue not affected.[5]

---

1. See Appendix 1 - Unit Trusts.
2. The irregular contribution to profits are ignored in what follows as being once and for all olportunities that are limited in number. However the aggressive manner in which the firm searches for such opportunities are indicative of its profit maximising behaviour.
3. In the particular investment managers investigated, the sale of units was divorced from the portfolio management so that sales promotion decisions were separate from the investment managers. However the decisions were not taken in isolation.
4. Note the commodity provided is investment services. Hence interest is in the revenue and cost from an extra unit of service. The investment managers' revenue is derived from portfolio asset values. Hence a change in asset values induces a change in revenue.
5. Unless funds are transferred from one investment manager who does not appear to have private information to one who does. The evidence would seem to indicate that few if any investment managers do have access to private information (see Jensen {50}).

Up to the present it has been assumed that advertising expenditure cannot be affected by the managers. Relaxation of this assumption involves the consideration of two possibilities. Firstly advertising might be expected to increase the overall market size and secondly it might be expected to increase or reduce individual investment managers' market shares. In so far as the latter occurs competitive pressures will induce other market competitors to advertise. Overall one might expect an increase in costs and a possible reduction in the number of small firms in so far as there are substantial economies of scale in advertising.[1] If advertising increases the market size and this increase accrues to those who advertise, then it will pay the firm to advertise until the marginal cost is equal to the marginal revenue derived from the increased funds managed. In general it seems likely that advertising both affects market shares and increases the size of the market.[2]

It is perhaps useful to restate the argument at this point. The evidence in the particular firm investigated indicates that the assumption of profit maximisation is, at the least, a good approximation to the complex of objectives pursued by the investment managers. Observation indicates that this conclusion also seems to hold true for the overwhelming majority of investment organisations. An implication of this assumption and of evidence adduced by the efficient market hypothesis is that unless the managers feel that they can secure private information - an unlikely event -

---

1. A similar prediction is likely if research provides private information. Overall it seems likely that portfolio management involves a falling average cost curve over low outputs (small total assets managed) which becomes horizontal for a wide range of output.

2. It has been suggested that much research in institutions is conceived with the idea of advertising in mind. It is window dressing designed to attract clients. If this is the case minimisation of research carried on may not be the most appropriate strategy.

they should reduce the size of their research departments. Observation does not indicate this to be happening. One might conclude either that the profit maximising hypothesis is an unrealistic assumption or that the managers believe that they can secure private information. The latter seems more probable and is in line with well documented resistance to the acceptance of 'academic' investment research.

Overall the assumption of profit maximisation, whilst providing interesting implications for the organisation of the investment managers, in particular the emphasis on flexibility and preparedness to change, says little about the main question of interest here - how portfolio decisions are made. For this it is necessary to turn either to normative portfolio theory or to a behavioural theory of investment.[1]

---

1. It is of course the intention of this thesis to provide some information to help construct such a theory.

Chapter 4

Institutional Limitations on Investment

Institutional limitations on the management of investment portfolios are an important factor in determining the nature of policies that may be pursued and in reducing the possible universe of stocks from which portfolios may be selected. In this chapter a very narrow view of institutional limitations is adopted, namely the constraints on decision making imposed from outside the investment managers. The analysis looks at each investment vehicle - unit trusts, investment trusts and gross funds - in turn and considers the nature of the external constraints on investment decision making. How in the unit trust portfolios for example, are the investment managers affected by the trust deeds or the requirements of the separate management company? Is substantial control exercised by the management company through the drawing up of the trust deeds or by its Board of Directors? Such question for which this chapter provides some answers are of considerable importance in the formulation of investment strategy and policy.

Each investment vehicle imposes its own particular limitations on investment behaviour. Consider first of all unit trusts. They are created by trust deeds between the management company and the trustees. The trustee is authorised to hold a trust fund of securities, cash and other assets for the benefit of the unit holder. He acts as legal owner of the underlying securities in the fund and is their official custodian, safeguarding the rights of the unit holder by supervising the investments of the fund and preventing management manipulation. The managers simply run the operation for a fee. Control over the managers depends on both the skill and integrity of the trustees and the precise framing of the trust deeds which in turn reflects in large part the aims and objectives of the trust.

The deeds usually specify a particular objective to be aimed for and may even restrict investment to particular areas such as the financial sector.[1] The extent of these restrictions is likely to depend on the investment market aimed at but it is important that sufficient scope is left available to the managers for achieving reasonable diversification. Construction of the trust deeds is by the managers and draws upon experience accumulated over many years.[2] As a general policy the deeds are likely to be drawn up as flexibly as possible so that later changes are unnecessary. Supervisory powers are exercised by the D.T.I. over the form and content of the trust deeds including technical matters such as sales methods and pricing (See Appendix 1 - Unit trusts).

The discussion so far has ignored the distinction between the investment managers and the unit trust management company.[3] This is an oversimplification. The deeds are likely to be shaped according to both investment and administrative needs. Within the latter category a particularly important influence in fact is likely to be the marketing requirements. Since the level of remuneration is geared to the total value of the funds managed there are obvious benefits to the managers from increasing the size of the funds. There may well in consequence be

---

1. Similarly the proportion of the fund invested in each sector held may be restricted so that the sector choice of the managers is very confined. The aim must then be to choose the best performing shares. Restrictions may also be placed on the bond and equity proportions in the portfolio, on the possibilities for international investment, on the amount of property that may be held and possibly on the quantity of cash to be maintained in the fund.

2. The trustees may of course insist on certain safeguards being included in the deeds. It is interesting to consider how important the trust deeds are, given the possibilities for the management to construct them as they desire. The role of the trustee is obviously likely to be restricted and fairly nominal. Their powers are likely to be of little significance given that the managers work within a framework which they impose themselves. In general the deeds are likely to correspond to the managers' own investment philosophy although as time passes this may change while the deeds remain static.

3. As noted in Chapter 3 this carries out the administrative and marketing functions of unit trust management.

pressures to orientate funds towards the fashionable areas that will attract the investor's money. This may be undesirable since restrictive trust deeds are likely to hamper the investment management in the future even if not in the present. In effect there may be a conflict between marketing requirements and investment flexibility.

The control exercised by the management company is not limited to restrictions on the trust deeds. Further influence is exerted by its board of directors who meet regularly. The members of the board are drawn both from the management and the investment sides of the organisation and from outside.[1] The general aim of the board is to ensure that the management company is doing its job effectively. Hence they are likely to consider not only the orientation of the management company - whether it is in the right sectors of the market[2] - but also the performance of the individual unit trusts run by the company. Consistently poor performance relative to its competitors is likely to lead to investigations intended to reveal whether the investments of the trust are being run efficiently or not. The board may also exert an influence on day to day decisions. Buying and selling investments at a loss over a short period of time may well require an explanation. The control exercised by the board influences fund managers to take less risky decisions (or perhaps more careful ones).[3]

---

1. The question naturally arises as to whether it is desirable for the board to be mainly composed of people from within the organisations concerned. Further attention is paid to this point when the investment trusts are considered.

2. For example in selling units to investors, should it be selling to the upper income investor or the low income regular saver? Are the company's activities broad enough? (e.g. should they include property bonds, life assurance etc.)

3. One might reasonably question the importance of the management company board of directors. A personal view is that their influence is relatively slight. Events are influenced by them to some extent since explanations of particular decisions may be required. They may also exert an influence on strategic decision relevant to the funds, but it is difficult to sort out how important the board is for such decisions or indeed to separate the opinions of the board from that of the investment managers' partners.

Unlike a unit trust an investment trust is a separate legal entity and as such each investment trust has a board of directors to whom the investment managers are directly responsible.[1] The function of the board is much the same but its influence on the managers is more direct than is the case with the unit trusts.[2] The board is essentially a supervisory body laying down policy for the future.

The composition and appointment of the board, and its powers, are particularly relevant in assessing its effectiveness. Considerable differences exist between institutions in the boards constituents. Some investment managers in forming an investment trust prescribe that the board be composed of the investment managers plus a certain number of outside directors (generally two). In consequence the board, the managers and the trust are in large part synonymous. The board is likely to be little more than a rubber stamp with no control over the managers' policies. The shareholders might in certain circumstances remove the board but such events are rare and unlikely. At the other extreme are institutions where the boards are more or less completely independent. One or two members of the investment managers are perhaps invited to sit on the board, the other members being all outside directors. The power of removing the investment managers is then much less theoretical and more of a practical possibility (although rare).

Not all the linkages between the managers and the trusts are necessarily so straight forward as in these two cases. One may for example find a trust owning more or less all the physical assets of the managers including their

---

1. An investment trust is a conventional limited liability company and has memorandum and articles of association laying down its interests, much as the trust deeds of a unit trust. However, such memorandum are generally vague and flexible and likely to be much less restrictive than is the case for the unit trusts.

2. The difference in influence arises because whilst each investment trust has its own board, the unit trusts are all responsible to the same board - that of the management company.

name so that control rests firmly with the board. At the same time, however, the initial and subsequent appointments to the board are influenced by the managers when setting up the trust, by their representatives on the board, or simply by their advice to it, so that the distinction between the managers and the board may well be more nominal than real.

This matters because it affects the overall importance of the board as a constraint on performance. The board may in some circumstances be little more than a rubber stamp. How accountable are the managers for errors? What would the board do if the managers consistently turn in a poor performance?[1] Consider first of all the accountability of the management for errors. It would appear that directors may be regarded in either of two ways. The first sees them as a check on management with the purpose of the directors being one of control. Each individual decision is scrutinised and questioned and appropriate steps taken if the outcome is not satisfactory. The second viewpoint regards the directors as an aid to investment - a sounding board for ideas. Policies are put to the directors for scrutiny so that they may be amended in the light of their experience. Thus the first approach regards the role of the directors as basically checking up on past decisions. If a purchase or sale has been made in error or if performance is poor a reason is required. The second approach sees this function of keeping people on their toes as relatively minor and credits the board with being responsible much more for long-term policy than interfering with day to day decisions. This latter approach is intuitively more appealing as one can see the interests

---

1. This raises the question as to how the managers judge performance - is it relative to other trusts or according to goals and objectives of the trust? The matter is dealt with in a later chapter.

of the outside directors being brought into the investment decision making process and possibly providing some inside information. It is not unknown for outside directors to address the fund managers on some particular sector or company about which they are knowledgeable.

To assess the effectiveness of the board it is also necessary to consider the powers of the board. The board like the investment managers is interested in considering whether there are any lessons to be learnt from past decisions. Both the board and the investment managers are similar in outlook and purpose. Their objectives for the trusts are likely to coincide: generally both seek to maximise the growth in asset values of the trusts. Hence it is likely that the board and the managers will interact, each influencing the trust's investment policy - both long-term, such as the choice of sectors to hold, and shorter-term, such as policy concerning particular day to day investment practices. Control is exercised informally if at all. The question of the penalties for ignoring the board does not arise. It is instructive to compare the roles of the board of an investment trust and of a unit trust's trustees. Does the board fulfil a similar role to the trustees, playing little direct part in the investment process so long as certain broad principles are not contravened? This is unlikely to be the case. The board does not have a readily available constructed set of principles for its guidance, but relies more on intuition and judgment as to the appropriateness of certain decisions.

The external constraints on the gross funds and private client portfolios follow a similar pattern to those on the unit and investment trusts. The gross funds - pensions and charities have particular requirements for income and reasonable capital appreciation. Trustees are by law only allowed to invest in certain securities unless the trust deed explicitly gives them

wider powers. If they are not so empowered and a loss ensues on a non-trustee security then the beneficiaries under the trust may sue the trustees for any loss incurred by their so doing. Losses and profits between different securities are not offsettable - the beneficiaries of the trust are entitled to take a profit on the one and sue for the loss on the other.

A trustee is empowered under the Trustee Investment Act of 1961 to divide a trust fund into two parts of which one part must be invested in "Narrower Range" securities (both not requiring advice, e.g. Defence Bonds, and National Savings Certificates, and requiring advice, e.g. British Government securities, Debentures and loans meeting certain requirements, mortgages etc.) and "Wider Range" investments, requiring advice and basically composed of the equity shares of companies fulfilling certain criteria of size and dividend record etc.

The law requires trustees to take advice from properly qualified advisers (in financial matters) although the trustee is not compelled to act on this advice. Machinery generally exists for considering the investment performance of the managers. Trustees and deeds may restrict investment to particular stocks or areas although in most cases the formal restrictions are few. Substantial flexibility is conferred on the managers to invest as they see fit. However control is much more immediate. There is no longer a mass of unitholders and shareholders to be protected. The charities are in a position to dictate changes in policies for their funds if they do not get satisfactory performance. Similarly most private clients are in a position to influence the disposition of their funds if they so desire. In practice, however, most clients pay little attention to the managers and leave the management of their portfolios entirely alone.

The main external limitations on the investment managers, arising from the

owners of the funds or their representatives such as the trustees and the board of directors, have been detailed. No mention has been made of their effectiveness in this role and the recurrent problem of the division between ownership and control. Attention has been directed at the more immediate influences affecting the fund managers' investment decisions, arising from the position of the directors and the trustees. The general conclusion has been that they do exert an influence on the investment process both over day to day decisions and over future policy. Observation indicates that this influence is not extensive, although this view may be misleading, firstly because policies are tailored to avoid the opprobrium of the directors and secondly because the board's influence may be exerted mainly on comparatively infrequent strategic decisions.

Apart from the constraints imposed by the owners of the funds certain constraints are also imposed by legal and official (mainly taxation) requirements. Trust deeds are inspected by the D.T.I. and changes may be demanded if considered necessary. Equally, to be classified as an investment trust, certain conditions must be fulfilled relating to the distribution of income, the proportion of assets that may be held in a particular company, and the types of investments that may be held. Similar rules exist for charities and other exempt funds and in some cases investment may be possible only in trustee stocks. These rules have grown up both from legislative requirements and from convention. They are by no means constant but are varied by the regulatory bodies as circumstances demand.

Overall then it can be seen that each portfolio is subject to some constraints. These constraints vary from the formal - legal and official - to those imposed

by such bodies as the board of directors on the basis of past experience. The overall effect is to reduce the types of securities that may be selected and it is for this reason that the constraints are important to the construction of a positive theory of investment.

Chapter 5

Portfolio Selection

Portfolio Selection is concerned with choosing the specific securities to be purchased for an investor's portfolio. It involves the allocation of total capital into major categories of investment and then further allocation into specific investments. In other words given a set of assets to be considered for investment the questions to be asked are, what particular assets from this set should be selected for investment and, given this selection, what proportion of the money available should be allocated to each item. The answers depend upon the methods employed. The selection of shares implies the use of one or a number of rules (or techniques) to devise a portfolio with the requisite characteristics. The choice of which rule to use[1] is crucial.

Concern here is with a particular institution and its methods of operation, and in consequence interest is centred on a subset of the possible rules. Other evidence suggests that the use of these or similar techniques is widespread throughout the investment community, but it is important to note that emphasis on particular rules differs both between individuals within the investment managers concerned and between different firms of investment managers. It is perhaps worth adding the perennial disclaimer. The discussion of these rules is in no sense a normative prescription for the institution. The remit was simply to try to describe actual behaviour. Very broadly this chapter describes what is known as the office philosophy - a body of knowledge that governs in large part the institution's approach

---

1. One may also ask on what basis this choice is made. In general this question is glossed over. One can at best resort to the level of "experience reveals it to be a more successful technique than any other" which begs more questions than it answers.

to investment.[1] Specific parts of the philosophy are examined in turn, in particular those aspects relating to diversification, liquidity, marketability, sector selection, time horizons, anchor stocks and capital gains. Attention is also paid to the fund managers' objectives.

Despite the marked differences in turnover that are discernible between the unit and investment trust portfolios it is assumed throughout that the office philosophy is of general applicability and governs investment in all the managers' portfolios. The variation in turnover levels is ascribed to institutional factors rather than to differences in investment philosophy.[2]

Fund managers' Objectives

Perhaps the most fundamental aspect of the office philosophy relates to the objectives of the fund manager. The fund manager must adopt investment goals similar to those of the investment managers as a whole if a uniform investment philosophy is to be applied. What are these goals likely to be? The usual assumption is that the investor takes into account the different features of the securities in which he may invest and then selects the best combination suitable for his purpose that will maximise his wealth[3] - the rationale for so doing being that otherwise his capacity for achieving all nonspecific economic goals is

---

1. The office philosophy is not a hard and fast body of rules to be applied regardless, but an acquired body of information that dictates within broad limits the scope of share transactions. The philosophy is intuitive to the fund managers acquired through experience and for this reason difficult to define. It is a body of knowledge compiled at the partner-fund manager level and used for both strategic and tactical decisions. The philosophy leaves much to the discretion of the fund manager and in consequence is a continually evolving philosophy with methods, procedures and emphasis between its different parts, constantly altering with changed circumstances. The aim of the chapter is to outline the main continuing strands of the philosophy important in portfolio selection.

2. Differences in turnover are discussed subsequently under the section on time horizons.

3. The investor will of course maximise his wealth subject to constraints such as risk over his lifetime or whatever other period he considers

needlessly sacrificed. However whilst true of the investor this is not true of the fund manager since it is not his wealth that is being sacrificed by failing to maximise its value (subject to constraints). He may well have less demanding objectives such as satisficing rather than maximising.[1] There seem to be two main possibilities. Firstly the fund manager might feel satisfied if he achieved the prior or stated objectives for the fund, and secondly he might feel satisfied if he achieved certain relative objectives. These relative objectives might take a variety of forms such as above average appreciation relative to the market or out performing the index over some period, long or short. These two types of objectives do not necessarily conflict but do help to indicate the problem that faces the fund manager. Beating the market (particularly if it is falling) may not be particularly valuable if the fund's prior objectives are not being achieved, whilst meeting the prior objectives (because the market has gone up) but performing poorly relative to the market may be equally unattractive. His goal is likely to be a compromise with prior objectives being achieved and the fund performing reasonably well relative to the market and other similar portfolios.[2] How does this aim differ from the goals laid down by the office philosophy? The differences are small. Realistic goals for the fund manager are in general similar to realistic goals for the office as a whole.

Diversification

Discussion of diversification within institutional portfolios involves consideration of both the virtues and the extent of diversification. With this in mind, this section considers the advantages of diversifying before going on to review the rationale for holding between 50 and 100 securities

---

1. For example picking the first security that meets certain requirements rather than choosing the best security.
2. Over longer time horizons the two objectives are rarely incompatible.

in a portfolio. It seems possible that rather fewer securities are needed to secure the benefits of diversification than is indicated by the office philosophy.[1]

Diversification involves the allocation of wealth among several securities. It is necessary because the investment process occurs within an environment of uncertainty. The risk associated with an individual share may be considered as being of two types; the market risk that exists because of uncertainty about future economic and psychological factors that may affect expectations (e.g. uncertainty as to whether the market will go up or down tomorrow, or next year) and the financial risk that can be eliminated by diversification.[2]

Financial risk is the portion of each stock's variability that is unique to itself (e.g. a serious strike unique to the firm will adversely affect its share price). By holding a cominbation of assets this financial risk can be removed. Over time and between companies one might expect the good unexpected events to balance out with the bad. Market risk, in contrast, reflects events that affect almost all shares in some measure, and cannot be eliminated by diversification.

It is useful to make the gains from diversification more explicit. It is easily shown that the expected return on a portfolio consisting of two securities is the weighted average of their expected returns, with the proportions invested in each used as weights. When the correlation between the returns on the two securities is less than one the portfolio

---

1. It is of note that the institution considered itself to have fewer holdings in a portfolio on average than the majority of investment management firms. The office philosophy is in favour of large concentrated holdings rather than hundreds of small holdings.
2. Market risk is sometimes termed the systematic risk and financial risk the unsystematic or residual risk.

standard deviation (risk)[1] is less than the weighted average of the standard deviations (risk) of both securities.[2] In other words so long as securities are not perfectly correlated risk may be reduced when securities are combined together into portfolios. This may be demonstrated more generally as follows{39}

Let an equal amount be invested in each of K assets the returns of which are independent so that the covariances between assets i and j = 0 ($i \neq j$). The variance of return on the portfolio is then

$$\sigma_p^2 = \sum_i^K X_i^2 \sigma_i^2 = \frac{1}{K^2} \Sigma \sigma_i^2$$

where $X_i = \frac{1}{K}$ is the amount invested in each share and σ_i^2 is the variance of the i^{th} share. If now, of all the assets in the market, the distribution of return on asset g has the largest variance $\sigma_g^2 = M$ (where M is finite) then the variance on the portfolio return must satisfy

---

1. Standard Deviation or Variance is used throughout this discussion as the measure of risk. Other measures than the dispersion of outcomes around their expected value could be used. A discussion of some of them (and their implied utility functions) is to be found in Markowitz {68}. In general in order to reconcile mean variance analysis with the expected utility model it is assumed either that the probability distribution of expected returns is normal or that an investors utility of wealth function is quadratic. (See for example H.A.J. Green {47}.)

2. For example, denoting $E_p E_1 E_2$, to represent the expected return on the portfolio, security one, and security two respectively, and X_1 to represent the proportion of the portfolio invested in security one.

$$E_p = X_1 E_1 + (1 - X_1) E_2$$

Denoting σ_p, σ_1, σ_2 to represent the standard deviation on the portfolio, security one and security two respectively, and ρ_{12} as the correlation coefficient between securities one and two, then portfolio standard deviation $\sigma_p = (X_1^2 \sigma_1^2 + 2X_1(1 - X_1) \sigma_1 \sigma_2 \rho_{12} + (1 - X_1)^2 \sigma_2^2)^{\frac{1}{2}}$

If now $\rho_{12} = 1$ then

$\sigma_p = X_1 \sigma_1 + (1 - X_1)\sigma_2$ whilst if $\rho_{12} = -1$ then $\sigma_p = X_1 \sigma_1 - (1 - X_1)\sigma_2$

thus illustrating how portfolio variance may be lower than the weighted average of the standard deviations of both securities.

$$\sigma_p^2 \leq \frac{KM}{K^2} = \frac{M}{K}$$

This expression is smaller the larger the value of K. Increased diversification has the effect of making portfolio return more certain. Clearly assuming independent returns is unrealistic. Dropping this assumption portfolio variance with equal weighting is

$$\sigma_p^2 = \sum_i \sum_j X_i X_j \sigma_{ij} = \frac{1}{K^2} \sum_i \sum_j \sigma_{ij}$$

$$= \frac{1}{K^2} \sum_i \sigma_i^2 + \frac{1}{K^2} \sum_i \sum_j \sigma_{ij}$$

$$i \neq j$$

So long as the variances of returns on individual assets have a finite upper bound, then as the number of assets in the portfolio is increased, the first sum approaches zero,

so that $$\sigma_p^2 \simeq \frac{1}{K^2} \sum_i \sum_j \sigma_{ij}$$

$$i \neq j$$

when K is large.

Denoting $\bar{\sigma}_{ij}$ as the average covariance this may be rewritten as

$$\sigma_p^2 \simeq \frac{K-1}{K} \bar{\sigma}_{ij}$$

As K increases $\frac{K-1}{K}$ approaches 1 so that the variance of the distribution of return on the portfolio approaches the average covariance between the returns on the individual assets in the portfolio. Thus in a diversified portfolio the riskiness of an individual asset depends more on the co-variability of the return on this asset with the returns on other assets than on the variance of the distribution on the return of the asset itself.[1]

---

1. This demonstrates that a cominbation of individual risky stocks does not necessarily result in a high risk portfolio.

Enough has been done to demonstrate the reason for diversification. There remains the question of how many securities are needed. A number of alternative approaches to this question are possible. One would be to consider the above demonstration when returns were assumed independent and plot an approximation to this expression.[1] Another approach is empirical. For example Evans {34} considered the variability of rate of return, over the period 1958 to 1967, of 2,400 portfolios chosen from 470 stocks. Each of the first 60 portfolios included only one security, the next 60 portfolios contained two securities and so on. For each group of 60 portfolios the average value of the standard deviation of the rate of return was calculated to provide an estimate of the variability of rate of return for a typical portfolio of comparable diversification. A typical portfolio with equal amounts in each 95 shares was found to have only 14% more risk (standard deviation) than the most highly diversified portfolio imaginable. A typical portfolio with equal amounts in 10 securities had only 7% more risk than the minimum possible, while a portfolio with equal amounts in 20 securities had only 3% more than the minimum. To illustrate this minimum possible and indicate in another way the possibilities for diversification one may assume that the return on a security is related to the level of an important index (such as the F.T. Actuaries),[2]

that is $R_i = a_i + b_i I + c_i$

where R_i = return on security i and I is the level of the index

a_i, b_i are constants, c_i is the error term.

$E(c_i) = 0 \quad \text{cov.}(c_i c_j) = 0 \quad i \neq j \quad \text{cov.}(c_i I) = 0.$

$\text{Var}(c_i) = \sigma^2_{c_i}$

---

1. The approximation is $\frac{1}{\sqrt{K}}$. The function moves toward 0 more and more slowly as K is increased. By the time about 20 securities are held little more diversification is achieved as the number is increased.

2. The index or diagonal model was first suggested by Sharpe in {83}.

Portfolio risk is then[1]

$$\sigma_p^2 = b_p^2 \sigma_I^2 + \sum_i X_i^2 \sigma_{c_i}^2 \quad \text{where } b_p = \Sigma X_i b_i$$

If now an equal amount is invested in K securities $X_i = \frac{1}{K}$, the risk due to the unique characteristics of the securities is

$$\left(\frac{1}{K}\right)^2 \sum_i \sigma_{c_i}^2 \quad \text{or} \left(\frac{1}{K}\right)\left(\frac{\Sigma\sigma_{c_i}^2}{K}\right)$$

where the last term represents the average value of the unsystematic risk for the K securities included in a portfolio. Then for the portfolio as a whole the total unsystematic risk is simply $1/K^{th}$ of this quantity. The unsystematic risk is likely to be so small a proportion of the total portfolio risk that it may reasonably be ignored. Hence for well diversified portfolios

$$\sigma_p^2 \simeq b_p^2 \sigma_I^2$$

The importance of this argument is that as noted above, while diversification can reduce the residual or financial risk, the risk due to movements of the market as a whole remains and cannot be diversified away. Both the advantages and the extent of diversification have now been considered.

It has been shown that diversification serves a useful function by enabling the fund manager to eliminate most of the unsystematic or financial risk of securities from a portfolio. Furthermore about twenty securities is probably sufficient for this purpose (provided they are not perfectly correlated). Why then did the institution investigated have 50 or more

---

1. Return on a portfolio $R_p = \sum_i X_i R_i$

$= \Sigma X_i a_i + (\Sigma X_i b_i) I + \Sigma X_i c_i$

Let $\Sigma X_i b_i = b_p$ then $R_p = \Sigma X_i a_i + b_p I + \Sigma X_i c_i$

The variance of a portfolio $= \Sigma \Sigma X_i X_j \sigma_{ij}$

In this case the covariances are zero hence $\sigma_p^2 = \Sigma X_i^2 \sigma_i^2$

Now $\sigma_i^2 = E(a_i + b_i I + c_i - E(a_i + b_i I + c_i))^2$

$= b_i^2 \sigma_I^2 + \sigma_{c_i}^2$

Now $\sigma_p^2 = \Sigma X_i^2 (b_i^2 \sigma_I^2 + \sigma_{c_i}^2) = b_p^2 \sigma_I^2 + \Sigma X_i^2 \sigma_{c_i}^2$

stocks in each of its portfolios? The cause is at least partly institutional. Government restrictions tend to limit individual holdings when purchased to less than 5% of a total portfolio.[1] Marketability (discussed later) and restrictive trust deeds are advanced as other causes whilst a further possibility is a general failure to appreciate how few shares are needed to secure diversification.[2]

In conclusion it is perhaps appropriate to ask whether fund managers select investments at all with reference to their effect on portfolio risk, or whether selection decisions are made simply on a share by share basis. Is diversification achieved simply by investing in large numbers of securities without explicit consideration of the inter-relationships between them? The answer is not obvious. It seems that some sort of balance is often desired between sectors and to this extent the portfolio as a whole is considered. Risk is considered at least implicitly in the analysis of sector balance, but little attention is likely to be paid to the relationships between individual securities. It is difficult to distinguish the accidental diversification that occurs from investing in large numbers of securities from the reasoned diversification due to sector selection.

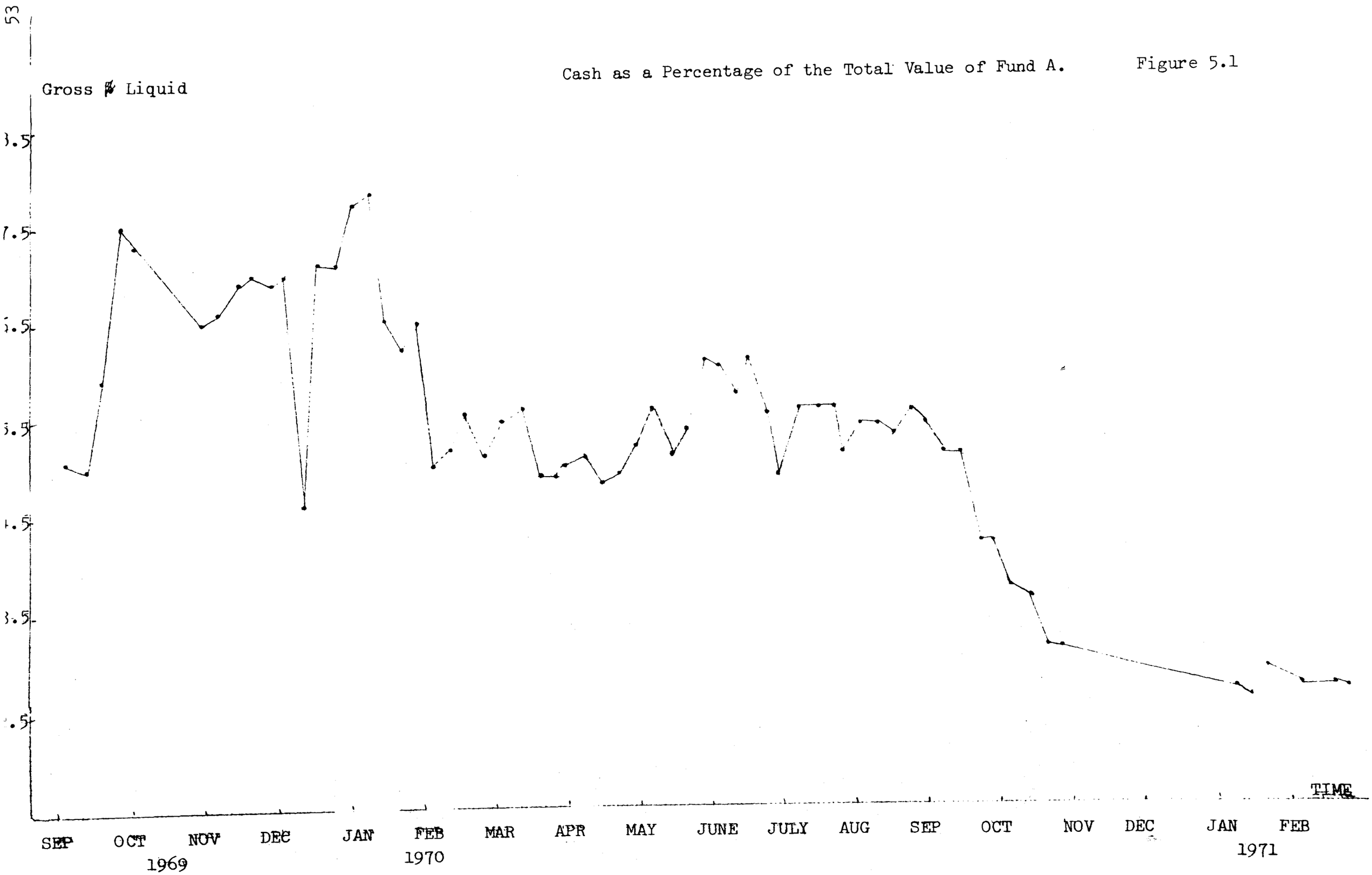
Liquidity

Some evidence on fund liquidity is provided in the accompanying graphs where A is a very large, well established fund (figure 5.1) and B is a fast growing fund (figure 5.2).[3] The graphs illustrate the percentage

---

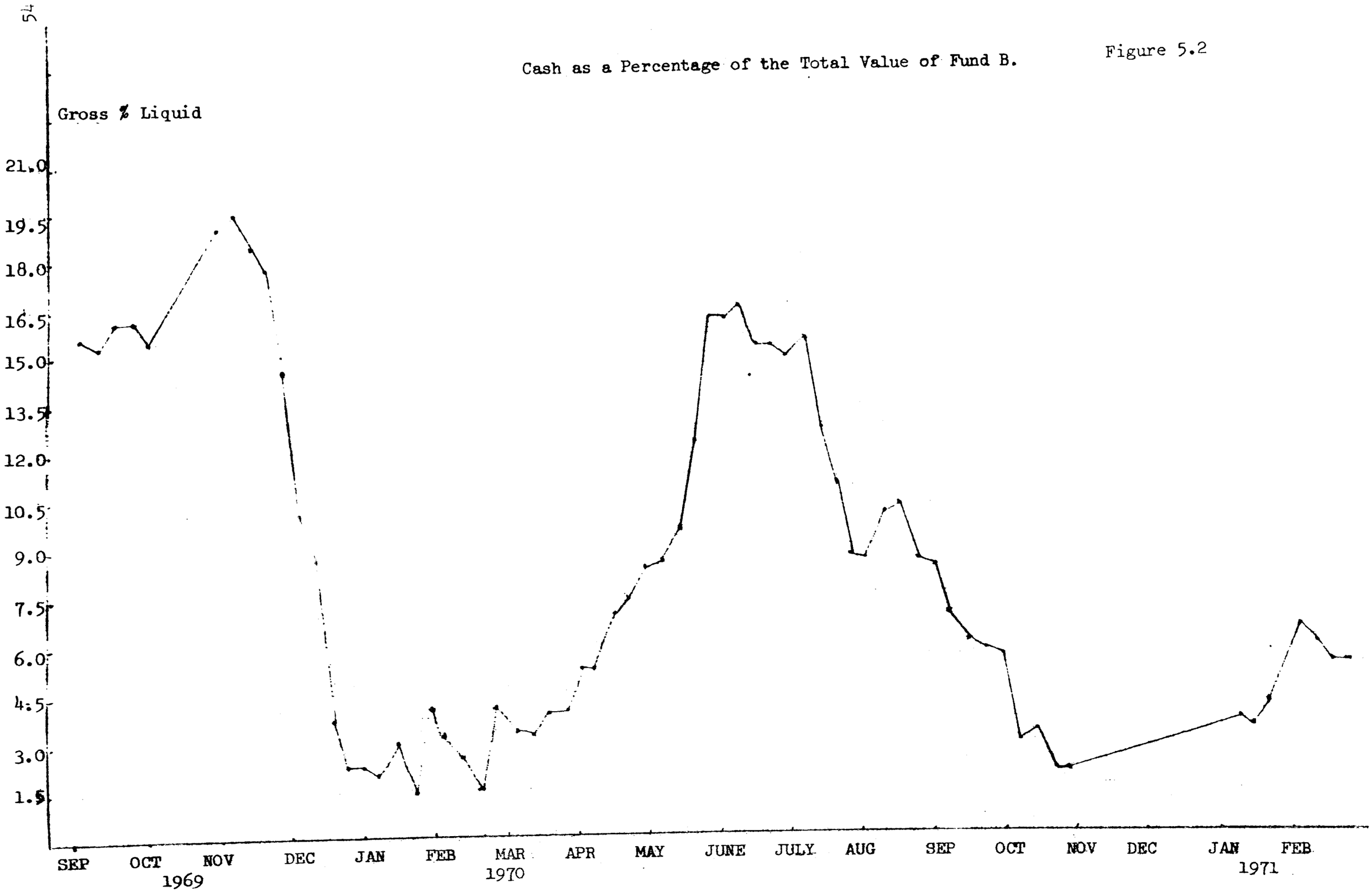
1. This is not true of all portfolios. In some cases it is a considerably higher proportion of the portfolio.
2. Discussion of the difference in number of portfolio holdings between portfolio theory and institutional portfolios is to be found in a recent paper by Mason {69}.
3. B is discussed in appendix 3, New Portfolio Construction.

Cash as a Percentage of the Total Value of Fund A. Figure 5.1



Cash as a Percentage of the Total Value of Fund B.

Figure 5.2



of the total value of the funds comprised by cash.[1] In general the managers' philosophy is to be as fully invested as possible even though this may involve the purchase of securities that are not quite optimal. In this section it is intended to discuss some of the reasons advanced by the managers for this emphasis on full investment and then to consider the implications of liquidity and gearing in terms of normative portfolio theory.

The liquidation of a portfolio is one of the classic defences to a bear market.[2] Consider for example a unit trust going 100% liquid. In a falling equity market the fund stands to outperform its competitors although in terms of growth prospects it offers little. Few unit holders are likely to be drawn into investment with such a prospect so that there are few marketing advantages in going liquid. The gains even if the managers judgment of a bear market is right are few. However if his expectations are ill-founded and the market continues to rise, the fund that has gone liquid will fail to register substantial gains in market value and is unlikely to attract substantial new funds into it. Thus if there is an equal chance of a rise or a fall in the market it is likely that the damage done by going liquid may far exceed the possible gains. For such reasons fund managers tend to be reluctant to carry substantial amounts of liquid assets in their portfolios. Low liquidity might be seen as a means of adjusting for uncertainty.

---

1. The substantial variability of the percentage of cash held by fund B mainly indicates the considerable inflows of funds that arise from block offers and to a lesser extent the continuous offering of units. As regards Fund A three influences would seem to have been at work affecting liquidity the inflows of new money, deliberate policy on the part of the fund managers to keep liquidity at or around a certain level (which changes with circumstances) and the fluctuations in sales and purchases which are unlikely to exactly correspond in both amount and timing. The inflows of new money were particularly important until early 1970, whilst in the bear market of 1970 more attention than previously was devoted to maintaining a certain degree of liquidity.
2. The other classic defence is to shift the portfolio into stocks with defensive qualities or to buy gilts.

In general then the fund manager actively tries to avoid high liquidity in most conditions. High liquidity does occur at times for the smaller funds when advertising is heavy and appropriations large but the policy is usually to reduce this as rapidly as possible. On this basis one might distinguish between temporary liquidity in a fund, owing to transactions and the inflow of funds, and liquidity as a means of avoiding an expected fall in share values. Both tend to be minimal. The question arises as to whether the cash position of the fund is managed at all? Observation would tend to indicate that it is a residual and that little management takes place. In most market conditions little attempt is made to keep a substantial liquidity balance to meet net redemptions. Redemptions have generally been light and little attention has been paid to the problem in the office under study.

It is interesting to contrast this emphasis on low liquidity with the predictions of portfolio theory. The discussion of diversification has shown the possibilities of combining securities to form portfolios with varying combinations of risk and return. For obvious reasons interest is generally centred on the members of the set of portfolios that are efficient where an efficient portfolio has either more return than any other investment of the same risk, or less risk than any other security with the same return. The problem becomes one of delineating the efficient frontier of portfolios in risk-return space. A number of solution methods are possible. One of the simplest is to use lagrangean multipliers[1] to

---

1. This is termed the Basic problem by Sharpe {86} . It is differentiated from the Standard problem by its absence of inequality constraints. In general portfolio analysis problems involve inequality constraints that prevent more than a certain amount being invested in any one share (but not usually in cash or Government bonds) and rule out negative holdings. The Separation Theorem described below will not always hold for the Standard problem. Constraints must not prevent the minimum variance portfolio from being composed simply of the riskless asset.

$$\text{minimize} \quad -\lambda E_p + \sigma_p^2$$

for all possible values of $\lambda \geq 0$ subject to $\Sigma X_i = 1$

where E_p is the expected return on the portfolio and σ_p^2 is its variance.

Having generated the efficient frontier for all values of λ (λ describes the investor's attitude regarding expected return vis à vis variance of return) it is possible to introduce borrowing or lending into the model. The investor is assumed to borrow or lend at the pure interest rate by investment in a riskless security (such as cash or Government bonds). Combining a riskless security with risky portfolio gives expected return/standard deviation of return values lying along a straight line.[1] The straight line with the greatest slope now forms the efficient frontier.

---

1. Let E_1 be the riskless security's expected return with variance $\sigma_1^2 = 0$, E_2 be the risky security with variance σ_2^2.

Then

$$E_p = X_1 E_1 + (1 - X_1) E_2$$

$$\sigma_p^2 = X_1^2 \sigma_1^2 + (1 - X_1)^2 \sigma_2^2 + 2X_1(1 - X_1)\rho_{12}\sigma_1\sigma_2$$

$$\text{i.e. } \sigma_p = (1 - X_1)\sigma_2$$

The slope of this frontier is $\dfrac{dE_p}{dX_1} \cdot \dfrac{dX_1}{d\sigma_p} = \dfrac{dE_p}{d\sigma_p}$

$$= \frac{E_2 - E_1}{\sigma_2}$$

Now if $E_2 = E_M$, i.e. it is the expected value of the market portfolio, $\sigma_2 = \sigma_M$, and if E_1 is replaced by R, to give $\dfrac{E_M - R}{\sigma_M}$ one has the slope of the Capital Market line which summarizes in equilibrium the relationship between expected return and risk for efficient portfolios.

A diagram (fig. 5.3) may make the analysis clearer.

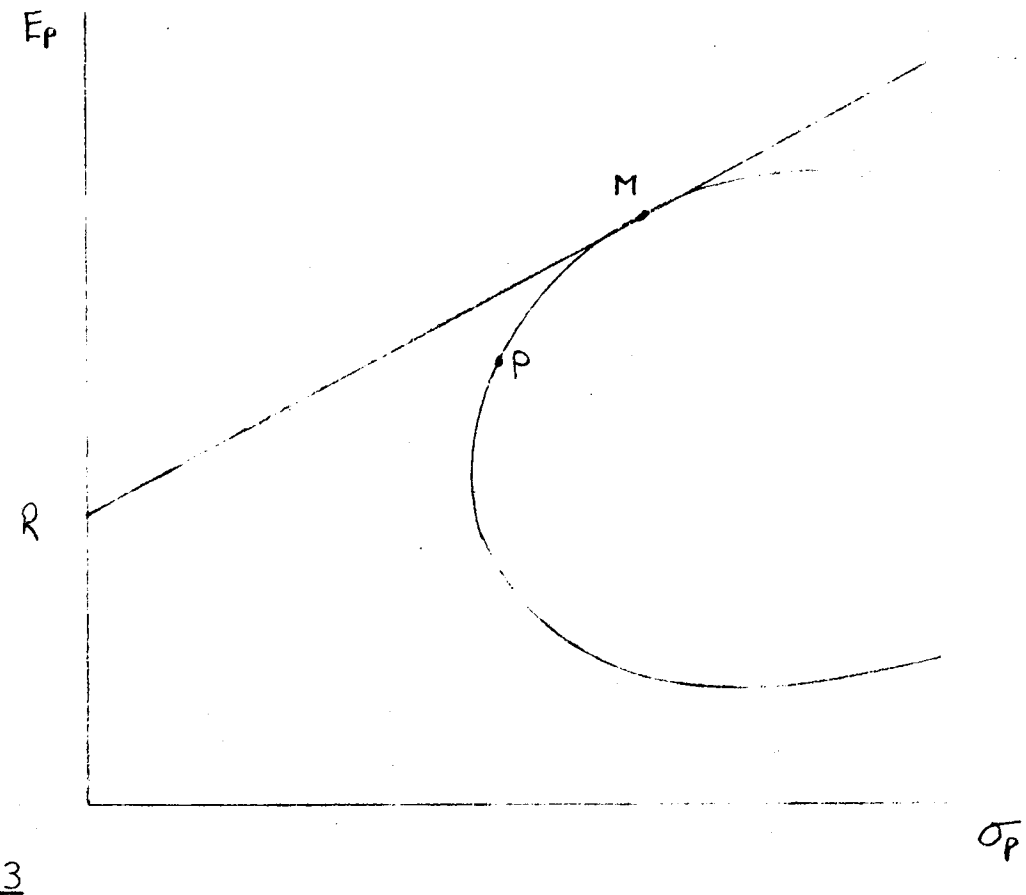


Figure 5.3

RM represents the efficient frontier when borrowing or lending at the riskless rate R is allowed.[1] M is the optimal combination of securities or under certain assumptions[2] the market portfolio. Faced with this situation the investor need only decide how much to borrow or lend. There is but one appropriate combination of risky securities in which to invest the remainder of his funds. The consideration of alternative

---

1. Note that if borrowing or lending at the riskless rate R was combined with the portfolio P then the line RP would be dominated by RM. Hence it would not be the efficient frontier.

2. Capital market theory assumes that all investors are Markowitz efficient diversifiers who delineate and seek to attain the efficient frontier. The market for investment assets is assumed to be perfect in the sense that all goods and assets are infinitely divisible; any information is costless and available to everybody; there are no transactions costs or taxes; and so on - i.e. investors are assumed to be price takers in frictionless markets. In addition any amount of money can be borrowed or lent at the risk-free rate of interest. Finally it is assumed that all investors visualize identical probability distributions for future rates of return - i.e. homogeneous expectations. Note that if the assumption of homogeneous expectations is dropped M is simply an optimal combination of securities. Each individual will face his own capital market line rather than the same capital market line. The separation theorem will still hold.

combinations of risky securities can thus be separated from the investor's attitude toward uncertainty relative to expected return.[1]

Interesting implications for fund management follow from this theory. Two interpretations are possible. The first sees fund managers as providing the investor with the market portfolio (assuming homogeneous expectations) or more realistically perhaps (not assuming homogeneous expectations) as providing the investor, given his own particular preferences summarized as broad general preferences such as growth, with his optimal combination of securities which may be combined by the individual investor with borrowing or lending.

The second interpretation sees fund management as providing investors with a particular amount of risk. This degree of risk is attained by combining the market portfolio with borrowing or lending. It might be argued that this second interpretation is much more realistic since it is difficult for the fund managers to know a particular investor's optimal combination of securities, whilst also borrowing and lending is often very difficult for the individual and much easier for the institution.[2]

---

1. This result is termed the separation theorem and is due to Tobin {96}. It may be demonstrated as follows {86}. The solution to the Basic problem is of the form $X_i = K_i + k_i\lambda$ where K_i and k_i are constants, λ is as defined above and X_i is the proportion invested in asset i. Now if X_1 is a riskless asset and there are no constraints preventing investment solely in the riskless asset the solution may be simplified i.e. $X_i = k_i\lambda \quad i \neq 1$ $(X_1 = 1 + k_1\lambda)$. Now the portion of the portfolio at risk will be

$$\sum_{j=2}^{n} X_j = \lambda \sum_{j=2}^{n} k_j$$

The proportion of such funds invested in security i will be

$$\frac{X_i}{\sum_{j=2}^{n} X_j} = \frac{k_i\lambda}{\lambda \sum_{j=2}^{n} k_j} = \frac{k_i}{\sum_{j=2}^{n} k_j}$$

which is unrelated to λ, the investors attitude to risk relative to return.

2. Whether or not unit trusts can borrow is a subject of some controversy. Certainly investment trusts can. In practice at least unit trusts do not borrow.

Two points are worth noting a propos the assumptions of the theory. The first concerns borrowing and lending at the pure rate of interest. It might reasonably be asked whether borrowing in particular is possible at the pure rate of interest. If it is impossible, then instead of a linear capital market line, one would expect a capital market curve which was linear over some ranges perhaps but became flatter as risk increased. In this case the separation theorem no longer holds.[1] The second point concerns transactions costs. In the presence of transactions costs a portfolio of relatively few securities (which the demonstration of diversification shows is all that is needed) may perform better than the market portfolio (assuming homogeneous expectations) so that the buying of relatively small numbers of securities by fund managers is perhaps rather more sensible than would appear at first sight.

A large number of other criticisms[2] of the theory are possible. Interest however lies in its implications. The theory suggests that investors need only combine the market portfolio with borrowing or lending to secure their desired amount of risk. This is in marked contrast to the ideas of most fund managers who combine particular stocks into portfolios in an endeavour to secure more or less risky portfolios. Given that it is the

---

1. Black {6} investigated the market equilibrium under the assumption that there is no riskless asset. His results together with those of Vasicek {103} would seem to indicate that the capital asset pricing model described above may be considerably generalised. The implications of the generalised model are likely to be similar to those of the more specific model for most institutional investors, i.e. the holding of the riskless asset and a portfolio of equity stocks although this portfolio should be of low to medium risk. (see Vasicek & McQuown {104 }).

2. The majority of criticisms have been of the Markowitz model. Briefly the criticisms have been firstly the use of the standard deviation as a measure of risk and the treatment of subjective probability estimates as though they were objective (the Bayesian approach). Secondly the input problem may be cited. Apart from the huge number of covariances necessary, random walk investigations show that it is extremely difficult to predict future price changes. (In fact this would seem to be an argument in favour of buying the market portfolio and using borrowing or lending to secure one's optimal risk position.) Thirdly one may note the computational costs involved and fourthly the single period nature of most of the solutions. Dynamic and multi period solutions have not yet been applied much.

covariances between securities that are in general important in determining portfolio risk and given the huge number of covariances involved[1] it is possible that traditional methods of portfolio selection are less than optimal.

Before leaving the question of liquidity it is worthwhile considering the question of gearing and its effect on investment trusts. The impact of gearing is to increase the variability of portfolio returns. Depending on the cost of fixed interest debt and the rise or fall in the market it can substantially increase (or decrease) portfolio returns. Increases in gearing rely on issues of capital. These are infrequent and likely to be dependent on their cost (in interest terms) and market prospects. An increase in gearing is generally a decision taken at the highest level after much consideration. Decreases in gearing are likely to come much more within the everyday investment decision and can be achieved simply by buying fixed interest stock. In this sense gearing is also available to the unit trust. Fund managers do not tend to look upon buying fixed interest stock as a gearing decision. The argument for buying fixed interest stock is much more likely to be that it offers a higher return (both dividends and capital gain) than equities, rather than as a method of reducing variability in the portfolio. In general the office invested little in bonds and fixed interest stocks. It is an option open to the managers but an option that is little exercised.

---

1. However, as an earlier discussion has illustrated, it is possible and indeed desirable to simplify the portfolio selection problem by use of the diagonal or index model which relates return on a security to the market return. Similarly it is typical of analysts to relate security returns not to other securities but to the market return, i.e. analysts simplify the problem in much the same way as has been suggested for mathematical portfolio selection procedures.

Marketability

It is common to distinguish two hypotheses in discussion about marketability.[1] The first, the price pressure hypothesis[2], argues that whilst one can buy and sell small quantities of stock at approximately the market price, when the size of the transaction is large relative to these small purchases or sales, then the price of the stock must fall to induce investors to purchase these additional shares.[3] This inducement results from an increase in the quantity of shares that must be held by other market participants. If the excess demand curve for shares is downward sloping, the additional shares will only be held at lower prices. In consequence purchasers buying shares at these lower prices are rewarded with extra profit. The second hypothesis, that of substitution, argues that the market for a security must be defined in a broader content than the security itself or its particular industry grouping. Most securities are close substitutes for each other with prices such that the expected rates of return on assets of similar risk are equal. If any security should be selling to yield a higher expected return due simply to large purchases or sales then

---

1. Marketability is taken to mean the ability to realise a security's value in money or alternatively to convert money into one particular security. The marketability problem involves both the length of time necessary to dispose of a holding and the cost of so doing where the cost is defined to include the difference between the ruling price for a share and the price actually received for a large holding. Marketability is used here interchangeably with liquidity. Monetary theorists frequently see liquidity as two dimensional (1) a time dimension for the expected ability to exchange out of the particular asset and into cash (2) a value dimension showing the extent to which the asset is expected to maintain its value when exchanged for cash. (1) is frequently termed marketability by the theorists but in the terminology adopted here both (1) and (2) constitute marketability.
2. See Scholes {81}.
3. As an expositional convenience it is probably best to view the market for any company's chares as being in two parts. The large block share transactions, generally between institutions with very few buyers and sellers and the normal small transaction market with a considerably number of buyers and sellers at least for reasonably large companies. Interdependence between the two parts of the market exist in the form of jobbers. They provide the machinery for connecting the different parts of the market - matching small sales and purchases and adjusting prices according to how much stock is on offer. Whilst unable to absorb a large block of stock immediately they may well buy and dispose of such a block in smaller parcels.

investors would soon arbitrage the extra profit away. The substitution hypothesis implies that the inducement necessary to sell large quantities of stock should be close to zero.

In general the institutions seem to favour the former hypothesis. They argue that two alternatives face the large fund[1] - either restriction to an unmanageably large list of small holdings in both good and inefficient companies, but which can be sold easily, or restriction to a short list of relatively unmarketable holdings.[2] An empirical study by Scholes{81} however supports the substitution hypothesis. Scholes derives testable hypotheses by relating the price pressure and substitution arguments to the efficient market model. He argues that the sale of shares takes place for a number of reasons. One such reason is that the investor feels he possesses adverse information about the company's prospects. There are substantial costs to acquiring information of value so that one would suspect that the sellers of a large block of stock possess more information of value than sellers of small quantities of stock. Hence one might expect small transactions to be effected at very little information discount from the previous transaction, whilst large transactions may only be sold at a lower price to reflect the expected value of information in these transactions. The information hypothesis states then that when a large block of stock is sold in the

---

1. The problem for the small fund is not so crucial. In general the managers are able to switch between stocks easily and quickly.

2. It is worthwhile asking whether it is important that shares should be marketable. Studies of turnover indicate that in general there is little reason to expect high turnover to be linked to high performance and that whilst there is a mechanical strategy that produces better returns than a buy and hold strategy the amount of turnover required for this is likely to be small. In fact, since the strategy in question is a reallocation strategy, it involves selling marginal amounts of stock rather than the large blocksof stock which are generally meant when discussing marketability. Again discussion of the separation theorem (although of course this was developed in a single period framework) emphasized the strategy of buying the market, which again would seem to imply low turnover.

market one would expect to see a downward price adjustment in the price of the stock. This fall is the expected value of information contained in large block transactions and is a permanent fall not simply an inducement as the price pressure hypothesis suggests. Casual observation of trading in markets has led the price pressure adherents to conclude that the price adjustments are due to downward sloping demand curves for shares and not to a change in the equilibrium value of the firm. The efficient market model implies that the value of information in transactions is much smaller than the price effects suggested by the price pressure hypothesis.

To test the hypotheses Scholes investigated the U.S. Secondary Market for common stock in order to isolate the effects due to size of offering from other factors influencing price. After adjusting for a stock's reaction to market movements he found that secondary distributions[1] were typically associated with a modest fall in price (2.2%, mainly concentrated on the day of sale and the five succeeding days). A variety of methods were then employed to isolate the effect on price of the size of the distribution but in general the results were negative. The price decline was no greater when 35% of the firm was sold than when the proportion was less than 1%. It would seem from Scholes' evidence that the price reaction associated with a secondary offering is not simply a consequence of the additional supply of stock. The impact of large block sales does not seem to depend on how large the block is but on how much information it conveys. The evidence would seem to be inconsistent with the price pressure hypothesis. Analysis of effective commission paid supported this conclusion.

Scholes also tested the information substitution hypothesis more directly. He examined the performance of the secondaries by vendor arguing that the likelihood of a sale containing adverse information is very different among

---

1. Secondary distributions are large block sales of stock initiated not by the company (as in a primary distribution) but by one or more shareholders to whom the proceeds accrue.

the five main vendor groups. At one extreme are the corporation's officers (due to the possibilities of insider knowledge) and at the other estates and trusts, individuals, insurance companies and other such institutuions. The results supported the information substitution hypothesis. On average the stocks sold by individuals and trusts did not perform particularly badly subsequent to their sale. In contrast corporate insider's sales were generally followed by prolonged price declines.[1]

Accepting Scholes' conclusions as being representative of all reasonably large companies and of the U.K. as well as the U.S. market implies that the problem of marketability is seriously over-rated. On Scholes' evidence it is unlikely that the demand for marketable holdings conflicts with other demands for portfolios containing a small number of holdings. The price effect resulting from a sale of a large block appears to be substantially less than is generally believed or accepted and certainly unlikely to be enough to deter sales by an institution. One question however does remain relating to the sample from which the conclusions were drawn. It is possible that the only large blocks of stock that are offered for sale (in one block) are those which the fund manager feels he can sell without much difficulty and without too much loss in price. It might be that Scholes' sample only included marketable stocks.

If one rejects Scholes' evidence and continues to accept the price pressure hypothesis then the institution has a twofold problem. It must decide what constitutes a reasonable degree of marketability (time traded off against cost) and then must choose assets with these properties. The question arises as to what are the properties that confer marketability? One possibility is to list all the properties assumed for a perfectly

---

1. In general the vendor is not officially known on the day of the distribution. However Scholes argues that some information as to the vendor and the cause of the sale leaks to the market.

competitive market - a large number of buyers and sellers no one of whom buys or sells more than a very small fraction of the total, identical products in exchange, complete information about all transactions available to both buyers and sellers and the only criterion for a transaction being that no better bargain is available elsewhere (no buyer loyalty to sellers) - and to use these as criterion for marketability.{91} No measure appears to exist as to what constitutes a reasonable degree of marketability. Subjective judgment has to be applied to determine those stocks that are or are not marketable and in what quantities. Some attempt has been made in the U.S. to measure a stock's marketability by calculating the dollar transactions for the week (volume times price, summed), and dividing this total by the percentage change in price over the week.{61} A large amount of transactions (by value) in a stock for each percentage point of change is then taken as an indication of a stock's marketability. No evidence was given as to the stability of the ratio from week to week or over longer periods. One would suspect that it would not be a very reliable indicator. The number of large blocks traded in a given period might be a more useful indicator of the institutional marketability being considered here. Some research has also been carried out into the U.S. Government Bils market on its "depth, breadth and resiliency"{1,66} but studies on measures of marketability remain rare.

Recently Copeman's study {23} of London institutions suggested that a considerable number of institutions and stockbrokers do try to measure marketability. Most of them considered market capitalisation a meaningful proxy for marketability although they also took into account any percentage of the total equity which was deemed to be 'tightly' held.

The conclusions that may be drawn from this discussion of marketability are mixed. On the one hand there are the practitioners who feel that marketability is an important quality in a share although measurement and

quantification is difficult. On the other hand a comprehensive study of large block transactions indicates that the price effects of such transactions are relatively small. It is possible that marketability is less of a problem than is currently thought.

Sector Selection[1]

The selection of shares by their sector or industry characteristics is considered by the investment managers to be a technique crucial to their methods of investing. It involves the buying of some sectors in preference to others. For example the faster growing sectors may be considered preferable to the slower growing sectors so that investment is orientated to the former rather than the latter. The weighting of the portfolio this selection procedure produces is compared at frequent intervals with the weights for the F.T. Actuaries Index so that an overall view of the divergence between the portfolio and index distributions may be gained and appropriate adjustments carried out. Much of the sector selection is carried out at a very aggregate level with for example consumer durables being compared to capital goods. Some comparison also takes place within these aggregates; for example within consumer durables, household and electronics may be preferred to less obvious growth sectors.

Two questions arise from this discussion - how are sector decisions reached, and how much attention is paid to these decisions in the portfolio selection process? In part explanation of how sector decisions are reached may be answered by consideration of the objectives and needs of the fund. Thus for example a high yield fund may have little choice of sector. In the main however the choice of sectors is the result of judgments about economic factors and other information that comes to the knowledge of the fund

---

1. Further discussion of sector selection is to be found in part II.

managers.[1] The second question is more difficult to answer. Observation does not yield a clear-cut answer. Examination of a new portfolio reveals divergence between the planned portfolio and the actual portfolio (see appendix 3: New Portfolio Construction) but with the broad outlines being maintained. Conclusions for established portfolios are much less easy.

Time Horizons

Earlier in the chapter mention has been made of the substantial difference in turnover and hence time horizons, between the unit and investment trust portfolios. Some observers within the industry see this difference as being due to the different orientation of the portfolios - the market orientation of the unit trusts with holdings and purchases on a short term basis (one to two years) contrasting with the more fundamental viewpoint of the investment trusts concerned not so much with correct timing and the latest peice of news, but more with the long term (five years) trend of earnings and prospects within a particular area for growth.

Overall one might summarise the essential differences between the two types of portfolios as being due to risk and turnover. The unit trusts might be seen as high risk, high turnover portfolios and the investment trusts as the reverse - low risk, low turnover portfolios. The question then arises as to how these differences have come about. The justification for the higher risk of the unit trusts seems to involve a variety of factors. The recent growth of the trusts has resulted in an influx of young aggressive fund managers in comparison to the older managers of the investment trusts who have perhaps less flexibility or desire to innovate. Size may also be a contributory factor. The relatively small size of many

---

1. A justification for sector selection may be made in terms of portfolio theory. King's {53} analysis indicated that the industry clusters in his study were negatively correlated. Investment in such clusters was therefore likely to confer substantial diversification with little computing or detailed analysis of covariances.

unit trusts in comparison to the much larger established portfolios of the investment trusts may make it easier for unit trust managers to construct higher risk portfolios. They are less constrained to invest in the large stable companies and may take positions in small very risky stocks.[1]

Consider now the differences in turnover. A number of explanations may be advanced. One possible cause is the effect of tax regulations on investment trusts. These undoubtedly limited turnover in the past. Another cause is perhaps the capital structure of the investment trusts. Once their capital has been subscribed for the managers do not need to consider their shareholders overmuch. Certain safeguards are provided for, but in general, if a shareholder is dissatisfied he cannot compel liquidation of the company but can only sell his shares to whoever will buy them. In contrast a unit trust must always maintain some sort of liquidity margin to meet the possibilities of redemption. The unitholder if he is dissatisfied can always cash in his units. The unit trust may feel therefore that they are in no position to invest totally for the future. Private companies are unsuitable since the shares cannot be easily liquidated. Redemptions however are not in general heavy. It is probably easy to over-emphasize this fear of illiquidity.

---

1. Whilst there is some truth in the arguments advanced above, on a number of counts they are less than satisfactory. The discussion of diversification for example has indicated that a combination of individual risky stocks does not necessarily result in a high risk portfolio. The important factor is not in general the riskiness of stocks in a portfolio but their covariance or correlation together. A second point involves the separation theorem. Under very specific assumptions it has been shown that the consideration of alternative combinations of risky securities can be separated from the investor's attitude toward uncertainty relative to expected return. The portfolio problem changes from being one of choosing an efficient portfolio to one of deciding how much cash to borrow or lend in combination with the best securities portfolio. Hence one might not so much expect a difference in the portfolios of equity securities held by the different trusts as in the extent of liquidity and gearing. It is here that a paradox occurs since the unit trusts are seldom geared and yet are said to be more risky than the investment trusts which are often substantially geared.

Perhaps the most likely cause of the difference in turnover is the linking of the idea of performance with turnover in the minds of many unit trust managers. It is worth exploring this idea in more detail. One approach is to look at empirical evidence and see whether any studies to date have indicated that performance has been helped by high turnover. The evidence is less than convincing. Studies by Sharpe{85} and Jensen{50} for example found that on average mutual funds did no better before expenses and considerably worse after expenses than market based portfolios of comparable volatility, whilst few funds consistently performed better than market based portfolios of comparable volatility. Most funds appeared to have spent too much money searching for mispriced securities. Expenses in fact did not include brokerage fees, so that the funds might have performed considerably better before all expenses than market based portfolios.[1] However it is the net returns that are of interest since for turnover to be beneficial it must produce higher net returns than buying the market[2] and holding.[3]

Apart from considering the problem empirically one may also ask whether on theoretical grounds one might expect a link between performance and turnover.

---

1. The recent Institutional Investor study reported in Mason{69} indicates that at best turnover is unrelated to performance and at worse is inversely related to performance.

2. Investing in a portfolio with similar characteristics to the market as a whole.

3. Interestingly in fact Evans {35} has shown that a buy and hold strategy is an adequate standard of comparison only when applied to securities. He shows that a mechanical trading rule - the fixed investment proportion maintenance strategy - when applied to portfolios of securities consistently leads to significantly greater expected returns than those produced by the naive buy and hold strategy even after allowing for transactions costs. The essence of the strategy is that at the end of each sub period the investor reallocates the investment bundle such that the same proportion of the investment bundle is maintained in each security as was originally allocated to it.
   Hence a priori one might expect some turnover (that necessary for re-allocation) to produce greater returns than a buy and hold stragegy. Note however that investment in a market index is equivalent to a re-allocation strategy under some circumstances (see later chapter.) whilst the amount of turnover necessary for following this strategy is likely to be fairly small.

Earlier chapters have drawn attention to the efficient market hypothesis which indicates that an investor can expect neither more nor less than a fair reward for the risks involved. On this basis one would not expect unit trusts on average to be able to secure performance substantially better than the market irrespective of their level of turnover.

Overall there is little reason to expect high turnover to be linked to high performance.[1] It seems that one must look elsewhere for an explanation as to why unit trusts have higher turnover than investment trusts. Tax, capital structure and the relative size difference between the unit and investment trust portfolios would seem likely to be the main explanations. Differences in portfolio composition, notably the large N. American holdings (with a penalty on sales due to the dollar premium surrender - see appendix 4: Capital Gains Tax),- may be another contributory factor.

A further facet of the turnover question that is worth pursuing is the emphasis of the office philosophy on long term time horizons. Despite the relatively short holding periods of most of the securities held in unit trust portfolios, the managers claimed that the stocks were selected on the basis of their long term prospects - perhaps five years or more. One way of considering this claim is to consider what is meant by long term prospects. It is unlikely that the managers mean by this the selection

---

1. If the investor feels he has some ability to analyse individual stocks he may prefer not to diversify his portfolio perfectly. He may be able to profit from a lack of diversification. Treynor and Black {98} show under certain assumptions that such an investor's holdings should consist of some risk free investment, some investment in a 'market' portfolio (i.e. a portfolio that is perfectly diversified and moves with the market) and some investment in an 'active' non diversified portfolio. In this situation high turnover may provide above average returns. The lack of empirical evidence that some investors can predict successfully or of consistency in portfolio performance however makes this justification of turnover rather less than likely. The Treynor and Black article is discussed in more detail in a later chapter.

of a share or industry that should perform very well sometime in the future. High performance five years from now is unlikely to appeal to either the directors or the unitholders. More probably, the requirement of the office philosophy for share selection on the basis of longer term prospects is intended to emphasise the desirability of selecting consistent good performers over the longer term rather than outstanding performers over very short periods. The philosophy does not require that investments should be held for five years but simply that they should be bought with long term horizons in mind. This aspect of the office philosophy accords with the majority of empirical evidence to date. The efficient market hypothesis leads one to conclude that it is unlikely that the investor can outperform the market and that in consequence the optimal strategy is to keep turnover low with only marginal adjustments to investment holdings, and hence long holding periods.

Anchor Stocks

An aspect of the office philosophy not considered as yet is the division of the portfolio into long term investment and trading sections. Whilst somewhat at variance with the demand for long term investment one might characterise some of the portfolios as containing stocks bought for trading purposes as well as stocks bought with a longer horizon in view. The latter stocks are termed anchor stocks - securities which fulfil the main conditions for a portfolio and have a proven record of success. The requirement for these stocks is based on the argument that it is difficult to turn round a portfolio quickly. The anchor stocks act as a support for the portfolio providing income if income is required or growth if that is the objective.

How reasonable is this concept of anchor stocks? Two main arguments have arisen from the portfolio theory discussed so far. The first is that

there is no need for any portfolio to be invested in stocks other than those comprising the market portfolio along with investment in the riskless asset.[1] The second is that there is no particular benefit from extensive turnover. Applying these two principles one might define an anchor stock as one which when combined with others performs in a manner similar to the market, and in the main is bought and held with only marginal sales and purchases over time. Clearly there is conflict with the 'institutional' definition given above but it is interesting that when considered in the light of portfolio theory the concept need not disappear altogether. It is also interesting to note that examination of portfolios does not reveal obvious anchor stocks. The problem is that ex post any stock that has been held for a number of years is declared to be an anchor stock although the reasons for buying it may have been completely different from those needed for it to qualify as an anchor stock. Overall the concept of anchor stock is not a particularly useful one.[2]

Capital Gains Tax

Until now little mention has been made of the effect of capital gains tax on decision making. In general the investment managers pay little or no attention to calculations of the amount of appreciation or depreciation in share price required for profitable switching between shares. Profit taking is however induced by the managers' knowledge of the existence of allowable losses for tax purposes.

---

1. vide the separation theorem (assuming homogeneous expectations).;

2. If one assumes that the managers were able to predict successfully then following Treynor & Black one might identify the anchor stocks as the passive portfolio and the trading stocks as the active portfolio. This might be thought to redeem the concept of an anchor stock although again it implies that the anchor stocks should be a surrogate for the market portfolio. In the event it is unlikely that the managers are able to predict successfully.

The question naturally arises as to what factors the fund managers should consider vis a vis capital gains taxation. The following attempts to detail the main considerations that must be borne in mind. Dealing expenses are ignored. It is also assumed that the institution will have to sell its shares at some stage. It does not have the option of holding them for ever and consequently paying no tax. The intention is to outline the basic rules for evaluating shares in the present of capital gains tax. The first and most important rule (ignoring dividends for the present) is that to be indifferent between them, the net of tax proceeds of a switch must be the same as the net of tax proceeds of the holding of the old shares. Thus if existing shares are to be sold sooner or later, a switch is justified if the shares to be acquired are expected to appreciate as much in absolute terms as those held at present, over whatever seems the most advantageous holding period of the old shares, if they are not sold now. If L is the existing capital gains tax liability expressed as a fraction of today's price, then to justify a switch the rate of appreciation expected on the new shares has to be at least $\frac{1}{1-L}$ times that expected on the old, over what would otherwise have been the holding period of the old shares. Restrictions on switching therefore depend on the size of the existing tax liability and on the expected appreciation on the old shares. If no appreciation on the old shares is expected at all then any appreciation on the new shares will justify a switch so long as the tax liability on the old shares is to be paid sooner or later. If the old shares are expected to fall to a permanently lower level, selling for cash now will result in a larger net of tax value than would result from future lower prices. Selling shares in the expectation of being able to repurchase at a lower price is analogous to a switch between shares but with the re-purchased shares being treated as new shares. The same rules apply. Thus if the old shares will be sold sooner or later the expectation of any fall

in price will justify a sale in advance whenever the recovery in price is expected to take the share price back to its old level but not beyond. Where the price of the old shares is expected to recover to above the level at which they are sold the question becomes one of calculating the maximum repurchase price above which the switch is no longer profitable since the proceeds of selling the investment (reduced because they have paid tax) can no longer be reinvested to yield the same net of tax proceeds as simply as holding the investment with no switching.

The formula $\frac{1 + A}{1 + \frac{A}{1-L}}$ times the existing share price may be shown to give the breakeven repurchase price where L is as before, and A is the appreciation expected on the old shares expressed as a proportion of the existing possible sale price.

The existence of allowable losses must strengthen the incentive to switch shares. Consider the case where shares are at a discount on their purchase price and a new share is in prospect. Sale of the old shares, presuming a tax liability exists, will effectively yield more capital for the purchase of the new share.[1]

Sale of the old shares in a future period will cause the use of that extra capital, between now and the future period, to be foregone. A given tax saving must be worth more today than at some future date. To defer a sale will not prove advantageous unless the old shares recover in price by an amount sufficiently more than that on the new shares, to compensate for

---

1. Complications arise because gains and liabilities are settled up in arrears. Hence the investor's actual capital will not change until the date when the gain would have had to be paid.

the appreciation which would have been obtainable over the period, on the tax saving obtained today. If there are no chargeable gains against which to set realised losses the effect is to lower the appreciation required from the old shares to an amount simply equal to that expected on the new.

Until now dividends have been ignored since they seldom affect the conclusion. Postponing the payment of capital gains tax provides extra capital on which income may be earned. In effect the investor obtains an interest free loan from the Government, equivalent to the amount of tax payable. What is being asked is "How much is this loan worth?" Its value depends on its size multiplied by the after tax yield of the security at present held. The investor's choice is between the return on the present investment and the return on a smaller investment in an alternative switch security offering a higher yield, the comparison being after tax. The returns on shares purchased with the proceeds of the sale of an existing holding must, among other things, compensate the investor for the element of income foregone by not postponing the payment of tax. The rules remain as before but it is necessary to calculate the net discounted cash flow returns on the two assets allowing for tax, over the shorter of the two expected holding periods. The problem becomes one of deciding whether the compounded value of what is expected to be the shorter term holding will reach that of the alternative investment, at the date at which the shorter term assets are likely to be disposed of. Income and capital gains must both be taken into account.

If the existing holding would have grown to $P(1 + r)^n$

and new assets accumulate to $P(1 - L)(1 + r_s)^n$

then the condition for breaking even on the change of assets must be

$$P(1 + r)^n = P(1 - L)(1 + r_s)^n$$

from which may be derived

$$r_s = \sqrt[n]{\frac{(1 + r)^n}{1 - L}} - 1$$

where r_s is the required minimum D.C.F. rate of return on the new asset over the period considered net of the relevant taxes; r is the expected rate of return per annum on the existing asset over the same period, net of the relevant taxes; n is the number of years over which the existing or alternative asset would probably be held, whichever is the shorter period; L is the existing capital gains liability as a proportion of P, the existing price of the asset considered for disposal.

This approach assumes that the investor has some idea of probable holding periods. Where assets are held or are being considered explicitly for short or medium term reasons then some figures can be placed on the likely holding period in these cases. In situations in which the investor is quite uncertain as to holding periods one approach is simply to assume that both the existing and alternative assets would be held for a time which experience has shown to be an average holding period for the investor concerned.

The above analysis leans heavily on Rose[79]. An equivalent approach is given in Smith[89] (see also Holt-Shelton[48]) who provides a simple decision rule. If the following condition holds

$$E_B > E_A \left[\frac{1+g_A}{1+g_A-g_{AW}}\right]$$

then the investor is better off to switch from security A to security B where E_A and E_B represent the expected percentage returns over the total horizon, from the respective securities, g_A represents the percentage

appreciation on A, and W = the applicable tax rate on capital gains. Smith also shows how the same framework of switching from one security to another can be expanded to include explicit brokerage fees. However as he notes the analysis does not consider the effect on market price of a given buy or sell transaction.

What conclusions can be drawn from the foregoing analysis of investment behaviour? Note first of all that the analysis takes no account of risk. It implicitly assumes that the difference in expected yield between securities is the only important factor. No allowance is made for the inter-relationship between risk and yield. To this extent these rules may need modification. On balance the tax means that switching must overcome an additional obstacle in the form of some minimum margin of return. However the margin of return needed to compensate the investor for paying tax sooner rather than later is often small. Using the tax as the main reason for not selling will rarely be justified unless the existing gain proportion is very large or the expected return on the old shares very high - in which case the shares would not be candidates for switching. An effect that does occur because of capital gains tax, arises when old trusts have large contingent gains liabilities compared to new trusts. On realising securities there is a smaller amount after tax to purchase new securities with, than is the case for a new trust, on the sale of equivalent securities. The portfolio of the taxed company is penalised by (a) the loss of the securities which could have been bought by the tax payment and (b) the loss of capital appreciation enjoyed by these foregone securities. Assuming all things equal other than contingent gains liability, the new trust and the expanding trust should 'perform'

better than the old and static one.[1]

Similar problems to capital gains tax are met with regard to the dollar premium. The rules for surrender of part of the premium on switching, deter switching unless the potential gain makes up for the tax payable and the element of the premium lost.

Conclusions

This chapter has been concerned with an investment philosophy. The main elements of this philosophy have been stated and examined, one by one. To this end various parts of normative portfolio theory as well as empirical studies, have been introduced in order to provide some standard against which institutional behaviour might be compared. The result it is hoped has been to illustrate some of the conflicts apparent in the managers' investment philosophy as well as to stress some of its basic precepts.

---

1. The improved' performance' arises because the base from which performance is measured does not take account of contingent liabilities.

Chapter 6

Investment Analysis

Investment analysis provides the inputs for the portfolio selection decision. It consists of a series of procedures designed to indicate the desirable and undesirable qualities in a share so as to allow the estimation of prospects and prices in the future.[1] It is based on the belief that the analysts concerned , whether from simply being superior analysts or from access to private or inside information, are able to make predictions that stocks will perform better than the market. Investment analysis might be described as a collection of tools and techniques which is applied to the consideration of most stocks. It employs both quantitative and qualitative methods in an endeavour to achieve superior forecasting. It is these techniques, rather than the particular desirable share characteristics that analysts are looking for, that are of interest here.

On the quantitative side most investment analysis employs a combination of economic and accounting data. The investment process might be seen

---

1. The previous chapter was concerned with how portfolios are constructed. As such it outlined the office philosophy and examined it against theory. This chapter takes a different approach. It accepts that empirical evidence suggests that it is very difficult to estimate share prices and that most analysts are likely to be unsuccessful, but all the same puts forward the techniques and factors that are commonly considered. It does not compare these techniques with those that should be used for portfolio analysis (such as for estimating variances and covariances). The efficient market hypothesis suggests that this would be unlikely to be particularly fruitful. From the point of view of normative theory the main suggestion must be that the analysts secure private information if their aim is successful share prediction. This chapter concentrates very much on the main interest of the thesis - How do investment managers select shares? It attempts to outline some of the main factors that are considered.

as comprising, first consideration of the economy as a whole (Economic Analysis), and then, with this in mind, consideration of the individual characteristics of each company. In the main the analysis in the institution investigated is fundamental[1] rather than technical in character, with the managers looking for a sound financial structure and long term underlying growth. On the qualitative side appraisal of the company management is generally considered to be the most important factor.

Economic Analysis[2]

Investment recommendations are made against a background of economic and

---

1. Fundamental analysis may be defined as the assessment of a stock's value on the basis of the present value of the future stream of payments to be received either by the company or from the company's earnings stream by the shareholder (as dividends). More generally the term can be applied to all attempts at assessing fundamental factors behind stock valuation. The alternative, 'Technical Analysis' does not consider the relationship between price and economic value but concentrates on price and, in the U.S., volume data. The technical analyst maintains that using prices, yields better results because of the complexities of analysing and predicting causal factors. The analysis involves the investigation of price histories of stocks, charted visually, from which it is said to be possible to identify both accelerating trends upwards and downwards and turning points. The chart follower buys shares with strong uptrends and believes that trends when established tend to persist. Warnings as to when a reversal is likely to take place are based on standard historical patterns. Inaccuracies in these patterns is normal and it is here that subjective judgment is important. It is always possible ex post to identify a particular pattern as heralding a reversal, but ex ante interpretation is not nearly so clear.

   Recently a renaissance in technical analysis has been brought about by the use of relative strength concepts made available by computer analysis. Essentially the idea is to identify by price analysis, firms and industries that have outperformed the market or sector and then invest in a subset of these on the grounds that these stocks and industries are likely to continue to do well. Rigorous testing of such methods does not seem to indicate that they perform particularly well.

   It is important to note that intuition and judgment are considered important elements in the application of technical analysis. In the managers investigated the technique is used more for inspiring ideas as to the companies that should be investigated or to give additional backing to an analysis already carried out than for decision making about which stocks to purchase or sell.

2. For a discussion of the use of Economics in Investment Analysis see R.E. Moor {70} .

industry analysis. It is necessary to weight the various factors determining the path of the economy and to come to certain conclusions therefrom. How the assessment is arrived at is not easily answered. Few people consider explicit economic models. Much of the reasoning is economically naïve. The judgments on the economy are likely to be strongly influenced by the trends in company profits and GNP (Gross National Product) as well as by the Balance of Payments and the rate of interest. It is impossible to detail all the factors that are considered but it is worth stressing that the investment community is generally interested in trends and predictions as to the future - the growth of GNP, of employment, government spending, profits and so on. Movements of the interest rate are of consequence since they act both as an indicator of Government policy and expectations, as well as having direct implications for the discount rate and for switching between bonds and equities. Opinion is formed both by professional economists, working for stockbrokers as well as within the institutions and by other commentators through the papers and other news media. In the final analysis, however, the analyst and the portfolio manager must make up their own minds as to how they think the economy[1] will behave and its implications for the market as a whole. The evaluation of which way the market will move is likely to be central to the analyst's investment thinking. Few analysts are likely to recommend substantial investment if they believe the market is going to fall substantially.[2]

At the industry level the attention paid to macro-economic factors is much more explicit. For example, favourable predictions might be made for large overall sectors, such as consumer durables if it is anticipated that

---

1. Attention must also be paid to the way other economies behave; the most notable example is the United States. It is of interest both because of investments held in America, which will be affected directly by the performance of the U.S. economy, and because of the effects of the U.S. on the world economy and in particular on British companies with substantial exports. There may also be a factor termed 'market sentiment' that can be carried over from Wall Street to the London Market.
2. Analysts may of course try and change the orientation of portfolios by movement into less volatile stocks.

consumer spending will be given a boost by the government. Then within this broad grouping more precise analysis is carried out on the individual industries, involving a consideration of a vast array of factors ranging from government economic policy to such matters as the average level of dividends and earnings yield within a sector.[1] Evaluation of a sector must involve an evaluation of the relative prospects in all respects vis-à-vis other sectors.

Share Selection

As a means of indicating the main factors involved in share selection the analysis begins by considering the intrinsic value approach to equity valuation - a formal model for valuing a company's shares. Then, having established the main variables an analyst is interested in, consideration is given to the main source of information about companies, namely accounting data and in particular the balance sheet variables that are considered by the analyst to be of prime importance. However whilst financial ratios are of great assistance in determining the appropriate valuation for a share it is the quality of management on which particular

---

1. One of the most useful indicators of industry prospects is sales. For the industry as a whole, fast expanding sales are an obvious bullpoint, although considerations such as increased competition, government regulations, and increasing costs are all relevant. Also important as an industry indicator are earnings. Analysts frequently endeavour to predict the impact on earnings of increased sales or costs. If wages are rising rapidly one might expect industries with low wage bills to be relatively better off, on the assumption that prices will not be able to rise sufficiently to absorb these increased costs without a considerable delay; the profits of the labour intensive firms are likely to be more affected than the profits of the capital intensive firms.

   Aside from the forecast of earnings, the likely p/e (price/earnings) ratio of the sector (the reciprocal of the capitalisation rate) and the time period over which changes are likely to occur must also be considered. In terms of the p/e ratio, the analyst will be looking for signs that indicate that the share will be re-rated. A decision that the capitalisation rate for the sector, relative to the market, is incorrect has obvious implications. However these implications must be tempered by an estimate of how long it will take the market to re-rate a particular share or sector. If the realisation is going to be protracted there may well be more profitable avenues for investment.

emphasis is placed and it is this that the analysis finally considers.[1]

In its most extreme form fundamental analysis sees the intrinsic value of a security as the present value of all future cash payments to be paid on the security. The assumption is that cash payments (dividends) determine a security's value. Retained earnings are not included in the discounting.[2] This approach (due to J.B. Williams{105}) is strictly a long term approach. If V is the value of a share at time t; and D_t . . . . D_{t+n-1} the dividends received in each year from 1 . . . . n then

$$V = \frac{D_t}{1+r} + \frac{D_{t+1}}{(1+r)^2} + \frac{D_{t+2}}{(1+r)^3} + \ldots + \frac{D_{t+n-1}}{(1+r)^n} \ldots \infty$$

The problem becomes one of estimating D_t, D_{t+1} and so on, in the future. Modifications have been suggested such as substituting $e_t p$ for D_t, $e_{t+1} p$ for D_{t+1} and so on where p is the payout ratio and e_t is the normalised[3] earnings per share in period t. Further sophistications allow the growth rate for a number of years to be estimated and then at the end of this period, for earnings to grow at the historical rate for

---

1. Earlier discussion has indicated that the interest of the analyst should be (and is to a certain extent) to secure private information. The extensive empirical evidence in favour of the Efficient Market Hypothesis suggests that the market price of a stock discounts all available public information; to be successful the analyst must therefore look for sources of information not generally considered and in valuing stocks should be interested only in the effect of new information on the market price. Actual behaviour does not reveal such single minded behaviour. In some cases only new information is evaluated but in others analysts tend to examine and re-appraise recent events affecting the company even though the Efficient Market Hypothesis indicates that these events are discounted in the stock price. Analysts frequently feel that the 'market has got it wrong' and act on this belief.

2. It is argued that they produce dividends later and if they do not, then this is of no consequence since a share is worth only what you can get out of it.

3. Normalised since all estimates are based on this figure and unusual influences could be a severe distortion.

for the economy.[1] It is also necessary to estimate the discount rate, r. It would seem reasonable to base the estimate of r on the long term historical yield of shares, with adjustment according to an evaluation of the risk assumed.

The information involved in the analysis consists of a forecast of present normal earnings, a forecast of the growth rate of earnings per share, the length of time this growth is likely to be continued, the growth rate forecast thereafter, an estimated payout ratio and finally the discount rate. The intrinsic value of a share can then be calculated on the assumption that one expects to earn the adjusted discount rate. Such an approach allows considerable experimentation with appropriate values for variables.

The assumption that a stock is being bought to hold indefinitely may easily be relaxed. If the stock is to be sold in the foreseeable future then the receipt of dividends will come to an end and there will be a receipt of the proceeds of the sale.

$$\text{Intrinsic Value} = \frac{D_t}{1+r} + \frac{D_{t+1}}{(1+r)^2} + \frac{D_{t+2}}{(1+r)^3} + \frac{p_{t+3}}{(1+r)^3}$$

for a three year horizon. How is p_{t+3} to be estimated? One approach is to use the share's intrinsic value at that date - the discounted value of dividends thereafter. Is this realistic since it assumes that price and intrinsic value are the same in three years' time? All one can say is that it is likely to be the best estimate available of price in three years' time.

This approach to equity valuation has been stressed, not because analysts follow it explicitly in all their calculations, but because it illustrates

---

1. If a stock was allowed to grow at an above average rate indefinitely, it would eventually become the only stock of consequence. In that case one would expect it simply to grow at the historical rate for the economy.

many of the variables they are trying to estimate.[1] Quite obviously the crux of the security analysis problem is the estimation of future growth rates whether of earnings or dividends. No future dividend earnings stream can be foreseen with complete confidence and it is necessary to turn to the consideration of the information that helps in the evaluation of these streams. Estimates of the discount rate (r) are also difficult since the discount rate is likely to be some function of the returns available on alternative investments and the risk involved in each stock examined. The quantification of risk involves numerous factors including the analyst's confidence in growth rate projections and price in some future period as well as his confidence in how long the growth will persist.

Having established the main variables the analyst is interested in, it is possible to consider one of the main sources of information - the company accounts. A number of financial services summarise the accounts data of the majority of British Companies. The more sophisticated services are increasingly supplanting the internal analysis (of the investment managers) that has been common up to the present. However in order to draw attention to the factors considered particularly relevant in the office under investigation, their own internal standardised format is reproduced as Appendix 5. Two years' historical data are generally considered sufficient

---

1. The cross sectional regression analyses carried out by several of the larger stockbrokers to predict the theoretical price earnings ratios are similar to this intrinsic value approach. The theoretical price earnings ratio is simply the intrinsic value divided by current earnings. In both cases it is assumed that what makes a stock valuable is what an investor thinks he will get for it in terms of dividends. In turn the level of dividends is determined by a forecast of earnings and the dividend payout ratio. One difference arises in that the regression approach is essentially a relative value approach. It ranks stocks as over or under valued. The intrinsic value approach has no such automatic mechanism.

   How much interest is paid to the stockbrokers' regression models? The answer is not simple. Few institutions use them automatically buying all the shares that are undervalued but they are probably important for drawing attention to stocks that appear to be out of line with the market. In any event the instability of the coefficients and their extreme sample sensitivity make them tricky tools to use.

and space provided for estimates for the next accounting year-end.

This particular format considers sales and wages costs first before moving on to consider earnings. The latter are generally broken down into a number of categories so that figures for cash flow, depreciation and equity earnings are readily available. The analyst is then in a position to consider the operating ratios of the firm. The data are not considered in isolation. The standard format provides a basis against which most companies are analysed. Over time a picture is built up of likely values for the various ratios within a firm, relative to all firms, and relative to similar firms' ratios. Ratios such as operating profit to net sales and per employee provide information on the operating efficiency of the firm whilst consideration of net sales per employee, net sales to stocks and similar ratios, provide evidence of the competitive position of the firm.[1] A similar approach is used to consider the financial position of the firm.[2]

The accounting data give valuable insight both into the financial structure of the firm and into its prospects. The aim is to forecast earnings growth on a per share basis. Economic reports on the industry and news comment

---

1. Some evidence as to the importance of ratios may be adduced from the fact that the investment managers commissioned a stockbroker to calculate sales/wages and wages/profit before tax figures for more or less all the major companies. These figures were then used to pick out shares and sectors that were considered least likely to be affected by wage cost inflation.

2. The particular ratios here are by no means sacrosanct. Several stockbrokers provide a rather more detailed and sophisticated analysis including charts showing the values of the variables for a firm relative to their main competitors. However the principles remain the same, as do the necessary cautions. Accounting standards between companies vary - many methods of adjusting earnings and profits are arbitrary. Inventories, Depreciation and Research and Development are well known problem areas.

   Standardised methods of analysing accounts help to point out some of the difficulties and to pinpoint areas for further investigation. The analyst must reduce to a manageable few the vast number of differences between companies in terms of financial details. The general approach is to prepare an analysis in the standard way and then in the comment to pick out particular quirks of the accounts and hence reasons for being cautious or optimistic.

may also provide valuable information on this variable. However, much is said to depend on the quality of the management and whilst financial ratios can be of assistance in determining its quality the preferred method of assessment is company visiting. This belief in the quality of management assumes firstly that a company's management can systematically affect the company's performance and secondly that 'good' management is identifiable. A variety of qualities have been claimed as indicating good management.[1] In assessing these factors the historical record is of some relevance. So also is trade and press comment, but ultimately the analyst has to rely on a discussion with the managing director and chairman. From the answers given to questions on the company's achievements and plans for the future it is necessary to judge the quality of the management. Undoubtedly some analysts have a flair for this analysis. Questioning on matters of earnings may well reveal ignorance and inconsistencies which lead one to suspect the quality of the managers. They may also reveal information of considerable relevance to the analyst, not disclosed in the accounts.[2] Company visiting might then be seen as a method of securing private information. However, whilst the assessment of company management should be the prime factor in company visiting there is a tendency to gloss over the qualities of the management and seize upon particular statistics relating, say, to sales and earnings. Company visiting may be seen as a game of bluff. The manager wants to convince the analyst that the company is growing and increasingly profitable. He attempts to understate the problems and overstate the benefits. The analyst generally wants specific

---

1. See for example P.H. Dutter {31} .

2. In at least one case, such questioning revealed the precise areas in which the company was losing money and why. It also revealed not only that the company was aware of the problems and had set in motion a mechanism to solve them, but also the time it was expected to take. Some of the information was public to the stock market. Certainly most of it was known to the trade, but personal interview brought home its significance for company earnings and allowed an accurate assessment of next year's earnings to be made.

details on company operations on which he can base his projections. It is not difficult for the questions about the quality of the management to become hidden by less relevant considerations. A side-benefit of company visiting is that it allows the analyst to ask about competitors and suppliers and so obtain additional information on the industry as a whole.

It is worth summarising the discussion so far. The analyst is interested in estimating earnings per share of a company and other important variables such as the capitalisation rate. He is also interested in the financial structure and the management team. Information on these components is obtained by analysing company accounts and other published information as well as by visiting the management. The analyst uses this information to try to predict company earings at least for the next financial year, which may well have only a few months to run, and possibly for several years in the future. He will probably estimate a range for the share price and say whether a share is under- or over-valued. It then remains to consider how soon the market price will adjust to this predicted price. The speed of adjustment has implications for yields from investments. It is this element that is the most difficult to judge. However correct the model may be , unexpected favourable and unfavourable short term events may cause the actual market index to move substantially above or below the level justified by more fundamental considerations. In general the best the analyst can do is to provide subjective appraisals as to the likelihood that prices will adjust within a specified time period. The stock assessment process is thus by no means purely mechanical; the analyst is considering all the time influences on the market, industry and similar firms which will interact with the more specific company information and affect the prospects for the stock.[1]

---

1. Although there is little explicit consideration of risk and variability several fund managers and analysts claimed that within their minds they have fairly clear-cut reward-risk ratios associated with particular shares. There were certainly clear indications that upside potential and the

Implicitly the discussion so far has been in terms of British equities. Nothing has been said, for example, about the evaluation of bonds and convertible loan stocks. The former have not been discussed because relatively few bonds were bought by the organisation under study (at least in the period considered.) Their experience with government bonds on a short term basis had generally been unhappy. Certain funds bought bonds to secure tax advantages, but the selection was left to the fund manager; the proportion of office holdings was small. Industrial bonds and debentures have also been of little importance, although serious undervaluation might result in some buying. However, convertibles present an interesting mixture of equity and bond. They confer the privilege of exchanging the bond for a specified number of shares should the bondholder find it to his advantage to do so. Pricing of convertibles must therefore attach a value to this privilege (which will be closely allied to the likelihood of the stock's price rising substantially) and a value to the income characteristics of the bond. If an analyst considers a share likely to rise substantially in say the next two years, purchase of the convertible may well yield considerable extra income in the meantime as well as substantial capital appreciation. Convertible evaluation may therefore be regarded as an extension of the ordinary share evaluation. It is usually regarded in the office investigated as a cheap way into the shares rather than as a means of income protection.

More details of particular types of investment evaluation could be given. No mention has been made of private company investment, options, warrants, letter stock or underwriting; several of these are undertaken. However, investment in them is limited in extent so that there is little to be gained from investigating the methods of evaluation employed on them. In any case the analyst's role in essence remains unchanged.

Chapter 7

Portfolio Evaluation

An important goal of investment management is superior portfolio management.[1] Such a goal implies the ability to assess the success of different portfolios and points to the significance of portfolio evaluation. Portfolio evaluation entails the comparison of the ex post performance of investment portfolios with the object of improving the methods and technique used in selecting particular portfolios as well as throwing some light on the abilities of analysts and fund managers. It provides a description of historical results and hopefully insight as to future results. The measurement of portfolio performance has in fact no unique meaning. Campanella{14} for example distinguishes between the portfolio manager's ability to maintain a portfolio consistent with a stated investment objective such as risk level, income characteristics or liquidity and the portfolio manager's ability to perform successfully. This he suggests might consist of standards designed to measure his ability to minimize risk through diversification, to predict and take advantage of market turns, to buy undervalued and sell overvalued securities or to correctly weight and time purchase and sale decisions. Until now measurement procedures used by institutions have been cruder than this division suggests. The object has been simply to indicate portfolios that have performed better or worse than some standard with little or no allowance made for the cause of the difference in performance. At best, risk has only been allowed for by restricting comparisons to portfolios with similar objectives.

This chapter considers some of the methods that have been used or suggested for performance measurement. It does not consider the results of applying

---

1. Where superior implies performance at least as good as that of an unmanaged portfolio, such as the market.

these methods.[1] For convenience the exposition is divided into two sections. The first considers simple return measures which take no account of risk, in particular the internal rate of return and the unit methods of calculating returns. It also considers some of the advantages and drawbacks of the usual index comparison standards. The second section considers composite measures based on capital market theory, in particular the Sharpe and Treynor methods which consider both the risk and return of a portfolio.

The importance of this chapter for a positive theory of investment lies in its ability to throw light on superior portfolio management. The desire for superior performance implies that portfolio evaluation must be an essential part of the portfolio management process. The methods by which superior performance is measured are obviously important. It is apparent that consideration must be given not only to the conventional cautions, such as the time periods comparisons cover, but also to the effect of risk on returns. In this respect most portfolio measurement up to the present has been deficient.

Portfolio Returns

There is no one unique method of calculating portfolio returns. Unit trusts subject to a continuous flow of capital into their portfolio require different procedures from investment trusts. Both are assumed to be measuring their rates of return, which include both dividends and capital appreciation although for short-run comparisons dividends may well be omitted.

A common method of comparing portfolio performance is the internal rate of return method.[2] This measure implicitly assumes that the inflows into a

---

1. For an illustration of the important conclusions that may be derived see Sharpe {85} and Jensen {50}.
2. See for example Archer & D'Ambrosio{3} K.V. Smith{89} and R. Levy{60}.

portfolio are reinvested at the calculated rate of return.[1] The internal rate of return (IRI) is the solution of the polynomial

$$\sum_{t=0}^{T} \frac{F_t}{(1+Y)^t} = 0$$

where F_t is a series of periodic flows. F_0 being the initial market value of a portfolio, and F_T the ending value. $F_t < 0$ indicates a capital addition whilst $F_t > 0$ indicates a withdrawal at period t. Y is the internal rate of return for which a solution is sought. If the time periods t are quarterly then Y is the rate of return per quarter. The IRI method provides information as to how fast a portfolio is building up. Thus if the IRI was higher than some expected or assumed return, the capital contributions needed to provide the same final income could be reduced. It is more likely to be useful to charities and pensions than to unit trusts.

The unit trusts are more interested in measuring the performance of the investment manager. If a unit accounting method is used and if the portfolio's value on each date a capital inflow occurred is known then the manager's performance quarter by quarter (presuming inflows are quarterly) can be calculated (in terms of rate of return). The portfolio at time 0 is considered to consist of n units. When an inflow (outflow) occurs the total number of units increases (falls). Over a quarter however the number of units is constant.[2] At the end of each quarter the value of each unit is calculated and hence for each quarter a unit's change in value is known. An overall rate of return is provided by the geometric mean of these

---

1. Note this measure gives conflicting answers in certain circumstances where the cash flows alternate in sign. Such problems are ignored here; they are of little practical importance in the cases dealt with.
2. The inflows (outflows) only occur at the end of each quarter.

quarterly changes.

$$\text{yield} = \left(\prod_{t=1}^{T} \frac{V_t}{V_{t-1}} \right)^{\frac{1}{T}} = \left(\frac{V_1}{V_0} \cdot \frac{V_2}{V_1} \cdot \ldots \cdot \frac{V_T}{V_{T-1}} \right)^{\frac{1}{T}}$$

$$= \left(\frac{V_T}{V_0} \right)^{\frac{1}{T}}$$

where V_0 is the value of a unit at the base period

and V_T is the value of a unit at time T

This method removes the advantages of heavy contributions to the fund at low points of the stock market and the disadvantages of heavy contributions at high points in the cycle.

This geometric mean calculation can obviously be applied to any portfolio where the inflows into a fund are small. Investment trusts may well find it convenient to use such measures although the IRI method is equally applicable. It is assumed in investment trust calculations that one is only trying to value the underlying assets of the trust. The share price may be at a premium or discount to these assets.

A number of other difficulties occur in the measurement of performance. There is for example the problem of foreign stocks in a portfolio. Is it appropriate to calculate the value of American stocks with or without the dollar premium particularly since part of it must be surrendered on sale?[1] Similarly, valuation of private companies is rather arbitrary and can be very important. How, for example, do you value a share-dealing subsidiary? Nor has the problem of time been considered anywhere. Starting dates for comparisons are often unfair and rather arbitrary. Since they make a

---

1. Such problems come into the same category as gains taxation generally. They are exactly analogous.

substantial difference the preferred method is to calculate performance over a number of periods. Outstanding performance is likely to be of real value only if it is consistent.

On their own, calculations of performance are of little relevance. A popular method of comparison is with an index.[1] The most usual type of index is an arithmetic mean of prices weighted according to the market value of the company at the base date. It may be interpreted as a weighted (by size) portfolio of stocks bought at the base date and held. It corresponds to a buy and hold type of strategy (that is, no change in a portfolio). Similar in conception are the F.T. Actuaries Indices. These might be termed periodic reallocation indices, reallocation of security values taking place when a capital change in one of its constituents takes place or a constituent is replaced. It is intended not to represent a fixed and static portfolio but to measure the changing value of a portfolio similar to the market.

The F.T. Industrials index on the other hand is a geometric mean index. Under certain assumptions it represents a portfolio in which the value representation of each stock is kept constant.[2] This type of index continuously reallocates the portfolio so that for an unweighted index equal pound amounts are maintained in each stock. When a stock rises in price part of it is sold and the money reallocated between the stocks so that equal amounts are maintained in each.[3] Apart from the difference in assumptions of these indices there is also a significant difference in their samples. The F.T. 500 index, for example, excludes the financial sectors. Choice of index for

---

1. Although only indices are described in what follows, other performance standards are available, such as portfolios of investments selected at random and the use of the long term rate of return on investments.
2. In particular it assumes that the price series is continuously differentiable see Rich {77} , and Latane, Tuttle & Young {58}.
3. The geometric mean index is always lower than the arithmetic mean due to the variability of prices of the component stocks. Cootner {22} has vigorously attacked its use and argues that any widely diversified portfolio is likely to surpass such an index.

comparison purposes should not be automatic. It should depend on the purpose for which it is required. In certain circumstances a buy and hold strategy is likely to be most appropriate. In other cases a periodic reallocation strategy is more representative.

The question arises as to whether it is appropriate to use any of these indices for a portfolio, such as an investment trust portfolio, that contains a substantial foreign element. In so far as one is simply judging the relative merits of one investment against another, what causes the difference in performance (e.g. N. American holdings) may be of little relevance. However, if one is interested in future performance and improving performance it may be very important to know. One possible solution is to compare investment trusts with an investment trust index, but this is unlikely to be satisfactory since investment trust share prices do not exactly reflect the asset values of the underlying portfolios. The difference (the premium or discount) reflects in a sense the stock market's optimism or pessimism about the trust's future performance and is indicative of the value the market puts on the trust's management record, gearing, foreign holdings and other similar variables. Another possibility is to divide the portfolio into segments and compare each of these in turn. The portfolio's American holdings may be compared with a suitable American index to give an indication of how well the managers have done in this segment. Similarly, the portfolios may be broken down into equity and bond sections and appropriate comparisons made. However the problem of comparison remains for companies which are not publicly quoted.

Considerable attention is paid by the investment managers to some of the indices and to some of the performance comparison problems that have been described. It is considered important to know how well a fund manager's performance compares with his objectives and with the performances of other fund managers. Performance measurement may also provide material for

improving future decisions, and of course it gives the investors a means of comparing different funds so that resources may be switched accordingly.

A particularly important use of indices in the organisation investigated is for the comparison of portfolio performance against the performance of an equivalent index. This use was given further impetus by computer programmes similar to that compiled by Fox for Mobil Oil.[42] For each fund being considered, a broad based Index equivalent investment is created. Whenever a security is bought or sold, an alternate hypothetical investment or liquidation is made in this index. Similarly whenever contributions (withdrawals) are made to the fund, equivalent units are invested (sold) in this index. Commissions are charged on the index purchases to allow for brokerage fees whilst dividends based on the dividend yield of the index are assumed paid and reinvested monthly. To obtain a complete range of performance information the model is used over three different time periods. Examination of the most recent quarterly results gives information on short term trends such as cash holdings, new areas of concentration, turnover, adaptability to present market conditions and the discounted rate of return equivalent to an index investment. Evaluation of annual trends and longer (3 - 5 years) performance is also possible.

It is perhaps worth considering the industry procedure in more detail. For each security information is known about purchases, sales, capital issues, dividends and interest. Each stock is assigned to an industry and in the original programme to broad categories such as growth, cyclical or defensive. When a stock purchase is made the same amount is hypothetically invested in the corresponding industry index as well as in the market index, with suitable adjustments for brokerage. When the stock is subsequently sold the profit (loss) over the time held is calculated for the stock, for the

equivalent industry and for the market. Comparison of these figures enables one to draw conclusions about the strategy and tactics of investments. If the industry index had outperformed the market then the right strategy had been adopted whilst if the stock had outperformed the industry the right tactic had been chosen.

The analysis is carried out for all stocks and industries and for the market. It could also be carried out for the cyclical portion of the portfolio, or whatever else is considered appropriate. Further refinements of the methods are obviously possible, but are not considered here. What must be stressed is that consistency of performance is the target. Spectacular short term performance is of little merit in itself. It may merely be due to chance.

Consistent long term performance may well denote a high level of risk. It is this that the analysis now considers. Before doing so, however, there remains one method of performance evaluation used extensively that has not explicitly been mentioned. This is the method of price relatives. Typically dividends are ignored and funds plotted graphically daily or weekly, relative to the market. Above 100 (or 1 or whatever the base figure is) and rising, indicates a desirable fund - outperforming the market. Since different funds have alternate objectives they tend to be grouped into similar categories (such as growth funds). The charts give a visual impression of short and longer term performance. To some extent they are inappropriate. Starting dates are often unfair, whilst there is also a tendency for events such as the payment of capital gains tax to reduce the price relatives rather erratically. However, considerable attention is paid to them and plunging price relatives often serve as the first indicators that portfolios need attention.

Performance Comparisons and Risk

The measures discussed so far have not allowed for risk in their calculations, but it is possible to utilise the capital market theory discussed in an

earlier chapter to construct composite measures which consider both a portfolio's risk and return.

One such measure is Sharpe's[85] reward to variability ratio $\frac{A_p - R'}{\sigma_{p'}}$ which may be interpreted as the excess portfolio yield per unit of ex post risk, where A_p is the average rate of return for a portfolio, R' is the actual pure interest rate and $\sigma_{p'}$ is the standard deviation of actual rate of return of a portfolio.[1] The higher the value of this ratio the better the performance of the portfolio during the investment horizon. The result can be illustrated diagrammatically (Figure 7.1). Points i and j represent the performance of portfolios i and j. In terms of average return portfolio i is better, in terms of variability j is better. By borrowing and lending at the pure rate of interest investors can reach any point along R'_iY or R'_jX. Clearly the latter dominates. Hence a natural measure of performance is the slope of the line associated with the portfolio. The slope of the line is the $\hat{r}$ward to variability ratio.

The risk term in Sharpe's ratio may be decomposed into a systematic and a residual risk component. Most institutional portfolios are well diversified so it is likely that most of the unsystematic risk has been diversified away

---

1. Note the relationship to the capital market line which was shown in chapter 5 page 57 to have slope $\frac{E_M - R}{\sigma_M}$ or in ex post values $\frac{A_M - R'}{\sigma_{M'}}$. Now if $A_p = E_p$ $\sigma_{p'} = \sigma_p$ and $R' = R$ then all portfolios that are ex ante efficient will also be ex post efficient. All such portfolios will lie along the capital market line in the ex ante case or its empirical counterpart in the ex post case. In fact it is unlikely that predictions will equal outcomes. However if one assumes predictions to be unbiased the reward to variability ratio of highly diversified portfolios will vary randomly around the value associated with the predicted capital market line. Persistent differences among reward to variability ratios will arise only in cases involving inadequately diversified portfolios.

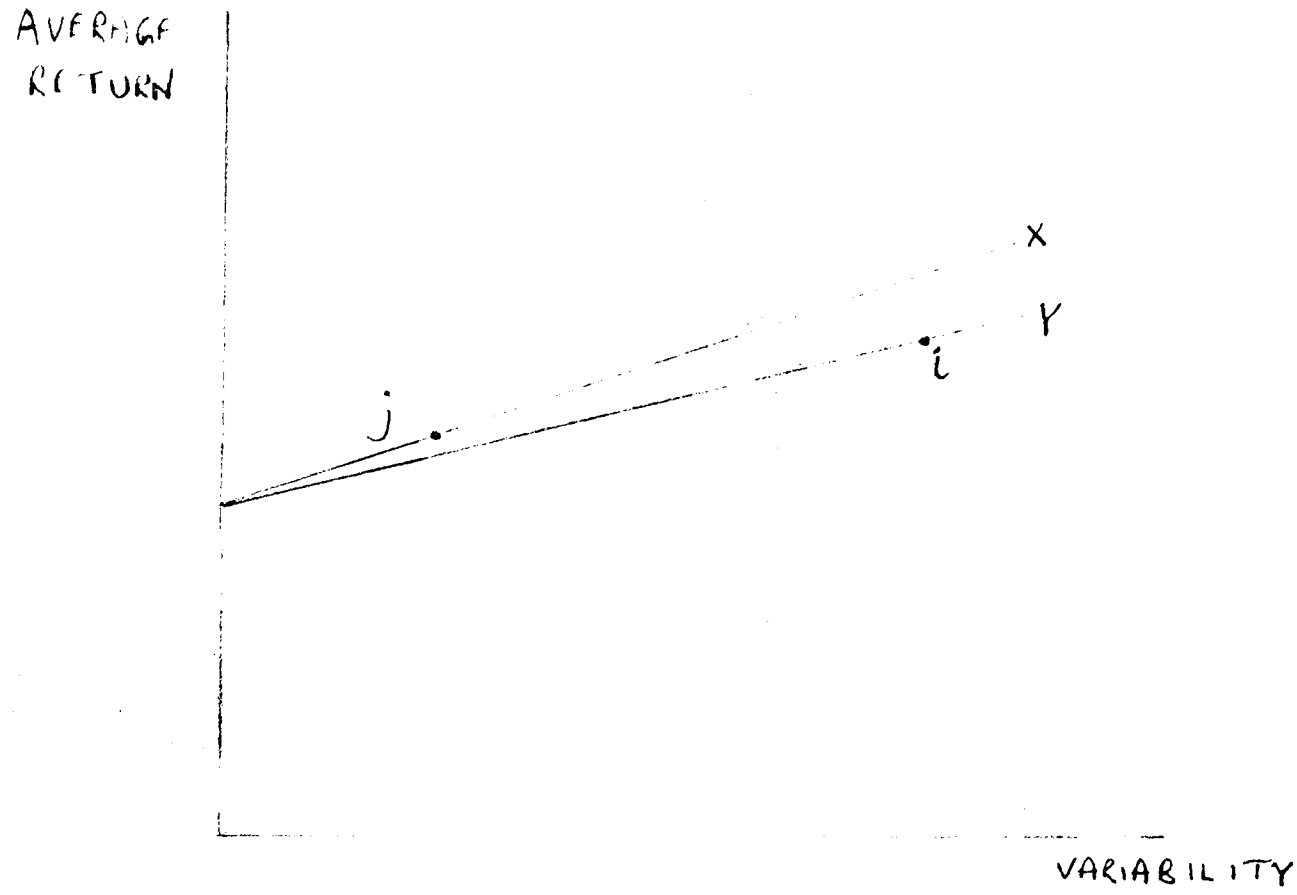


Figure 7.1

and only systematic risk remains. Hence the slope of the characteristic line - Treynor's[97] term for the line resulting from the regression of portfolio rate of return against the market rate of return - may be taken as a measure of ex post risk. The characteristic line portrays the responsiveness of portfolio yield to changes in return obtainable from the market. The component of total variation explained by the line is the systematic risk. Substituting the slope of the characteristic line (or volatility) into Sharpe's measure[1] gives $\frac{A_p - R'}{b'_p}$ where A_p is the average return on a portfolio, R' is the actual pure interest rate, b'_p is the actual volatility of the portfolio.

---

1. The Treynor measure may be derived from the security market line - the linear relationship between the return on a security (portfolio) and its risk in equilibrium - with slope $\frac{E_i - R}{b_i}$ where E_i is the expected rate of return on security (portfolio) i, and b_i the volatility of security (portfolio) i is equal to $\frac{Cov(iM)}{\sigma^2_M}$; Cov(iM) being the covariance between the return on security (portfolio) i and the return on the market portfolio M, and σ^2_M the variance on the market portfolio.

Treynor showed that rankings consistent with this measure of fund performance could be obtained directly from the regression coefficients of the portfolio's characteristic line (portfolio returns (R_p) are regressed on returns from the market (R_M), that is [1], $R_P = A + B_p R_M + e_p$) so that $\psi = \frac{R' - A}{B_p}$. The smaller the value of ψ the better the ex post performance of the fund.

Diagrammatically ψ is defined by the intersection of the characteristic line and a horizontal line through the risk free rate. (Figure 7.2.)

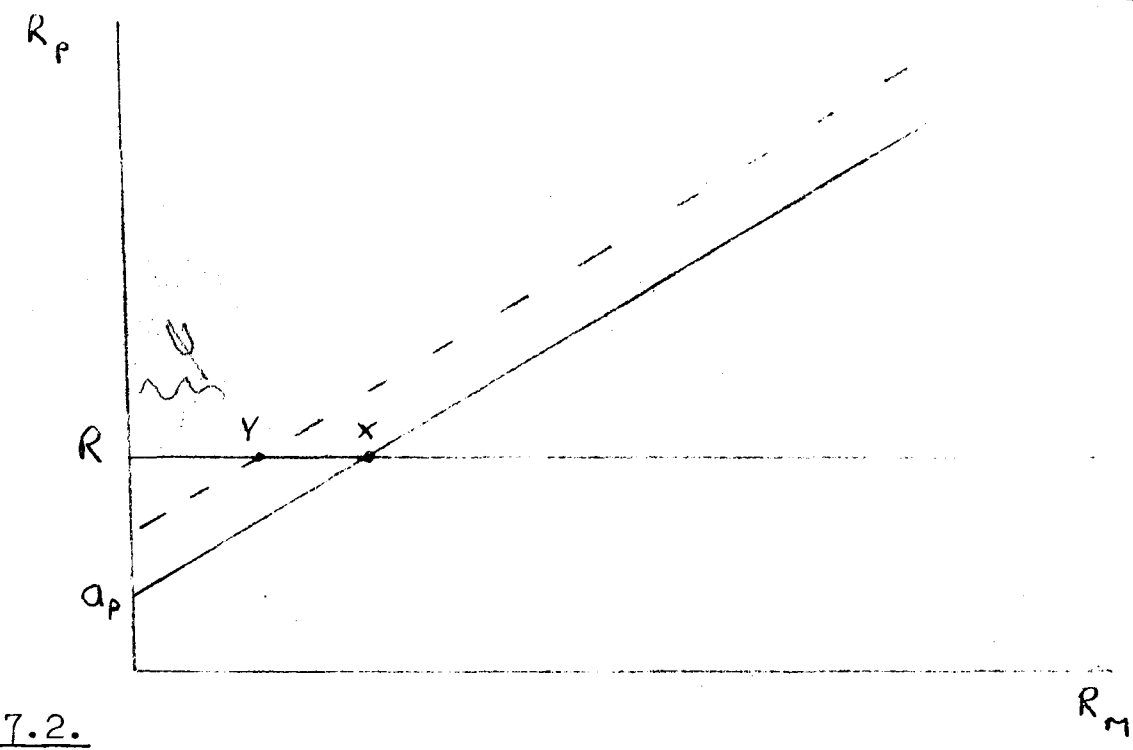


Figure 7.2.

If two characteristic lines were exactly parallel then the one higher in the space would exhibit a lower ψ and thus preferred performance. The Treynor ranking measure may be seen as the distance RY or RX. A smaller distance is preferable to a larger distance. Even if fund volatilities differ, funds with a smaller distance are preferred since they may be combined with the risk free asset to give the same volatility as a fund with a larger distance, but a higher return. Comparison with the market is facilitated by construction of a market characteristic line at 45° to

---

1. It is assumed that the e_p's are random errors and $E(e_p) = 0$, $Var(e_p)$ = a finite constant, $Cov(e_p, R_M) = 0$ and $Cov(e_{pt} e_{pt+k}) = 0$. It is the expected value of the equation that is termed the characteristic line.

the origin. (Figure 7.3) Combining the market portfolio with the risk free asset allows a direct comparison between a fund and the market

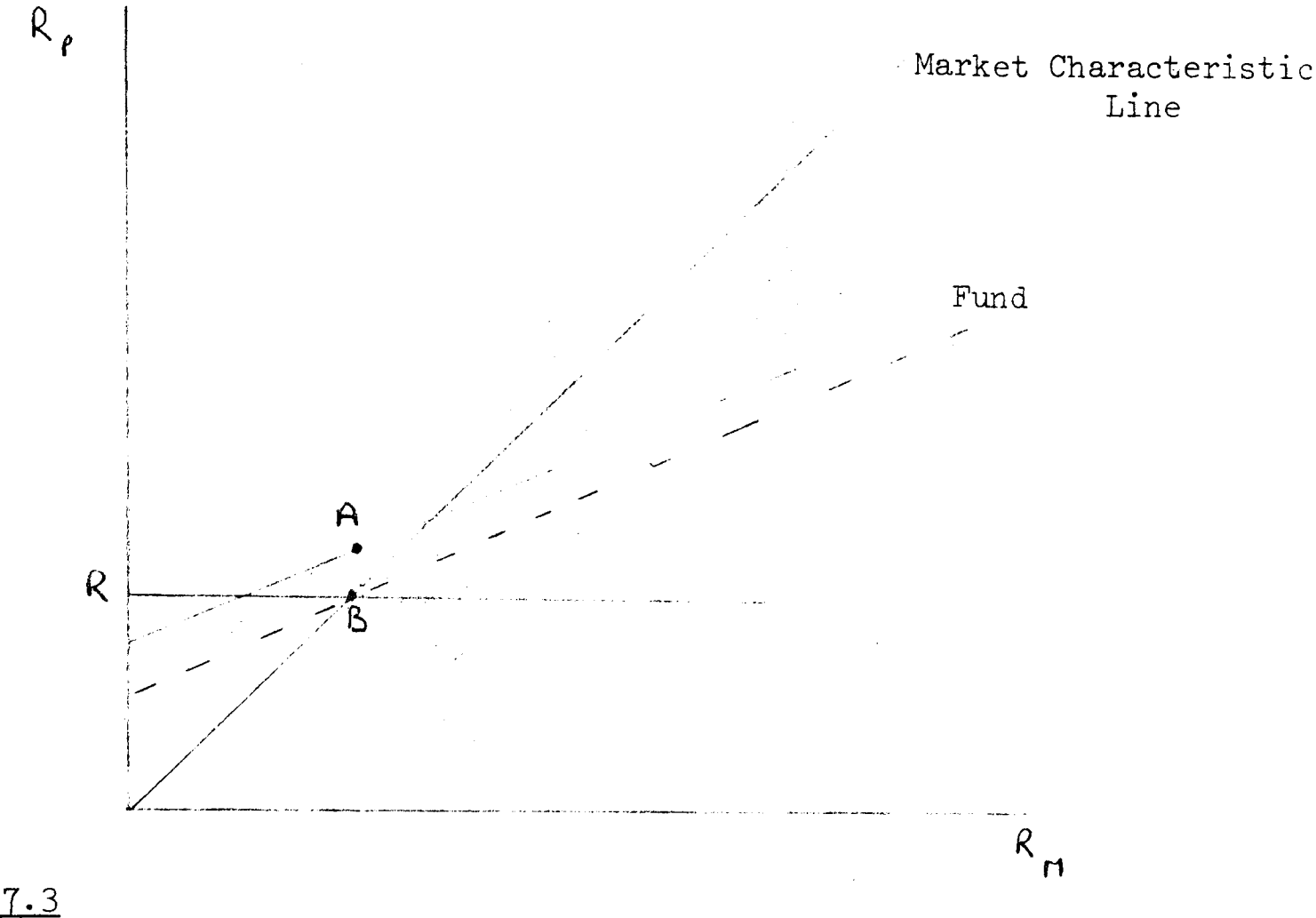


Figure 7.3

portfolio. AB represents a measure of the difference in return by which the fund outperformed the market. This measure is closely analogous to a composite measure proposed by Jensen {50}.[1] The Sharpe and Treynor measures may be shown to be consistent if a fund is assumed to be perfectly diversified[2] and in general empirical studies have shown all three measures to be very highly correlated (e.g. Smith and Tito {90}).

These measures of performance are not of course without their problems. Two particularly important assumptions are that portfolio volatilities are stationary over time and that they are invariant with respect to the length of time interval over which the returns are measured. It is not intended

---

1. Jensen assumes that portfolios are well diversified such that residual risk is zero. His measure is akin to Treynor's and may easily be related to it (see {90}).

2. See for example {90}.

to explore these areas here. The discussion has been intended to point out some of the newer methods of portfolio evaluation that are now being applied and to indicate the deficiencies in some of the more traditional methods of portfolio evaluation. Performance comparisons which make no allowance for risk are second best measures in most situations and do not allow performance comparisons to be as objective as one might wish.

....

This discussion of performance concludes part one. This chapter and those preceding it have each examined different aspects of portfolio decision making within an investment management organisation. They have attempted to outline the main factors governing investment decisions, whether arising from the structure of the institution, for example, the influence of the directors on investment decisions, or from a deliberate investment strategy such as the demand for large concentrated portfolio holdings. Part two goes on to consider one such strategy more exhaustively. It provides evidence on the value of sector selection as an investment method as well as examining the extent to which the managers actually make use of it. The assessment of the different strands of the investment process is therefore left for the present; the threads are best drawn together at a later stage when material from part two can also be considered.

PART II

The importance of Sector Selection in Portfolio Performance

Chapter 8

Sector Selection

Earlier chapters have already indicated that scepticism of the importance of some of the influences affecting decision making in an investment management organisation led the author to make a detailed analysis of one particular aspect of the managers' investment philosophy. The aspect considered, the selection of shares by their sector characteristics - a technique thought by the managers to be particularly useful and valuable - is the subject of this and the succeeding three chapters. This chapter sets the scene for those following. It attempts to outline more precisely than previously, the definition, meaning and advantages of sector selection, and also explains the hypotheses and tests examined in subsequent chapters. This is followed by a survey of the relevant published academic studies.

The Logic of Sector Selection

The rationale for the classification of a group of firms as an industry is generally their similar output or technology.[1] This similarity in product or production technique suggests that some of the factors affecting the individual firms may be common to the industry as a whole, an idea reinforced by bargaining at the industry level between the employers and the employed on wages, and between the Government and the manufacturers on taxes, aid and legislation. Common products and techniques are not of course the only similarities between firms. From a wider viewpoint, the common economic environment facing most companies leads one to expect economy-wide influences which affect the great majority of firms. Similarly individual differences between firms, even if only of a geographical nature, suggest the existence of influences unique to particular firms. One is thus led to distinguish between market, industry

---

1. Classification by output or technology is by no means the only grouping possible. Aggregating stocks by their growth rates, their share price volatility or some other criteria might in certain circumstances be equally useful.

and unique influences on individual companies, a categorisation that immediately suggests a variety of possible investment techniques in which the investor's preferences depend on an assessment of the importance of each set of influences - market, industry and unique - as well as on his particular investment skills.

The origin of sector selection may now be seen clearly. It arises from the investor's belief in the importance of industry influences on the company, or more precisely on company profits or share price, and the possibilities of applying this knowledge to select superior portfolios. It reduces the investor's task to the selection of those industries that will perform well and the conscious weighting of portfolios toward some sectors and against others. Industries are related to overall economic and social influences in an attempt to determine those areas in which shares are likely to show the greatest profit.

The sector selection technique implicitly assumes that the firms in a sector move together. This does not mean that the share prices in a sector are at the same level, or that they move together in terms of absolute amounts, but rather that the proportional price changes of the constituent firms are much the same. These price changes may be considered as proxies for the rate of return[1] (yield) on the shares, the variable which in a taxless world would ideally be the one considered.[2] Well defined homogeneous sectors will exhibit a high degree of

---

1. This is computed using both the dividends and capital gains on a share. Consequently the length of time over which a price change is being considered may well be an important influence. Over different time horizons the elements of price changes due to the sector characteristics are likely to vary so that the appropriate strategy may alter. For short time horizons one might expect the individual share component to be the most important (due to random fluctuations in prices). Similarly over very long time horizons as firms change their products and move between industries, the effect due to the firm itself is likely to be dominant. In the medium term however it might be that sector selection is the dominant influence since chance fluctuations in prices are much less significant whilst even good management is unlikely to be able to change processes and plants quickly. Hence performance may correspond to that of the industry as a whole.

2. The existence of differential rates of tax between income and capital gains confer advantages to higher tax payers who receive capital gains rather than dividends. In consequence, price changes rather than gross rate of return figures in which dividends are a large component are more representative of returns to these tax payers.

correlation between the rates of return of their component firms. Ill defined, heterogeneous sectors in contrast will exhibit a low degree of correlation between rates of return.[1]

An important implication follows from this correlation between companies. If within the same sector the yields of individual shares are highly correlated, then the selection for a portfolio of more than one share from the sector is likely to contribute little to the reduction of the financial risk of the portfolio. The existence of well defined, homogeneous sectors[2] enables the investor to secure a diversified portfolio easily, quickly and cheaply by simply choosing one share from each of several sectors.[3] Clearly in this case sector selection is an information saving approach. It allows a reduction in the evaluation of possible investment opportunities so that portfolio construction may be framed in terms of a few simple decision rules.[4] The analyst is faced with a choice between industries rather than between shares.

Unfortunately two influences are at work to reduce the usefulness of the technique. The first is the existence of heterogeneous sectors with consequently relatively low correlation between the sector components. The second is the requirement imposed on fund managers by law, the office philosophy or marketability which prevents them from holding large amounts of any one share. Faced with these two influences, one possible strategy is to include in a portfolio several shares from a sector in an attempt to secure the average performance of the sector.

---

1. Sector size has so far remained unspecified. A relationship is likely to exist between sector size and heterogeneity. Larger sectors in terms of number of companies generally imply less precise definition of the sector and hence greater variation in the constituents.
2. Assuming that the sectors are orthogonal or negatively correlated.
3. The analysis also has implications for share prices. If for example two assets are perfectly correlated and have the same variance, profits are to be made by buying the share with the higher yield and selling short the share with a lower yield. Such behaviour is likely to adjust prices so that yields in a sector are equal if the shares are perfect substitutes.
4. In terms of capital market theory it allows the analyst to construct a portfolio that is a proxy for the market portfolio easily and cheaply.

Then, provided that the investment managers are able to predict the relative performance of sectors, their overall portfolio performance will exceed the performance of the market as a whole. The success of the strategy depends on the fund managers' ability to forecast sector performance, a matter discussed in a later chapter.

Sector Selection as a Rational Investment Strategy

In defining the nature and purpose of sector selection, a variety of questions were inevitably left unanswered. Three questions may be singled out as of partifular relevance to this study in view of its interest in the construction of a positive theory of investment. Firstly, do sector effects exist or not? Clearly, if analysis reveals that the aggregation of shares on the basis of industrial product or some other easily established criteria is not associated with any effect peculiar to that grouping, there is no basis for selecting shares from one grouping or sector rather than another. To put it another way, if the rates of return of shares within a sector are uncorrelated, then such shares are unlikely to be satisfactory substitutes within a portfolio and the shares must be selected on some other basis than their sector characteristics (which are of little consequence).[1] To provide some answers about the existence of sector effects, regression techniques are used to partition changes in share prices into market, sector and residual components and to provide estimates of the relative contributions made by these factors.

The second question of interest is whether the investment managers do select shares on a sector basis for their portfolios. Observation of their investment

---

1. If little evidence of sector effects is found a number of possibilities exist. The simplest is that the statistical methods employed are not sufficiently sensitive or discriminating (or even appropriate) to identify effects that do in fact exist. Another possible explanation is that the sector classification used is inappropriate and that different, more suitable criteria may be employed by the investment managers. Finally one might argue that both the methods used and the classification scheme are appropriate, and that the conclusion that no sector effects exist is right, but that the investment managers erroneously believe that sector effects do exist and select shares on this basis. In this case the managers are probably rational in their procedures but misguided due to poor information.

decision making process does not reveal a clear answer. The procedure adopted to investigate this question, is to compare the constituents by sector of an actual portfolio with a distribution of securities that might have been expected to occur by chance, given the distribution of securities between sectors over the market as a whole. If the investment procedure used had been to select shares on the basis of their sector characteristics, then on average one might expect substantial divergence between the market and the portfolio.

Thirdly, it may be asked whether the sector selection technique is a valuable one and rewards the managers with above average investment performance. To answer this question an actual portfolio, its constituents selected as before on the basis of sectors, is broken down into components such as the shares held throughout the holding period, the shares bought during the period and the shares sold during the period, and the performance of these components compared with equivalent amounts invested in the appropriate sector indices. A portfolio performance close to that of the sector equivalents, and substantially better than the market equivalents over several periods, would provide some evidence of the success of sector selection as an investment technique.

Taken as a whole the answers to these three questions help build up a picture of sector selection techniques. In particular they provide evidence of its value as an investment technique although additional evidence either directly from an analysis of other portfolios or indirectly from studies of share price prediction, is of course desirable.

A question that remains to be answered is the relationship of the sector concept to the efficient market hypothesis.[1] The problem lies, not in the presence of market, sector and individual firm influences in an efficient market, but in the

1. Many of the studies of share price prediction mentioned previously have provided support for the efficient market hypothesis.

existence of a decision rule (sector selection) that results in above average rewards for given risks. In short the efficient market hypothesis suggests that the likelihood of such a rule consistently providing above average rewards is very small. In the event of the tests employed here indicating sector selection to be a successful decision rule, two explanations are possible. The first and most likely is the failure of the analysis to take account of risk. It has been assumed throughout that differences in risk between sectors are relatively small. This assumption would need to be re-examined. The second possibility is that the investment managers have access to private information that allows them to predict industry performance successfully. A result such as this would provide valuable evidence against the strong-form of the efficient market model (see Fama {37}).

Academic Studies of Sector Grouping

Academic interest in sector selection has until now largely been confined to the statistical grouping of shares. Attention has been centred on the dual question of whether shares cluster into statistically meaningful groups and whether these groups correspond to industry classifications. Prime concern here however is not whether better more meaningful (in a statistical sense) groups can be formed but whether given the existing and widely accepted sectors there are identifiable sector effects. It is this existing sector classification of shares that is of interest in deciding whether sector selection is a valid method of portfolio construction. The distinction between the two questions is of importance in that it determines in large part the statistical methodology employed - Factor Analysis or Analysis of Variance. The primary aim of factor analysis may be thought of as being exploratory. It seeks to discover principles of classification although it is likely that one will start with certain notions or hypotheses that one wishes to test. The statistical analysis takes the form of a verification or refutation of one or more of the hypotheses proposed, and perhaps as well a

modification of the hypotheses in the light of experience.[1] An analysis of variance on the other hand is not concerned with discovering new schemes of classification. The primary objective is to determine whether the difference between groups within an already established classification is statistically significant or not. Factor analysis in these circumstances may well be extremely circuitous and fail to answer the specific question being asked.{ 11 }

The most thorough and comprehensive study to date of industry groupings is that by King { 53 } who applied factor analysis to an observed covariance matrix comprised of series of price changes (monthly and logged). He argued that a piece of information can affect more than one security price change, possibly even the whole market in a given time period, and in consequence the securities will exhibit correlated behaviour to some degree. To investigate this King

---

1. Borch{ 7 } provides a brief, intuitively appealing description of the technique. "Assume that we have n strongly interdependent stochastic variables z_1 z_2 ... z_n which may represent return in n industries. It may then be possible to find a few, say three stochastically independent variables x_1, x_2 and x_3, so that equations of the form

$$z_1 = a_1x_1 + b_1x_2 + c_1x_3$$

$$z_2 = a_2x_1 + b_2x_2 + c_2x_3$$

. . . . . .

$$z_n = a_nx_1 + b_nx_2 + c_nx_3$$

hold with sufficiently good approximation. Here a; b; and c; are constants to be determined so that we in some sense obtain the best possible fit .... It may be possible to give a concrete interpretation to the components or the factors x_1, x_2 and x_3. If for instance these stand for return on investment in the three industries,

1. Automobile production
2. Shipbuilding
3. Aluminium production

it is quite reasonable to assume that return on investment in the steel industry may be determined approximately by an expression such as

$$z = 0.8x_1 + 0.3x_2 - 0.1x_3$$ "

analysed the price changes of 63 stocks both for a period of 403 months and for four sub-periods thereof. He endeavoured to determine whether market, industry and individual firm effects could account for the complex inter-relationships of security price changes, and whether the industry effects corresponded to the Securities and Exchange Commission (S.E.C.) classification.

The factor analysis model attempts to break down the covariance matrix into a common and a unique part,[1] although doing so involves the estimation of communalities. King used the squared multiple correlation (R_j^2) of each share on the others as his estimate of communality and adjusted the covariance matrix appropriately. The adjusted covariance matrix was then analysed by both the centroid and the Guttman-Harris factoring techniques.[2] The results were similar. The mean value for the variance extracted by the first factor for the overall period by both methods was 52% - the typical stock had about half of its variance explained by the element of price change that affects the whole market. However considerable variation was apparent both between industries and over time. Metals and rails were most closely associated with the market and tobaccos least dependent. The time behaviour of the market component of variance was reflected in a downward drift of the sub-period means. Approximately 58% of variance was attributable to the market from June 1927 to September 1935 as against 31% for the period August 1952 to December 1960 indicating the diminished effect of the general stock market comovement.[3] Subtracting these figures from R_j^2 indicates the proportion of variance the industry effects might account for.

---

1. Principal components analysis does not assume a unique part in the model in contrast to the factor analytic model used by King. However whilst the latter is clearly more appropriate in this application, experience suggests that results do not differ markedly by failing to make this assumption.

2. Granger & Morgenstern{46} illustrate the corresponding regression equations to the factor methods used by King.

3. However possible unique influences such as the extreme boom and slump in the first period and the war in the second, both possibly contributing to the larger market movement than in later periods, should be noted.

Removal of the market factor left a matrix of residual covariances that were useful for the following stage in the analysis, a cluster analysis of the transformed residual covariance matrix (that is transformed into a correlation matrix). The new matrix was searched for the highest positive pairwise correlation between two variables. When this was found the two variables were added together to form a new combined variable and the procedure then repeated until all the variables had grouped together. The result was spectacular with the variables clustering according to industry grouping. The most recent sub-period however showed a weakening of industry affiliation.

In addition a multiple factor solution was forced upon the residual covariance matrix, the object of which was to fit a possible factor pattern to a given covariance matrix, and then to reconstruct the covariances so that the reconstructed covariance matrix could be compared with the original. The factor pattern would be accepted as a possible explanation of the observed inter-relationships of the variables if the differences between the two matrices were small enough. The result of this forcing of a pattern on a matrix was considered successful. The high loadings in the proper industry locations and low loadings elsewhere suggested that the market-industry model was adequate. There was for example, no variable in which the appropriate industry factor did not have the highest loading after the market factor was excluded. The computing of the residual covariances and the examination of the proportion of total communality explained would seem to bear out the goodness of the fit.

The final step in the analysis was to use the Guttman-Harris technique to grind out a factor analysis from the data, and then to rotate the factors found orthogonally to obtain as uncomplicated a factor pattern as possible. The result, for the overall period at least, was to bring out strongly the industry groups even though the orthogonality constraint forced the factors to be uncorrelated and so broke up some of the industry clustering.

The several different forms of analysis used by King all tended to confirm that price changes may be broken down into market and industry components. However, a number of criticisms have arisen. The most obvious relate to King's data. For each company monthly changes in price over 33 years were required so that the basic population of securities was confined to those stocks that had been listed continuously over the period - 316 stocks covering 46 industries. In turn, within each industry it was necessary to have sufficient firms to allow industry and individual firm effects to be separable, but not so many firms that only one industry was represented. With a practical programme limitation of seventy stocks, King selected six distinct industries - tobaccos, petrol, metals, railroads, utilities and retail stores. All of these were fairly homogeneous groups and it is of interest to consider what the results would have been if groups such as engineering had been considered.[1] Again as King pointed out the continuous listing for 33 years requirement, restricted the study to mature industries and excluded the unsuccessful firms. However, continuous listing does not guarantee that the behaviour of a particular series is highly correlated with other series in the same industry or even the same market.

Besides the data a number of other criticisms of the study have been made. Granger & Morgenstern contend that the methods used introduce a bias in favour of the market factor and against the industry factor whilst Elton & Gruber[32,33] note problems with King's use of correlation coefficients in his cluster analysis. Criticisms have also been made of the usual assumptions of normality and stationarity in the data.

King's numerous and various applications of factor analysis to the problem all seem to indicate that shares can be grouped meaningfully and that these groups

---

1. King found that metals split up into smaller sub groupings of ferrous and non ferrous metal stocks. The same might have occurred for engineering with the division of a large heterogeneous sector into sub groups by product.

correspond to industries. His study provides a justification for the use of analysis of variance techniques to discover whether statistically significant effects exist for a large number of sectors.

A number of other studies in the area have also been carried out. One of the earliest was by Farrar [40] who was interested in explaining the investment behaviour of mutual funds in terms of the Markowitz model. In an attempt to make the analysis more tractable Farrar employed principal components analysis to reduce the 47 x 47 variance - covariance matrix of share price indices (industrial equity groupings) to a more reasonable size. He reduced it to 11 x 11 but found little basis for identifying the components with familiar industry groupings. His first component explained 76% of the trace of the correlation matrix. A number of reasons have been advanced for the failure of the analysis to identify industry factors. King contended that the use of highly autocorrelated series of monthly levels of index number values, rather than first differences, and aggregate figures rather than individual security prices were important explanations. Feeney & Hester [41] similarly disputed the appropriateness of his basic variable and criticised his extraction of roots from the correlation rather than the covariance matrix. They argued that Farrar ignored the existence of considerable differences in both the variance of different individual stock indices and the stocks used for constructing the indices. In addition they contended that Farrar inappropriately applied factor analytic techniques which assumed the existence of a particular model.

Feeney & Hester's paper used principal components analysis to analyse the stocks included in the Dow Jones index. When investigating rates of return they found 41% of variance to be explained by the first component, a figure similar to King's. Their analysis also provided some measure of support for industry effects. Stocks of the same industry appeared to have positively correlated rates of return over time although because industries move together they thought that this might be of

little use to investors.[1]

Feeney & Hester provided interesting evidence on the use of raw prices as well as on rates of return. They point out that because of the trend in price series raw prices are correlated over time. Prior to removal of the trend approximately 70% of the variance is explained by the first factor. On removal of the trend the proportion of variance explained by the first factor comes down to about 40%. In consequence obvious doubts are cast on Farrar's analysis.

Overall, from these American studies it seems reasonable to conclude that firms do form statistically meaningful groups and that these groups correspond, to some extent at least, to the industry groups. Reported Studies for the U.K. have so far been confined to a pilot study by Russell & Taylor { 80 } on the same lines as Farrar's study and with similar disadvantages. The results were not particularly encouraging.

A rather different approach to the testing of the validity of the industry approach to investment analysis was that used by Tysseland { 90 }. He set out to discover firstly, what returns have been available to investors from investment in the common stocks of various industry groups in the past, and secondly whether an analysis of the behaviour of such returns over time indicates that the industry concept has been useful for investment decisions. He computed for each of 470 firms the dividend, capital gains and combined returns figures for the period 1949-1966 in addition to computing the industry returns and their variability. Non-parametric rank correlation tests were then used to test for the consistency of industry returns over time, and for the consistency of the

---

1. However King's analysis indicated predominantly negative correlations between industry clusters and a reasonable fit when orthogonal rotation was employed, so that their criticisms - that industries move together - may not be too serious.

variability of industry returns over time. Little consistency was found between the longer time periods with respect to either industry returns or their variability. Tysseland then concluded that industry rates of return would be of little use to investors in making portfolio decisions.

Fortunately however the outlook is perhaps not as bleak as it appears. As Dietz [29] has pointed out, the results are biased particularly for short time periods by Tysseland's use of the mean of high and low stock prices in computing rates of return. Dietz goes on to criticise the lack of independence in the data and to argue that the rank correlation tests are not powerful enough to determine movement within successive rankings. Some exploitable consistency in rankings did appear to exist.

Apart from the direct tests on the industry market hypothesis using price or rate of return data, a number of other studies have also thrown light on the area. One of particular interest is that by Wippern [107] who was interested in the validity of the equivalent risk class assumption frequently made in studies of capital structure. He considered the variability of the stream of net operating earnings to be an appropriate proxy measure of basic business uncertainty, and using this tested the hypothesis "Do objectively determinable risk classes exist?" and, "Do these classes correspond to industry groups?" His sample consisted of 61 firms in 8 industries to which he applied a one way analysis of variance to test the within and between industry variance. Significant differences were found between industries. The analysis of variance gives no indication as to whether the null hypothesis is rejected because all industries differ significantly from each other, or just one or two industries differ. Scheffes method of multiple comparisons amongst means provided a method of determining this. It indicated that all of the attributable differences were due to one industry and that even this one industry did not differ significantly from all of the other industries. Given acceptance of the basic measure of

uncertainty it would appear that industry classifications do not discriminate among groups of firms with equivalent degrees of basic business uncertainty. A possible explanation of this result is the low power of the test resulting in the acceptance of the null hypothesis when in fact it is not true. The small sample sizes of three of the industries left much to be desired in this respect. The study is of interest in illustrating the possibility of applying analysis of variance to the question as to whether industry differences exist or not.

A number of other studies have also directly considered market and industry factors. Brealey [8], for example, suggests that the variation in company earnings has reflected in part both common and industry influences. He argues that aggregate corporate profits exhibit wide swings which could scarcely be possible unless the profits of individual companies were responding in part to a common influence. The existence of this comovement might arise because all goods and services are in some measure substitutes for each other, so that variations in available wealth must exert a wide impact on sales. A similar argument, he suggests, is possible for costs, with the industry affected by a sympathetic movement in costs helped by Government action in such areas as corporate taxation and minimum wage rates. Insofar as each member's product is directed at the same market, each must feel the effect of any change in consumers' tastes and must respond to any change in the price of a rival's product. In the same way, to the extent that each company employs the same production process, it must feel the effect of any labour settlement, any change in material costs, or in production techniques.

From this line of reasoning, Brealey argues that it is reasonable to assume that the variance of a company's earnings changes can be expressed as the sum of a common influence, an incremental portion explained by the industry influence and residual unexplained variance. 217 companies with accounts from 1948 to 1966 were then selected (non randomly) and assigned to 20 industry groups. Using as his

basic variable the first difference in the logarithms of earnings per share, Brealey goes on to estimate the proportions of variance due to the market and industry factors. The estimate for each factor was 21%. In the case of the industry factors the proportion of variance explained was generally larger for industries characterised by homogeneous product lines, and least for those characterised by a diverse range of products, or with strong brand preferences.

Elton & Gruber [32,33] have also given considerable attention to the grouping of firms. They argue that most empirical work in the area of finance makes tacit or explicit assumptions about firm grouping and suggest three reasons why this is so. The first reason - the one with which this study is most concerned - is the need to isolate units that should in some sense act alike. The grouping of firms by industry implicitly assumes that industrial classification is a suitable basis for homogeneity. The second reason they advance is to hold the effect of an omitted variable, or group of variables (such as risk) constant; failure to hold this effect constant can result in a complete misspecification of the relationship under study. The third reason for grouping is to obtain a homogeneous relationship between the variables included in a regression. Suppose for example one was examining a sample of firms that financed their investments from internal funds. A positive relationship might be expected between stock price and payout for firms which earned a low return on their marginal investment and a negative return relationship for firms which earned a high return. Pooling the data and carrying out a regression might find no relationship between payout and price even though two different relationships existed. In such circumstances the usual method of grouping firms by industry to overcome the problem is less than ideal.

Clearly no one grouping is appropriate for all purposes. The appropriate grouping depends on the objectives of the study and the nature of the process under investigation. Elton & Gruber argue that one must first decide why one wants

homogeneous groups and then with that objective in mind select a variable or group of variables with respect to which homogeneity is desired.

They go on to provide a technique for the clustering of variables based on principal components analysis. Their method benefits from being insensitive to the correlation and scale of the original variables and is applied by them, as an example, to the forecasting of earnings per share for industrial corporations. They argue that the determinants of earnings per share are not homogeneous across all companies and that improvements in forecasts result from the substitution of statistical grouping techniques for groupings based on the final product. The results appear to bear their contention out and indicate that analysts might benefit from grouping companies according to the particular purpose in mind.

In order to throw light on the related price movements of industrial price indices, Granger & Morgenstern {46} analysed a number of indices by means of cross-spectral methods. Substantial correlations between pairs of indices were found, and it was suggested in explanation that traders in one group keep a close and constant watch on price changes in other sectors of the market and then use these price changes as a relevant information about how price should change in their sectors. This results in a constant feedback between price changes in different parts of the market. Estimates of the market factor for each of the sectors considered were also computed and found to be substantial. However, as Granger & Morgenstern point out, the fact that averages for large sections of the market appear to move together, throws little light on the extent to which individual stocks move together. An exploratory study of 25 stocks found little evidence of an important market factor in explaining the variance of weekly price changes, although stocks of closely related companies appeared to move together.

The overall impression of this survey is that on balance price changes appear to be affected by industry and market factors. However the evidence as to the strength of these effects is by no means conclusive and it is to this that the analysis now turns.

Chapter 9

Sector Influences on Share Price Variability

The present chapter is concerned with establishing whether the classification of shares by sector is associated with clearly distinguishable sector effects. There is no basis for selecting shares from one sector rather than another unless the aggregation of shares into sectors is associated with effects peculiar to those sectors. In consequence the identification of sector effects, as the previous chapter indicated, constitutes the first stage in the investigation of the usefulness of sector selection techniques.

To some extent the question of whether sector effects exist or not has already been answered. As the discussion of the last chapter made clear, several studies have examined the two questions of whether statistically meaningful groups exist and whether these groups correspond to industries. The circuitous methods employed have however, due to computational limitations, tended to narrow the number of industries considered.

Evidence on non homogeneous industry groups has been particularly scarce.

In addition almost all the studies have used American data. This study is aimed at filling some of the gaps by providing evidence for the U.K. and for a wide range of sectors.[1]

---

1. The available data bank consisted of quarterly price information on 520 companies for the years 1965 to 1970 inclusive. The original intention was to use the companies included in the F.T. Actuaries Index in January 1965. However a substantial proportion had been taken over and in order to maintain adequate industry representation additional companies were added. Use of the F.T. Actuaries companies is equivalent to selecting companies by market value. (Generally greater than £4m but varying slightly according to the number of companies in the industry with a larger market capitalisation. The smaller companies are generally excluded.) Prices were adjusted for rights and scrips using Extel cards. They were not adjusted for issues of loan stock and convertibles, or for dividends. In general with take-overs the taken over company was dropped. Schemes of Arrangement were dealt with by using the price information of the dominant company.

   The classification by which companies were assigned to sectors was generally that of the F.T. Where possible the analysis tried to use the data as it came so that sectors were of unequal sizes reflecting the divergence in sector size of the market itself. However at times computational and programming requirements demanded equal sector sizes. The shares included for each group were then selected on a random basis. It was also occasionally necessary to merge small sectors. Efforts were made to keep the components as comparable as possible.

The method of presenting this evidence deserves a few clarifying comments. The chapter is centred on testing the hypothesis that the classification of shares by sector is associated with clearly distinguishable sector effects. In the process a number of different statistical models and subsidiary hypotheses are considered. To present each model, the hypothesis of interest and the empirical evidence simultaneously would complicate the assessment of the main interest of the chapter, the existence of sector effects. In an attempt to overcome this problem, the chapter segregates the hypotheses of interest from both the statistical methodology and the empirical evidence, each of which is considered separately.

Hypotheses

The original objective was to determine whether the variability of the prices of the shares within any particular sector was mainly due to factors causing movements of the sector as a whole or due to the individual characteristics of the different shares.[1] To this end movement of the share price, or more correctly of the share price relative,[2] was partitioned into sector and firm components and the variability of these components measured. The ratio of these components was termed the contribution ratio and was used as an estimator of the relative strength of the sector and firm effects. Values of the ratio larger than one implied that the error sum of squares was greater than the sum of squares explained by the sector. Values smaller than one indicated that the explained sum of squares predominated. Difficulty in specifying the sampling distribution of the ratio ruled out

---

1. No attempt has been made in this study to compare the variance of price changes between sectors. For example it might be the case that on average the price changes of bank shares have a smaller variance than the price changes of rubber shares. Whilst of interest time did not permit such an analysis.

2. Use of the share price relative was an attempt to abstract from movements of the market as a whole.

the application of tests of significance to the relative contributions. However Monte Carlo studies provided some data on the values of the statistic when no sector effects were present so that approximate standards existed against which the relative strength of the sector and firm effects could be compared.

Attempts at probing the contribution ratio in an effort to specify formal hypotheses revealed its close affinity to a one way analysis of variance. The null hypothesis of this analysis is that the means of the sectors are all equal, and the rejection of this hypothesis implies that there is a significant difference between sectors. The null hypothesis was tested both for each time period and for the overall period.

The null hypothesis that the means of the sectors are all equal is also common to the second model considered - a replicated measures, hierarchal analysis of variance. Whilst the general conception of the model is similar to the one way analysis of variance described above, the sophistication of the model is somewhat greater. The model relates the rate of return on a security to market, sector and firm factors and in addition specifies interaction terms that allow one to test the adequacy of the basic structure of the model. In particular it allows the testing of three hypotheses. Firstly the null hypothesis that the time (market) means are all equal. Failure to reject this hypothesis would indicate the absence of a market effect. Secondly the null hypothesis, described above, that the sector means are all equal, and thirdly the null hypothesis that the interaction term means are equal. Rejection of this hypothesis would cast doubt on the reasonableness of assuming an additive model.

Apart from providing mean squares enabling tests of the significance of these factors to be made, the model also allows estimates of the variance of the

components to be made.[1]

The analysis of variance simply indicates the existence (or not) of an overall sector effect. It tells one nothing about individual sectors. In the event of a significant sector effect however it is desirable to know which sectors are responsible for this effect. To find this out an analysis of means must be employed. A Newman Keuls analysis of means is used to indicate the sectors that are not significantly different from other sectors.

Despite the complexity of the analysis of variance model outlined above, it fails to provide a mean square suitable for testing the effect due to the individual firm. One way of providing such information is to apply an analysis of variance to each individual sector and test the null hypothesis that all the individual firm means are equal. Apart from providing information about the existence of an effect due to the firm, the analysis also provides an indirect way of considering sector difference. For example if significant differences are found to exist between firms within a sector, this may indicate a marked heterogeneity of rates of return within the sector, and hence that it is unlikely that a pronounced sector effect may be found.

The estimate of sector effects provided by the replicated measure analysis of variance provides data on the overall importance of sector influences for a large number of sectors. It is also of interest however to know for individual sectors the importance of sector and market effects. One means of providing such estimates is through the regression of share price on sector and market indices, an approach to the identification of sector

---

1. The model employed involves a considerable number of assumptions. Tests were also made of the validity of some of these assumptions.

effects which permits both tests of significance of the regression coefficients and estimation of the importance of sector and market effects. However, two statistical problems in particular must be noted: the existence of multicollinearity between the indices and the close relationship between the individual firms in a sector and the sector index.

Statistical Methodology

Early attempts to determine whether the variability of prices within any particular sector was mainly due to factors causing movements of the sector as a whole or due to the individual characteristics of the different shares, employed a three stage procedure. This consisted of partitioning the share's price movement into its components, measuring the variability of these components and then subsequently examining the statistical properties of the measure employed.

In an attempt to abstract from movements of the market as a whole, and obviate the requirement for a market component in the model, the proportional changes in individual share price relatives (rather than simply prices) were considered to depend multiplicatively on a component due to the firm, and an element due to the sector. To convert the relationship to an additive form a logarithmic transformation was applied to arrive at[1]

$$\Delta_j \log F_{..t} = \Delta_j \log F_{ist} + \Delta_j \log F_{.st} \qquad (1)$$

where $\Delta_j \log F_{..t}$ represents the change in the share price relative, $\Delta_j \log F_{ist}$

---

1. See Appendix 6.

represents the element due to the firm and $\Delta_j \log F_{.st}$ the element due to the sector.[1]

It was then necessary to devise a measure of the contribution of these components to the performance of the share. Since interest is centred on the dispersion or variation of the distribution of changes of the logged relatives the second moment was used as a measure of these quantities.[2]

In order to compare the contributions of the sector and firm effects to the variation in the share price relative, a variety of ratios may be formed such as

$$C_F^2 = \frac{\sum_{t=1}^{n} (\Delta_j \log F_{ist})^2}{\sum_{t}^{n} (\Delta_j \log F_{.st})^2} \quad t = 1 \ldots\ldots n \text{ time periods} \qquad (2)$$

Interest in general does not however relate to the relative contributions

---

1. At first sight the notation in this chapter is rather confusing. It is worth noting the following points. Firstly that $\Delta_j \log F_{..t}$ represents the firm relative to the market (since the market index is arrived at by summing) of which $\Delta_j \log F_{.st}$ represents the sector element (hence summed over i) and $\Delta_j \log F_{ist}$ represents the element due to the individual firm.

   Secondly, the individual share index (or price) is denoted by $I_{ist}(P_{ist})$ where i represents the i^{th} firm for the s^{th} sector in the t^{th} period. Sector and market indices are than $I_{.st}$ and $I_{..t}$ indicating summing over all firms in the sector and over all firms and sector respectively.

   Thirdly $\Delta_j \log I_{ist}$, $\Delta_j \log I_{.st}$ and $\Delta_j \log I_{..t}$ may be conveniently abbreviated by X_{ist}, $\bar{X}_{.st}$ and $\bar{X}_{..t}$ respectively.

   Whilst it would have been possible to use $\bar{X}_{..t}$ from the outset it was felt that this rather cumbersome notation was more informative.

2. The analysis was carried out using both the variance and the second moment about the origin as measures. The justification for the latter rested on the possibility of a strong trend in the data. If for example a sector exercised a constant effect over time then it would have no variance as the model was originally constructed. Subsequent analysis shows that this argument loses much of its force but the second moment about the origin turns out in this context to be much more tractable algebraically. In fact variance measures were also calculated and showed little divergence in general from the second moment about the origin.

of each individual share, as this ratio illustrates,[1] but to the relative contributions of sectors and other factors to all the shares in the sector taken together. Summing the contributions found for the individual shares in a sector leads to a sector contribution ratio

$$C_s^2 = \frac{\sum_t^n \sum_i^{k_s} (\Delta_j \log F_{ist})^2}{\sum_t^n k_s (\Delta_j \log F_{.st})^2} \qquad i = 1 \ldots k \text{ firms in the sector} \qquad (3)$$

The ratio indicates the contribution of the sector ($\Delta_j \log F_{.st}$) and other factors ($\Delta_j \log F_{ist}$) to the share price movement.[2] Analysis of the firm and industry components reveals that the basic variable of the study has become $\Delta_j \log I_{ist}$ (or X_{ist} for convenience.)[3] This may be identified as the change

---

1. Further light on the influence of the individual company on the ratio may be gained by substituting back into the ratio, prices and indices for the expressions $\Delta_j \log F_{ist}$ and $\Delta_j \log F_{.st}$

then $$C_F^2 = \frac{\sum_t^n \left[\log\left(\frac{P_{ist+1}}{P_{ist}} \cdot \frac{I_{.st}}{I_{.st+1}}\right)\right]^2}{\sum_t^n \left[\log\left(\frac{I_{.st+1}}{I_{.st}} \cdot \frac{I_{..t}}{I_{..t+1}}\right)\right]^2}$$

Hence a share with a substantial price change from one period to the next, will have a larger contribution ratio than a share with a small price change over the same period.

Looking ahead to later results one may similarly show that the individual firm component in the analysis of variance $\Sigma\Sigma\Sigma(X_{ist} - X_{.st})^2$ can be represented as $\Sigma\Sigma\Sigma_{tsi}\left[\log\left(\frac{P_{ist+1}}{P_{ist}} \cdot \frac{I_{.st}}{I_{.st+1}}\right)\right]^2$ with similar implications.

2. See Appendix 8.

3. From Appendix 7 it can in turn be seen that $\Delta_j \log I_{ist} = \Delta_j \log P_{ist}$ so that the basic variable could equally be the change in log prices.

in the logarithm of the share price. This variable represents a close approximation to the investor's rate of return when dividends are ignored.[1] Composite variables such as $\Delta_j \log F_{..t}$ may be identified as the rate of return of a firm abstracting from the market rate of return, $\Delta_j \log F_{ist}$ as the firm rate of return adjusted for the sector rate of return and $\Delta_j \log F_{.st}$ as the sector rate of return adjusted for the market rate of return.[2] On this interpretation the comparison has become one of relative rates of return and the C_s^2 measures are simply ratios of squared (and summed) adjusted rates of return. To probe the meaning of the C_s^2 ratios it is necessary to break them down to their basic components. Denoting the basic variable as before by $\Delta_j \log I_{ist} = X_{ist}$ and summing over time, firms, and sectors, the partition of the price relatives may be denoted as

$$\sum_t^n \sum_s^L \sum_i^{k_s} (X_{ist} - \bar{X}_{..t})^2 = \sum_t^n \sum_s^L \sum_i^{k_s} (X_{ist} - \bar{X}_{.st})^2 + \sum_t^n \sum_s^L k_s (\bar{X}_{.st} - \bar{X}_{..t})^2 \qquad (4)$$

$$n(\Sigma k_s - 1) \qquad n(\Sigma k_s - L) \qquad n(L-1)$$

the cross product term being zero. Summation over t provides replication and may be omitted. In this case the partition is seen to be a one way analysis of variance.

$$\sum_s^L \sum_i^{k_s} (X_{is} - \bar{X}_{..})^2 = \sum_s^L \sum_i^{k_s} (X_{is} - \bar{X}_{.s})^2 + \sum_s^L k_s (\bar{X}_{.s} - \bar{X}_{..})^2 \qquad (5)$$

Providing all the usual assumptions are met, notably the independence of the

---

1. Fama has shown that the change in log price is the yield with continuous compounding from holding the security for whatever period the change is taken over

$$\frac{P_{is(t+1)}}{P_{ist}} = \exp\left(\log_e \frac{P_{is(t+1)}}{P_{ist}}\right)$$

$$P_{is(t+1)} = P_{ist} \exp\left(\log_e \frac{P_{is(t+1)}}{P_{ist}}\right)$$

$$= P_{ist} \exp\left(\log_e P_{is(t+1)} - \log_e P_{ist}\right)$$

2. Interpretation of these composite variables follow from the demonstration in Appendix 6 that $\Delta_j \log F_{..t} = \Delta_j \log I_{ist} - \Delta_j \log I_{..t}$ and so on.

explained and error sum of squares, normal distribution of the errors, homogeneous population error variances and the additivity of effects, then F ratio tests may be carried out. The null hypothesis in this case is that the means of the sectors are all equal, implying that there is no significant difference between sectors. If the means were not significantly different there would be no point in investing by sector as there would be no difference between the sectors. When summed over t the null hypothesis remains the same although the analysis becomes one of a hierarchal classification with the sector effect nested within the time effect. The F ratio in this case is of the form

$$\frac{\sum_{t}\sum_{s} n\, k_s(\bar{X}_{.st} - \bar{X}_{..t})^2/n(L-1)}{\sum_{t}\sum_{s}\sum_{i}^{n,L,k_s}(X_{ist} - \bar{X}_{.st})^2/n\sum_{s}^{L}(k_s - 1)} = \frac{\sum_{t}\sum_{s} n\, k_s(\Delta_j \log F_{.st})^2/n(L-1)}{\sum_{t}\sum_{s}\sum_{i}^{n,L,k_s}(\Delta_j \log F_{ist})^2/n\sum_{s}^{L}(k_s - 1)} \qquad (6)$$

Before considering the underlying model to this breakdown it is useful to decompose the sum of squares (4) further in order to throw light on the contribution ratios outlined earlier.

$$\begin{aligned}\sum_{t}\sum_{s}\sum_{i}^{n,L,k_s}(X_{ist} - \bar{X}_{..t})^2 &= \sum_{t}\sum_{i}^{n,k_s}(X_{i1t} - \bar{X}_{.1t})^2 + \sum_{t}\sum_{i}^{n,k_s}(X_{i2t} - \bar{X}_{.2t})^2 \\ &+ \ldots + \sum_{t}\sum_{i}^{n,k_s}(X_{iLt} - \bar{X}_{.Lt})^2 + \sum_{t}^{n} k_1(\bar{X}_{.1t} - \bar{X}_{..t})^2 \\ &+ \sum_{t}^{n} k_2(\bar{X}_{.2t} - \bar{X}_{..t})^2 + \ldots + \sum_{t}^{n} k_L(\bar{X}_{.Lt} - \bar{X}_{..t})^2 \qquad (7)\end{aligned}$$

The contribution ratio may now be seen to be simply a ratio of

$$\frac{\sum_{t}\sum_{i}^{n,k_s}(X_{ist} - \bar{X}_{.st})^2}{\sum_{t}^{n} k_s(\bar{X}_{.st} - \bar{X}_{..t})^2} \qquad \text{for the } s^{th} \text{ sector} \qquad (8)$$

If the number of firms in a sector is taken to be $\bar{k}$ (the average number of firms in a sector)then it can be shown, on the previous assumptions, that

for the s^{th} sector

$$\frac{\sum_{t}^{n} \bar{k} \, (\bar{X}_{.st} - \bar{X}_{..t})^2 / \, n(L-1)}{\sum_{t}^{n} \sum_{i}^{k} (X_{ist} - \bar{X}_{.st})^2 / Ln(\bar{k} - 1)} \sim F_{\alpha}, \; n(L-1), \; Ln(\bar{k}-1) \qquad (9)$$

and that the expected value of the contribution ratio C_s^2 is approximately equal to $\frac{L(\bar{k} - 1)}{L-1}$.[1]

Monte Carlo methods were also used to establish the properties of the C_s^2 ratio. The ratio contains two effects reducing its value as sector size decreases. The first of these is the effect due to the better specification of the sectors. This may be removed by drawing companies at random from the data, grouping them into sectors of size n (where n varies from 5 to 100 companies) and conducting the analysis on these artificial sectors. The mean value of the Contribution Ratio for each n, then contains only the second effect, the effect due to the smaller number of companies, and provides a standard against which to judge the values obtained from analysis of the F.T. sectors. (Random Sample C^2 values (mean) are given in Appendix 9.)

It is perhaps useful to review the contents of the last few pages. By partitioning individual share price relatives and then measuring the variability of the resultant components, a contribution ratio was derived. This measure is an intuitively plausible attempt at estimating the relative contribution of the sector and firm effects to share prices (from which the market element has been removed.) However problems arise in the specification of the sampling distributions of the statistic so that tests of significance of the relative contributions are unavailable. Even so Monte Carlo studies provide some data on the values of the statistic when no sector effects are present and thus provide an approximate standard against which at least qualitatively, if not quantitatively, the relative strength of the firm and sector effects may be judged. Such estimates are not available from more orthodox statistics.

---

1. An F test is only valid if a number of assumptions are made. The most important of these is th at the numerator and denominator are independent. It has not been possible to show this.

The analysis of variance to which the C_s^2 measure is intimately related, only provides information on overall effects. It does not provide data at the individual sector level. Tests of means provide information about the existence of differences between sectors but provide little detail on the relative strength of effects. Overall one might conclude that whilst the contribution ratio is far from ideal, it does provide information unavailable from the analysis of variance. It also provides a means of corroborating results obtained from elsewhere.

Analysis of the Contribution Ratio would be incomplete without some discussion of its underlying model. Consideration of the Analysis of Variance breakdown (4) indicates that the ratio is implicitly testing a model of the form

$$X_{ist} = \mu + \alpha_{s(t)} + \varepsilon_{ist} \qquad (10)$$

where μ is a constant, α a sector effect nested within time and ε_{ist} the error. $\alpha_{s(t)}$ and ε_{ist} are assumed to be independent and the latter normally distributed.

For each time period the model is simply

$$X_{is} = \mu + \alpha_s + \varepsilon_{is} \qquad (11)$$

where α_s the sector effect is no longer nested within time. The change in log price (the rate of return) is treated as if it were composed of a constant factor, an effect due to the firm's sector characteristics and an error term. The null hypothesis is simply that the sector means are all equal. In sample quantities the sector effect may be written as $(\bar{X}_{.st} - \bar{X}_{..t})$ in (10) and $(\bar{X}_{.s} - \bar{X}_{..})$ in (11).

Despite the original foundation of the model on price relatives, in order to abstract from movements of the market, it is evident that as it stands the model makes no allowance for the existence of a market effect. A more realistic hypothesis might be that the rate of return on an individual share

is affected by three main factors, a market effect, a sector effect and a firm effect (such as its own growth rate). Such considerations lead to a model of the form

$$X_{ist} = \mu + \alpha_s + \beta_t + \gamma_{i(s)} + \alpha\beta_{st} + \beta\gamma_{i(s)t} + \varepsilon_{ist} \qquad (12)$$

where the variables μ, α_s and ε_{ist} retain their previous interpretation and β_t and $\gamma_{i(s)}$ are seen as the market and firm effects respectively, both being independently distributed. Interaction terms of the form $\alpha\beta_{st}$ and $\beta\gamma_{i(s)t}$ have also been postulated.[1]

Before considering the assumptions of this model it is of interest to consider the identification of β_t with a market effect. In sample terms β_t is of the form $(\bar{X}_{..t} - \bar{X}_{...})$ and when squared and summed represents the variation of the overall mean of firms and sectors between time periods. In other words it is measuring the variation between the whole market at different periods of time.[2] $\bar{X}_{..t}$ may be identified as the mean market rate of return for the t^{th} period. Hence $(\bar{X}_{..t} - \bar{X}_{...})^2$ indicates the variation of the market rate of return over time.

---

1. Interaction terms allow the possibility of non additivity of effects to be specified. The models discussed so far have not included such terms. In general their specification involves no problems. Note however that with nested terms the corresponding interaction terms disappear. For example in the model
$$X_{ist} = \mu + \alpha_{s(t)} + \beta_t + \varepsilon_{ist}$$
$\alpha_{s(t)}$ is formed from $\alpha_s + \alpha\beta_{st}$
{Letting $\alpha_s = (\bar{X}_{.s.} - \bar{X}_{...})$ and $\alpha\beta_{st} = (\bar{X}_{...} - \bar{X}_{.s.} - \bar{X}_{..t} + \bar{X}_{.st})$
then $\alpha_{s(t)} = (\bar{X}_{.st} - \bar{X}_{..t})$ is formed by summing α_s and $\alpha\beta_{st}$}

2. To throw more light on this relationship consider a regression of the form $X_{ist} = b_o + b_1 \bar{X}_t$ where $\bar{X}_t$ is summed over all firms and sectors and is calculated as the arithmetic average of $\Delta_j \log P_{ist}$ (see Appendix 7). The regression is postulating (for simplicity) that the rate of r eturn is a function of the market rate of return.
Now the explained sum of squares by time in the analysis of variance is equal to
$$\sum_t^n \sum_s^L k_s(\bar{X}_{..t} - \bar{X}_{...})^2$$
while the explained sum of squares in the regression is $b^2 \Sigma x_t^2$. Since $x_t = (\bar{X}_{..t} - \bar{X})^2$ one may write $b^2 \sum_t^n \sum_s^L k_s(\bar{X}_{..t} - \bar{X}_{...})^2$
If b^2 equals 1, then the variance explained by time in the analysis of variance is equivalent to the element explained by the appropriate transformation of a geometric market index in a regression.

The transformation of the basic variable to the change in the logarithm of price, removed the need to detrend the price series. It also helped reduce the problem of increased variance in the price series that might have been expected to occur in later periods due to the rising price level. Intuitively taking logarithms is likely to compress the scales and hence reduce the increase in variance. Moore{71} has shown empirically that on taking logarithms most of the problem disappears. The logarithmic transformation brings the data closer to that required for the analysis of variance, since in general it has been found that the transformed prices are more nearly normally distributed than the untransformed prices. Heterogeneity in the error variance (but not necessarily the covariance) is also reduced.

The model set out in (12) provides the opportunity to test a number of different hypotheses. These were discussed earlier and are only mentioned here.[1] The null hypotheses are firstly that all the time means are equal, secondly that all the sector means are equal, and thirdly that all the interaction term ($\alpha\beta_{st}$) means are equal.

Computational requirements limited the analysis that might be carried out to twenty sectors each of ten firms over the six year period. The twenty sectors and the time periods chosen are considered to constitute the population of interest with respect to these characteristics. The ten firms were chosen at random from within the companies assigned to each sector.

Before considering the mean squares it seems valuable to replace the population parameters with their sample quantities and then derive the

---

1. See discussion of hypotheses involved in replicated measures design.

appropriate sum of squares

$$\underset{t}{\overset{n}{\Sigma}}\,\underset{s}{\overset{L}{\Sigma}}\,\underset{i}{\overset{k}{\Sigma}}(X_{ist} - \bar{X}_{...})^2 = \underset{t}{\overset{n}{\Sigma}} L\,k(\bar{X}_{..t} - \bar{X}_{...})^2 + \underset{s}{\overset{L}{\Sigma}} n\,k(\bar{X}_{.s.} - \bar{X}_{...})^2$$

$$nLk - 1 \qquad\qquad n - 1 \qquad\qquad L - 1$$

$$+ n \underset{s}{\overset{L}{\Sigma}}\,\underset{i}{\overset{k}{\Sigma}}(\bar{X}_{is.} - \bar{X}_{.s.})^2 + \underset{t}{\overset{n}{\Sigma}}\,\underset{s}{\overset{L}{\Sigma}} k(\bar{X}_{.st} - \bar{X}_{.s.} - \bar{X}_{..t} + \bar{X}_{...})^2$$

$$Lk - 1 \qquad\qquad (n - 1)(L - 1)$$

$$+ \underset{t}{\overset{n}{\Sigma}}\,\underset{s}{\overset{L}{\Sigma}}\,\underset{i}{\overset{k}{\Sigma}}(X_{ist} - \bar{X}_{is.} - \bar{X}_{.st} + \bar{X}_{.s.})^2 \qquad (13)$$

$$L(k - 1)(n - 1)$$

The model is of the repeated measures type involving assumptions in addition to those of the usual analysis. The expected values of the mean squares may be shown to be

Sectors	$\sigma^2_\varepsilon + n\sigma^2_\gamma + kn\sigma^2_\alpha$
Firms within sectors	$\sigma^2_\varepsilon + n\sigma^2_\gamma$
Time	$\sigma^2_\varepsilon + \sigma^2_{\beta\gamma} + kL\sigma^2_\beta$
Sector X time (interaction)	$\sigma^2_\varepsilon + \sigma^2_{\beta\gamma} + kL\sigma^2_{\alpha\beta}$
Time X firms within sectors	$\sigma^2_\varepsilon + \sigma^2_{\beta\gamma}$

and the appropriate F statistics to be

$$F = \frac{MS(\text{sectors})}{MS(\text{firms within sectors})} \qquad \text{Sector Effect}$$

$$F = \frac{MS(\text{time})}{MS(\text{time X firms within sectors})} \qquad \text{Market Effect}$$

$$F = \frac{MS(\text{sector X time})}{MS(\text{time X firms within sectors})} \qquad \text{Interaction}$$

Estimates of the variance components may be obtained from

$$\hat{\sigma}^2_{\alpha} = \frac{MS(\text{sectors}) - MS(\text{firms within sectors})}{kn}$$

$$\hat{\sigma}^2_{\beta} = \frac{MS(\text{time}) - MS(\text{time X firms within sectors})}{kL}$$

$$\hat{\sigma}^2_{\alpha\beta} = \frac{MS(\text{interaction}) - MS(\text{time X firms within sectors})}{k}$$

Consideration of the expected values of the mean squares reveals that estimates of $\hat{\sigma}^2_{\varepsilon}$ cannot be made.

The mean square used in the denominators of the F ratios represent a pooling of different sources of variation. Thus the variation due to firms within sectors is the sum of the variations due to

Firms within sector 1 + Firms within sector 2 + ... + Firms within sector L each with k - 1 degrees of freedom.

For the F ratios to actually follow an F distribution it is necessary that these sources of variation are homogeneous. A similar assumption is necessary for the MS(time X firms within sectors). The homogeneity assumption required for pooling in this case is equivalent to the assumption that the correlation between periods for all the firms is constant within each of the sectors. Since this is unlikely to be true modified degrees of freedom must be used to provide the critical F values for the interaction and time factors (see Winer {106}). These critical values err on the negative side and will yield too few significant decisions. It is worth noting that the F tests are robust with respect to most violations of the assumptions.

The analysis of variance outlined above only provides information on the existence of overall sector effects. It tells one nothing about the individual sectors. In the event of a significant sector effect it is desirable to know which sectors were responsible for this effect. For this

purpose a test on means is required. A number of different tests on means are possible, the one adopted here is the Newman Keuls procedure. A number of factors governed the choice of test. If only a few meaningful comparisons were to be made the comparisons of interest being known in advance of the ANOVA results, the F test associated with individual components of variation would have been most appropriate. Such an a priori comparison is justified whether or not the overall F is significant in contrast to the Newman Keuls a posteriori procedure which is justified only if the overall F statistic is significant. The Newman Keuls procedure however may be applied to any number of comparisons and hence is more appropriate to the question of interest here. The level of significance for the procedure is considered individually with respect to each test and is always kept equal to α for all ordered pairs no matter how many steps apart the means may be. The general procedure is to order the means and then take differences of from 2 to 20 steps in this case. Tabled values for the appropriate α and number of steps are then multiplied by the standard error of the mean for all observations at a given level of the factor, to provide critical values against which the matrix of ordered differences may be compared. A set testing order precludes contradictory decisions.[1]

The model specified in (12) provided for a firm effect $\alpha_{i(s)}$. The expected values of the MS square however fail to provide a suitable denominator for testing purposes and in consequence no information has been provided on this effect. However it is possible to specify a model for the s^{th} sector

---

1. If the interaction term is significant somewhat different methods are necessary.

of the form[1]

$$X_{ist} = \mu + \gamma_i + \beta_t + \varepsilon_{it} \qquad (15)$$

which may provide some evidence on this subject.[2] The model relates the rate of return of each firm in the sector to an individual firm factor such as the firm's rate of growth (γ_i) and the market factor (β_t). A number of fairly strong assumptions are necessary for the model: no interaction term is possible; the ε_{it} are normally distributed, uncorrelated and with expected value equal to zero within each of the treatment populations, and variance equal to σ^2_ε; and the effect of treatment β_t is a constant for all observations within treatment population t.

The no interaction assumption is particularly restrictive and implies that the covariance between all pairs of treatment levels are equal. As with the repeated measures design the solution turns out to be the use of reduced degrees of freedom. F ratios may easily be formulated from the expected mean squares with both firm and time effects being tested against

---

1. Substituting in sample values, summing and squaring gives

$$\underset{nk_s - 1}{\sum_t \sum_i (X_{it} - \bar{X}_{..})^2} = \underset{n - 1}{\sum_t k(\bar{X}_{.t} - \bar{X}_{..})^2} + \underset{k_s - 1}{\sum_i n(\bar{X}_{i.} - \bar{X}_{..})^2}$$

$$+ \underset{(n - 1)(k_s - 1)}{\sum_t \sum_i (X_{it} - \bar{X}_{i.} - \bar{X}_{.t} + \bar{X}_{..})^2}$$

2. See earlier discussion of hypotheses.

the residual MS.[1] Individual tests on means were not carried out for this analysis.

The final approach to the problem of sector effects is rather more direct.[2] A regression of the form

$$X_{ist} = \beta_o + \beta_1\phi_t + \beta_2\alpha_s + \varepsilon_{ist} \qquad (16)$$

for the s^{th} sector is proposed where ϕ_t and α_s represent the market and sector rates of returns, and ε_{ist} is assumed to have zero mean, constant variance and zero covariances. The rate of return is postulated as depending on the rate of return prevailing in the market and sector. The constant is expected to be zero. The data employed to represent ϕ_t and α_s, are the appropriate transformed market and sector indices, $\bar{X}_{..t}$ and $\bar{X}_{.st}$, respectively.

Two important statistical problems should be noted with regard to this regression formulation. The first is the problem of multicollinearity that may exist between the sector and market indices in some of the regressions. The use of the transformations, first differences in the logarithm of prices, should ameliorate the problem but does not remove it entirely. However warning of its appearance is available from examination of the correlation coefficient between the two indices. The higher this correlation, the more severe the problem.[3] The second important problem is the relationship between X_{ist} and $\bar{X}_{.st}$. Particularly for small sectors

---

1. Since the quantity of data involved was small and there was no convenient ANOVA programme to hand for the analysis, a regression model was adopted with the independent variables as dummies taking the values 1 or 0. The analysis then became

   $$X_{it} = b_o + bz_{12} + bz_{13} + \ldots + bz_{1k} + bz_{22} + bz_{23} + \ldots + bz_{2t}$$

   where z_{1i} represent the individual firm dummies and z_{2t} represent the time dummies. The regression coefficients may then be interpreted directly as the differences of each firm or time period from the base (b_o) of firm 1 in time period 1. Note that z_{11} and z_{21} have been dropped to prevent the singularity of the matrix (see Suits {94}).

2. See earlier discussion of hypotheses.

3. The problem of multicollinearity does not however prevent one from measuring the <u>incremental</u> effect of the industry influence.

X_{ist} may be a significant component of the sector index. The same problem although to a lesser extent also arises with $\bar{X}_{..t}$, the market mean. In an attempt to minimize the problem only large sectors (with one exception) were considered so that $\bar{X}_{.st}$ was calculated over a considerable number of companies. However some bias in the regressions may still be expected.

These regressions (16) and those involving the dummies (15) were both estimated on a limited subset of sectors thought to be of particular interest.

Empirical Results

Before considering the individual sectors in detail it is useful to consider whether there is any significant difference between the sectors for all sectors and firms. Both the model outlined in equations (10) and (11) and that detailed in equation (12) provide some information for establishing this.[1] Table 9.1 provides the F values for each individual time period derived from testing the first model on time horizons[2] of 3, 6, and 12 months.

The F ratio was of the form

$$\frac{MS(sectors)}{MS(error)} = \frac{\sum_{s}^{L} k_s(\bar{X}_{.s} - \bar{X}_{..})^2/(L-1)}{\sum_{s}^{L}\sum_{i}^{k_s}(X_{is} - \bar{X}_{.s})^2/\sum_{s}^{L}(k_s - 1)} \sim F_{\alpha,\ L-1,\ \sum_{s}^{L}(k_s-1)}$$

The overall F statistic (corresponding to the individual F statistic but with both numerator and denominator summed over t and divided by n) of 2.88 (828,11109 degrees of freedom) for the 3 month difference was overwhelmingly

---

1. See discussion on hypotheses in particular that relating to the analysis of variance arising from the Contribution Ratio and the replicated measures analysis of variance.

2. The procedure adopted is to use non-overlapping periods for significance testing to reduce bias, and overlapping periods when the main interest is in estimation. Thus in the latter case 1 year horizon price changes were from January 1965 to January 1966, April 1965 to April 1966 and so on as a result of the use of quarterly data.

significant at the .05 significance level.[1] The significant F values indicate the rejection of the null hypothesis that the sectors had no effect.

Table 9.2 presents the results obtained from the model outlined in equation (12). Two sets of results are presented: the values for 20 sectors selected as being of particular interest from all available sectors, and the values for 20 sectors selected simply from the industrial sectors. Results are presented for a 3 month time horizon only. Both sets of results show the same features. The interaction term is insignificant, indicating the suitability of the additive model, whilst both market and sector effects are significant. The null hypothesis of no difference between the means is rejected in both cases.[2]

---

1. Too much reliance should not be placed on the overall F value since the error mean square is possibly biased given that the market component has not been removed.

2. The normal degrees of freedom were used for the analysis since a partial test of the homogeneity of the sources of variation carried out using the statistic

$$F.max = \frac{max.(S.S.\ firms\ w.\ sector\ i)}{min.(S.S.\ firms\ w.\ sector\ i)}$$

where the critical value is $F\ max._{(1-\alpha)}(L,k-1)$, indicated that the hypothesis that the variation is homogeneous for the S.S. (firms within sectors) was not contradicted. A similar test on the S.S. (Market X firms within sectors) did contradict the hypothesis but the violation was not extreme. Transformations to overcome this violation were not considered necessary since the F test is apparently robust for small violations of the assumptions.

If modified degrees of freedom were used the market effect became insignificant. However there is no particular reason to think that the use of the modified d.f. is correct. The correct d.f. lie somewhere between the normal and the modified, the critical value depending on the extent of the heterogeneity of the covariances. Without more information of the extent of this heterogeneity, conclusive answers are difficult to arrive at.

TABLE 9.1

Individual F statistics

Differences	3 months	6 months	1 year
Degrees of freedom	36,483	36,483	36,483
	2.26	2.64	1.81
	2.78	2.33	1.87
	2.64	2.20	2.71
	2.36	3.46	3.34
	1.43	2.98	2.72
	2.45	3.30	
	3.44	1.88	
	3.35	4.68	
	1.64	1.59	
	3.36	3.40	
	3.06	4.09	
	2.84		
	2.25		
	2.73		
	2.63		
	6.27		
	1.98		
	2.54		
	2.18		
	2.72		
	2.62		
	3.85		
	3.04		

All values significant at the .05 significance level

TABLE 9.2

a) All Sectors

	df	MS	F
Between firms	199		
1(sectors)	19	0.10	2.38*
Firms within sectors	180	0.04	
Within Firms	4,400		
2 (market)	22	0.16	2.72*
1.2 (interaction)	418	0.06	1.00
2 by firms within sectors	3,960	0.06	

b) Industrials

	df	MS	F
Between firms	199		
1 (sectors)	19	0.07	1.67*
Firms within sectors	180	0.04	
Within firms	4,400		
2 (market)	22	0.14	2.49*
1.2 (interaction)	418	0.06	0.99
2 by firms within sectors	3,960	0.06	

All but the interaction terms significant at the .05 level of significance (unadjusted degrees of freedom).

* Significant at .05 level.

squares are

		All Sectors	Industrials
$\hat{\sigma}^2_\alpha$	(sector)	.00026	.00013
$\hat{\sigma}^2_\beta$	(market)	.00051	.00047
$\hat{\sigma}^2_{\alpha\beta}$	(interaction)	.00001	0

Unfortunately no estimate is available for the proportion of variance accounted for by each of the other terms in (12), that is for the error term, the firm effect and the market firm interaction. Approximations indicate that they account for a substantial proportion of the total variance. Of the remaining variance the market appears to account for at least twice as much as the sector in both the Industrials and All Sectors analyses.

Overall the results discussed here provide substantial evidence in favour of the hypothesis that a significant difference between sectors exists, and encourage investigation of the differences between individual sectors. Before considering the differences however it is useful to consider the interpretation of the contribution ratio outlined in equation (3).

Remembering that

$$C_s^2 = \frac{\sum_t \sum_i^{k_s} (\Delta_j \log F_{ist})^2}{\sum_t^n k_s (\Delta_j \log F_{.st})^2} \qquad i = 1 \ldots k_s \text{ firms in the sector}$$

the ratio may be seen to be an attempt to estimate the relative importance of sector and individual firm (error) effects. C_s^2 is the ratio for the individual sector of the error sum of squares to the explained sum of squares. A value smaller than one indicates that the sum of squares explained by the sector is larger than the error sum of squares (factors peculiar to the individual firm). Large sector effects are indicated when

the C_s^2 measure fulfils two conditions - firstly it is close to one or less, and secondly it is considerably below the C_s^2 values for the same size of sector with no sector effect. Appendix 9 provides a comparative table of C_s^2 values for varying sector sizes when the condition of no sector effect is met.

It is perhaps worth considering one or two examples. Consider the following industry where the total variability is 0.6314 and the sector and individual firm characteristics 0.4164 and 0.2150 respectively. The contribution of the sector to variability is almost twice the contribution of the error term. Appendix 9 indicates that for any sector size included there the results would be significant. In another case however it might be that $C_s^2 = \frac{0.7251}{0.0699} = 10.37$ indicating that the sector sum of squares 0.0699 was less than 10% of the error sum of squares. If the sector size was 5 companies the result would indicate no significant effect, but if the sector size was 40 one might attach some importance to the result. Clearly this need to consider two factors in the interpretation of the ratios is sub-optimal, since it is difficult to attach very much precision to the estimate. However the ratios do provide an approximate estimate of the strength and importance of sector effects and help augment other methods discussed below.

Table 9.3 tabulates the results for the F.T. Actuaries Sectors.

Building materials provide an example of a sector with increasing sector influence over time.[1] At the 3 month horizon level some 15% of the variability of the shares is provided by the sector influence increasing to as much as 40% for the 2 year time horizon. The dominant factor affecting the sector is likely to be the extent of building activity both public and private. On this, the level of interest rates, the availability of mortgages and even the weather are obvious influences. Many more could easily

---

1. Note that whilst increasing sector influence over time implies non randomness, it does not necessarily imply any inefficiency in the market.

TABLE 9.3

Contribution Ratio for F.T. Actuaries Sectors

Sector	No. of Companies	3 months	6 months	1 year	2 years
Building Materials	25	6.65	5.30	4.24	2.45
Contracting & Construction	13	3.70	4.69	6.03	17.30
Electrical	11	6.94	10.84	12.97	12.39
Engineering	64	33.94	35.16	46.47	41.65
Machine Tools	14	7.53	7.34	6.70	5.48
Misc. Capital Products	18	16.13	14.74	18.21	18.82
Motors	18	13.32	13.38	12.84	13.26
Household	12	4.98	6.66	7.46	4.85
Electronics	13	4.20	2.97	2.54	2.21
Brewing	20	1.28	0.85	0.62	0.86
Entertainment	11	10.60	11.57	13.81	17.08
Food Manufacturing	22	12.92	13.71	13.48	15.49
Food Retailing	11	6.14	5.54	5.53	6.77
Newspapers	13	4.99	3.87	3.73	12.57
Paper & Packaging	15	6.02	5.22	5.53	4.79
Stores	30	5.45	4.31	4.12	3.87
Textiles	22	9.31	7.37	7.10	5.56
Office Equipment	7	4.47	4.69	4.73	2.68
Shipping	9	2.48	2.03	1.10	0.76
Chemicals	18	15.56	15.11	10.88	7.40
Misc. Unclassified	37	27.67	24.64	29.16	42.30
Property	23	2.76	1.71	1.07	0.67
Investment Trusts	20	0.63	0.75	0.94	1.14
Merchant Banks	7	1.04	0.69	0.46	0.28
Banks	4	0.28	0.23	0.50	0.33
Insurance (Composite)	7	1.64	1.36	5.30	3.76
Insurance (Life)	8	0.99	0.99	1.56	1.14
Insurance Brokers	8	1.53	0.90	0.63	0.48

be added. One would expect them to be long term forces restricting the firms' activities more in the long run than in the short as indeed is found.

How then are the ratios for Contracting and Construction to be explained? Far from becoming more important the sector influence declines markedly over longer time horizons. Surely the influences providing a sector effect in Building Materials should have prevailed in Contracting and Construction? After all if the demand for Building Materials fell, one would expect a corresponding fall in demand for Contracting and Construction. The answer might well lie in terms of risk. The risks are high with the possibility of large cost over-runs and substantial losses in a time of inflation and financial stringency. The price histories of the constituents reflect these divergencies. One concludes then that the economics of the sector are such that good management is more critical than the underlying sector influences, although it might in fact be that it is not good management that is critical but simply being in the right part of the Contracting market for the period concerned. If the sector were partitioned into appropriate sub-sectors, sector influences might become clearly identifiable.

Before considering the Engineering sectors, attention must be drawn to the diversity of product and processes of individual firms and in consequence the difficulty of specifying exact divisions between sectors. The relatively small size of the sector effect could well be due to this. The results are by no means encouraging. Heavy Electricals show a very low and decreasing sector influence over time. One might have expected a more pronounced sector influence particularly over longer time horizons in line with ideas of a plant ordering cycle. The small decline in the Machine Tools ratios might represent the effect of the Capital Goods cycle so making the sector effect more important over time. In both the Engineering and Miscellaneous Capital Goods group the sector influence is very small.

Within the Consumer Durables group Electronics shows a substantial increase in the influence of the sector over longer time periods in contrast to Motors. The Motors result is rather surprising. Given the pronounced change in Car sales that occur and the consequent effect on profitability one might have expected a substantial sector effect particularly over longer time periods. It might be of course, that the demand for cars moves in line with the rest of the economy, so that the forces affecting car demand specifically are few.

Consumer Non Durables show similar characteristics to the other sectors. Brewing is revealed as a group in which the sector influence is particularly strong. Similar products, processes, retail outlets and methods of financing, as well as overall price control are presumably important causes, not to mention taxes and weather. It would seem that good investment performance depends on buying and selling the sector at the right time, rather than on buying the individual share.

The Brewing result is in some senses surprising. The industry is by no means totally homogeneous - Guinness is an obvious misfit. Several of the brewers are local and subject to considerable speculation as to the possibility of takeovers, whilst management and the beers vary considerably. These individual differences are apparently secondary. The main variation in the shares is accounted for by the sector characteristics.

Of the remaining sectors excluding the Financials, most of the results are unremarkable. Varying degrees of sector influence are indicated, with Stores and Shipping standing out, the former presumably due to the universal importance of the level of consumer spending and labour costs to the sector, whilst similarly, factors affecting shipping such as the growth of World trade may be particularly clear cut. Chemicals as one might expect appear to show sector effects over longer time horizons.

It is among the Financial groupings that the sector influences predominate. Most of the sectors are probably too small to attach much weight to their results, but the ratios for Property and Investment Trusts stand out. Consider first the Investment Trust ratios. The sector influence decreases slightly over longer time horizons but generally is the dominant factor affecting the variability of the shares. In the short run all the trusts being diversified portfolios, are likely to find it difficult to beat the market to any significant extent. As however the time horizon lengthens it would seem likely that individual characteristics of the trusts make some of them perform considerably better (or worse). The individual characteristics that seem most likely to be important, are, the degree of gearing, the proportion of the portfolio held in American companies, and the quality of management. The degree of gearing is likely to be particularly important in that it makes the shares much more volatile.

Particularly marked is the increase in the sector effect of the Property group over longer time horizons. The main cause of the sector effect is likely to have been the similarity of the capital structure of the property companies. The substantial debt capital and the consequent leverage in earnings with rising property rents would seem to have dominated the individual characteristics of the shares. Of the rest of the Financial results, the three Insurance ratios are of interest in showing considerable diversity over two year horizons. One might have expected the three ratios to have been more or less the same.

One possible explanation of a low sector effect is badly defined sectors. To this end several sectors were subdivided into more homogeneous components After allowing for the smaller sector sizes it appears that stronger sector influences may become apparent when the sub sectors are very homogeneous groups, such as drugs and multiple stores, but otherwise the results were not encouraging.

To cater for the possibility that the classification system used by the F.T. and the London Stock Exchange was not very satisfactory, it was decided to re-run the analysis using Broad Sector Groupings based on the F.T. classification and grouping based on the Standard Industrial Classification system. The results indicated a smaller sector influence in general.

It would seem overall from the Contribution Ratio results that of the larger sectors, Investment Trusts, Brewing and Property stand out whilst Stores, Paper and Packaging, Building Materials, and Contracting and Construction might reasonably be said to have substantial sector influences.

How far do these conclusions agree with the results of the Newman-Keuls analysis? Tables, 9.4. and 9.5 indicate the differences between the means, with an * denoting insignificant results (.05 level of significance), for the All Sectors and the Industrials analyses respectively. The number of insignificant mean differences is seen to be very small and almost always for adjacent (2 step) mean differences.[1] In so far as the Investment Trusts and Brewing both figure as being not significantly different from Insurance and Household in the first case, and Printing and Publishing in the second, the results are slightly discouraging since one might from the previous analysis have expected the mean differences to be largest for all comparisons in these cases. The Industrials table indicates even fewer non significant differences, although as before the Brewing and Printing figures are insignificant.

Apart from the Contribution Ratio and the replicated measures analysis of variance model, the earlier parts of this chapter outlined two other models.[2] These were both tested on the same limited number of equal sized sectors. Table 9.6 presents the results for (15). It is immediately seen that for all the six sectors considered the market effect is significant (at the .05

---

1. Note that differences between means could represent different loadings of the market factor.

2. See discussion on hypotheses and equations (15) and (16) in statistical methodology.

Text cut off in original

TABLE 9.4

All Sectors — Newman Keuls (mean differences)

	Pack	Cars	B.Mat	Elec	Plant	Brew	Prnt.	Text	Machine Tools	Trust	Ins.	H.Hld	C.Con	L.Elec	Mult Store	Chem	F.Ret	Bank	Ent	Prop
Pack		0.266	0.287	0.373	0.415	0.472	0.495	0.686	0.772	0.821	0.833	0.836	0.979	1.010	1.085	1.155	1.191	1.268	1.672	1.993
Cars			0.021*	0.107	0.149	0.206	0.229	0.420	0.506	0.555	0.567	0.570	0.713	0.744	0.819	0.889	0.925	1.002	1.406	1.727
B.Mat				0.086	0.128	0.185	0.208	0.399	0.485	0.534	0.546	0.549	0.692	0.723	0.798	0.868	0.904	0.981	1.385	1.706
Elec					0.043	0.099	0.122	0.313	0.400	0.448	0.460	0.463	0.606	0.637	0.712	0.782	0.818	0.895	1.299	1.620
Plant						0.056	0.079	0.271	0.357	0.406	0.418	0.420	0.564	0.594	0.669	0.739	0.775	0.852	1.256	1.578
Brew							0.023*	0.214	0.301	0.349	0.361	0.364	0.507	0.538	0.613	0.683	0.719	0.796	1.200	1.521
Prnt								0.192	0.278	0.327	0.338	0.341	0.485	0.515	0.590	0.660	0.696	0.773	1.177	1.498
Text									0.086	0.135	0.147	0.150	0.293	0.324	0.399	0.468	0.505	0.582	0.985	1.307
M.Tools										0.049	0.061	0.063	0.207	0.237	0.312	0.382	0.418	0.495	0.899	1.221
Trust											0.012*	0.015*	0.158	0.189	0.263	0.333	0.370	0.446	0.850	1.172
Ins												0.003*	0.146	0.177	0.252	0.322	0.358	0.435	0.839	1.160
H.Hld													0.143	0.174	0.249	0.319	0.355	0.432	0.836	1.157
C.Con														0.031*	0.106	~~0.175~~	0.212	0.289	0.692	1.014
Lt.Elec															0.075	0.145	0.181	0.258	0.662	0.983
Mul.Stores																0.070	0.106	0.183	0.587	0.908
Chem																	0.036*	0.113	0.517	0.838
F. Ret																		0.077	0.481	0.802
Bank																			0.404	0.725
Ent																				0.321
Prop																				

* not significant at the .05 level of significance

TABLE 9.5

Industrial Sectors — Newman Keuls (mean differences)

	Pack	Ind H	Cars	B.Mat	Elec	Plant	Brew	Prnt	F.Man	Dept S	Text	Machine Tools	H.Hld	M.Eng	C.Con	L.Elec	Mult Stores	Chem	F.Ret	Ent
Pack		0.228	0.266	0.287	0.373	0.415	0.472	0.495	0.570	0.645	0.686	0.772	0.836	0.869	0.979	1.010	1.085	1.155	1.191	1.672
Ind H.			0.038	0.059	0.145	0.188	0.244	0.267	0.342	0.418	0.458	0.545	0.608	0.642	0.752	0.782	0.857	0.927	0.963	1.444
Cars				0.021*	0.107	0.149	0.206	0.229	0.304	0.379	0.420	0.506	0.570	0.603	0.713	0.744	0.819	0.889	0.925	1.406
B.Mats					0.086	0.128	0.185	0.208	0.283	0.358	0.399	0.485	0.549	0.582	0.692	0.723	0.798	0.868	0.904	1.385
Elec						0.043	0.099	0.122	0.197	0.273	0.313	0.400	0.463	0.497	0.606	0.637	0.712	0.782	0.818	1.299
Plant							0.056	0.079	0.155	0.230	0.271	0.357	0.420	0.454	0.564	0.594	0.669	0.739	0.775	1.256
Brew				0.023*	0.098	0.174	0.214	0.301	0.364	0.398	0.507	0.538	0.613	0.683	0.719	1.200				
Prnt					0.075	0.151	0.192	0.278	0.341	0.375	0.485	0.515	0.590	0.660	0.696	1.177				
F.Man						0.075	0.116	0.202	0.266	0.299	0.409	0.440	0.515	0.585	0.621	1.102				
Dept.S							0.041	0.127	0.190	0.224	0.334	0.364	0.439	0.509	0.545	1.026				
Text								0.086	0.150	0.183	0.293	0.324	0.399	0.468	0.505	0.985				
M.Tools									0.063	0.097	0.207	0.237	0.312	0.382	0.418	0.899				
H.Hld										0.034*	0.143	0.174	0.249	0.319	0.355	0.836				
M.Eng											0.110	0.140	0.215	0.285	0.321	0.802				
C.Con												0.031*	0.106	0.175	0.212	0.692				
Lt.Elec													0.075	0.145	0.181	0.662				
Mult Stores														0.070	0.106	0.587				
Chem															0.036*	0.517				
F.Ret																0.481				
Ent.																				

* not significant at the .05 level of significance

TABLE 9.6

Sector	df.	SS	F
Building Materials			
Market	22	4.93	5.53 (22,207)
Firm + Market	31	5.27	4.18 (31,198)
Total	229	13.32	
Brewing			
Market	22	2.72	8.38
Firm + Market	31	2.87	6.27
Total	229	5.78	
Investment Trust			
Market	22	2.53	6.77
Firm + Market	31	2.68	5.07
Total	229	6.04	
Electronics			
Market	22	4.78	4.23
Firm + Market	31	5.03	3.10
Total	229	15.41	
Multiple Stores			
Market	22	2.56	1.81
Firm + Market	31	3.10	1.55
Total	229	15.88	
Property			
Market	22	3.90	1.86
Firm + Market	31	4.96	1.70
Total	229	23.57	

level of significance using unadjusted degrees of freedom). As the results are presented no test for the firm effect is reported. However simple manipulation yields a suitable numerator and denominator M.S. for such a test.[1] The firm effect is found to be insignificant. The null hypothesis that the means of the individual shares do not significantly differ from each other is not rejected.

Table 9.7 provides the results of the regressions using a market and sector index as the independent variables. The same six sectors, 23 time periods and ten firms reported on above were used for the analysis.

For each sector the results are provided for a regression on a constant, sector index and the market index, and for the constant and market index alone. As an indicator of the extent of multicollinearity between the sector and market indices the simple correlations between these two independent variables are provided. The correlation between the two is generally high and together with the change in the sign and significance of the coefficients of the second regression for each sector, indicates the presence of considerable collinearity between the independent variables. A frequent consequence of high collinearity between the independent variables is to make the variance of the estimates extremely large resulting in a low reliability of the estimates. The R^2 may be interpreted as the percentage of variation explained by the independent variable. Thus for property 24.7% of the variation in the sector rates of return (excluding dividends) is explained by market and industry factors.

---

1. Let 'a' be the number of variables in the market regression with error sum of squares of SSE_1 and (a + b) be the number of variables in the market + firm regression with error sum of squares of SSE_2. Then $\frac{(SSE_1 - SSE_2)}{b}$ will be an unbiased estimator of σ^2 if there is no firm effect. It may be tested against $\frac{SSE_2}{T-(a+b)}$ which is always an unbiased estimator of σ^2, where T is the total number of observations.

TABLE 9.7

Sector		Constant	Sector Index	Market Index	Correlation between sector and market independent variables	Corrected R^2	No. of observations for t statistic
Building 1		0.0310	1.7145	-0.6513	0.943	0.247	227
		(1.97)	(4.70)	(-1.73)			
Materials	2.	-0.0031		0.9457			
		(-0.21)		(7.25)		0.184	228
Brewing	1.	0.0062	1.2665	-0.0681	0.743	0.421	227
		(0.77)	(9.14)	(-0.63)			
	2.	0.0075		0.6670		0.211	228
		(0.80)		(7.89)			
Stores	1.	0.0273	1.7492	-0.5820	0.869	0.103	227
		(1.64)	(4.13)	(-1.93)			
	2.	0.0356		0.5002		0.040	228
		(2.09)		(3.24)			
Property	1.	0.0290	1.3619	-0.2496	0.801	0.095	227
		(1.23)	(3.67)	(-0.82)			
	2.	0.0738		0.6473		0.045	228
		(3.56)		(3.45)			
Investment	1.	0.0098	0.8279	0.0824	0.868	0.364	227
		(1.10)	(5.28)	(0.53)			
Trusts	2.	0.0215		0.7966		0.290	228
		(2.37)		(9.72)			
Electronics	1.	0.0180	1.1552	-0.0625	0.902	0.248	227
		(1.19)	(3.92)	(-0.20)			
	2.	0.0275		1.0470		0.195	228
		(1.78)		(7.51)			

In addition to the difficulties in interpreting the regressions caused by multicollinearity, problems also arise from the inclusion of the dependent variable in the independent variables. For each sector analysed the dependent variable, the individual company's change in share price, is a component of both the sector and market means. The problem caused by the latter may be safely ignored since the individual company is a small part of the market as a whole, but the same may not be true for the sector mean. In an extreme example all the components of the sector mean might be involved in the regression. To minimize the problem efforts were made to use reasonbly large sectors (with one exception - Electronics) so that the sector index was computed using a considerably larger number of companies than were involved in the sector regression, but even so one would still expect an upward bias in the regressions involving the sector index. This problem and that of multicollinearity indicate that considerable care must be taken in the interpretation of these regressions. Despite these problems however the regressions do provide useful, additional estimates of the variation accounted for by sector and market effects.

Overall the conclusion, both for the regressions outlined above and for the variety of other tests carried out, must be that there is considerable support for associating distinguishable sector effects with the classification of shares by sector. Analysis of both a large number of sectors by means of the analysis of variance and individual sectors by means of regression indicates that sector and market effects are significant. Estimation of the importance of these effects is more difficult. Consideration of the C_s^2 statistic and the individual regressions indicates that for a few homogeneous sectors market and industry factors may account for more than 25% of the variance. The effect for all sectors (or a large subset thereof) is probably lower, although lack of a suitable estimate for the error variance in the analysis of variance made a precise estimate by this means impossible. Investigation

of a component corresponding to the individual firm, such as the firm's rate of growth, revealed little additional information. It did not appear to be significant for any of the sectors considered, although it was important for one or two individual firms.

The conclusion that sectors, and in particular homogeneous sectors, are influenced by an industry effect clear the way for an investigation of the two further questions posed in the previous chapter. Do investment managers select shares by sectors? and Is sector selection a valuable investment technique? Attempts to answer both these question are discussed in the next chapter. In so far as the answer to the latter question depends largely on the managers' abilities to forecast relative sector rankings, further evidence derived from published studies is discussed in the chapter following that.

Chapter 10

The Contribution of Sector Selection to Performance

The previous chapter established that sectors are influenced by industry events. This conclusion provides the foundation for the investigation of the questions posed earlier. Do investment managers select shares by sectors? and Is Sector Selection a valuable investment technique? Both questions are considered here. The first is ascertained by a comparison of the holdings of a portfolio selected by means of sector techniques with the holdings of a portfolio selected by chance. The second is answered by a comparison of the performance of a portfolio, its shares selected on the basis of sector characteristics, with the performance of a portfolio composed of sector equivalent investments.

The ideas and justifications behind these two comparisons are easily explained. For convenience they are described here. The technical problems involved in the implementation of the comparisons and the results are discussed later. The question, do managers select shares by sectors, is examined first since its fulfillment is a necessary condition for ascertaining the value of sector selection as an investment technique.

Consider an investment selection technique, completely uncorrelated with sector selection methods, that selects shares for a portfolio on the basis of the individual characteristics of the securities. On average, provided the portfolio contains a large number of individual securities, one might expect the distribution (by sector) of holdings in this portfolio to correspond to the distribution (by sector) of the population of securities from which they were chosen. (termed the market distribution hereafter.) By way of contrast, if the shares selected for the portfolio are chosen on the basis of their sector characteristics (or by some correlated technique) then one might expect substantial divergence between the distribution of shares within the portfolio and the market distribution. This deviation of the portfolio distribution from

the market distribution may be considered to provide a measure of the extent of sector selection.

The comparison of market and portfolio distributions involves the question of time. The simplest procedure is to compare the distributions at the same date. A portfolio may be thought to represent the Fund Manager's beliefs about which sectors he should be invested in, so that comparison of the actual portfolio with the market should reflect any sector deviation. It might be however, that at any moment of time the fund manager is altering his policies so that remnants of some former selection decisions remain in the portfolio. Hence sector selection may also be thought of as the deviation of purchases from the market distribution.[1]

Thus deviation between the portfolio and the market is seen to lie at the heart of the investigation of whether managers select shares by sectors. In contrast the evaluation of the value of sector selection as an investment technique relies on comparisons of performance. The performance of an actual portfolio, its constituents selected on the basis of their sector characteristics, is compared with the performance of equivalent amounts invested in the appropriate sector indices. Performance of the portfolio close to the sector equivalents and substantially better than the market over several periods would provide prima facie evidence of the success of sector selection as

---

1. Analogously one may also consider the deviation of sales from a norm - the market value of each sector held in the portfolio. If sales correspond to the portfolio balance (that is, the distribution of sales correspond to the portfolio distribution) then there would be no evidence of sector selection taking place. If however sales were predominantly in one, or a few sectors, significant deviation might occur and indicate the influence of sector selection.

an investment technique.[1]

To facilitate comparison between the portfolio and the sector equivalents the change in value of the portfolio was broken down into a number of components such as the change in value of the shares held throughout, the change in value of the shares bought during the period and held until the end, and the change in value of shares held at the beginning of the period but subsequently sold. A breakdown of this type enables the behaviour of the two portfolios to be compared in greater detail than might otherwise be possible. It may also throw some light on the particular talents of the fund manager. Consistent ability to select shares that perform above average on a short term basis may be reflected by superior performance relative to the sector or the market in one of the components.

The extent of sector selection

The technical problems involved in measuring the deviation between the distribution of holdings of an actual portfolio and the distribution of

---

1. In fact two interpretations of the evidence are possible. The first assumes that the sector deviation of the portfolio is predominantly due to the sector selection methods used by the managers and on this assumption endeavours to judge the value of sector selection as an investment method. In view of the managers' claims that they select shares by sector this interpretation is preferred here.

   The second more conservative interpretation considers that sector deviation could have been caused by the use of a correlated technique that causes substantial sector deviation and hence that the deviation is not necessarily a direct resultant of sector selection methods. The portfolio performance analysis then asks whether the shares selected for the portfolio were representative of their industry and selected for their sector characteristics, or whether the shares were unrepresentative of their sector and likely to have been chosen for their individual characteristics. (It is possible that shares are selected for their sector characteristics but fail to behave according to the sector or alternatively that they are bought for their individual characteristics but behave according to the sector. These effects cannot be separated out but it seems reasonable to presume that on average shares selected for their sector characteristics behave accordingly, and vice versa.) The sector equivalent portfolio indicates what would have happened had the contribution to the portfolio been purely due to the sectors the portfolio was invested in.

Text cut off in original

securities on the market, mainly revolve around the formation for each of the two portfolios[1], of a distribution of securities.

The first step in the analysis was to classify the constituents of both the portfolio and the market distributions[2] into sectors, since it is the sector, not the security deviation that is of interest. The classification scheme used was that of the F.T. which was thought to provide a reasonable balance between a classification that divided the market into a few large sectors with consequently little sector deviation, and a classification which divided the market and the portfolio into many small sectors and hence confirmed substantial sector deviation.[3] To classify the market portfolio by means of the F.T. classification is a substantial task. To lighten the burden the market portfolio was considered to consist of the 600 or so stocks that were included in the F.T. Actuaries indices. The effect of this restriction was to introduce a size bias into the analysis. However the impact of the bias was probably fairly small since many of the stocks excluded were small and unmarketable with little institutional dealing, whilst the securities of interest to fund managers were generally, because of time constraints, the larger more important companies. A rather more important bias was that arising from the exclusion of virtually all foreign stocks from the data. Apart from the classification of the constituents of the market portfolio into sectors with each firm weighted by its market value, it was necessary to classify the holdings of the portfolio with which the market

---

1. For convenience all the securities in the market are considered as elements of a portfolio - the market portfolio.

2. Strictly it is not the market distribution that is of interest but the population from which all securities are chosen by the investment managers. Such a population is very large and difficult to document and as an approximation might be restricted to the stocks quoted on the London Stock Market.

3. At one extreme is the case where the distribution of securities on the market and the portfolio distribution each comprise one large aggregate sector. In consequence there can be no sector deviation and hence no sector selection. At the other extreme, division of the market and the portfolio into many small sectors increases the likelihood of the portfolio deviating from the market. For example, if each firm comprises one sector then automatically any portfolio that doesn't contain all the firms (weighted by their market value) shows substantial deviation.

is being compared into their sector components. The value of each company's holding in the portfolio provided the weights for the distribution. A large holding by value implied a large weight for that company. Several large holdings in the same sector imply a large sector weight.

Once this classification of the market and portfolio was complete, the measurement of deviation between the actual portfolio and the market portfolio was straightforward. The distributions were simply compared at the same date and the deviations measured. The same claim cannot however be made for the more sophisticated analyses comparing the distribution of a purchase portfolio. It represents the purchases made by the fund manager over some period of time, generally six months.[1] With what market portfolio[2] should it be compared? That of the beginning date at which purchases were started, or that of the date when purchases were completed or some period in between? The procedure adopted was to compare the purchases with the market at the last date. Investigation of the effect

---

1. Over what period should comparisons involving purchases and sales, be made? Over a very long time period it might be the case that the distribution of purchases corresponds to the market distribution. Over the very short period, the discreteness of the investment procedure might give the appearance of a considerable deviation in the distribution The appropriate time period is likely to vary with the portfolio being considered. A high turnover is likely to require a relatively short period. A general problem of the analysis is that policy is constantly changing. The purchases and sales over a period may represent the views of several different fund managers who have all managed the portfolio. Even if this is not the case any one fund manager is confronted with a changing set of expectations necessitating changes of policy. The basic period for purchases and sales portfolios adopted in this study was six months. Such a time period represented a considerable turnover for the portfolios. It was also unlikely that more than one fund manager exercised control over such a period.

2. It is the market portfolio with which it is compared and not the change in the market portfolio. A comparison such as the latter would provide information on the adjustment of the fund manager to changes in the market distribution rather than evidence of sector selection.

of using different market dates revealed little difference over short purchase periods.[1]

A question arising from the analysis relates to what is meant by purchases. A number of means of measuring purchases are apparent. The simplest is to use the change in market value between two dates for each sector, convert this into a proportion and then compare it with the market distribution of the appropriate date. Such an approach is obviously only a rough approximation to the purchases (or sales) that have been made. A more sophisticated approach is to derive the change in numbers of shares for each security, and sector and then to multiply by the share price to bring the figures back to market values.[2]

This second procedure indicates the purchases that have been made more accurately than the aggregate sector approach. In effect the former provides the net change over the period. The changes due to purchases or sales are included within an overall figure for capital appreciation or depreciation. An apparent change in purchases (sales) may be caused simply by an increase (decrease) in the price of the shares in the sector and no actual change in purchases (sales). Over short time periods, however, the impact of these changes is small. Some problems still exist in the second approach, in that the shares are assumed to be bought at the last date of the portfolio. If they had been bought just after the first date then considerable appreciation or depreciation might have taken place

---

1. The deviation of sales from the market value of the portfolio is compared with the portfolio at the beginning of the sales period. In fact little attention is paid to sales in the analysis that follows. This is because the number of sales transactions tended to be small over most of the period considered. The factor mainly responsible for this was the fast growth of the portfolio during the bull market. New money coming into the portfolio removed the need for sales in order to change the balance of the portfolio.

2. The price used is that of the latest balance sheet data. The price that ideally should be used depends on when the shares were bought. This information is not conveniently available and approximations were necessary.

and be included in the purchase (or sales) figure.

Sector Deviation Measures

With the criteria for constructing both the market and sector distributions decided on, appropriate measures of deviation may be considered. The task is to compare the distributions in order to indicate whether sector selection takes place. Two possible results may usefully be considered to illustrate this procedure. The first consists of a comparison of the distributions and no deviation being found. The distributions in terms of proportions are exactly the same. The second case is where the entire portfolio is concentrated in the smallest sector in the market and hence the deviation is considerable. In this latter case sector selection (or some correlated technique) might reasonably be thought to have taken place.

Two measures of deviation were adopted for comparing the distributions. The first was an absolute deviation measure of the form

$$D_1 = \frac{1}{2} \sum_{i=1}^{n} | x'_i - x_i | \qquad (1)$$

where there are i sectors and x_i represents the proportion of the market taken up by the sector and x'_i the corresponding proportion of the portfolio. This measure has certain numerical advantages since it varies linearly between 0 and 1. Consider the following cases. If for example $x'_i = x_i$ for all i then $D_1 = 0$. If on the other hand the investment in the portfolio is concentrated entirely in the smallest market sector n then the

deviation ratio approaches one.[1] The value of D_1 is seen to increase, as the portfolio becomes more heavily concentrated in a few sectors. Thus a portfolio distributed in the same proportions as the market but confined to sectors comprising half of the total market value of all securities would have $D_1 = 0.5$ Concentrated in 40% of the total market in the same proportions would give a $D_1 = 0.6$ and so on.

In terms of purchases and sales, purchases made over all sectors in proportion to the market distribution will involve low deviation whilst purchases concentrated in a few sectors will involve high deviation. Similarly in terms of sales, sales concentrated in a few sectors will involve high deviation whilst sales made over all sectors corresponding to the portfolio distribution will involve low deviation.

The second measure for considering the portfolio deviations was of the form

$$D_2 = \sqrt{\frac{1}{n}\sum_{i}^{n}(x_i' - x_i)^2} \qquad (2)$$

an ordinary least squares goodness of fit test. Interpretation of the squared deviation measure is not so easy. Algebraically it is akin to the

---

1.

$$D_1 = \frac{1}{2}\sum_{i}^{n} | x_i' - x_i |$$

$$= \frac{1}{2}\{(\sum_{i}^{n-1} |0 - x_i|) + | x_n' - x_n| \}$$

where $x_n' = 1 = \sum_{1}^{n} x_i = \sum_{i}^{n-1} x_i + x_n$

$$= \frac{1}{2}(\sum_{i}^{n-1} x_i + x_n - x_n)$$

$$= \sum_{i}^{n-1} x_i$$

Now as x_n tends to zero, $\sum_{i}^{n-1} x_i$ tends to one since $\sum_{i}^{n} x_i = 1$

portfolio's standard deviation using the market as a standard of comparison.[1] It is to be noted that the measure gives greater weight to the extreme differences than does the absolute deviation measure.

Both measures suffer from a problem related to the number of companies in a portfolio. The assumption is made that if the shares were selected on the basis of their own characteristics then one might expect the portfolio distribution between sectors to conform to that of the market and hence to exhibit zero deviation. Now if many portfolios were analysed and if the number of companies invested in each were very large, one might expect the deviation to be close to zero, but in general the number of companies is unlikely to be sufficiently large for this to be the case. If only a few companies are selected then a fairly high deviation is likely to arise by chance each time.[2]

It is obviously desirable to have some knowledge as to the likely value of each of the measures with varying numbers of transactions. Consequently a large number of portfolios are constructed by random procedures (so implying no sector selection to be present) and the deviation measures calculated. The probability of selection of a share was dependent on the proportion of its market value relative to the market values of all the shares from which it was selected (a population of some 520 stocks). Failure to weight the probabilities of selection in such a manner would have meant that sectors with a small number of companies, such as oils, would have been consistently under-represented. Constraints on the size of holding in any one share were imposed with a maximum of 5% for the portfolios

---

1. It is of interest to note the relationship of the measure to a chi-square test where x_i represents the expected observations and x_i the observed observations. Note however that chi-square is not applicable in this situation since relative frequencies are being compared.

2. If for example the number of investments made is less than the number of sectors then deviation must arise even if the shares are chosen at random.

involving more than 50 stocks and 10% for smaller portfolios.[1]

These random portfolio calculations provide information not only on the influence of the number of holdings on the statistic but also suggest a comparison standard against which to judge the extent of deviation.[2] (see Appendix 10.)

Results

First attempts at measuring portfolio deviation concentrated on comparing the actual portfolios with the market. Table 10.1 presents the results for the F.T. Actuaries calssification. Comparison with the random sector results indicates a significant and substantial sector deviation when measured in terms of D_1, the absolute deviation measure.

An analysis of means corroborated this. The means of the random samples (denoted D_1 random) and of the D_1 values in Table 10.1 (denoted D_1 actual) are significantly different. Using the random sample values for portfolios of 40 stocks[3] the D_1 actual and random mean comparison gave a t value of 5.64 with 55 d.f. so rejecting the null hypothesis that D_1 actual and D_1 random are equal (H_1 : D_1 actual > D_1 random) at the .05 level of

---

1. Note that this constraint is in line with the maximums found for the actual portfolios. While the Department of Trade and Industry restrict portfolio constituents to less than 5% of the value of the fund in general, this is far from the case in the portfolios analysed here, since foreign stocks are left out so that 5% of the total portfolio constituted a larger proportion of the actual analysed portfolio.
2. It is difficult to construct portfolios composed of purchases (or sales) by random means. It is therefore necessary to use the random results for actual portfolios as proxies for the figures of random purchase portfolios.
3. Use of the random sample values for portfolios of 40 stocks is in fact likely to underestimate the actual t value since the number of stocks in the actual portfolio is generally considerably more than 40.

TABLE 10.1

Values of the Sector Deviation Measures Derived from a comparison of the portfolio and market distributions

Portfolio and Market Dates	D_1	D_2
April 1968	0.56	4.40
Oct. 1968	0.57	4.31
April 1969	0.54	3.89
Oct. 1969	0.51	3.99
April 1970	0.58	4.26
Oct. 1970	0.51	3.77
April 1971	0.52	3.61
	———	———
MEAN	0.54	4.03
ST. DEV	0.029	0.298

significance.[1] Comparison of the D_2 squared deviation measure (D_2 actual) and the D_2 from the random samples did not look so hopeful. Early portfolio values looked encouraging but later values seemed little different from those found for random samples. Again a test on means was carried out. Using the random sample portfolios of 40 stocks at t value of 3.95 was obtained with 55 d.f.[2] Overall it seemed reasonable to conclude that there was evidence of sector deviation using even a relatively crude comparison such as actual portfolios.

The next step was to consider the simple purchases portfolio.[3] Consideration was given to purchases in order to overcome the problem of finding no sector deviation when in fact sector selection had taken place, a result of portfolios containing a substantial number of stocks - remnants of former policies - which were relatively unmarketable and not quickly saleable. If this is the case greater sector deviation should be found in purchase portfolios since such portfolios do not represent the result of a variety of different philosophies. Table 10.2 provides some information. The 12 month values are not of course independent and the tests may be biased

---

1. On several occasions although not in fact this one, the two means being compared appeared to come from populations with different variances. The violations were not severe so it was not thought worthwhile to explore possible tests when the variances are unequal. What is of interest is why the variances should be unequal. One possible explanation is that high variability in the measures particularly for the purchases portfolios, arises from variations in portfolio behaviour over time. Different fund managers might be expected to use sector selection techniques to a lesser or greater degree with consequently, considerable variation in the deviation measures. In some periods there is little sector selection and in others a great deal, so that the deviation measures varies considerably more than when portfolios are simply selected by random selection.
2. However in this case the means appeared to come from populations with different variances.
3. The change in market value of the sector with a positive change indicating a purchase and a negative change a sale.

TABLE 10.2

Deviation Values of Purchases Portfolios
(first definition of purchases)

6 months	D_1	D_2
April 1968 to Oct. 1968	0.59	4.39
Oct. 1968 to April 1969	0.63	4.85
April 1969 to Oct. 1969	0.78	6.65
Oct. 1969 to April 1970	0.67	5.57
April 1970 to Oct. 1970	0.73	5.90
Oct. 1970 to April 1971	0.69	7.28
Mean	0.69	5.77
St. Dev.	0.077	1.08
12 months		
April 1968 to April 1969	0.59	4.58
Oct. 1968 to Oct. 1969	0.65	5.35
April 1969 to April 1970	0.66	5.24
Oct. 1969 to Oct. 1970	0.67	5.03
April 1970 to April 1971	0.75	6.48
Mean	0.66	5.34
St. Dev.	0.057	0.70

in consequence. A test on means between the 6 months purchases portfolio D_1 measure and the random sample portfolio of 30 stocks D_1 produced a t value of 7.6 with 54 d.f.[1] Encouraged by this success the more refined calculation of purchases were computed.[2] Details of the results are given in Table 10.3. Calculation of t values once more give significant values for both the D_1 and D_2 measures.

To provide an indication of the reliability of these results some of the assumptions underlying these results were varied. The results confirmed their reliability. Thus using the earliest market for the 6 month comparison with purchases, instead of the latest market, made only a negligible difference to the D_1 and D_2 measures. The mean values also remained virtually the same (0.65 and 5.19 respectively.) Similarly valuing the change in the number of securities purchased at the earliest, rather than the latest price, produced only very small changes in the D_1 and D_2 measures. (The new means were 0.64 and 5.28 respectively). Such results seemed to indicate that the purchases figures were fairly robust and indicated quite well the extent of sector deviation.

---

1. The 30 stock random portfolios are used because the purchase portfolios are generally smaller in terms of number of holdings than has been the case in the previous comparisons. In fact all the present comparisons involve more than 30 stocks. Note that in this case the null hypothesis that the means came from populations with the same variance is not rejected.

2. Figures for sales were also calculated. The results are not included here as it was difficult to provide any meaningful comparison standard. The values of the deviation ratio were in general low, indicating that the distribution of sales corresponded closely to the actual portfolio distribution at the beginning of the period over which the sales were calculated. Hence overall, the conclusion from consideration of sales seemed to be that there was little sector deviation. However the low number of sales that took place made these figures considerably less reliable than the purchases data, and it was not felt safe to place much weight on the sales results. This belief was confirmed when by a varying of the assumptions under which the analysis was made, different results could be obtained with higher values for the sector deviation.

TABLE 10.3

Deviation Values of Purchases Portfolios
(second definition of purchases)

6 months	D_1	D_2
April 1968 to Oct. 1968	0.58	4.37
Oct. 1968 to April 1969	0.56	4.03
April 1969 to Oct. 1969	0.62	5.09
Oct. 1969 to April 1970	0.69	5.62
April 1970 to Oct. 1970	0.70	5.61
Oct. 1970 to April 1971	0.68	6.51
Mean	0.64	5.21
St. Dev.	0.06	0.91
12 months		
April 1968 to April 1969	0.53	3.85
Oct. 1968 to Oct. 1969	0.50	4.10
April 1969 to April 1970	0.62	4.73
Oct. 1969 to Oct. 1970	0.60	4.35
April 1970 to Aoril 1971	0.69	5.22
Mean	0.59	4.45
St. Dev.	0.07	0.54

Overall it seemed reasonable to conclude that in the portfolio investigated there did appear to be considerable evidence of sector selection (or some correlated technique) taking place, so bearing out the assertions of the Managers that shares were selected on the basis of their sector characteristics.

Portfolio Performance

A comparison of portfolio performance as the introduction to this chapter made clear, is the basic idea behind the techniques for evaluating the value of sector selection. The performance of an actual portfolio, its constituents selected on the basis of their sector characteristics, is compared with the performance of equivalent amounts invested in the appropriate sector and market indices.

To establish the contributions of sector and market equivalent investments it is necessary to find the change in value of the portfolio over time period t to t+h for both the actual portfolio and a portfolio of sector (market) equivalent investments. To aid the analysis the change in value of a portfolio (ΔV_t) is decomposed into a number of components. Let

$$\Delta V_t = V_{t+h} - V_t$$

where V_t is the value of the portfolio at the beginning of the period and V_{t+h} its value at the end of the period;

Now

$$V_t = Z_t + C_t$$

where Z_t is the value of shares in the portfolio at time t and C_t is the cash at time t.[1]

---

1. Note that $Z_t = \sum_j^m \sum_i^{n_j} q_{ijt} p_{ijt}$ where q is the quantity of the i^{th} share in the j^{th} sector held at time t, and p_{ijt} the respective price. There are n_j shares in the m sectors.

The value of shares at time t (Z_t) is composed of the shares held throughout over the period t to t+h and the shares held at t but sold before t+h. Letting S_t be the initial value of the shares held throughout and D_t the initial value of the shares subsequently sold then

$$V_t = S_t + D_t + C_t$$

and similarly

$$V_{t+h} = S_{t+h} + P_{t+h} + C_{t+h}$$

where S_{t+h} is the final value of shares held throughout. P_{t+h} is the final value of shares purchased during the period and C_{t+h} is the cash held at t+h.[1]

Consideration of the cash term C_{t+h} reveals that it consists of the initial cash plus or minus some quantity x which represents the difference between the value of the shares sold during the period and the value of shares subsequently purchased.

$$x = D_{t+k} - P_{t+g}$$

where D_{t+k} is the value of shares sold during the period and P_{t+g} is the values of shares bought during the period.[2]

Thus $C_{t+h} = D_{t+k} - P_{t+g} + C_t$

Substituting into $\Delta V_t = V_{t+h} - V_t$

gives

$$\Delta V_t = \Delta S_t + \Delta P_t + \Delta D_t$$

where ΔS_t is the change in value of shares held throughout ($\Delta S_t = S_{t+h} - S_t$). ΔP_t is the change in the value of shares bought during the period and held

---

1. $Z_{t+h} = S_{t+h} + P_{t+h} = \sum_{j}^{m} \sum_{i}^{n_j} q_{ij(t+h)} P_{ij(t+h)}$

2. $t < t+k < t+h$
   $t < t+g < t+h$

   when k = g, purchases and sales are synchronised.

until $t+h(\Delta P_t = P_{t+h} - P_{t+g})$ and ΔD_t is the change in value of shares held at t and sold during period t to $t+h(\Delta D_t = D_{t+k} - D_t)$.

Until now it has been assumed that no securities are both bought and sold in the period. If purchases occur at F_{t+k} and sales at F_{t+g} then one may analogously have a quantity $y = (F_{t+g} - F_{t+k})$ representing the difference between purchases and sales during the period.

Then

$$C_{t+h} = C_t + x + y$$

$$C_{t+h} = C_t + D_{t+k} - P_{t+g} + F_{t+g} - F_{t+k}$$

and

$$\Delta V_t = \Delta S_t + \Delta P_t + \Delta F_t + \Delta D_t$$

where ΔF_t is the change in value of the purchases during the period that are subsequently sold before the end of the period. No account has so far been taken of inflows of money (M) into the portfolio, of dividends and interest received (I), expenses $(E = \alpha V_{t+h})$ or taxes $(T = \gamma(V_{t+h} - V_t.))$

The complete model of the change in value of a portfolio allowing for these items may be represented by[1]

$$\Delta V_t = \Delta S_t + \Delta P_t + \Delta D_t + \Delta F_t + I - E - T + M$$

However the object of the analysis is simply to compare an actual and a notional sector portfolio. In consequence several simplifications are possible. Thus M is the same in both cases and may be ignored. It is also legitimate to ask whether E and T may be ignored. Expenses are a

---

1. One may easily show this. For example, assume that new money inflows (M) occur and are kept as cash. Then M is simply an addition to C_{t+h} that is $C_{t+h} = C_t + D_{t+k} - P_{t+g} + M$.
If M had been totally invested at t+g say, then P_{t+g} would include shares bought with M. Hence ΔP_t would contain all the increase (decrease) in value due to M. If M was actually negative - redemptions - then ΔD_t would pick up the change. In both cases it is still necessary to include the term M since ΔP_t or ΔD_t only record the change in value due to M. The portfolio also changes in value by the absolute amount of M. The same reasoning applies to I, E and T.

function of the end value of the portfolio, generally a percentage. Deduction of expenses from the change in value of the actual and sector equivalent portfolios will reduce the difference between the two since a larger absolute amount of the more successful portfolio would have to be paid. The same is true of taxes and indeed in certain circumstances the tax payable may be a larger proportion of the gain of the more successful portfolio than of the less successful one. In consequence it would seem reasonable to ignore expenses and taxes and compare the portfolios on a gross of tax and expenses basis. It remains then to estimate the components of

$$\Delta V_t = \Delta S_t + \Delta P_t + \Delta D_t + \Delta F_t + I$$

for both portfolios, using the actual values in one case and index equivalents in the other.

The procedures used to estimate these components has much in common with the sector deviation methods outlined previously. The firms were segregated into sectors and the necessary exclusions of foreign (and a few other) firms made in order that the data was compatible with the sector indices available. The individual components were then estimated. For each sector an estimate of the value of the shares held throughout, the shares bought during the period and held, the shares owned at the beginning and sold before the end, and shares both bought and sold, were made. For any individual security it was quite possible that some shares were held at the beginning of the period, further shares were subsequently added, and then all the shares were sold during the period. As before the number of shares held were adjusted for rights, scrips and divisions and then multiplied by the appropriate price to give an estimate both of the cost of the investments and of their value when sold. The difference between the cost and the sale proceeds gave the change in value for each security. Summed, for each sector and for the portfolio, the ensuing results provide estimates for the performance comparison.

It was also necessary to calculate the performance of an equivalent sector portfolio. To this end, the actual amount (cost) of shares in a sector was invested notionally in the appropriate sector index and the change in value of this amount over the period the shares were held, calculated. Summing for all sectors and all the different components to be estimated yielded the total change in value of the equivalent sector portfolio.[1]

This procedure was also carried out to construct a market index equivalent portfolio. This market equivalent portfolio provided another standard against which the portfolio could be compared. For example if the shares in the actual portfolio were selected on the basis of their individual characteristics, then on average one might expect the overall portfolio to be closer to the market equivalent portfolio than to the sector equivalent. This of course only holds true if the managers do not have, or have not used, superior investment skills on the portfolio. If they have such skills their selection of individual shares should result in performance superior to both the sector and the market equivalent portfolios.

In general it has been assumed that any individual portfolio is unlikely to show consistent superior performance (for given risk) on the basis of superior individual share selection. It might show superior performance on the basis of the selection of the best sectors, but one would then expect either the portfolio performance to be similar to that of the sector equivalent portfolios, or for the portfolio to show that the selection of

---

1. It is perhaps worth considering a problem that could arise in estimating the sector equivalent portfolios. The weighted arithmetic mean indices of the F.T. Actuaries series that were used to calculate the sector equivalent may be dominated in some cases by one large firm. In consequence if this firm performs well, whilst the other sector constituents perform poorly, then the sector index may still be high, even though selection of any other share in the sector would result in poor performance. The effect of this is likely to be small when reasonably large sectors are employed but it remains a factor that might be important in considering the results of small sectors.

sectors has been right, and within those sectors the selection of shares has been superior as well. If the portfolio did perform well solely on the basis of the individual share selection, then one would expect the individual share performance to be good whatever the sector performance was like.

A difficulty of the analysis was the securing of adequate data for the study. At times it was necessary to make somewhat arbitrary estimates of some of the components. Thus since complete records of the dates of purchases and sales were not available, it was necessary to use approximate dates for the prices of purchases and sales during the period covered.[1] Indeterminancy in the dates of purchases or sales meant a difference between the actual purchase price and the recorded purchase price of perhaps several per cent, and consequently room for considerable error. The adjustment for 'rights' also presented some problems since the raw data lacked consistency in its treatment. In some cases a 'rights' allotment had been credited to the portfolio immediately on announcement with a positive market value but rated as nil or part paid, whilst in other cases the rights were entered only when fully paid. The general procedure adopted was one of apportionment with the partly paid shares converted into an appropriate reduced number of fully paid shares.

Further problems arose from changes in the F.T. Actuaries classification scheme and in particular, the deletion of old sectors and inclusion of new ones. This meant that sector indices were not available for some sectors after or before certain dates, and in consequence meant the reclassification of data in some instances.[2] It was also as a result found impossible to

---

1. The data was generally available monthly for the early portfolios but only three monthly for some of the later period.

2. The assignment of shares to sectors necessitated three classification schemes to cope with the addition of new sectors and the deletion of old ones. The appropriate classification depended on the time period.

carry out a comparison of portfolios from the six months beginning October 1969 to April 1970. Initially comparisons were made for six month periods. Perusal of the results however suggested that individual shares might be leading or lagging the appropriate indices by varying time periods and that comparisons of longer duration might also be useful. Unfortunately a year was about the longest possible due to the classification changes.[1]

Another problem arose from the estimation of dividends and interest. One possibility was to assume that the actual portfolio and the index portfolio dividends were both the same. Appealing in its simplicity, the assumption did not seem justified since the portfolio under investigation had been orientated to growth, and hence one might expect its dividend income to be lower than that of the sector equivalent portfolio.[2] The procedure adopted in fact was to calculate from sector yield indices the dividends that might have been expected on the sector equivalent investments. For the actual portfolio, estimates of the yield of each share involved in the analysis were aggregated. These procedures were restricted to the shares held throughout in the six month portfolios. It was felt that calculation of dividends for shares held perhaps only a month or so, was both arbitrary and unnecessary since in general the extra amounts involved were rather small. The total dividend amounts recorded are considerably less than the actual dividends received by the funds. This arises from the omitting of dividends on stocks held for a short time, from the method of estimation, and from the exclusion of foreign stocks and certain other specific categories of stocks held in the portfolio, from the analysis. No calculations

---

1. Intuitively one would expect the two appropriate six month portfolio changes to equal the year portfolio change, although with a redistribution in the size of the changes between the various components. Whilst this is the case for the actual portfolios, it does not necessarily hold for the sector equivalent (see Appendix 11).

2. In fact the portfolio was orientated toward growth sectors, so that it might be a reasonable assumption to assume that the dividends were equal.

of dividends were made for the year portfolios. The appropriate six month estimates were simply aggregated.

Results

A summary of the respective amounts contributed to the total portfolio change in value is provided by Tables 10.4 and 10.5 For each six and twelve month period, values are provided for the actual portfolio and both sector and market equivalent.[1]

Over the three year period as a whole it would appear the sector and actual portfolios behaved very similarly. Aggregating the six month figures gives overall changes in value of -126,700 for the actual portfolio, -133,960 for the sector equivalent and -631,400 for the market equivalent,[2] indicating that the portfolio performed considerably better than the market as a whole and closely to a portfolio composed of its sector equivalents.

Consideration of the overall six monthly figures does not however bear this out. Table 10.4 reveals that only in the first six month period are the

---

1. The approach in this section is to consider the results of the performance comparison first at a very aggregate level and then on a more disaggregated basis. Clearly the aggregate figures by themselves are insufficient to indicate the success or otherwise of sector selection as an investment technique. What is required above all is consistency in several indicators. For example if all the major components of the change in value of a portfolio consistently (that is over several time periods) indicated the performance of the portfolio to be close to the performance of the sector and superior to the market, then this would represent prima facie evidence in favour of sector selection. It would also require a further investigation of performance taking risk into consideration. It is possible although unlikely, that the superior performance is due to the assumption of a higher degree of risk, arising as a result of the managers' selecting shares from sectors that are more risky than the majority of sectors.

2. Note that these figures underestimate the true performance of the portfolios as they exclude the period October 1969 to April 1970, underestimate dividends, and exclude foreign stocks.

TABLE 10.4

6 month portfolios

April 1968 - Oct.1968

	ΔV_t	ΔS_t	ΔD_t	ΔP_t	ΔF_t	I
Actual	829,500	596,400	52,100	128,700	16,100	36,200
Sector Equivalent	710,540	522,500	83,400	49,300	14,800	40,500
Market Equivalent	355,700	228,200	50,900	18,200	13,300	45,100

Oct.1968 - April 1969

Actual	101,800	94,600	2,400	-32,700	-6,200	43,700
Sector Equivalent	-104,500	66,900	-8,300	-214,200	-7,900	59,000
Market Equivalent	104,100	97,900	89,200	-145,100	-6,800	68,900

April 1969 - Oct.1969

Actual	-1,115,600	-805,100	-414,300	36,400	-900	68,300
Sector Equivalent	-680,900	-610,600	-225,400	64,800	-600	90,900
Market Equivalent	-1,172,800	-969,300	-259,400	-45,900	-500	102,300

April 1970 - Oct.1970

Actual	-252,800	-202,900	-143,300	-	-	93,300
Sector Equivalent	-99,200	-85,800	-126,600	-	-	113,300
Market Equivalent	-55,700	-68,200	-122,800	-	-	135,300

Oct.1970 - April 1971

Actual	310,400	258,600	-90,300	67,200	-	74,900
Sector Equivalent	40,100	23,500	-101,800	29,000	-	89,400
Market Equivalent	137,300	49,600	-60,700	46,400	-	102,000

Where ΔV_t = change in value of portfolio over the respective time periods, ΔS_t = change in value of shares held throughout, ΔD_t = change in value of shares held at the beginning and sold before the end of the period, ΔP_t = change in value of shares bought during the period and held to the end, $\Delta F_t \equiv$ change in value of shares bought and sold during the period and I represents interest and dividends.

TABLE 10.5

12 month portfolio

April 1968 to April 1969

	ΔV_t	ΔS_t	ΔD_t	ΔP_t	ΔF_t	I
Actual	931,400	492,300	216,500	82,300	60,400	79,900
Sector Equivalent	596,800	406,100	253,700	-173,400	10,800	99,600
Market Equivalent	442,960	175,700	180,500	-78,000	50,800	114,000

April 1970 to April 1971

Actual	26,500	216,900	-524,600	186,400	-20,500	168,200
Sector Equivalent	9,800	43,500	-303,200	87,200	-20,400	202,600
Market Equivalent	75,900	-2,200	-204,600	55,200	-9,800	237,300

actual and sector overall change in values closer than the actual and market values. In the periods beginning October 1968 and April 1969 the actual and market equivalents are closer than the actual and sector equivalent whilst the other two portfolio periods do not seem to indicate a marked superiority of sector or market equivalent. The large actual and proportionate difference in the April to October 1970 period would seem to make decisions on similarity difficult.

For the twelve month period the portfolio might be seen as closer to the sector than the market equivalent, although in the first period there is a substantial actual difference.

How are these results to be interpreted? A number of possibilities present themselves. The first is to consider each period in relation to the stage of the market. It might for example be the case that the portfolio illustrates sector performance over the bull stages of the market such as April to October 1968 and individual share performance over bear stages of the market such as April to October 1969. On the evidence presented it is difficult to generalise. The periods were not defined in terms of bull and bear stages of the market and in consequence represent in some cases, overlapping periods. Equally with only one, or at most two periods in each stage of the market, conclusions would be rash. It remains however a possibility that in some periods the managers are able to pick the good sectors and perhaps in other periods the good shares. It is also possible that other factors in a particular period may make the overall results similar to the market or the sector equivalents.[1]

To shed further light on the portfolio's performance it seems advisable to

---

1. For example, whether the individual fund manager is particularly committed to the sector selection philosophy or not.

consider the individual components of the portfolios. Tables 10.4 and 10.5 again provide details of the changes in value for the sub components. How similar are these values? The period April to October 1968 for example indicates that a large part of the difference between the actual and sector equivalent portfolios is due to investments bought during the period and held whilst the differences between the actual and market equivalent portfolio are seen to be due both to this component and to the investments held throughout. Similarly, analysis of the October to April 1969 period reveals considerable divergence in the individual components. Both the change in value of shares sold (ΔD_t) and the change in value of shares purchased (ΔP_t) differ markedly. In the former case between the actual and market equivalent portfolio and in the latter between the actual and sector equivalent, and to a lesser extent the market. Such comparisons may be made for all the other periods as well. The over-riding conclusion is of very substantial divergence between the individual components. It does not appear that any clear relationship exists or that the actual portfolio results, for example, are always relatively more similar to the market than to the sector, or vice versa. The variability of the relationships would seem to suggest that the possible interpretations placed on the aggregate figures must be treated with caution.

Consideration of the yearly figures reinforces this conclusion. Substantial divergencies exist for all the main components in one or other of the periods. The question naturally arises as to whether this variability is important. It might for example be argued that the six month periods in particular begin and end on arbitrary dates as regards fund management. If the managers made their decisions for longer time horizons, then over this period the actual and sector equivalent results might be very similar. However it seems unlikely.

Up to the present only aggregate component figures have been considered. Useful information may also be gained from a consideration of individual sectors

and firms. Table 10.6 presents a section of the analysis indicating the results of making purchases during the period and then holding these purchases to the end of the period. Sector and market equivalents are also given. The total change in value figure indicates that the actual and sector equivalent portfolios were reasonably close and considerably outperformed the market equivalent portfolio. This conclusion is borne out by examination of the individual firm figures. In nearly every case the actual and sector equivalent portfolio outperformed the market.

The table also indicates the possibilities of individual share analysis. One sees for example that the purchase of 100,000 Trafalgar in period two, performed poorly relative to the sector and little better than the market whilst the 50,000 Star purchased in period eleven performed considerably better than either the sector or market equivalents. Such analysis allows one to come to conclusions about the ability of the fund managers to select shares and sectors.[1] Thus in the Trafalgar example the manager was in the right sector (since the sector did so much better than the market(but the wrong share (since the share was well below the sector average) whilst in the Star case the manager chose both the right share and the right sector.[2]

The example given in Table 10.6 indicates a considerable diversity between the actual and sector outcomes. The question arises as to whether any of the sector results showed a consistent relationship over several periods.

Table 10.7 (an extract of appendix 12 table 1)[3] indicates the change in value for the actual market and sector equivalent portfolios for the Property and Entertainment sectors for each of the five six month periods covered.

---

1. Fox {42} provides a number of illustrations and interpretations.
2. Note that the usefulness of this analysis is limited to large numbers of observations. One would expect the manager to have a variety of results both better and worse than the average of the sector. Over a long period or large number of observations, however one might expect a trend to emerge with the manager choosing the right sectors but the wrong shares consistently or some other similar possibility.

April 1968 to April 1969

TABLE 10.6

Sector No.	Company	Period Bought	Period Sold	Quantity	Price Bought	Price Sold	Change in Value (actual)	Sector Index Bought	Sector Index Sold	Change in Value (sector)	Change in Value (market)
41 (Property)	Hammerson	2	13	6,000	3.137	3.950	4,878	94.07	128.97	6,982	1,729
	Hammerson	10	13	2,500	4.425	3.950	-1,187	141.33	128.97	- 967	- 948
	Town & City	3	13	25,000	0.712	0.819	2,662	95.07	128.97	6,351	2,025
	Town & City	4	13	50,000	0.762	0.819	2,825	104.28	128.97	9,026	1,556
	Town & City	13	13	40,000	0.819	0.819	0	128.97	128.97	0	0
	Trafalgar	2	13	100,000	0.814	0.915	10,060	94.07	128.97	30,214	7,481
	Trafalgar	3	13	43,750	0.700	0.915	9,406	95.07	128.97	10,920	3,482
	MEPC (ord.)	5	13	75,000	1.037	1.244	15,487	103.62	128.97	19,036	-18
	Second Cov.Gdn.	5	13	10,000	0.942	1.350	4,083	103.62	128.97	2,303	- 2
	Second Cov.Gdn.	6	13	46,000	0.950	1.350	18,400	107.13	128.97	8,908	505
	Second Cov.Gdn.	7	13	5,000	0.944	1.350	2,03o	107.52	128.97	941	114
	Second Cov.Gdn.	9	13	39,000	1.412	1.350	-2,418	134.61	128.97	-2,307	-1,970
	Second Cov.Gdn.	12	13	13,000	1.212	1.350	1,787	120.71	128.97	1,078	128
	Greenhaven Secs.	9	13	36,000	1.262	1.462	7,182	134.61	128.97	-1,904	-1,626
	Estates Prop.	9	13	100,000	0.879	0.850	-2,916	134.61	128.97	-3,683	-3,145
	Star	10	13	50,000	1.217	1.137	-3,983	141.33	128.97	-5,320	-5,217
	Star	11	13	50,000	1.017	1.137	6,016	127.08	128.97	756	309
	MEPC (Conv)	11	13	350	93.500	93.589	31	127.08	128.97	486	199
PROPERTY							74,344			82,824	4,604

Text cut off in original

TABLE 10.7

Property	Shares held throughout			Shares held at period & subs.sold			Shares bought during period & held to end			Bought & Sold			Dividends		
	A	S	M	A	S	M	A	S	M	A	S	M	A	S	M
4/68-10/68	44,790	46,650	23,060	130	430	280	43,620	26,090	8,870				3,460	4,850	4,560
10/68-4/69	85,760	131,710	16,050	10,400	13,550	3,350	4,510	-11,860	-12,270				6,390	11,320	11,620
4/69-10/69	-30,430	-19,840	-172,510	240	-3,700	-7,840	6,110	2,210	-3,120				10,990	14,540	18,040
4/70-10/70	27,660	52,900	-9,970	3,250	3,480	- 660							10,350	12,660	19,720
10/70-4/71	39,350	130	6,430	-24,550	-18,390	-16,280							6,230	6,530	13,610
Entertainment															
4/68-10/68	36,060	27,200	17,860	760	1,820	2,520	24,650	8,520	3,400	500	1,120	850	4,530	4,150	3,520
10/68-4/69	320	9,050	3,110	-1,210	3,000	1,770	57,880	-6,810	-5,380	5,120	- 30	-650	3,040	2,280	2,260
4/69-10/69	-110,020	-32,580	-43,030	-28,720	-11,960	-14,110	6,970	9,700	1,850				5,280	4,760	4,500
4/70-10/70	2,690	-22,230	-3,220	-33,050	-32,720	-31,570							5,030	5,600	5,406
10/70-4/71	-3,400	17,550	2,780	-1,130	1,220	-1,460							5,660	5,810	5,880

A = Actual Portfolio

S = Sector Equivalent Portfolio

M = Market Equivalent Portfolio

TABLE 10.8

Frequency Analysis of Change in Value due to 'Shares held throughout 'Component

a)

Date	Shares Better than Sector			Shares Worse than Sector		
	Sector worse than Market		Sector better than Market	Sector better than Market		Sector worse than Market
	Shares worse than Market	Shares better than Market		Shares worse than Market	Shares better than Market	
4/68-10/68	0	1	7	3	4	0
10/68-4/69	2	5	2	1	2	5
4/69-10/69	0	1	3	4	7	6
4/70-10/70	0	3	4	2	1	7
10/70-4/71	1	6	6	1	1	3
	3	16	22	11	15	21

b)

Right Shares Wrong Sectors	Right Shares Right Sectors	Wrong Shares Right Sectors	Wrong Shares Wrong Sectors
19	22	26	21

TABLE 10.9

Frequency Analysis of the Change in value due to 'Purchases made during the period' Component

a)

Date	Shares Better than Sector			Shares Worse than Sector		
	Sector worse than Market		Sector better than Market	Sector better than Market		Sector worse than Market
	Shares worse than Market	Shares better than Market		Shares worse than Market	Shares better than Market	
4/68-10/68	1	3	8	3	1	4
10/68-4/69	4	4	5	2	0	5
4/69-10/69	0	2	5	1	4	3
10/70-4/71	1	2	3	1	0	1
	6	11	21	7	5	13

b)

Right Shares Wrong Sectors	Right Shares Right Sectors	Wrong Shares Right Sectors	Wrong Shares Wrong Sectors
17	21	12	13

The Property results are particularly appealing. Both the sector equivalent and the actual portfolio are seen to have outperformed the market in almost every period and component (ignoring dividends.) Thus in the first period Property was the right sector to have chosen since the sector performed at least twice as well as the market. Within the sector about average shares were selected for the shares held throughout component, and much above average shares selected for the purchases component with the shares performing almost twice as well as the sector component. Examination of the dividend column indicates that the actual shares bought had a lower dividend yield than the market and sector equivalents reflecting perhaps the growth orientation of the individual shares. Consideration of subsequent periods reinforces these conclusions. The sector equivalent generally outperformed the market, whilst the individual share selection although less successful than the sector average was still considerably better than the market. Particularly noteworthy is the huge market decline of the shares held throughout component in the third period but the relatively small declines in both the sector and actual portfolio equivalents. Generally the Property sector was the right sector to have been in. The final period it is true, saw the sector perform poorly, but above average share selection in the shares held throughout component, still gave favourable overall performance.

The pattern within the Entertainment sector was rather different. The first period indicates good sector and share performance relative to the market. The second period results are to some extent in line with this conclusion with good sector and bad share performance in two of the components, and bad sector and good share performance in the other two (excluding dividends). The third period however was swamped by disastrous share selection in the shares held throughout component, although the overall sector selection result was better than the market. The fourth period reverses this result with a very poor sector performance and a relatively good share performance

(given the wrong sectors). Finally the fifth period indicates poor share and good sector performance. Overall it would seem that the right sector was chosen most of the time.

The question arises as to whether these two results are typical of all the sectors. To this end a frequency analysis of the event of picking the right sectors and shares was carried out. Tables 10.8 and 10.9 provide the results. Table 10.8 summarises the results for the shares held throughout component, and Table 10.9 for the purchases made during the period component, (earlier sections having indicated that one might expect sector decisions to be more obvious when purchases are considered.) Table 10.8a indicates only one event occurring much less frequently than the others, the cominbation of the shares being better than the sector, the sector being worse than the market and the shares being worse than the market, not a particularly interesting case for the analysis at present. Aggregating the appropriate columns to give frequencies for right shares, wrong sectors and so on, Table 10.8b indicates that the right sector was chosen 54% of the time and of these occasions the majority of cases involved the choice of the wrong shares. In terms of purchases Table 10.9b indicates the right sector to have been chosen 51% of the time and the right shares some 60% of the time. There seems to be little evidence from a frequency analysis that the managers were particularly good at choosing the right sectors to be in. A value of right decisions as low as 54% (or 51%) would require considerably more observations and experience of different periods before much weight could be placed on it occurring other than by chance.

It seems necessary to draw rather negative conclusions from the overall analysis of performance. Optimistic aggregate figures for the entire period 1968 to 1971 indicating the actual and sector figures to be very close and substantially different from the market, have proved to be rather illusory. Consideration of sub-periods of six months and indeed further breakdown of the

results, indicate a considerable diversity of answers but with no clear trends emerging to indicate that the managers had been particularly successful with their choice of sectors. Having said this it is necessary to point out a number of problems with the analysis. One major one relates to the possibilities of the managers using sector selection methods much more in a bull than a bear market, so that one would only expect it to show up clearly in these periods, or indeed for it to be a method that is best suited to certain stages of the market. The analysis presents little evidence on these points.

A further fault of the analysis relates to its ex post nature. It provides no evidence on the ex ante intentions of the managers, so that answers as to whether the sector deviation was mainly due to sector selection, or only to some correlated measure, are necessarily cautious. The results say nothing about the managers' intentions.

Of particular interest are the results for the homogeneous sectors. The earlier analysis indicated that substantial sector effects were restricted to a few homogeneous sectors, so it is of interest to determine whether the investment associated with these sectors was close to the sector equivalent. Taking Property (Table 10.7) as an example the results vary from being close to the sector in one period and substantially different from the market (such as in 4/68 to 10/68), to being divergent from both sectors and market equivalents (such as in 10/70 to 4/71).

Another consideration of interest relates to the number of companies in a sector. One might expect sectors with only one or two companies in the portfolio to be much more likely to produce results substantially divergent from the sector equivalent (even though the shares had been selected for their sector characteristics) than sectors with a large number of companies in the portfolios. This factor would seem to account for a number of the more

exceptional sector results such as Investment Trusts and Merchant Banks but by no means for all the discrepancies between actual and sector equivalent portfolio results.

In view of these caveats it seems reasonable to conclude that more evidence is required before a definite conclusion may be reached. On the basis of the evidence presented here there would seem to be little reason to believe that the managers found the selection of shares by sectors to be a particularly successful investment technique. However the analysis of the portfolio encompasses a period noted for an abnormally severe bear market which may well have disturbed techniques such as sector selection that may be successful in other, more normal, periods.

One means of providing further evidence on the value of sector selection is by the analysis of additional portfolios. Constraints of information (and time) however prevented this. An alternative approach discussed in the next chapter is to consider some of the studies that have attempted to predict share prices and use these as a basis for deriving implications about forecasting sector performance. Inability to predict the market or firm components of share price does not necessarily imply that it is impossible to predict the sector component of share price. The results of this chapter however suggest that it is unlikely that such prediction is possible.

Chapter 11

The Prediction of Share Price Changes

The previous chapter attempted to ascertain the value of sector selection as an investment technique. From the evidence there appeared little reason to believe that it is particularly valuable, but before a conclusive answer can be given either additional portfolios must be examined or, alternatively, evidence of ability to predict sector performance must be considered.[1] Since the examination of additional portfolios was ruled out by data and time constraints, the latter question is investigated here.

A considerable number of studies, including both tests in which the information set is just historical prices (weak form) and tests in which the concern is whether prices efficiently adjust to other information that is publicly available (semi strong form), have concentrated on the prediction of share price changes. With few exceptions security prices appear to reflect fully all available information and have confirmed the efficient market model.

With this background the outlook for predicting share price changes as a whole is poor. One possibility, however, not explicitly explored in the literature is to consider the share price change as being due to a market effect, a sector effect and an individual firm effect and to investigate whether it is possible to predict any of these effects. It might be that whilst the forecaster is unable to predict movements of the share price

---

1. There is also the question of whether it is worth investing a substantial effort in the examination of further portfolios. The advantages of the micro approach to the question followed in this thesis were that in addition to considering the value of sector selection, it offered a chance of investigating whether the managers were able to predict any component of a portfolio's performance either short term (for example, purchases and sales) or long term (for example, holdings held throughout the period), and hence whether the managers had access to private information which the efficient market hypothesis indicates is necessary for successful prediction. Since the evidence does not confirm the managers' forecasting abilities, it might well be asked whether investigation of other portfolios is likely to be justified, particularly as both the portfolios and the managers have an impressive record relative to other portfolios and managers.

as a whole he can predict sector effects and so provide the basis for a profitable decision rule. With this idea in mind the rest of the chapter considers several academic studies of share price forecasting with a view to establishing from them the possibility of forecasting market, sector or firm effects.

Before evidence of investors' success in share price forecasting is considered a paper by Treynor & Black{98} which outlines the theoretical implications of an analyst's ability to forecast the market and independent returns[1] deserves particular mention. They suggest that a portfolio may be thought of as having three parts; a riskless part, a highly diversified or passive part which contains no specific risk, and an active part which contains both market and specific risk.[2] They show that the amount of market risk in the active portfolio is unimportant so long as one has the option of increasing or reducing market risk via the passive portfolio. Optimal Selection in the active portfolio is shown to depend on only the appraisal risk and appraisal premium[3] and not at all on the market risk

---

1. The paper makes a considerable number of assumptions, such as no restrictions on borrowing or selling short; interest rate on loans is equal to the interest rate on short term assets; no taxes; no transactions costs.

2. The paper distinguishes between market or systematic risk on the one hand and appraisal or insurable risk on the other. Treynor & Black indicate that optimal balancing of portfolios does not in general lead to either negligible levels of appraisal risk or to negligible levels of market risk.

3. The appraisal premium is the expected value of the independent return z_i of the i^{th} security (the independent return is defined to be the excess return minus the explained return). The one period return on the i^{th} security is

$$x_i = r + b_i y_m + z_i$$

where x_i is the market return on the i^{th} security, r is the riskless rate of return, b_i is the market sensitivity of the i^{th} security, y_m is the excess return on the market (excess return on the market is the actual return on the market less the interest paid on short term risk free assets) and $b_i y_m$ is the explained or systematic return on the i^{th} security. (the explained return on the security over a given time interval is defined to be its market sensitivity times the market's excess return over the interval).

or premium;[1] nor on investors' objectives as regards the relative importance to him of expected return versus risk; nor on the investment managers' expectations regarding the general market. Two managers with radically different expectations regarding the general market but the same specific information regarding individual securities will select active portfolios with the same relative proportions.

The potential contribution of security appraisal to the portfolio is shown to be summarized by the appraisal ratio - the ratio of appraisal premium squared to appraisal variance. This ratio depends only on the quality of security analysis and on how efficiently an active portfolio is balanced. It is independent of the relative emphasis between active and passive portfolios and of the degree to which the risky portfolio is levered or mixed with debt. It is also independent of the market premium. The ratio measures how far one has to depart from perfect diversification to obtain a given level of expected independent return. The higher the appraisal ratio (for a given market ratio) the less well diversified the resulting portfolio will be. In short, the more attractive incurring specific risk is relative to market risk, the less well diversified an optimally balanced portfolio will be. It is clear then that any improvement in the quality of security analysis (or in the number of securities analyzed at a given level of quality) can only cause an optimally balanced portfolio to become less well diversified. Finally the paper indicates that the security analyst's potential contribution to overall portfolio performance over time depends only on how well his forecasts of future independent returns (or analogously forecasts of the market return) correlate with actual independent returns and not on the magnitude

---

1. The market premium is the expected value of the excess return on the market.

of these returns. In the absence of prior knowledge concerning the analyst's current forecast, the potential contribution of the security in question to the optimum active portfolio depends solely on the correlation. The larger the correlation the more the security contributes to the optimal active portfolio.

The role and importance of forecasting in the investment process having been stated, it is now possible to consider some empirical evidence on the possibilities of forecasting the various components of price change. If the behaviour of the market component is interpreted as being equivalent to the movements of a market index, then considerable evidence on the possibilities of forecasting this component is available for consideration. Most of the research has taken place within a random walk framework with the investigators endeavouring to ascertain whether future index (price) changes can be predicted using past index (price) values. A common form of the model is

$$P_t = P_{t-1} + \varepsilon_t$$

where P = price at time t and t-1 and ε_t is a residual with zero mean and uncorrelated with all past ε_{t-s} $(s \neq 0)$. If this model is true it follows that price changes canot be predicted from previous prices since the best predictor of tomorrow's price is today's price, or more generally one may conclude that the best predictor of any future price is the current price.[1]

An early investigation by Kendall{52} analyzed the Actuaries Index of Industrial Share Prices for the years 1928-1938. Nineteen series of weekly figures for various industry and aggregate groupings were tested for serial

---

1. See Granger & Morgenstern {46} for a more detailed description of the various models and their implications.

   Note that the following account is not intended as a comprehensive account of the voluminous studies that have taken place of the random walk model but simply to point out the main conclusions.

correlation[1] using lags of one to twenty nine weeks. The results were not encouraging with little connection shown between price changes over time. Cross correlations between industries were not particularly interesting either. It proved impossible to use the price changes of one industry to predict those in another. A similar serial correlation analysis by Dryden{30} on more recent British series has supported Kendall's results. Using American data Moore{71} investigated the S. & P. stock index, calculating serial correlations using a one week lag. He found a small positive relationship, but after considering the length of runs of price changes in the same direction he came to the conclusion that they could well have occurred by chance from a random walk series. Construction of his own price index for a randomly selected sample of thirty stocks again showed a weak positive relationship, whilst an investigation of the individual constituents indicated that most of these had a small (but significant) negative relationship. Various possible justifications for this were proposed by Moore although it may simply have been a spurious result arising from the statistical techniques used. A number of other similar studies have consistently shown near zero estimates of serial correlation.

A rather different technique, suggested by Alexander,{2} involves the use of a filter. The intention is to filter away short term movements of market prices, but to benefit from longer movements. A filter size of say 5% is selected. Then if the price rises by more than 5%, the index (stock) is bought and held until there is a fall of more than 5% from the highest value reached. The index (stock) is then sold and held short until the price rises again by more than 5% from the new lowest point reached. Such a filter

---

1. Serial correlation measures the amount of covariation between successive changes in price. If two variables P_t and P_{t-1} are correlated, knowledge of one variable will aid in the prediction of the other variable.

minimizes the losses when holding the index (shares). The problem is that to make large gains it is necessary to specify a small filter, but a small filter increases the number of transactions and hence brokerage costs.

A mistake in Alexander's computations pointed out by Mandelbrot[1] {66a} was corrected in a later paper. This correction led to a substantial reduction in the profitability of the filter rule. Overall, however, after conducting a number of other tests and finding that these methods provided better results than buy and hold, Alexander was led to reject the random walk model. Subsequently Fama{36} pointed out a further error in Alexander's computations[2] and in a comprehensive study with Blume{38} applied the filter technique to the thirty Dow Jones stocks. They found little to recommend the strategy after commissions were taken into account.

An interesting model of stock market behaviour related to the filter technique has been proposed by Cootner{20}. He suggests that stock market investors be viewed as being either of two types, the ill-informed part-time participant whose projections about stock prices are about as likely to be wrong as right, and the knowledgeable professional who makes rational judgments about

---

1. In his initial tests of filters Alexander assumes that purchases could always be executed exactly y% above lows and sales exactly y% below highs. Mandelbrot pointed out that whilst this assumption would do little harm with normally distributed price changes (since price series are then essentially continuous) with non normal stable distributions it would introduce substantial positive bias into the filter profits (since with such distributions price series will show many discontinuities.)

2. "Alexander neglects dividends in computing profits for all of his mechanical trading rules . . . Under the buy and hold method the total profit is the price change for the time period plus any dividends that have been paid. However all Alexander's more complicated trading rules involve short sales. In a short sale the borrower of the securities is required to reimburse the lender for any dividends that are paid while the short position is outstanding. Thus taking dividends into consideration will always tend to reduce the profitability of a mechanical trading rule relative to buy and hold" Fama {36} page 83.

justified prices for stocks. If the actual price of a stock is driven too far away from its justified price by the ill-informed investors, the professional enters the market and causes actual price to move into line with justified price. In essence then, the professional sets up a barrier on either side of a stocks justified price and within these barriers the price changes are random. Long term all the price changes will be random since the expectations of the professionals change randomly as new information becomes randomly available. Short term also the price changes will be random reflecting the influence of the ill-informed. Between the long and the short terms however price changes should be systematic reflecting the influence of professionals buying or selling at the barriers. The problem is of course to identify what constitutes such an intermediate term. Cootner suggests a number of ways in which this theory, if correct, could be translated into a profitable decision rule.

Another technique of considerable importance is that known as runs tests. If a series of price changes is replaced by a series of symbols, + when the price change is positive and - otherwise, then a run is an unbroken sequence of one or other of these symbols. An extensive study of runs was made by Fama{36} who considered the daily logarithmic price changes of thirty different companies. The actual total number of runs was usually slightly less than the expected number (if the process had been purely random), but the difference was not significant. Fama concluded that his analysis of runs showed no indication of dependence between price changes of any importance.

Attempts have also been made to break indices and stocks into seasonal and cyclical components. Granger & Morgenstern{46} have applied spectral

analysis[1] to a large number of time series and found only small deviation from the random walk model. They divide their conclusions up into three periods corresponding to the high, middle and low frequency ranges. In the middle period the random walk model was more or less totally supported. The long period revealed a trend and long period component (which they concluded was difficult to predict) whilst the short period indicated that over short time horizons, transaction price series (that is series not evenly spaced in time) do not follow a random walk although the data was consistent with the hypothesis that the series obeyed a random walk between reflecting barriers caused by stop limit orders.

Spectral analysis has also been used to examine the relation between movements in one price series and another, but low coherence (correlation) has generally been the rule. There would seem to be little evidence that other series can be predicted by, or used for, predicting stock market price series.

So far the discussion has concentrated on mechanical techniques for predicting share prices using limited information. It is also worth asking whether analysts having a wide range of information on which to draw have been able to provide accurate price forecasts. Early studies by Cowles{24} provide considerable evidence on this question. The first study in 1933

---

1. Rayner & Little {75} (page 108) provide the following brief account of spectral analysis

   "Spectral Analysis is a technique used to examine time series for periodicity by looking at the percentage of the variation over the whole period than can be accounted for by cycles of differing lengths. If the time series follows a random walk path, it is easy to calculate how large a contribution to the total variance each particular cycle should make and therefore it is possible to see which, if any, contributes significantly more or less to the predicted amount. Thus if the cycle based on a period of one year contributes more than expected to the overall variance, this means that over the period there is some significant annual pattern in prices. The technique shows the whole spectrum of cycles of various prices and their contribution to the total variation of prices; and therefore it is possible to separate out the significant cycles from amongst all the ones of differing length that add up to the observed time series."

examined the weekly recommendations of sixteen financial services over a $4\frac{1}{2}$ year period. For each service the result of investing funds equally over all recommendations was considered in relation to the movement over the period of the whole market. Only six services performed better than a buy and hold strategy. Cowles suggested that there was no clear reason for believing that the best service had performed well owing to good management rather than good luck.

Cowles in the same study investigated the forecasts made by twenty four financial publications. He found that only a third of the publications did better than a buy and hold strategy, whilst following the advice of a prominent financial journalist over the period 1902 to 1929 would have earned a lower return than that yielded by the stocks composing the market averages. Investigation of the investment success of twenty five insurance companies provided no better results.

A later study in 1944 {25} investigated the performance of eleven financial services over most of the 1930's. Their success was only marginally better than a random forecasting record. Cowles found that by far the overwhelming majority of forecasts were bullish despite the fact that the period covered only eighty eight months of bull market, against ninety eight bear months.

The results of later studies have accorded more or less with those of Cowles. Scott {82} found that the comments of the F.T. had no worthwhile relationship with prices. An analysis by Colker {18} however, of over a thousand specific purchase recommendations found that on average the issues appreciated over the following year by 3.6% relative to the market index. A variety of explanations have been advanced for this result. They range from claims that the period covered was abnormal, or that the results were inflated by one or two very successful stocks, to arguments that the recommendations involved substantial risk and that the extra return was no more than a just reward for the assumption of this extra risk.

Most of the studies discussed so far have been concerned with absolute price changes. It is perhaps also worth considering the prediction of relative price changes. The information content implicit in price changes for any individual stock after removal of market and industry factors may have little value in absolute terms, but be of considerable relevance when compared with price information about other companies. A study by Levy {59} used such relative information to examine the performance of various groups of stocks. Levy started from the position that a stock that is currently outperforming the market will probably continue to do so. His strategy was to devise a method involving the concept of relative strength for constantly checking on those stocks that were outperforming the market and those that were under-performing, so that the investor can constantly shift his funds from the latter to the former. The results of the study were encouraging but a subsequent replication by Jensen & Bennington {51} did not support Levy's results.[1] After allowance for transaction costs the trading rules did not on average earn significantly more than a buy and hold policy. After explicit adjustment for the level of risk it was shown that net of transactions costs the trading rules tested earned less on average than an equivalent risk Buy and Hold strategy. It would seem that predicting relative price changes is no easier than predicting absolute price changes.

---

1. Levy tested a large number of trading rules on the same body of data. As Jensen & Bennington put it {51} (page 173) " . . . given enough computer time, we are sure that we can find a mechanical trading rule which 'works' on a table of random numbers - provided of course that we are allowed to test the rule on the same table of numbers which we used to discover the rule. We realise of course that the rule would prove useless on any other table of random numbers, and this is exactly the issue with Levy's results."

The discussion so far has concentrated on price change prediction as such. Price changes are to some degree at least affected by company earnings, and in the area of earnings forecasts several studies of interest have been carried out.

Consider first of all the relationship between earnings and stock prices. Latane & Tuttle{56} correlated the percentage price changes of forty eight stocks for the period 1950-63, with the earnings changes during the year, and found that whilst the proportion explained fluctuated substantially, on average some 17% of the variation in price changes could be explained by changes in earnings. Ball & Brown{5} in a study concerned with the value of firms' accounting income numbers, identified the effect of information pertaining to individual firms, separated it into an expected and unexpected element, and then compared these elements with a forecast value (forecast on the basis of the firm's historical relationship with the average level of company earnings, it being assumed that the market was able to forecast the latter). The differences between the forecast and the expected elements were classified into good or bad news as appropriate, and then the price action, (after abstracting from market effects) over a period of twelve months from before the publication of the preliminary report to six months after, examined for the cases in which actual earnings were better or worse than forecast. When earnings were above the original forecast there was a rise in the price of the stock over the period. When earnings were below expectations, the price fell. Market adjustment in price to the published results were spread fairly evenly over the twelve months before publication although with some small price adjustment up to two months after the publication of the figures also taking place.

This and other similar studies show that earnings exhibit a considerable effect on prices. In consequence forecasting earnings accurately might well provide a means by which price predictions could be improved.

Just as with prices, one of the first questions that may be asked about forecasting earnings is whether earnings can be forecast simply using past earnings data. One of the earliest studies on this question was that by Rayner & Little{75}. They concluded from a study of growth rates based on dividend and earnings figures (expressed as a percentage of equity capital) that in the short run it was virtually impossible to find any growth consistency, due to bias upsetting all the investigations attempted, whilst over a longer period it was hard to discover any repetition of earlier behaviour.[1]

> "Any unbiased reader . . . . must come to the conclusion that there is no tendency for previous behaviour to be repeated in the future."

(Rayner & Little {75} page 59).

Similar studies of U.S. data by Cragg & Malkiel{26} again found that earnings growth in past periods was not a useful predictor of future earnings growth.

Brealey{89} used correlation techniques to examine the persistence of earnings progress. Correlation coefficients beteeen adjacent and lagged years percentage earnings changes were calculated for seven hundred companies and indicated a slight negative correlation between the earnings changes. Similar results applied to industries. These and a number of other tests all showed a slight tendency for a good short term earnings gain to be reversed. One reason advanced for these findings was that earnings are dominated in the short run by the impact of non-recurring events, and that in the long run coherent earnings patterns may be apparent. To test this, the five year trend in earnings per share were calculated for four periods and correlations calculated.[2] The magnitudes were very small. A variety of other tests again revealed at best only slight persistence in earnings progress.

Overall then there would seem substantial evidence to indicate that forecasts based solely on the past behaviour of a company's earnings are of little

---

1. However note criticisms of Rayner & Little by Reddaway.{76}
2. Lintner & Glauber - unpublished paper quoted in Brealey.

value. As with prices it is worth considering whether forecasts by analysts or by techniques using considerable amounts of information, are profitable. The major published study in this area by Cragg and Malkiel [26] used date from five investment firms on the expected growth of earnings per share for one hundred and eighty five corporations, as of the end of 1962 and 1963. All the firms were attempting to predict the same future figure, the long run average (normalized) earnings level.[1] The definition of earnings varied between the investment firms. The study considered a number of questions such as a comparison of different predictions of future growth rates, a comparison of predictions with past growth rates, and with price earnings ratios, as well as an investigation into the accuracy of predictions. Only the latter is considered here. It was of particular interest since the authors divided an inequality coefficient (similar to Theil's inequality coefficient [95]) into three parts

1) errors in predicting the average overall earnings growth of the sample firms

2) errors in predicting the average growth rate of particular industries

3) errors in predicting the growth rate of firms within industries.

It was found that failure to forecast the industry means correctly accounted for only a very small proportion of the inequality coefficient. The main sources of inequality were the within industry errors. The authors also attempted to associate forecasting success with industry or company characteristics. They had little success.

The overall conclusion of the study was that the forecasting performances of the predictors had been rather poor. The careful estimates of security analysts perform little better than the use of past growth rates. It might be that the results were peculiar to the particular period investigated,

---

1. Strictly the average annual rate of growth expected to occur in the next five years.

or that shorter term predictions may be more accurate. However until results to the contrary are produced, it seems unlikely that the widening of information from which forecasts are made, (unless it is private information) helps one to forecast changes in earnings.

The difficulty of predicting the index, or prices, or even earnings, has it is hoped been made abundantly clear. It is easy to adduce many other studies. "In short, the evidence in support of the efficient markets model is extensive and (somewhat uniquely in economics) contradictory evidence is sparse." (Fama{37} page 416). Overall there is little hope for predicting the market, industry, and individual firm effects.

Much of the discussion about prices has centred on the prediction of the market index. Other studies have examined both industry and firm forecasting although with little more success. It might be argued that to identify industry and individual price forecasting with the problem of predicting the industry, and individual components of a price change is inappropriate. Difficulty in predicting an industry index may be due to the substantial element of covariation of the industry index with the market, or indeed with other industry indices, and hence the amalgamation of a random and systematic series, the former swamping the latter. However the inability of techniques such as spectral analysis to pick out systematic elements makes this unlikely. It is true that Cragg & Malkiel showed that the forecasting of the industry earnings component in earnings forecasts was subject to little error, but whether this conclusion may be generalised to the forecasting of an industry price component, remains to be answered.

On balance the studies quoted in this chapter together with the evidence of the last chapter indicate that it is unlikely that knowledge of the existence of sector effects in the past is particularly useful as a device for increasing the analyst's predictive abilities.

Chapter 12

Conclusions

The introduction to this thesis outlined two complementary objectives which this study was striving to achieve. The first was the provision of more information about investment management.[1] The second was the use of some of this information to make some strides towards a positive theory of investment. The intention here is to assess how far each of these goals has been met.

The first objective, the provision of information, is the subject of almost all of Part I of the thesis. Each chapter examines in turn one aspect of investment management, moving from the more general to the more particular aspects of portfolio management. The coverage is necessarily selective and subjective; the intention was to include those factors that are important for understanding how investment decisions are made. The analysis starts (chapter two) with an outline of the role of the institution both in the macro sense of its relationships to other types of financial institutions and in the micro sense of the services, notably diversification and management, that the institution provides. To a considerable extent the organisation and structure of the institution (chapter three) follows from the institution's role. By organisation is meant the process by which decisions are made. The chapter attempts to describe who makes decisions and very broadly, the influences on these decisions. In addition consideration is given to the execution of investment decisions, as well as to the influence of the objectives of the investment managers on the organisational structure. Some of the main influences on decision making, in particular institutional limitations on investment, are then discussed (chapter four). The different investment vehicles impose a variety of constraints on investment management

---

1. More correctly perhaps, this sentence should read the provision of 'some' information about investment managers. The finance literature is almost totally devoid of any discussion of such institutions.

decisions for each portfolio. These constraints vary from the formal - legal and official - to those imposed on the basis of past experience by such bodies as the board of directors. The overall effect is to reduce the type of securities that may be selected by the managers, an important factor that needs to be considered in any positive theory of investment.

These institutional limitations on investment are all external, to a greater or lesser degree, to the investment management organisation. In contrast, the fifth chapter is concerned with what might be termed an internal limitation on investment behaviour - the Office Philosophy. Portfolio Selection, the main interest of the chapter, encompasses a wide variety of rules and techniques which govern the construction of portfolios. Emphasis between different techniques varies between institutions. In the firm investigated the particular rules that were employed constituted the main elements of the Office Philosophy. Each element of the philosophy was considered, its importance for the firm discussed briefly, and then the implications of the rule in terms of capital market theory examined. For example, according to mean-variance theory, diversification generally requires only about twenty stocks, in contrast to the fifty or more that the typical portfolio of the investment managers contained. Similarly key concepts (according tothe firm) in the selection of portfolios, such as liquidity, marketability and anchor stocks, are contrasted with the requirements of theory. Various parts of normative portfolio theory as well as empirical studies are introduced in order to provide a standard against which institutional portfolio behaviour may be compared. The theory also serves to illustrate some of the conflicts apparent in the managers' investment philosophy as well as to stress some of its basic precepts.

The subsequent chapter (chapter six) concentrates on the selection of shares for a portfolio. Its accent is on quantitative and qualitative methods commonly used in the evaluation of shares rather than on the particular

desirable characteristics that the fund managers or analysts are looking for. Emphasis is placed on the fundamental rather than technical methods of analysis and special attention is given to Economic Analysis, intrinsic value analysis - a formal model for valuing a company's shares which enables one to establish the main variables an analyst is interested in - accounting sources of information and the quality of management. The role of information is only touched upon briefly but the overall conclusion is that since investment analysis represents attempts to value information analysts must in general secure private information if their aim is successful share prediction.

The final chapter of Part I concludes the attempt to meet the first objective of this thesis. The chapter is concerned with Portfolio Evaluation and entails the comparison of the ex post performance of investment portfolios in order both to improve the methods (and techniques) used in selecting particular portfolios and to assess the abilities of analysts and fund managers. Portfolio evaluation provides the institution with a control system with which it can supervise its members and check how far the objectives of the institution are being met. More immediately, portfolio evaluation provides the fund manager and analyst with a monitoring system which can be used to provide information on the changes to portfolios that may need to be made. Some of the methods that have been used or suggested for performance measurement are considered - in particular simple return measures, such as the internal rate of return, that take no account of risk, and composite measures, based on capital market theory, which consider both the risk and return of a portfolio.

To summarise, the chapters on the role and organisation of the institution as well as on the institutional limitations on investment are aimed at outlining the structure in which investment decisions are made. These

chapters are not concerned with the detailed techniques of decision making, the subject of the portfolio selection and investment analysis chapters, but with the framework in which decisions are made and with the wider factors influencing the structure of portfolios. In contrast, portfolio analysis is concerned with outlining the main considerations and constraints involved in the immediate task of constructing portfolios, and investment analysis deals with the methods used to select the securities, subject to these constraints. Finally, portfolio evaluation examines the overall suitability of the portfolio and provides the information necessary for modifying and revising the portfolios in the light of changing circumstances.

Part I then has provided some evidence about how portfolio choices are made by an investment management organisation. It has endeavoured to outline both indirect influences on portfolio decision making resulting from the institutional structure and the more direct influences arising from a particular investment philosophy. The two are of course interdependent. The intention has been to go some way towards fulfilling the need Lintner{64} outlined in his discussion of the priorities for further financial research: the requirement both for more detailed institutional knowledge and for information on how portfolio choices are made. In addition these chapters provide some evidence about the factors a positive theory of investment, constructed on the lines suggested by Clarkson's{16} pioneering study, should consider.

Interest in the factors that a positive theory of investment may consider is not of course confined to Part I. The second objective of the thesis is to build on the foundations provided by Part I and make a specific contribution to the construction of a positive theory by examining one of the rules or elements of the Office Philosophy that the investment managers claim to use. Can their assertion that it is a valuable and useful investment technique be verified empirically? Sector selection techniques, the

element of the Office Philosophy considered, are evaluated with the aim of discovering both whether the investment managers use sector selection techniques and whether the choice of shares by their sector characteristics is a rational investment strategy.

This investigation of sector selection is the subject matter of Part II. It is shown initially (chapter eight) that the existence of well defined homogeneous sectors enables the investor to secure a diversified portfolio easily, quickly and cheaply, simply by choosing one share from each of several sectors. But three important questions must be asked: Do sector effects exist or not? ; Do the investment managers select shares on a sector basis for their portfolios? and Is sector selection a valuable investment technique? Taken as a whole the answers to these questions help build up a picture of sector selection techniques. The question whether the classification of shares by sector is associated with clearly distinguishable sector effects is then considered (chapter nine). There is no basis for selecting shares from one sector rather than another unless the aggregation of shares into sectors is associated with effects peculiar to those sectors. To test this hypothesis a number of different models are employed, which partition changes in share price into sector, market and residual components. Both tests of significance and estimates of the relative contributions made by these factors provide evidence that sectors, and in particular homogeneous sectors, are influenced by an industry effect and hence that the classification of shares by sector is, for some sectors at least, associated with clearly distinguishable sector effects.

This conclusion provides the foundation for the investigation (chapter 10) of the other two questions outlined above. The answers to both involve the examination of an actual portfolio. Answers to the second question are ascertained by a comparison of the holdings of a portfolio selected by means

of sector techniques with the holdings of a portfolio selected by chance. Overall, it seemed reasonable to conclude that in the portfolio investigated there did appear to be considerable evidence of sector selection taking place, so bearing out the assertions of the managers that shares for the portfolio were selected on the basis of their sector characteristics. The third question is answered by a comparison of the performance of a portfolio, its shares selected on the basis of sector characteristics, with the performance of a portfolio composed of sector equivalent investments. On the basis of the evidence from this part of the investigation there seemed little reason to believe that the managers found the selection of shares by sectors to be a particularly successful investment technique. Portfolio performance did not appear to have benefited from the use of sector selection as an investment technique.

The poor results achieved from the sectors selected in this fund might of course have been unrepresentative of the results of the technique. To examine this question some of the studies to date that have attempted to forecast and predict share prices, and the likely implication for the possibilities of forecasting sector performance, are discussed (chapter 11). After considering these studies and the evidence of the previous chapter, it seemed on balance unlikely that knowledge of the existence of sector effects in the past is particularly useful as a device for increasing the analyst's predictive abilities.

Corresponding to the three questions of interest posed at the beginning of Part II, three conclusions emerge from the investigation ofsector selection techniques. The first confirms that the classification of shares is associated with clearly distinguishable sector effects, a conclusion in line with the majority of academic studies. The second, and most important conclusion from the point of view of constructing a positive theory of

investment, is that the available evidence confirms the investment managers' statements about the methods they employ. More precisely, analysis of a portfolio confirmed that sector selection methods had been used in its construction. Thirdly, and most importantly for the investment managers, there is no evidence from the analysis of a portfolio or from considering a variety of empirical studies, that sector selection techniques confer above average returns for the risks involved. This finding constitutes additional evidence in favour of the efficient market hypothesis . Selecting shares by their industry characteristics might be expected to be a successful investment technique only in an inefficient market. Inability to detect such success might therefore be interpreted as evidence in favour of the hypothesis that the capital market is efficient. As a technique, sector selection's only advantage is that of information saving, and in particular securing diversification at low cost.[1]

Overall the main contribution of this thesis must be seen in terms of its explanation of sector selection techniques. In addition, however, it provides a basis for further research and investigation by outlining a number of factors significant in determining the investment behaviour of a little studied, but important, type of financial institution.

---

1. Even this may well be achievable by an easier method since capital market theory suggests (under certain assumptions) that to achieve a desired risk position all one requires is an appropriate combination of the market portfolio and the riskless asset.

APPENDIX 1

FORMAL MECHANISM OF UNIT TRUST OPERATIONS[1]

Unit trusts are created by trust deeds between the management company and the trustees. The trustee is authorised to hold a trust fund of securities, cash and other assets, for the benefit of the unitholder. The fund is divided into equal and convenient sized units of no nominal value. It is free to expand and contract the number of units in existence, new investors being able to participate on terms exactly the same as present investors, the precise way in which this is done being specified in the trust deeds.

In general, authorisation of the scheme is required by the Department of Trade and Industry. Qualifications for authorisation basically revolve around the standing of the managers and the trustees, and protection of the unitholders by suitable provisions in the trust deeds.

THE TRUSTEE

The trustee acts as the legal owner of the underlying securities in the fund and is their official custodian. He is also responsible for the collection and distribution of interest and dividends, as well as issuing certificates and supervising the registers. It is up to him to make sure that the fund has a corresponding amount of cash or securities for each unit issued.

The trustee is there to safeguard the rights of the unitholders. It is his duty to supervise the investments of the fund and make sure that they are within the categories authorised by the trust deeds. He should prevent management manipulation and to this end he has certain rights for removing

---

1. See {12, 72, 73, 93, 101}

managers. One should also note the supervisory position of the Department of Trade and Industry.

THE MANAGER

The manager's function is to run the operation for a fee, investing as prudently and profitably as possible for the benefit of unitholders.

The manager is generally responsible for investment of the fund (with which we are not concerned here) and administration and marketing. The issue of further units is an important management function. It is essential that the value of existing units should not be diluted by the issue of further units. To this end the manager must deposit with the trustee, cash equal to the issue price of the new units, before they are issued. Large cash inflows of this kind can of course present substantial investment problems. It is possible for the managers to use an appropriation basis by which securities are deposited with the trustee instead of cash. This method is open to abuse, the main problem being that securities may have gone up or down in value before they are taken up by the trustee and can result in substantial profits for the management, e.g. the managers buying a line of stock at a discount on market price, and selling it at the market price to the trust fund. This method is unacceptable for obtaining a London Stock Exchange quotation.

AGENCY/PRINCIPAL MODES OF OPERATION

The managers may act as 'agents' or 'principals' for the trust. The essential difference is that when the fund expands under the principal system the units are in the first place issued to the manager, who sells them to investors, as principal in the transaction, if and when they are in demand. He therefore takes the profits and losses from changes in the value of the underlying securities. When the fund is contracting,

the units are bought from the unitholders by the manager and he decides whether to hold or cancel them.

Under the agency system, when the fund expands, the manager registers new units directly in the name of investors. The manager simply acts as agent and makes no profit or loss.

The agency system helps prevent conflicts of interest but makes difficult 'block offers' of units at favourable prices. Block offers are an invitation to the public to buy a certain number of units at a stated fixed price over a given period of time. They usually occur at the beginning of a trust's life or when it is desired to expand it rapidly. If the issue price, calculated in the ordinary way, rises above the block offer price during the offer, there is an inducement to new investors to buy the units. However, existing unitholders would suffer dilution in the value of the units if only the block offer price were paid into the trust fund as received. Hence the manager has to deposit cash (or securities if on an appropriation basis) with the trustee and issue an equivalent value in units to himself before it makes the block offer. The block offer price which the managers receive as principals will not then affect the trust fund at all. If during an offer the price falls below the block offer price, the manager sells the units offered at a lower price.

It is advantageous to the managers to have an expanding fund. Hence units are almost always available, despite the impression to the contrary given by block offers.

PRICING OF UNITS

Before considering the calculation of unit trust prices it is worthwhile to clear up terminology. An "offer" price is the price at which a security may be bought by the stockbroker from the jobber. The "bid"

price is the price at which a stockbroker may sell a security to a jobber. The difference between bid and offer prices depends on marketability and other influences and is known as the jobber's turn.

Maximum and minimum prices for units are calculated according to the Department of Trade and Industry (D.T.I.) formulae. Within this range, the trusts set their own spread. The fundamental idea is that if there is a demand for new units say, then the new money paid per unit should exactly match the value of an existing unit (and all units are equal). Additions or withdrawals to the fund are not to affect the value of each unit. In calculating the D.T.I. offer price, valuation is made with the purpose of determining what it would cost to constitute a new unit precisely equal in value to existing units. Hence the offer price consists of an appropriation price (investments valued at lowest purchase price adjusted for taxation and other liabilities per unit, and to which brokerage, stamp duties and cash have been added) plus an initial service charge and a small allowance for rounding. (An amount is also added for dividend equalisation - equal to the share of the amount of dividends already declared on underlying securities, but not received as yet by the trust, and in which purchasers of new units will share at the next distribution of dividends.)

Similarly the bid price is based on what each unitholder would be entitled to were the whole of the trust fund to be sold and distributed. Hence it consists of the value of investments per unit, valued at the highest selling prices, adjusted as necessary and to which brokerage, bank charges and other fees are added such as would be incurred in connection with a complete sale of the investments and a distribution of the proceeds in cash. Many of the prices and adjustments are rather arbitrary and it is important that the trustee keeps tabs on the manager in these calculations.

A spread of as much as 10% between the bid and offer prices may occur in consequence of the initial service charge, stamp and investment duties, buying and selling expenses of the underlying investments, and the jobbing turn. If the managers' transactions involve buying and reselling the same units, then trading at D.T.I. prices, the manager will make a very large profit. He will be making in effect the buying and selling expenses of the underlying investments and the jobber's turn. Competitive pressure may induce him to take a narrower spread between bid and offer prices than that allowed by the D.T.I. formulae. The problem then arises as to whether it should be based on the D.T.I. offer or bid price or somewhere in between. The problem arises because when extra units are created the cost to the manager will be the D.T.I. offer price (as investments will have to be purchased for the fund) whilst if units are cancelled some investments will have to be realised with costs appropriate to the D.T.I. bid price to be met.

The unitholders' position is different. Incoming unitholders want the offer price as low as possible and outgoing unitholders will want the bid price as high as possible. Two arguments would seem to indicate that the D.T.I. offer price is most suitable. Firstly, one would expect the fund to be expanding on balance and hence the D.T.I. offer price is most appropriate. Secondly, the manager's duty is to his outgoing unitholders and so prices based on the D.T.I. offer price are more appropriate.

The wider the D.T.I. price spread, the larger the area for manoeuvre in the quoted prices and the greater the potential loss to the manager if he has to cancel units at the D.T.I. bid price that he has bought back at his price, based on the D.T.I. offer price. The wider the D.T.I. price spread the bigger the potential loss. By this narrowing of the spread the investor may well get back most of his initial service charge since he receives considerably more than the D.T.I. bid price.

REMUNERATION

It remains to consider managers' and trustees' remuneration. Charges fall into two categories. The initial service charge (not more than 5% of the value of the fund) designed to cover promotional expenses, commissions to agents and initial administrative expenses and periodical management remuneration, designed to cover running expenses. Total charges must not amount to more than $13\frac{1}{4}\%$ of the value of the fund over a twenty year period, and since in fact, periodical remuneration is offsettable for tax purposes, the actual cost is somewhat lower. Trustee remuneration is usually a small portion of the periodical management fee.

It is perhaps worth noting two other possible sources of managers' profits. Dealers' margins and holding profits from acting as principal. In general unit trusts endeavour to reduce the latter whilst dealing margins occur only after the unit trust has been running for some time.

REGULATIONS AND CONTROL

No legal provision exists for the ascertainment of the wishes of unit-holders by holding meetings or for the imposition of their wishes on the manager and trustee. Unitholders are unable to veto acquisitions for investment or compel sales. However, if the unitholders unanimously direct the manager or trustee to act in a certain way, they must obey, since the unitholders collectively are the equitable owners of the trust fund. Such agreement is impossible and consequently no effective control is exercised over the managers and trustee by the unitholders.

GEARING

Although there is no reason why a trust deed should not contain a clause allowing borrowing, in practice difficulties arise because of the absence of a permanent capital to provide asset and interest cover for the loans. Hence unit trusts are rarely geared. {93 }

APPENDIX 2

INVESTMENT TRUSTS

The object of both unit and investment trusts is to invest funds as safely and profitably as possible for the benefit of the investor. They differ not in their manner of doing this but simply in their legal form. An investment trust is a conventional limited liability company incorporated under the various company acts. It is a separate legal entity (unlike a unit trust) with memorandum, and articles of association laying down its interests and possible activities. In general participation is possible in most financial markets and property, although the Department of Trade and Industry (D.T.I.) require for approval as an investment trust, that most of the company's income comes from share or security holdings. The memorandum or articles of association also specify that capital gains shall not be paid out in the form of dividends (although other types of capital distribution are possible) and it is this restriction which differentiates them from finance companies, (and leads in consequence to different rates of tax being applicable). Restrictions are placed on the proportion of the trust's assets that may be invested in a particular company (generally not more than 15% (when acquired) of the trust's assets), and on the proportion of income that may be retained and not distributed (15%). There are in addition a number of rules, understood by the investment trusts imposed on them by the D.T.I. Thus in the past turnover in any one year was generally to be less than 15% of total assets (by value), although such restrictions were not imposed completely rigidly and have subsequently been lifted in this case.

CAPITAL STRUCTURE

Investment trusts have a capital structure similar to that of most companies - with perhaps ordinary, preference, debentures and loans.

The nominal capital available to the trust is more or less fixed, although changes are possible by the issue of further shares and other forms of capital. This however is by no means part of an investment trust's normal business. The quotation of investment trust company shares on the stock market is normal. However the markets in them are usually thin. The share price generally reflects asset values, plus a premium (discount) for good or bad management records, and gearing. These and other such factors are not fixed in their combination but vary with market assessment and feeling.

In contrast the units of a unit trust are valued on a basis precisely related to the value of the underlying assets. In addition the unit trust is free to expand and contract the number of units at will as opposed to the fixed nature of the capital of an investment trust who are not allowed to buy and sell their own shares.

GEARING

Gearing is due to the prior claim on both income and capital of debentures and preferences, over ordinary shares. It has arisen because of the ability of the investment trusts to issue fixed interest securities. The investment trust has a fixed amount to pay on its prior (fixed interest) capital out of its income. The remainder of its income represents the earnings of ordinary capital which may be distributed as dividend (ignoring management expenses and taxation). Increases (decreases) in total income will see no variation in the fixed interest costs, so that the ordinary shareholders take all the benefits (losses) from a change in earnings. Hence the earnings of ordinary capital will be affected more than proportionately to the change in the trust's income. Naturally, the higher the proportion of the trust's nominal capital in fixed interest securities, the greater the gearing and the greater the fluctuations in the earnings

of ordinary capital when the investment trust's income changes. (It should be noted that if all the trust's investments were in fixed interest securities, then there might still be a benefit (loss) from gearing, but that the trust's income would not fluctuate).

Calculation of gearing is generally on a capital or income basis. In the capital case, the ratio of total assets (however valued) to total assets net of fixed interest capital is generally used, and in the income case, the ratio of total income of the trust, to income net of fixed interest/dividend charges.

It is common for articles of association to restrict the borrowing of a trust. Practice varies but generally borrowing may be between one and two times paid up ordinary capital. Although most trusts exercise their borrowing rights to some extent, it is not uncommon for gearing to "run itself off" because the growth of assets has been faster than the growth of share capital and hence borrowing capacity.

EXERCISE OF CONTROL BY SHAREHOLDERS

As with other companies, shareholders have rights to elect the board of directors and sanction the dividends declared. Apart from this and the provision of a minimal amount of information, there are few opportunities for shareholder control. The usual hope is that institutions who are large holders of the investment trust shares will exercise some control and supervision. The problem is compounded by the responsibility of the investment trusts to prod the sleepy company into life. It is unlikely that a poor investment trust will be able to induce changes that might safeguard their investments without sales (which may well be difficult due to the size of their holding). It may be that it is undesirable for investment trusts to become involved in such activities,

but there is in general little the shareholder can do either way. The possibility of trusts buying unquoted shares and becoming closely involved in industrial company management is ever present. The results may be contrary to the general interests of the shareholders who are not informed, if at all, until after the event and can do little except sell the shares to indicate disapproval. The articles of association may include specific provisions for shareholder involvement and protection, but such provisions are by no means general. Not only is there no trustee to protect the shareholders' interest (although this is not to say that trustees are a particularly effective method of control) nor is there likely to be a division between administration and investment found to some extent in unit trust operations and which may act as some unitholder protection.

MANAGEMENT FEES

Information on management fees is not so readily available as with unit trusts. However some estimates are available {13} and would seem to indicate for 1964 at least, that very few trusts had management expenses greater than 0.5% of capital employed. The vast majority recorded expenses of less than 0.3%. From the investment trusts' nature one would expect their fees to be lower than for unit trusts (due to larger holdings, lower turnover . . . .) although as turnover increases the differential is likely to narrow.

APPENDIX 3

CASE STUDY : NEW PORTFOLIO CONSTRUCTION (UNIT TRUST)

The first step in constructing a portfolio, consists of laying down the portfolio objectives. In this particular case the prime objective of the fund was to be growth. The managers were to have complete flexibility and to have no need to achieve any particular income pattern. Investment was generally to be in equities but the managers were empowered to switch into fixed interest stocks and gilts as they considered appropriate.

The general approach was to be for the managers to take a view and to hold for growth. It was described as an investment trust philosophy and was in contrast to the market orientated funds which switch between shares according to market sentiment and rumour. (However it is worth noting that in a subsequent document arguing the case for increased fees for the investment managers, one argument advanced was that a more active dealing policy was pursued than was general and that this entailed greater costs.) In contrast to most investment trusts, holdings were to be selective and small in number.

It was intended that a substantial part of the portfolio should be abroad particularly in North America. Substantial investments were to be built up by direct purchase where possible, and as an interim measure by the purchase of selected investment trusts with a substantial American content. ('Back to Back' loans were subsequently negotiated for this fund.) The rest of the fund was to be spread initially over companies in industries with established growth patterns, operating internationally and providing the greatest protection against devaluation and inflation.

In terms of investors, it was intended to attract those who could afford to disregard the income requirement from their investments and could go simply for growth. In order to attract such people a high minimum holding was imposed along with a low initial fee. Charges were reduced for deals in excess of £5,000. The buying and selling margin was also kept to a narrow

range (about $3\frac{1}{4}\%$).

The arguments put forward in favour of the trust were (i) flexible investment policy constantly seeking the areas of fastest growth, (ii) constant expert supervision, (iii) readily marketable, (iv) charges on a reducing scale, (v) lower rate of capital gains tax than was applicable to the private investor, particularly for short term gains.

Having established the objectives of the trust and delineated the market of investors that was being aimed at, the procedure followed by the managers was to write round to a number of brokers asking for suggestions as to particular sectors and shares the fund should invest in. On the basis of this and their own judgement various meetings were held and schemes drawn up to determine the weighting of funds within broad investment areas. The procedure followed was to construct a proposed portfolio detailing the individual constituents and the weights to be placed on them. This suggested portfolio distribution was compared against the F.T. Actuaries sector weights. (In this case, for example, the portfolio was underweighted in Financials and overweighted in Consumer Durables.) Thus particular sectors were weighted (such as 14% of the portfolio in Financial Services and 23% in Consumer Durables) and then the kinds of shares to be included listed (for example within Financial Services, 5% in Mercury Securities and 1% in Atlantic Assets). Income and overall yield were then calculated for the size the portfolio was expected to reach in its first month or two (in this case for a portfolio of about £1m.) The portfolio was then tested to make sure it fitted in with all the initial requirements and constraints (such a yield and growth potential).. Its exposure to risk was also considered, the exposure being in terms of geographical spread, overall industry involvement and stock exchange fashion.

This proposed portfolio was, of course, only a rough approximation. Naturally

over time expectations and preferences for sectors and shares change, whilst the amount of new money that will be received is rather an unknown quantity. In the event the inflow of funds was heavy.

Growth of a Unit Trust Portfolio

	Cumulative amount of Cash paid into the Fund for Units £m	£m Investments	Cash
End of 1st month	£2.219	2.003	0.257
2nd month	2.532	2.020	0.527
3rd month	2.701	2.492	0.404
6th month	3.997	4.748	0.190
9th month	5.228	6.417	0.152
12 months	6.319	7.677	0.323
15 months	7.262	10.022	0.307
18 months	8.100	9.883	0.544
21 months	8.589	8.214	0.999
24 months	8.799	9.132	0.691
30 months	8.934	10.795	1.487

Period covered was late 1967 to early 1970 when the number of units actually fell in one month.

In order to be able to cope with such large inflows it was necessary for the managers to plan a size they expected the portfolio to become (about £10m in this case) and then to use building blocks which were big enough to allow growth to take place. Failure to do this would have resulted in overstretched investments in smaller companies thereby giving rise to unmarketability so restricting the flexibility of the portfolio. The problem was made more acute by the tendency of the unit trusts to grow in bull market conditions when stock was generally short and choice severely curtailed. In consequence some divergence between the proposed portfolio

and the actual portfolio was only to be expected.

The question arises as to whether there is an optimal portfolio size. Intuitively one would expect there to be an optimum, but analysis of unit and investment trust performance charts does not immediately reveal one. One might reasonably have expected small portfolios to outperform the large on the grounds of marketability and other such factors mentioned before. However the evidence does not reveal any consistent pattern. With the growth of the unit trust the procedures described under portfolio selection took over. The principles remained the same as described here, but tended to be much less obvious in their application.

APPENDIX 4

SUMMARY OF MAIN PROVISIONS FOR TAXATION OF UNIT AND INVESTMENT TRUSTS[1]

Capital gains tax is an important element in the taxation of unit and investment trusts. Consequently one or two matters applicable primarily to this tax, are considered before the general corporation tax problem of the trusts.

For a gains tax liability to arise there must be (a) the disposal of a (b) chargeable asset by a (c) chargeable person within a (d) period of charge. (i.e. who and what is taxable, and how and when?)

(a) A disposal is a change in ownership of the whole or part of the asset whether disposal takes place inside or outside the UK. An exchange of shares in a takeover does not constitute a disposal; receipt of a cash consideration would.

(b) A chargeable asset includes most forms of goods and property, particularly portfolio holdings with the exception of certain Gilt Edged securities.

(c) A period of charge relates to gains after April 6, 1965. Where securities have been held from before that date and are subsequently sold, the institution must calculate the difference between original cost and sale proceeds, and the difference between the 6 April, 1965 price and sale proceeds and where both are negative or positive, take the lower of the two as being the chargeable gain, or allowable loss. Where the two methods conflict and reveal a gain and a loss there is no chargeable gain or loss. An alternative open to the institution is to elect that all holdings of fixed interest and/or of equities be treated as if acquired at the 6 April, 1965 price.

The taxation of unit and investment trusts is generally governed by the same provisions both being treated as companies with shareholders subject to corporation tax at the long-term capital gains tax rate.

---

1. See {13,72,78,100}

Three sources of revenue for the trusts may be differentiated.

(1) Franked Investment Income (net distributions from UK companies on which both corporation and income tax have been paid. The income tax is reclaimable although not directly). No tax is payable on this as it has already borne corporation tax at the company level.

(2) Unfranked Investment Income (such as debenture interest and on which income tax has usually been paid, but is redeemable direct and so is in effect gross). It will not have paid corporation tax at the company level.

(3) Capital Gains

Both (2) and (3) pay corporation tax but certain deductions, management expenses and charges on income, are allowed against either the unfranked income or the capital gains. Past capital losses may be set off against present capital gains.

The income tax paid on (1) may be offset against income tax payable on dividends and interest to the trust's shareholders. Provisions exist, in case (1) is greater than this amount, to carry the surplus forward.

Provisions also exist for the using up of "unused management expenses" and for reducing a trust's chargeable capital gains (or allowable losses) when the total monies paid to cancel units exceeds the total monies received for the creation of new units.

In order to prevent the double taxation of unit and investment trust holders (i.e. charged on both the gains made by the company and subsequently by the shareholders) the net chargeable capital gains, after tax may be apportioned amongst the shareholders with each shareholder adding his apportionment to the acquisition cost of the shares, so that on subsequent sale his personal chargeable capital gains will be

reduced. (But note the individual cannot set off the capital gains paid by the trust against his private capital losses.)

This apportionment does not totally achieve its object since standard rate tax payers pay capital gains tax at half the standard rate (i.e. less than the trusts' 30%), or in many cases are totally exempt from gains since disposals in any year are less than £500. There is in addition widespread ignorance as to the meaning and use of the tax certificates sent to shareholders.(1) It would be more equitable to tax the individuals and not tax the trusts. As the system works at present, if the trust realises no capital gains the whole liability devolves upon the unitholders whilst if it realises all its capital gains as it goes along, this will exempt the unitholder from liability, if he pays tax at the standard rate.

CAPITAL GAINS TAX AND PERFORMANCE COMPARISONS

Two main influences of capital gains tax on performance comparisons may be distinguished. The first consists of the effect on valuation of assets of different ways of treating capital gains, two extreme cases being evident - no capital gains being realised in a period, and all capital gains being realised in the period. The second effect is that resulting from the loss of capital due to the tax payment, on overall performance. However, this is not of relevance to the shareholder who expects the trust only to switch if it can make more by doing so than by not switching.

Conventional methods of comparison ignore all the effects of tax complications and consider performance as being the net change in the

---

1. Note the rate of tax was changed to 15% in April 1972. This point loses some of its force in consequence, but is still valid.

be the same. However, it does help to illustrate the problems involved.

A problem not dealt with is that of the contingent tax liability - the unrealised gains in a portfolio. Should one reduce the values of the investments to take these into account? In so far as apportionment of capital gains is successful it is probably unnecessary. At the moment a serious problem is the sudden dip in the price of units that takes place annually when capital gains tax is paid. The apportionment of the capital gain effectively increases the price of the shares, but is disadvantageous particularly to small new shareholders insofar as they are not liable to capital gains tax personally and have a substantial portion of their working capital removed. The problem is that the new unitholder does not know to what extent his units will be reduced by the taxation of gains acquired before his ownership of the shares. The potential gains may be huge, and apportionment does nothing to help such small shareholders. In the absence of relief for such shareholders there may well be an excellent case for adjusting valuations.

Comments so far have mainly been on a year to year basis. It is worth noting that any estimate of asset values must be an over valuation if net gains are being realised and the accrued tax liability on them is not being taken into account. The same is true for the $ premium. (The liability to surrender 25% of the $ premium on the sale of investments so that at any time a fund will have an actual and contingent liability.) The extent to which unit trusts do adjust their bid and offer prices on a daily basis for gains and $ premium liabilities is not clear.

ARGUMENTS FOR ADJUSTMENT OF ASSETS FOR CONTINGENT GAINS (AND $ PREMIUM LIABILITY [13]

Burton and Corner argue that adjusting net asset value for the contingent gains liability could be justified in two cases:

(i) portfolio turnover involving realisation of all capital gains

(ii) liquidation of the company.

In the case of (i) the contingent gains liability becomes actual liability and it is reasonable to adjust the offer and bid prices of a unit so as not to overcharge the purchaser. In case (ii) it is argued that liquidation is not a normal state of affairs and that investors are interested in companies as going concerns and not as about to wind up. They then extend their argument to say that apportionment of net capital gains to their shareholders increases the original cost of the shares and so reduces shareholders' own gains tax payments so that the contingent gains liability does not involve the shareholder in an inescapable loss of capital value.

The argument is faulty, firstly insofar as the logic behind the pricing of units in the case of unit trusts is to ascertain a break up or cost value of each unit and in consequence to remove liabilities for taxation from the asset value. In the case of investment companies justification for adjustment may simply rest on the provision of better information for making investment decisions. The second point relates to the apportionment argument. Earlier comments have indicated that apportionment is a poor solution to the gains tax problem in cases where the unit/shareholder is small and would normally be exempt from capital gains tax. Failure to adjust for contingent gains tax liability effectively removes a portion of the investor's working capital. The argument against taxing contingent capital gains must surely rely on the administrative difficulties involved.

APPENDIX 5

(1) CONSOLIDATED P & L Year to

NET SALES
(No. of Employees)
Wages & Sal.

OPERATING PROFIT
Investment Income
Income B.I. & T.
Interest on Debt
Interest on Convertible

Profit B/T.
Tax
Income A/T.
Minority Interests
Pref. Dividend

EQUITY EARNINGS
Dividend
Retained Earnings
Depreciation

CASH FLOW

---

(2) OPERATING RATIOS
Op. Profit % Net Sales
Op. Profit % Net Op. Assets
Op. Profit per Employee

Wages: Profit B/T.

Net Sales: Wages

Net Sales per Employee
Net Sales: Stocks
Net Sales: Net Op. Assets
Net Sales: Net Fixed Assets
Equity Earnings % Equity Cap. Funds.
Retained Earnings % Equity Cap. Funds.

---

(3) PER SHARE: NO. OF SHARES:

Equity Capital Funds
Investments
Net Sales
Cash Flow
Equity Earnings
Dividend

---

(4) RELATIVE VALUE

Date
Price
P/CF.
P/E .
Yield
Cover

Mkt. Cap.

(5) HALF YEAR FIGURES

Net Sales	½	1
	½	2
Op. Profit	½	1
	½	2
Op. Profit % Sales	½	1
	½	2

(6) CONS. BALANCE SHEET Year

(Intangible Assets)
Land
Plant & M/C.
Fixed Assets

\- Depreciation

Net Fixed Assets

Operating Net Curr. Assets (1-2)

1 (Current Assets)

2 (Current Liabs - O/D)
Current Liabs.
Stocks
Cash

NET OPERATING ASSETS

Investments

TOTAL ASSETS

Overdraft
Long Term Debt
Pref. Capital
Future Tax
Tax Equilisation

Total Borrowing

Convertible
Minority Interests

EQUITY CAPITAL FUNDS

TOTAL LIABILITIES

---

(7) CAPITAL RATIOS

Curr. Assets: Curr. Liabs.
Quick Assets: Curr. Liabs.
O/D% Net Op. Assets

Total Borrowing % Net Op. Assets
Net Borrowing % Total Assets
(TB - I - C)
Stocks % Net Op. Assets

Net Op. Assets per Employee

Appendix 6

Let I_{is} represent the firm index, $I_{.s}$ the sector index, and $I_{..}$ the market index. A multiplicative relationship of the form

$$\frac{I_{is}}{I_{..}} = \frac{I_{is}}{I_{.s}} \cdot \frac{I_{.s}}{I_{..}}$$

was postulated, or for convenience

$$F_{..t} = F_{ist} \cdot F_{.st}$$

The change in price for the (t-j) to the t^{th} period is denoted by

$$\frac{F_{..t}}{F_{..(t-j)}} = \frac{F_{ist}}{F_{is(t-j)}} \cdot \frac{F_{.st}}{F_{.s(t-j)}}$$

Taking logs gives

$$(\log F_{..t} - \log F_{..(t-j)}) = (\log F_{ist} - \log F_{is(t-j)}) + (\log F_{.st} - \log F_{.s(t-j}$$

which is equivalent to equation (1)

In turn $\Delta_j \log F_{..t} = \Delta_j \log I_{ist} - \Delta_j \log I_{..t}$

$\Delta_j \log F_{ist} = \Delta_j \log I_{ist} - \Delta_j \log I_{.st}$

$\Delta_j \log F_{.st} = \Delta_j \log I_{.st} - \Delta_j \log I_{..t}$

$\Delta_j \log I_{ist}$ (and similarly $\Delta_j \log I_{..t}$ and $\Delta_j \log I_{.st}$) may be shown to equal $\Delta_j \log P_{ist}$ where P denotes the share price of the i^{th} firm in the s^{th} sector for the t^{th} period. (See Appendix 7).

Appendix 7

Let I_{ist} be an index of the individual firm's share price such that

$$\frac{P_{ist}}{P_{iso}}$$

where P_{ist} = price of the i^{th} firm in the s^{th} sector for the t^{th} period, and P_{iso} denotes the price of the i^{th} firm in the s^{th} sector for the base period.

Then $\log I_{ist} = \log(\frac{P_{ist}}{P_{iso}})$

$$\Delta \log I_{ist} = \log(\frac{P_{ist}}{P_{iso}}) - \log(\frac{P_{is(t-1)}}{P_{iso}})$$

$$= \{\log P_{ist} - \log P_{is(t-1)} - \log P_{iso} + \log P_{iso}\}$$

$$= \Delta \log P_{ist}$$

Generalising to differences of length j gives $\Delta_j \log P_{ist}$. Similarly for the sector (or market) index of k companies at the t^{th} period.

Let $I_{.st} = \left(\prod_{i}^{k} \frac{P_{it}}{P_{io}}\right)^{\frac{1}{k}}$

For the $t+1^{th}$ period $I_{.s(t+1)} = \left(\prod_{i}^{k} \frac{P_{i(t+1)}}{P_{io}}\right)^{\frac{1}{k}}$

Hence $\log I_{.s(t+1)} - \log I_{.st}$

$$= \frac{1}{k}\log\left(\prod_{i}^{k} \frac{P_{i(t+1)}}{P_{io}}\right) - \frac{1}{k}\log\left(\prod_{i}^{k} \frac{P_{it}}{P_{io}}\right)$$

$$= \frac{1}{k}\{\log P_{1(t+1)} - \log P_{10} + \log P_{2(t+1)} - \log P_{20} + \ldots\ldots +$$

$$\log P_{k(t+1)} - \log P_{k0} - \log P_{1t} + \log P_{10} - \log P_{2t} + \log P_{20} \ldots\ldots$$

$$\ldots\ldots - \log P_{kt} + \log P_{k0}\}$$

$$= \frac{1}{k}\sum_{i}^{k}\{\log P_{i(t+1)} - \log P_{it}\}$$

Appendix 8

Applying the second moment measure to the individual share, produces a small cross product term.

$$E(\Delta_j \log F_{..t})^2 = E(\Delta_j \log F_{ist} + \Delta_j \log F_{.st})^2$$

$$= E\{(\Delta_j \log F_{ist})^2 + (\Delta_j \log F_{.st})^2 + 2(\Delta_j \log F_{ist} \cdot \Delta_j \log F_{.st})\}$$

where E is the expected value operator.

For the sector as a whole this cross product is zero.

Computing the sector index $I_{.st}$ as the geometric mean of the individual firm price indices I_{ist} and letting $\Delta_j \log I_{ist} = X_{ist}$ where X_{ist} represents the change in the log of the share price of the i^{th} firm in the s^{th} sector for the t^{th} period then

$$\Delta_j \log I_{.st} = \frac{1}{k_{si}} \sum^{k_s} X_{ist} = \bar{X}_{.st}$$

Now $F_{ist} = \frac{I_{ist}}{I_{.st}}$ and $\Delta_j \log F_{ist} = X_{ist} - \bar{X}_{.st}$

Summing over the sector

$$\sum_i^{k_s} \Delta_j \log F_{ist} = \sum_i^{k_s} X_{ist} - k_s \bar{X}_{.st} = 0$$

The cross product summed over all i shares in the sector gives

$$2 \sum_i^{k_s} (\Delta_j \log F_{ist} \cdot \Delta_j \log F_{.st})$$

$$= 2 \Delta_j \log F_{.st} \sum_i^{k_s} \Delta_j \log F_{ist}) = 0$$

If X_{ist} is distributed normally then the geometric mean is the most appropriate measure of location (Work has been carried out by Fama {36} and others on the distribution of changes in log price. The distributions were found to be significantly non normal. Considerable argument has centred on these results and research has generally continued to assume normality.) In terms of a portfolio the geometric mean is a continuous reallocation index. Price movements of individual stocks are continuously adjusted for to maintain equal pound amounts in each stock. It is equivalent to continuously selling off stocks that have gone up in price and adding to those that have not. It might be seen as similar to a portfolio with investments bought in units of £10,000 say. When the value of some individual units increases substantially, the portfolio might be considered as over represented in those stocks and consequently sales made. (See Latané & Tuttle {57}.)

Appendix 9

Random Sample C_s^2 values

Sector Size		3 month	6 month	1 year	2 years
5	mean	4.63	4.60	4.51	7.42
	St.Dev.	1.49	2.82	3.42	8.13
10	mean	12.13	11.59	12.20	17.56
	St.Dev.	4.49	4.71	5.41	12.51
20	mean	19.37	21.38	27.39	40.38
	St.Dev.	3.42	8.57	12.57	27.44
30	mean	33.66	36.58	38.12	42.33
	St.Dev.	8.23	15.31	18.23	31.76
40	mean	43.63	38.74	44.73	46.90
	St.Dev.	10.01	7.28	13.50	22.43
50	mean	63.61	75.67	105.36	189.74
	St.Dev.	23.56	31.56	76.38	219.77
100	mean	138.10	120.04	146.78	188.77
	St.Dev.	30.36	23.58	72.36	143.55

Note The very high variability (standard deviation) of periods longer than 3 months suggest the need for considerable caution in interpreting the C_s^2 ratios for these periods. The 6, 12 and 24 month values are for overlapping time periods.

Appendix 10

Random Sector Deviations

Size of Portfolio		D_1	D_2
100 stocks	mean value	0.29	2.29
	St. Dev.	0.04	0.33
90	mean	0.31	2.39
	st. dev.	0.04	0.32
80	mean	0.30	2.36
	st. dev.	0.03	0.33
70	mean	0.33	2.61
	st. dev.	0.04	0.46
60	mean	0.34	2.58
	st. dev.	0.03	0.29
50	mean	0.39	3.19
	st. dev.	0.05	0.48
40	mean	0.44	3.40
	st. dev.	0.04	0.48
30	mean	0.48	3.84
	st. dev.	0.06	0.58

Portfolios of 30, 40 and 50 stocks, constraint of 10% maximum on any one firm in the portfolio. 60, 70, 80, 90 and 100 stock portfolios, 5% maximum.

Appendix 11

Intuitively one would expect the two appropriate six month portfolio changes to equal the year portfolio change, although with a redistribution in the size of the changes between the various components. This is the case for the actual portfolios but not necessarily the case for the sector or market equivalent portfolios.

Let q be the number of shares held throughout and p_o, p_1 and p_2 be the prices at the beginning of the period, end of the first period and end of the second period respectively.

Then

$$(qp_1 - qp_o) + (qp_2 - qp_1) = q(p_2 - p_o)$$

That is, the first period change in value plus the second period change in value equals the overall change in value.

This may be rewritten as

$$qp_o\left(\frac{p_1}{p_o} - 1\right) + qp_1\left(\frac{p_2}{p_1} - 1\right) = qp_o\left(\frac{p_2}{p_o} - 1\right)$$

Substituting in the index numbers I_o, I_1 and I_2 representing the sector equivalent investment prices, the change in sector value becomes

$$qp_o\left(\frac{I_1}{I_o} - 1\right) + qp_1\left(\frac{I_2}{I_1} - 1\right)$$

which is not equal to $qp_o\left(\frac{I_2}{I_o} - 1\right)$

unless $\left(\frac{I_1}{I_o}\right) = \left(\frac{p_1}{p_o}\right)$ and $\left(\frac{I_2}{I_1}\right) = \left(\frac{p_2}{p_1}\right)$

Hence the summing of the two sub period portfolio changes do not in the sector value case, in general, equal the overall portfolio change.

Appendix 12

SECTORS	SHARES HELD THROUGHOUT			SHARES HELD AT PERIOD 1 AND SUBS. SOLD			PROFIT DURING PERIOD & HELD TO END			BOUGHT & SOLD			DIVIDENDS		
	ACTUAL	SECTOR EQUIV.	MARKET EQUIV.	ACTUAL	SECTOR EQUIV.	MARKET EQUIV.	ACTUAL	SECTOR EQUIV.	MARKET EQUIV.	ACTUAL	SECTOR EQUIV.	MARKET EQUIV.	ACTUAL	SECTOR EQUIV.	MARKET EQUIV.
AIRCRAFT							-34,400	1,730	2,280						
BUILD.MATS.	5,600	6,060	5,650	630	1,080	90	6,540	-1,820	-3,790	3,290	-1,010	-560	2,250	1,200	1,120
CONT.& CONTN.				20,000	22,520	13,900	29,090	-14,210	-660						
ELECTRICALS	38,190	30,590	13,500	9,370	6,330	2,590							2,710	2,610	2,670
ENG.										-1,260	2,830	1,920			
SHIPBUILDING							-6,260	2,320	-1,430						
MISC.CAP.	36,700	19,460	11,480				4,090	-3,200	-1,570				1,440	2,710	2,270
ELECTRONICS	-2,830	67,710	41,490	1,560	3,490	2,080	220	200	3,600	10,540	6,140	4,500	6,580	5,570	8,200
H.HLD.							-6,560	-3,000	-1,110						
MISC.DUR.	282,100	169,850	46,020	-8,950	9,360	2,810	34,880	21,900	2,230				3,780	5,710	3,090
ENT.	36,060	27,200	17,860	760	1,820	2,520	24,650	8,520	3,400	500	1,120	850	4,530	4,150	3,520
FOOD MAN.				-900	3,610	760									
FOOD RET.	11,800	10,090	7,630				-6,150	-3,530	10				900	1,060	1,510
NEWS. & PUB.	18,400	10,540	7,390				8,040	3,130	2,580				1,300	1,940	1,460
TEXTILES							14,690	7,870	3,430	-130	230	-290			
MISC.NON-DUR.	15,600	17,900	13,680	24,930	26,170	13,480	-1,060	-890	1,700	-2,750	30	580	1,940	2,500	2,700
CHEMICALS	310	4,950	4,410	14,250	12,300	6,740	1,880	-3,300	-520	6,340	6,270	6,430	1,080	860	870
OIL	23,520	36,240	13,070				-3,560	1,050	320				3,120	2,730	2,580
SHIPPING	12,640	20,750	6,790				1.140	2,830	420				1,260	1,960	1,340
MISC.UNCL.							-4,130	-2,290	-2,340						
INS.(COMP.)				-11,250	-6,820	330				-500	-1,020	-350			
INS.BROK.				1,580	3,160	5,330									
INV. TR.	21,000	2,010	3,460				5,440	130	-590	70	210	180	180	530	680
M. BANK	103,500	50,560	12,740				16,550	5,790	1,350				1,630	2,180	2,520
PROP.	44,790	46,650	23,060	130	430	280	43,620	26,090	8,870				3,460	4,850	4,560
	596,380	522,550	228,240	52,110	83,430	50,910	128,710	49,340	18,170	16,110	14,780	13,250	36,160	40,550	45,080

The importance of the sector within the portfolio is approximately represented by the size of the market equivalent under the shares held throughout, column..

Appendix 12

SECTORS	SHARES HELD THROUGHOUT			SOLD AT PERIOD 1 AND SUBS. SOLD			BOUGHT DURING PERIOD & HELD TO END			BOUGHT & SOLD			[illegible]		
	ACTUAL	SECTOR EQUIV.	MARKET EQUIV.	ACTUAL	SECTOR EQUIV.	MARKET EQUIV	ACTUAL	SECTOR EQUIV.	MARKET EQUIV.	ACTUAL	SECTOR EQUIV.	MARKET EQUIV.	ACTUAL	[illegible]	MARKET EQUIV.
AIRCRAFT	-44,350	-13,210	2,600										1,560	2,000	1,880
BUILD.MATS.	-20,310	-9,930	1,680	-5,540	-9,800	6,300							1,260	1,300	1,220
CONT.& CONTN.	-51,970	6,920	8,850	-1,370	-2,020	330	-13,600	-7,220	-5,420	-770	10	-240	5,560	4,450	6,410
ELECTRICALS	-13,680	-26,150	4,550	-31,500	-19,780	1,040	-30,720	-30,000	-6,860				2,320	2,500	3,300
ENG.							2,790	-1,600	-890						
SHIPBUILDING				10	-490	3,330									
MISC.CAP.	59,580	-1,120	3,640	10,830	6,710	10,950	-3,030	-4,590	-5,080				1,400	2,910	2,630
ELECTRONICS	21,610	-27,060	8,930	-4,720	-13,060	7,070	3,010	980	290				5,610	4,650	6,470
H.HLD.	-9,430	-9,500	2,700				-7,570	-3,370	-4,330				1,880	2,080	1,950
MISC.DUR.	-80,990	-48,390	15,040	-19,760	1,500	26,300	-3,630	-1,710	60				1,560	5,250	8,900
BREW.:							-6,740	-3,880	-4,230						
ENT.	320	9,050	3,110	-1,210	3,000	1,770	57,880	-6,810	-5,380	5,120	-30	-650	3,040	2,280	2,260
FOOD MAN.										-2,630	-4,490	-4,510			
FOOD RET.				10,100	-1,270	11,990									
NEWS. & PUB.	-19,250	240	2,910	-8,440	4,130	3,640				-1,870	370	1,080	1,100	2,470	2,110
TEXTILES	7,270	-20,860	4,680				-23,780	-24,070	-12,700	-2,340	460	1,100	980	3,600	3,390
MISC.NON-DUR.				-1,120	-1,730	1,170	-21,390	-28,200	-18,210						
CHEMICALS	13,790	-6,980	4,870	-520	160	240	-4,030	-7,310	-4,020				2,100	3,500	3,530
OIL	20,840	36,810	5,850				27,110	-5,900	-2,950				4,600	3,910	4,240
SHIPPING	34,650	9,810	2,400	2,490	320	920	29,020	6,870	-11,400				2,350	2,060	1,740
MISC.OTHERS				42,750	10,510	9,930	36,000	-9,590	-10,010						
H.P.															
INS.(COMP.)							-2,500	-6,850	-4,610						
INS.BROK.							-41,430	-30,100	-14,960						
INV.TR.	38,290	-500	2,830				-5,790	-5,040	-2,970	-3,750	-4,260	-3,540	220	1,660	2,050
M.BANK	52,500	36,000	7,230				-28,800	-33,930	-19,160				1,810	3,000	5,240
PROP.	85,760	131,710	16,050	10,400	13,550	3,350	4,510	-11,860	-12,270				6,390	11,320	11,620
	94,630	66,920	97,920	2,400	-8,260	89,210	-32,690	-214,160	-145,090	-6,230	-7,930	-6,760	43,740	59,010	68,940

Appendix 12 Table 1

4.69 - 10/69

SECTOR	SHARES HELD THROUGHOUT			SHARES HELD AT PERIOD 1 & SUBS. SOLD			BOUGHT DURING PERIOD & HELD TO END			BOUGHT & SOLD			[illegible]		
	ACTUAL	SECTOR EQUIV.	MARKET EQUIV.	ACTUAL	SECTOR EQUIV.	MARKET EQUIV.	ACTUAL	SECTOR EQUIV.	MARKET EQUIV.	ACTUAL	SECTOR EQUIV.	MARKET EQUIV.	ACTUAL	SECTOR EQUIV.	MARKET EQUIV.
AIRCRAFT	-36,250	-14,010	-10,190										30	1,55	1,070
BUILD.MATS.	-2,110	-11,720	-7,950										1,305	1,07	830
CONT.& CONTN.	-137,360	-69,490	-71,980	-2,620	-1,720	-1,660	-1,310	-1,560	-2,730				7,137	5,69	7,860
ENG.	-17,500	-11,940	-10,100				580	-13,460	-15,900				1,180	1,31	1,130
MISC.CAP.	-4,000	-3,280	-3,790	-41,810	-41,060	-43,450							640	46	390
ELECTRONICS	-43,750	-28,320	-71,730				3,240	7,200	750				6,080	6,130	7,500
H.HLD.	-16,360	-16,310	-15,540	-16,700	-23,480	-22,470							860	1,960	1,630
MOTORS							-1,870	-690	-1,780						
MISC.DUR.	61,380	330	-73,390	-89,060	-8,300	-32,440	3,690	3,700	-1,110				1,980	4,460	7,680
BREW.	-6,230	-4,800	-6,940				2,970	-620	80				880	880	720
ENT.	-110,020	-32,580	-43,030	-28,720	-11,960	-14,110	6,970	9,700	1,850				5,280	4,760	4,500
FOOD MAN.															
NEWS. & PUB.				-3,440	-15,890	-19,090									
TEXTILES	-15,700	-25,990	-29,450	-82,950	-7,170	-18,680	10,300	-2,370	740				2,650	3,950	3,080
TOBACCO							-930	-640	-500	-920	-640	-500			
MISC.NON-DUR.	-18,920	-24,180	-31,140										2,630	3,300	3,260
CHEMICALS	-28,690	-19,200	-31,720	-17,500	-8,710	-14,640	1,310	-740	-1,570				1,860	3,660	3,320
OIL	-87,320	-68,020	-71,610	-19,800	-25,590	-30,880	-270	-210	60				6,120	6,340	7,490
SHIPPING	-33,220	-4,380	-71,240				43,460	32,960	610				5,380	9,510	7,450
MISC.OTHERS	-79,020	-74,620	-72,310	0	-1,630	-2,860	-23,650	-7,820	-6,380				4,090	8,100	8,120
H.P.							-14,250	37,140	-16,880						
INS.(COMP.)				-8,500	-7,340	-4,590									
INS.BROK.	-30,620	-29,060	-18,410	-36,620	-28,230	-18,940							1,170	1,580	1,920
INV.TR.	-29,680	-26,160	-29,960										220	2,610	3,140
M.BANK	-95,930	-86,860	-71,710	-66,800	-40,630	-27,730							2,680	4,020	7,500
PROP.	-30,430	-19,840	-172,510	240	-3,700	-7,840	6,110	2,210	-3,120				10,990	14,540	18,040
ELECTRICALS	-43,370	-40,070	-54,600										4,260	5,090	5,710
	-805,100	-610,590	-969,300	-414,280	-225,420	259,390	36,360	64,790	-45,890	-920	-640	-500	68,330	90,890	102,350

Appendix 12 Table 4

10/70 - 4/71

SECTORS	SHARES HELD THROUGHOUT			SHARES HELD AT PERIOD 1 AND SUBS. SOLD			BOUGHT DURING PERIOD & HELD TO END			DIVIDENDS		
	ACTUAL	SECTOR EQUIV.	MARKET EQUIV.	ACTUAL	SECTOR EQUIV.	MARKET EQUIV.	ACTUAL	SECTOR EQUIV.	MARKET EQUIV.	ACTUAL	SECTOR EQUIV.	MARK EQUI
CONT.& CONTN.	34,370	-15,790	1,020	4,950	-1,080	-1,120				1,340	1,580	2,160
ENG.	-27,500	-8,170	1,030				9,360	8,430	6,720	2,450	2,460	2,190
MACHINE TOOLS				-40,970	-59,780	-8,500						
MISC.CAP.				-22,400	-20,540	-5,270						
ELECTRONICS	13,810	-15,440	2,080	-44,980	-16,000	-8,720	1,830	4,160	3,220	3,360	2,750	4,410
H.HLD.	28,800	-6,300	1,740							3,250	4,080	3,690
MOTORS	57,080	-540	2,350				5,750	5,320	1,930	2,840	5,130	2,980
BREW.				-940	-100	-1,830	13,000	11,320	5,700			
ENT.	-3,400	17,550	2,780	-1,130	1,220	-1,460				5,660	5,810	5,880
FOOD RET.	53,590	16,820	4,000							2,020	6,990	8,480
TEXTILES				5,100	-1,190	-1,010						
CHEMICALS	7,060	-3,340	3,340	-6,400	-11,870	-5,160				6,560	7,250	7,060
OIL	-73,930	-44,070	4,850				-6,280	-3,050	1,080	10,520	10,220	9,230
SHIPPING	-72,800	-112,270	5,200				5,400	-14,690	8,180	12,240	11,500	11,000
MISC.OTHERS	17,090	6,330	3,650	-1,890	-2,280	-2,830	26,840	9,620	10,230	8,000	8,960	7,720
H.P.	44,000	9,270	1,000				11,250	7,880	9,380	2,170	2,160	2,120
INS.(LIFE)	1,530	570	120							140	200	250
INS.(COMP)				-200	-40	-820						
INS.BRCK.	24,500	42,260	2,050							2,270	3,610	4,340
INV.IP.	-33,840	100	1,410							1,060	2,210	2,990
PROP.	39,350	130	6,430	-24,550	-18,390	-16,280				6,320	6,530	13,610
WINES & SPIRITS	14,110	12,700	1,060	-1,080	-560	-1,840				2,300	2,570	2,240
OFFICE EQUIP.	134,810	123,650	5,510	44,230	28,790	-5,880				2,440	5,380	11,660
DISCONT.	258,630	23,460	49,620	-90,260	-101,820	-60,720	67,150	28,990	46,440	74,900	89,390	102,010

Appendix 12 Table 5

4/70 - 10/70

SECTOR	SHARES HELD THROUGHOUT			SHARES HELD AT PERIOD 1 & SUBS. SOLD			DIVIDENDS		
	ACTUAL	SECTOR	MARKET	ACTUAL	SECTOR	MARKET	ACTUAL	SECTOR	MARKET
CONT. & CONTN.	-62,970	-21,640	-2,450	-17,200	-9,440	-8,550	6,310	3,080	4,860
ENG.	-28,120	-3,470	-1,370	-5,120	-6,240	-6,550	2,660	2,950	2,720
MACHINE TOOLS	-45,210	-27,790	-2,500				2,480	5,180	4,950
ELECTRONICS	-117,120	-70,480	-9,030	2,750	-7,540	-1,090	15,890	10,530	17,920
MOTORS	9,650	-30,020	-1,930	-8,570	-17,640	-13,650	2,650	4,550	3,830
BREW.	2,640	2,550	-440				820	970	880
ENT.	2,690	-22,230	-3,220	-33,050	-32,720	-31,570	5,030	5,600	5,400
FOOD RET.	-820	-58,040	-4,770	-2,700	-16,000	-1,320	4, 150	6,680	9,471
TEXTILES	-8,800	-6,980	-750				2,780	1,860	1,480
CHEMICALS	-25,150	6,940	-7,080	-42,050	-19,820	-32,710	8,580	14,470	14,040
OIL	54,980	24,110	-4,080				7,320	8,640	8.090
SHIPPING	55,750	34,150	-4,850	1,140	5,000	-710	4,580	11,330	9,620
MISC.OTHERS	-129,150	-28,380	-5,850	-41,710	-25,630	-25,940	12,160	12,610	11,600
INV. TR.	-30,420	3,970	-1,790				1,270	2,860	3,560
PROP.	27,660	52,900	19,970	3,250	3,480	-660	10,350	12,660	19,720
WINES & SPIRITS	-7,920	-2,600	-1,270				3,120	2,900	2,520
OFFICE EQUIP.	99,460	61,200	-6,880				3,040	6,390	13,650
	-202,870	-85,805	-68,230	-143,260	-126,550	-122,750	93,290	113,260	135,310

Appendix 12 Table 6

4/68 - 4/69

SECTORS	SHARES HELD THROUGHOUT			SHARES HELD AT PERIOD 1 & SUBS. SOLD			BOUGHT DURING PERIOD & HELD TO END			BOUGHT & SOLD			DIVIDENDS		
	ACTUAL	SECTOR EQUIV.	MARKET EQUIV.	ACTUAL	SECTOR EQUIV.	MARKET EQUIV.	ACTUAL	SECTOR EQUIV.	MARKET EQUIV.	ACTUAL	SECTOR EQUIV.	MARKET EQUIV.	ACTUAL	SECTOR EQUIV.	MARKET EQUIV.
AIRCRAFT							-78,750	-15,940	5,770				1,560	2,060	1,880
BUILD.MATS.				620	4,870	6,140	-24,380	-13,280	-20	13,950	-6,930	3,160	3,510	2,500	2,340
CONT.& CONTN.				20,000	22,520	13,900	-36,370	-12,360	3,450	-2,240	-4,820	-1,290	5,560	4,450	6,410
ELECTRICALS	24,510	5,500	17,460	9,370	6,330	2,590	-30,720	-30,000	-6,860	-31,500	-19,780	1,940	5,030	5,110	5,970
ENG.							2,790	-1,600	-890	-1,260	2,830	1,920			
SHIPBUILDING										-6,250	1,750	2,200			
MISC.CAP.				46,790	25,060	20,100	62,130	-9,270	-3,410	-740	960	1,080	2,840	5,620	4,200
ELECTRONICS	16,720	7,470	13,840	-20,740	42,920	37,800	27,020	-15,940	8,080	6,400	1,020	9,180	12,190	10,220	14,670
H.HLD.							-23,560	-16,170	-2,610				1,880	2,080	1,950
MISC.DUR.	84,750	74,900	38,160	57,230	71,600	34,730	370	3,990	5,970	11,310	4,980	2,850	5,340	10,950	17,990
BREW.							-6,740	-3,880	-4,230						
ENT.	-3,050	28,700	15,390	38,980	13,340	9,160	57,880	-6,810	-5,380	30,270	9,460	4,280	7,570	6,430	5,780
FOOD MAN.				-900	3,610	760				-2,630	-4,490	-4,510			
FOOD RET.				16,850	9,470	13,370				-1,100	-4,180	6,390	900	1,060	1,510
NEWS. & PUB.	2,300	10,720	9,550				1,020	1,230	1,420	-6,440	6,190	6,000	2,400	4,410	3,570
TEXTILES							-1,810	-36,330	-4,860	-2,460	690	810	980	3,620	3,390
MISC.NON-DUR.				39,590	42,600	28,120	-21,390	-28,200	-18,210	-4,000	-1,150	2,500	1,940	2,500	2,700
CHEMICALS	8,440	3,100	5,700	14,250	12,300	6,740	3,570	-15,450	-770	5,760	6,220	6,520	3,180	4,360	4,400
OIL	36,520	63,900	16,900				31,390	6,950	-770				7,720	6,640	6,820
SHIPPING	36,260	27,230	7,910	3,990	2,280	1,190	37,820	11,470	-10,550	870	650	390	3,610	4,020	3,080
MISC.OTHERS							36,000	-9,590	-10,010	38,620	8,430	7,770			
H.P.															
INS.(COMP.)				-11,250	-6,820	330	-2,500	-6,850	-4,610	-500	-1,020	-350			
INS.BROK.				1,570	3,160	5,330	-41,430	-30,100	-14,960						
INV.TR.	40,470	1,840	4,470				18,470	-5,130	-2,310	-3,680	-4,050	-3,360	400	2,190	2,730
M.BANK	146,630	75,970	16,480				-2,880	-23,010	-16,880				3,440	5,180	7,760
PROP.	98,720	106,820	29,820	130	430	280	74,340	82,820	4,600	16,010	14,050	3,300	9,850	16,170	16,180
	492,270	406,150	175,680	216,490	253,660	180,540	82,270	-173,440	-78,040	60,400	10,810	50,780	79,900	99,600	114,000

Appendix 12 Table 7

4/70 - 4/71

SECTORS	SHARES HELD THROUGHOUT			SHARES HELD AT PERIOD 1 AND SUBS. SOLD			BOUGHT DURING PERIOD & HELD TO END			BOUGHT & SOLD			DIVIDENDS		
	ACTUAL	SECTOR EQUIV.	MARKET EQUIV.	ACTUAL	SECTOR EQUIV.	MARKET EQUIV.	ACTUAL	SECTOR EQUIV.	MARKET EQUIV.	ACTUAL	SECTOR	MARKET	ACTUAL	SECTOR	MARKET
CONT.& CONTN.	30,800	-24,580	-60	-71,650	-23,160	-11,960							7,650	4,660	7,080
ENG.	-55,620	-13,590	-70	-5,120	-6,240	-6,550	9,360	8,430	6,720				5,110	5,410	4,910
MACHINE TOOLS				-86,180	-92,960	-12,870							2,480	5,180	4,950
MISC.CAP.										-22,400	-20,540	-5,270			
ELECTRONICS	9,250	-31,850	-120	-154,790	-78,430	-18,330	1,330	4,160	3,220				19,250	13,280	22,330
H.HLD.							28,300	-6,300	1,740				3,250	4,080	3,690
MOTORS	56,870	-30,380	-100	-8,570	-17,640	-13,650	15,610	5,220	2,340				5,490	9,680	6,810
BREW.				2,260	2,500	-1,120	13,000	11,320	5,700	-560	-60	-1,100	820	970	880
ENT.	-1,000	-3,710	-150	-33,890	-33,980	-33,350							10,690	11,410	12,280
FOOD RET.	67,770	-34,900	-220	-17,700	-24,980	-2,050							6,170	13,670	17,950
TEXTILES				-3,700	-8,210	-1,890							2,780	1,860	1,480
CHEMICALS	3,220	40	-190	-69,760	-29,130	-41,710							15,240	21,720	21,100
OIL	-12,810	-13,490	-220				-12,420	-6,710	1,480				17,840	18,860	17,310
SHIPPING	-17,050	-73,440	-260	1,140	5,000	-710	5,400	-14,690	8,180				16,820	22,830	20,620
MISC.OTHERS	-56,110	-8,030	-130	-102,100	-39,130	-32,110	29,380	13,110	12,240				20,160	21,570	19,300
DISCOUNT							11,250	7,880	9,390						
H.P.							44,000	9,270	1,000				2,170	2,160	2,120
INS.(LIFE)							1,530	570	120				140	200	250
INS.(COMP.)										-200	-40	-820			
INS.BROK.							24,500	42,260	2,050				2,270	3,610	4,340
INV.TR.	-64,260	4,090	-100										2,330	5,070	6,550
PROP.	50,400	23,900	-350	-35,350	4,570	-19,230				-540	-1,620	-1,430	16,670	19,190	33,330
WINES & SPIRITS				-9,000	-3,190	-3,220	14,110	12,700	1,060				5,420	5,470	4,760
OFFICE EQUIP.	205,430	162,410	-270	69,820	41,770	-5,900				3,240	1,850	-1,200	5,480	11,770	25,310
	216,890	43,530	-2,240	-524,590	-303,210	-204,650	186,350	87,220	55,240	-20,460	-20,410	-9,820	168,230	202,650	237,320

BIBLIOGRAPHY

1 Ahearn D.S. "Federal Reserve Policy Reappraised 1951-[illegible]" Columbia University 1963

2 Alexander S.S. "Price Movements in Speculative Markets : Trends or Random Walks" Industrial Management Review Vol 2, 1962 also in Cootner (1964)

3 Archer S.H. & D'Ambrosio C.A. "Business Finance : Theory and Management" 2nd ed. The Macmillan Co. 1972.

4 Bain A.D. "Control of the Money Supply" Penguin 1970

5 Ball R. & Brown P. "An Empirical Evaluation of Accounting Income Numbers" Journal of Accounting Research, Aut. 1968

6 Black F. "Capital Market Equilibrium with Restricted Borrowing" Journal of Business July 1972

7 Borch K. "The Economics of Uncertainty" Princeton University Press 1968

8 Brealey R.A. "Some Implications of the Co-Movement of Company Earnings" Applied Economics Vol. 3 1971

9 Brealey R.A. "An Introduction to Risk and Return from Common Stocks" MIT Press 1969

10 Brealey R.A. "Security Prices in a Competitive Market : More about Risk and Return from Common Stocks" MIT Press 1971

11 Burt C. "Appropriate Uses of Factor Analysis and Analysis of Variance" in Cattell (ed.) Handbook of Multivariate Experimental Psychology. Rand McNally 1966.

12 Burton H. & Corner D. "Investment & Unit Trusts in Britain & America" Elek 1968

13 Burton H. & Corner D. "Capital Gains Tax Liabilities and Investment and Unit Trusts" Journal of Business Finance, Aut. 1970 Vol. 2 No. 3.

14 Campanella F.B. "The Measurement of Portfolio Risk Exposure" Heath Lexington 1972.

15 C.F.A. Research Foundation Monograph 2. "Personal Trust Investment Management" Irwin 1968

16 Clarkson G.P.E. "Portfolio Selection : A Simulation of Trust Investment" Prentice Hall 1962

17 Coddington A. "Positive Economics" Canadian Journal of Economics Feb. 1972 V. No. 1

18 Colker S. An Analysis of Security Recommendations by Brokerage Houses Quart. Review of Econ. & Bus. 3. Summer 1963

19	Cooper G. & Cridlan R.	"The Law and Procedure of the Stock Exchange" Butterworth 1971
20	Cootner P.H.	Stock Prices : Random vs Systematic Changes. Ind. Management Review Vol. 3 (1962) also in Cootner.
21	Cootner P.H. (ed.)	"The Random Character of Stock Market Prices" M.I.T. Press 1964.
22	Cootner P.H.	"Stock Market Indices - Fallacies and Illusions" Commercial & Financial Chronicle, Sept. 29, 1966.
23	Copeman R.C.	"Attitudes to Stockmarket Investment Decisions In the City of London" Graduate Centre for Management Studies Discussion Paper, Birmingham Nov. 1970
24	Cowles A.	"Can Stock Market Forecasters Forecast?" Econometrica V 1933
25	Cowles A.	"Stock Market Forecasting" Econometrica Vol. 12, 1944.
26	Cragg J. & Malkiel B.	"The Consensus and Accuracy of Some Predictions of the Growth of Corporate Earnings" Journal of Finance, Vol. 23, 1968.
27	Cyert R.M. & Grunberg E.	"Assumption, Prediction and Explanation in Economics" in Cyert & March
28	Cyert R.M. & March J.G.	"Behavioural Theory of the Firm" Prentice Hall 1963
29	Dietz P.	Discussion, Journal of Financial & Quantitative Analysis, Vol 5 March, 1971
30	Dryden M.	"A Statistical Study of U.K. Share Prices" Scottish Journal of Political Economy, Nov. 1970.
31	Dutter P.H.	"The Quality of Management - the X Factor in Investment Analysis" Financial Analysts Journal 50, March-April 1969.
32	Elton E. & Gruber M.	"Homogeneous Groups and the Testing of Economic Hypotheses" Journal of Financial & Quantitative Analysis Vol. 4, Jan. 1970.
33	Elton E. & Gruber M.	"Improved Forecasting Through the Design of Homogeneous Groups" Journal of Business, Vol. 44, No. 4, October 1971.
34	Evans J.L.	"Diversification and the Reduction of Dispersion : An Empirical Analysis" Doctoral Dissertation, University of Washington, 1968, reported in Sharpe "Portfolio Theory and Capital Markets."

35	Evans J.L.	"The Random Walk Hypothesis, Portfolio Analysis and the Buy & Hold Criterion." Journal of Financial & Quantitative Analysis Sept. 1968.
36	Fama E. F.	"The Behaviour of Stock Market Prices" Journal of Business, June 1965.
37	Fama E.F.	"Efficient Capital Markets : A Review of Theory & Empirical Work" Journal of Finance May 1970.
38	Fama E. & Blume M.	"Filter Rules of Stock Market Trading" Journal of Business, Vol. 39 (1966) Supp.
39	Fama E.F. & Miller M.H.	"Theory of Finance" Holt, Rinehart & Winston 1972.
40	Farrar D.	"The Investment Decision under Uncertainty" Prentice Hall 1962.
41	Feeney G. & Hester D.	"Stock Market Indices: A Principal Components Analysis" in Hester, D. & Tobin, J. "Risk Aversion and Portfolio Choice" J. Wiley, 1967.
42	Fox E.A.	"Comparing Performance of Equity Pension Trusts" Financial Analysts Journal 24, 1968.
43	Friedman M.	"The Methodology of Positive Economics" in Essays in Positive Economics, Univ. of Chicago Press 1953.
44	Friend I., Blume M. & Crockett J.	"Mutual Funds and other Institutional Investors" McGraw Hill 1970
45	Goodman G. 'Adam Smith'	"The Money Game" Random House 1968
46	Granger C. & Morgenstern O.	"Predictability of Stock Market Prices" Heath Lexington Books 1970
47	Green H.A.J.	"Consumer Theory" Penquin 1971
48	Holt C.C. & Shelton J.P.	"Implications of the Capital Gains Tax for Investment Decisions", Journal of Finance 16.Dec. 1961.
49	Jensen M.C.	"Random Walks: Reality or Myth- Comment" Financial Analysts Journal, Vol. 13, Nov.-Dec. 1967
50	Jensen M.C.	"Risk, the Pricing of Capital Assets, and the Evaluation of Investment Portfolios." Journal of Business April 1969
51	Jensen M.C. & Bennington G.A.	"Random Walks and Technical Theories : Some Additional Evidence" Journal of Finance May 1970.

52	Kendall M.G.	"The Analysis of Economic Time Series - Part 1 : Prices" Journal of the Royal Statistical Society, Vol. 96, Part 1, 1953, also in Cootner (1964)
53	King B.	"Market and Industry Factors in Stock Prices Behaviour" Journal of Business Vol. 39 (1966)Supp.
54	Koopmans T.C.	"Three Essays on the State of Economic Science" McGraw Hill 1957
55	Lancaster K.	"An Introduction to Modern Microeconomics" Rand McNally & Co. 1969
56	Latane H. & Tuttle D.	"An Analysis of Common Stock Price Ratios" Southern Economic Journal, Vol. 33 1967
57	Latane H. & Tuttle D.	"Security Analysis & Portfolio Management" Ronald, 1970
58	Latane H.A., Tuttle D.L. & Young W.E.	"How to choose a Market Index" Financial Analysts Journal, Sept/Oct 1971
59	Levy R.A.	"Random Walks: Reality or Myth" Financial Analysts Journal, Nov.-Dec. 1967 Vol.13
60	Levy R.A.	"Measurement of Investment Performance" Journal of Financial & Quantitative Analysis March 1968
61	Levy R.A.	"Most and Least Liquid Stocks" Institutional Investor, Nov. 1969
62	Lintner J.	"The Valuation of Risk Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budgets" Review of Economics and Statistics XLVII Feb 1965.
63	Lintner J.	"Security Prices, Risk and Maximal Gains from Diversification" Journal of Finance, Dec. 1965.
64	Lintner J.	"Finance and Capital Markets" N.B.E.R. 50th Anniversary Colloquium II Columbia Univ. Press 1972
65	Loasby B.	"Hypothesis & Paradigm in the Theory of the Firm" Economic Journal, Dec. 1971
66	Luckett D.	"Bills only: A Critical appraisal" Rev. of Economics & Statistics 1960 XLII
66a	Mandelbrot B.	"Forecasts of Future Prices, Unbiased Markets, and Martingale Models" Journal of Business Vol. 39, Jan. 1966.
67	Manne H.G.	"Insider Trading and the Stock Market" Free Press 1966
68	Markowitz H.	"Portfolio Selection" (1959) 1970 Second printing, Yale.

69	Mason S.	"Diversification & Turnover of Equity Portfolios Among U.K. Institutional Investors" Investment Analyst Dec. 1972.
70	Moor R.L.E.	"The Use of Economics in Investment Analysis" Financial Analysts Journal Nov Dec 1971
71	Moore A.	"Some Characteristics of Changes in Common Stock Prices" (1962) in Cootner (1964).
72	Morley M.F.	"A Guide to the taxation of investment institutions" Institute of Chartered Accountants in England & Wales 1971
73	Pennington R.	"The Investor and the Law" Macgibbon & Kee 1968
74	Planned Savings	Unit Trust Survey. A Supplement to Planned Savings, Wootten Publ. 1970
75	Rayner A. & Little I.	"Higgledy Piggledy Growth Again" Basil Blackwell 1966
76	Reddaway W.B.	"Higgledy Piggledy Growth" Economic Journal, Sept. 1967
77	Rich C.D.	"The Rationale of the Use of the Geometric Average as an Investment Index" Journal Institute of Actuaries 1974
78	Robinson J.	"Capital Gains Tax and Unit Trust Performance" Investment Analyst, October 1969
79	Rose H.	"Investment Policy and Capital Gains Tax" Investment Analyst, June 1968
80	Russell A. & Taylor B.	"Investment Uncertainty and British Equities" Investment Analyst, Nov.-Dec. 1968
81	Scholes M.S.	"The Market for Securities : Substitution versus Price Pressure and the Effects of Information on Share Prices" Journal of Business. April 1972
82	Scott M.	"Relative Share Prices and Yields" Oxford Economic Papers, Vol. 14, 1962, No. 3
83	Sharpe W.F.	"A Simplified Model for Portfolio Analysis" Management Science. Jan. 1963
84	Sharpe W.F.	"Capital Asset Prices : A Theory of Market Equilibrium under Conditions of Risk" Journal of Finance. Sept. 1964
85	Sharpe W.F.	"Mutual Fund Performance" Journal of Business. Jan. 1966
86	Sharpe W.F.	"Portfolio Theory and Capital Markets" McGraw Hill, 1970

87 Silbertson A. "Price Behaviour of Firms" Economic Journal Sept. 1970

88 Simon H.A. "Theories of Decision Making in Economics & Behavioural Science" American Economic Review 49,1959

89 Smith K.V. "Portfolio Management" Holt, Rinehart & Winston, 1971

90 Smith K.V. & Tito D.A. "Risk Return Measures of Ex Post Portfolio Performance" Journal of Financial & Quantitative Analysis,Dec. 1969

91 Smith P. "Economics of Financial Institutions and Markets" Irwin 1971

92 Smith R.G. "Uncertainty Information and Investment Decisions" Journal of Finance, March 1971

93 Stutchbury O. "The Management of Unit Trusts" Skinner 1964

94 Suits D.B. "Use of Dummy Variables in Regression Equations" Journal American Statistical Association Vol 52, 1957

95 Thiel H. "Applied Economic Forecasting" North Holland 1966

96 Tobin J. "Liquidity Preferences as Behaviour Towards Risk" Review Economic Studies, Feb. 1958

97 Treynor J. "How to Rate the Management of Investment Funds" Harvard Business Review, Jan.-Feb. 1965

98 Treynor J. & Black F. "How to Use Security Analysis to Improve Portfolio Selection" Journal of Business Jan 1973

99 Tysseland M. "Further Tests of the Validity of the Industry Approach to Investment Analysis" Journal of Financial and Quantitative Analysis, March 1971

100 The Unitholder Jan., Feb., March, April, June 1969.

101 Unit Trust Year Book 1970 Fundex Ltd.

102 Van Horne J. "Function and Analysis of Capital Market Rates" Prentice Hall, 1970

103 Vasicek O.A. "Capital Asset Pricing Model with No Riskless Borrowing" unpublished paper quoted in Vasicek & McQuown

104 Vasicek O.A. & McQuown J.A. "The Efficient Market Model" Financial Analysts Journal Sept/Oct 1972

105 Williams J. "The Theory of Investment Value" Cambridge University Press 1938

106 Winer B. "Statistical Principles in Experimental Design" McGraw Hill 1962

107 Wippern R. "A Note on the Equivalent Risk Class Assumption"
The Engineering Economist, Spring 1966, Vol. XI.
in Weston, J.F. & Woods, D.H. "Theory of Business Finance: Advanced readings." Wadsworth 1967.

TABLE 9.2

a) All Sectors

	df	MS	F
Between firms	199		
1(sectors)	19	0.10	2.38*
Firms within sectors	180	0.04	
Within Firms	4,400		
2 (market)	22	0.16	2.72*
1.2 (interaction)	418	0.06	1.00
2 by firms within sectors	3,960	0.06	

b) Industrials

	df	MS	F
Between firms	199		
1 (sectors)	19	0.07	1.67*
Firms within sectors	180	0.04	
Within firms	4,400		
2 (market)	22	0.14	2.49*
1.2 (interaction)	418	0.06	0.99
2 by firms within sectors	3,960	0.06	

All but the interaction terms significant at the .05 level of significance (unadjusted degrees of freedom).

* Significant at .05 level.