The Economics of the United Kingdom Pension Funds

Thesis

Presented for the Degree of Doctor of Philosophy at the University of Sheffield
Department of Economics

by

Ivan Keith Cohen, B.A. (Honours), M.A.

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Thesis Supervisor: Professor George Clayton

DEDICATION

This dissertation is dedicated with love to the memory of April Dawn Stocker, a very special friend who was taken from life far too early.

ACKNOWLEDGMENTS

Completion of this dissertation has taken a number of years and occurred in at least two continents.[1] The vagaries of the academic job market have meant that there were long periods of time when it was not possible to make much headway on this research. Similarly, it was not always easy to obtain the requisite materials on the U. K. financial system (eg, data) at a distance of several thousand miles! Indeed, there were times when completion seemed unnecessary, unworthwhile and occasionally irrelevant. During those times, as well as when progress was swift and rewarding, a number of people have made themselves available for reassurance or to give me the swift kick up the rear I needed. I would like to take this opportunity of thanking them here.

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"It's finished!"

(January 1990)

[1] The reader is therefore asked to excuse any TransAtlant'c phrases that may have crept into the language of this dissertation!

SUMMARY

This Thesis examines the nature and rôle of the pension funds in the United Kingdom, in theory and in practice, from within and without, and from a contemporary and historical perspective. The pension funds are considered via a series of broad surveys, wherein each chapter may be regarded as a complete study of its own. This is necessary to gain the insight into the behaviour of the pension funds and their operational environment that enables a model of their actual behaviour to be accurately constructed.

The earlier chapters—Chapters One to Four—examine the institutional context of British pension fund activity, such as their historical development, the rôle of financial intermediation in general, and the socio-legal environment within which they operate.

The middle chapters—Five and Six—provide surveys of the literature on investment portfolio theory and theoretical and empirical studies of British financial intermediation. The latter tend to divide into two distinct approaches, whose relative strengths we consider.

Finally, the remaining chapters—Seven through Nine—offer an empirical view of the U. K. pension funds' behaviour over the period 1963 - 1985. Chapter Seven considers the flow of funds through the pension funds, ie sources and uses. Chapter Eight analyses the rôle of the pension funds in the U. K. capital markets. Chapter Nine suggests a simple econometric model of the investment behaviour of the United Kingdom pension funds based upon the salient features from earlier chapters. In the final chapter we consider what we have learned from the research of the other chapters, consider the implications, and make suggestions for further research in the area.

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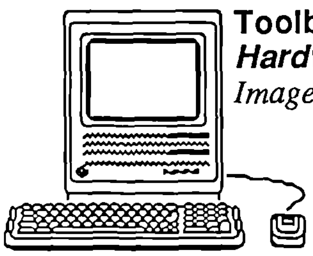

Toolbox:
Hardware: *Apple IIc, Mac™ SE, Mac™ SE30, ImageWriter, ImageWriter II, LaserWriter Plus*
Software: *AppleWorks, Apple File Exchange, Microsoft Works, Microsoft Excel, WriteNow, Microsoft Word, SuperPaint, CricketDraw, Expressionist™, Suitcase™ II, ATM™*

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Chapter One: Introduction

1.0 Introduction

It is fascinating to observe that each and every period of history has its own characteristics. Indeed, if one pauses to consider the matter more closely we find that these characteristics are determined by the changes that occur during a given era. These changes may be in political and economic circumstances, or in social attitudes, or even in technology, etc. One of the least noticed yet most obvious changes which would appear to characterise the twentieth century (especially the latter half) is the change in the life expectancy of an individual. For although we are informed in the Bible that man shall live for "three score and ten" years, it is only in the current century that these words have begun to ring true. Current data on life expectancy in the United Kingdom is presented in Table 1-1 below. As can be seen, the average life span of a man is currently expected to be some seventy years whilst that of a woman is about six years greater. That we are expected to live longer than our forebears is something that we take very much for granted, but to what causes may we ascribe this particular phenomenon? By and large, we may classify all of the contributory factors under the umbrella heading of technological improvement: vastly superior foodstuffs in both quantity and quality; ever-improving medical knowledge and facilities; greater hygiene, etc. All of these and other factors have combined to assist the individual to live a longer life. However, in this study we are not so much concerned with the causes of longevity, nor do we consider the question of its desirability; our main concern deals with one of its major consequences, the provision of pensions.

The impact of the increasing longevity of the individual is very much bound up with trends in other demographic factors. For example, in the OECD countries (in particular) over the post-War period, while life expectancy has been increasing the birth rate has been experiencing a long-term downward trend. The result of this has simply been an increase in the ratio of the elderly to the remainder of the population. Because the OECD countries typically provide a retirement income to the older members of their population, a higher proportion of older people places a greater strain on current national resources than would otherwise be the case. A recent article in *The Economist* illustrated this point very clearly.[1] Table 1-2 shows that, barring any unforeseen catastrophes, the percentage of the population accounted for by pensioners (those elderly who have retired from gainful employment) is expected to

Table 1-1: Life Expectation in the U.K.

	1931		1981	
	Male	Female	Male	Female
From birth	58.4	62.4	69.8	76.2
From age:				
1 year	62.1	65.1	65.1	76.1
10 years	55.6	58.6	58.6	67.2
15 years	51.1	54	55.9	62.3
20 years	46.7	49.6	51.2	57.4
30 years	38.1	41	41.6	47.6
40 years	29.5	32.4	32	38
45 years	25.5	28.2	27.5	33
50 years	21.6	24.1	23.1	29
60 years	14.4	16.4	15.6	20.6
65 years	11.3	13	12.4	16.7
70 years	8.6	10	9.5	13.2
75 years	6.4	7.4	7.4	10
80 years	4.8	5.4	5.5	7.3

Source: Government Actuary's Department
Social Trends (January 1986)

Table 1-2: Number of pensioners as % of the labour force

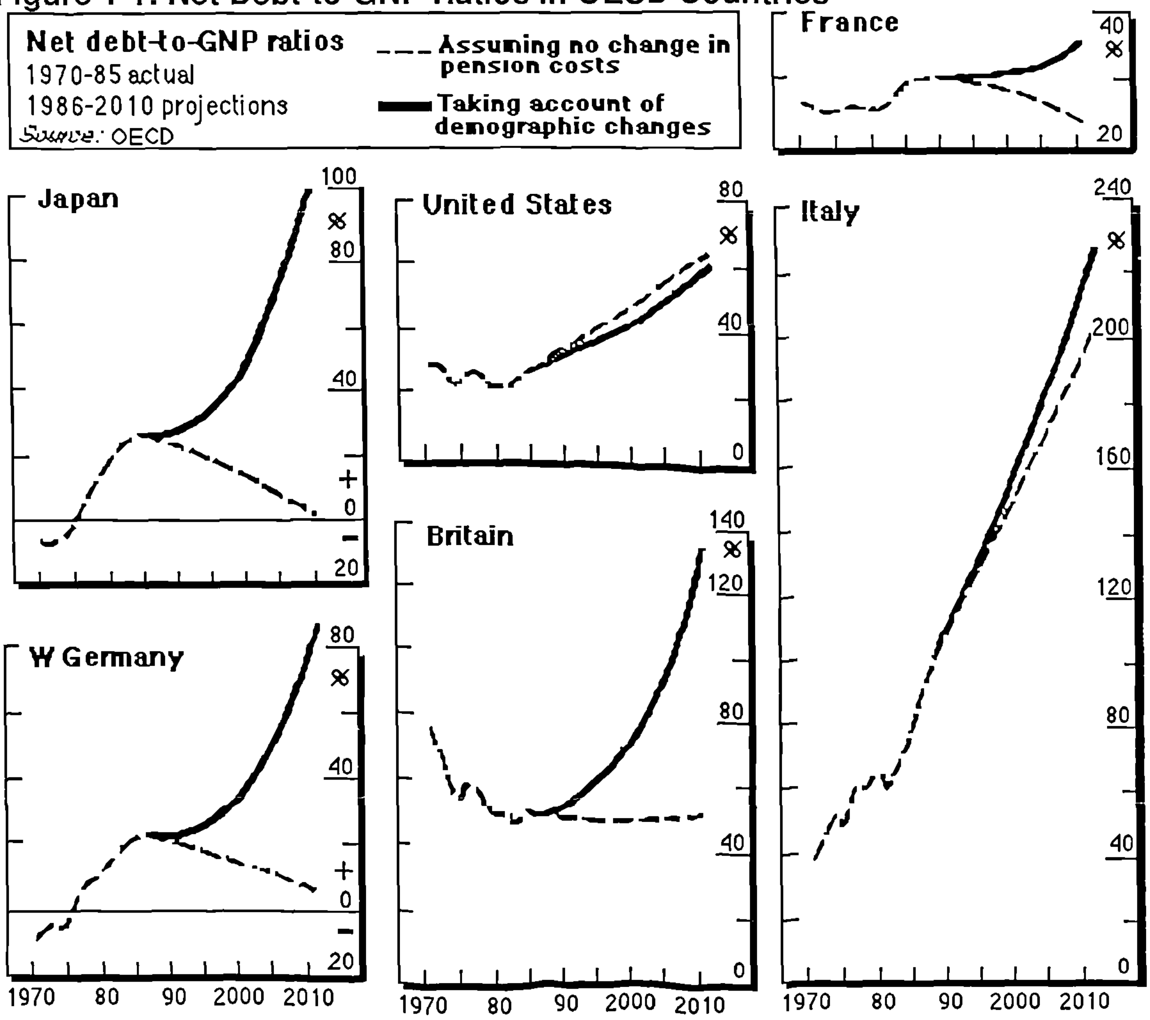
	1985	2010 *	2030 *
U. S.	24	25.6	41.5
Japan	18.3	40.1	42.7
W Germany	29	40.8	63.6
France	31	39.5	54.6
Britain	30.3	28.1	37.6
Italy	27.1	33.6	46.5
Canada	16	22.6	39.4

* OECD Projections

Source: *The Economist,* June 14 1986, page 67.

increase over the next half-century. (This trend is a continuation of that of the past fifty years or so.) The graphs in Figure 1-1 show what these increasingly elderly populations mean for the debt-to-GNP ratios of the countries involved. The dotted lines show the OECD's projections for debt-to-GNP ratios over the next 25 years if governments maintain the non-interest part of their budgets as a constant proportion of GNP. The solid line shows what is likely to happen to public-debt ratios if the cost of state pensions automatically moves in line with demographic changes, while all other expenditures and taxes remain constant as a proportion of GNP. In virtually all cases the cost of providing pensions can be seen to increase the ratio of debt to GNP, often quite dramatically. The only exception here seems to be the United States where "...immigration and higher birth rates imply favourable demographic movements." This example gives us a very clear picture of one of the major macroeconomic impacts of pensions provision as undertaken in the OECD countries. Thus, the importance of the rôle of pensions in determining other aspects of economic and social policy cannot be overstated, and studies that examine any aspect of the provision of pensions are possessed of dual importance. Firstly, they are important in their own right, for the light they shed on the issues they examine directly. Secondly, they are important for the implications they have for other aspects of economic and social policy.

Figure 1-1: Net Debt-to-GNP Ratios in OECD Countries



Source: *The Economist*, (June 14, 1986) page 67.

In this Thesis our major aim is to model the investment behaviour of the pension funds in the United Kingdom. These pension funds, together with the State-administered scheme, are the means by which British citizens are able to provide themselves with an income during retirement; the two are in many respects complementary. Therefore, we spend a considerable portion of this Thesis on examining the history of pensions provision in the United Kingdom, as well as the institutions relating to both pensions provision and investment behaviour. Nonetheless, prior to all this there are a number of related questions that need to be addressed, to which we now turn our attentions.

1.1 Why Study the Pension Funds?

To a large extent the choice of studying the pension funds reveals the author's preference. It reveals a combination of both interest in the pension funds and a belief that there is still something left to say about them. Certainly, there are many economists who are interested in consumer behaviour but do not pursue its study because (perhaps wrongly) they believe there is not a great deal remaining to be said. The study of the pension funds should be seen as an integral part of the study of the workings of the financial system. Traditional (or classical) economic theory typically abstracts away from the problems of a monetary economy. Little attention is paid to the notions of money or finance in the average undergraduate course in (eg) microeconomic theory. And yet we live in a monetary economy; indeed, one with a highly advanced financial system. Money is itself an institution. It provides the vehicle by which most of us conduct our transactions. As we shall see in Chapter Two, the financial system has been built up around the core which is money; money is the centre of the financial system. If we are truly to understand how our economy works we must consider the workings of the financial system as an integral part of the whole. In addition, Goldsmith (1969) has shown that there is a distinct correlation between the level of financial development in an economy and its level of economic development. There has been much debate on the direction of causation in this relationship, and it is possible that the study of financial institutions such as pension funds may shed some light on the issue.

Further reasons abound for encouraging the study of pension funds. It is often suggested in both the press and the literature that the financial institutions affect the transmission of monetary policy. In fact, it is usually argued that they impede monetary policy, thereby reducing its effectiveness. If this is the case then they are acting contrary to the objectives of the elected representatives of the population, ie, they are not acting in the public interest. This point is hotly denied by those tagged with the epithet of 'strict monetarists'. The fact that the pension funds are major purchasers of financial assets, including those issued by the government, gives *a priori* credence to the former viewpoint. Indeed, because the pension funds purchase such huge quantities of government securities it could be argued that they may also impede the effectiveness of fiscal policy by affecting the government's ability to finance its activities. The study of the pension funds may help to throw some light onto these issues too.

Other issues follow from this. Later in this chapter, as well as in later chapters, we shall see that since 1945 (in particular) the financial institutions, such as the pension funds, have increased their market share in terms of their purchase of financial claims. If individuals are accounting for a decreasing percentage of the quantity of financial claims issued in the United Kingdom, then the implication is that the financial markets are becoming less competitive and increasingly oligopsonistic, if not wholly monopsonistic. Traditional microeconomic theory teaches us that a lower degree of competition results in an allocation which is less efficient. This may have particularly undesirable effects at the macroeconomic level. For example, suppose that the pension funds decided to unload a particular security. Because they hold such large quantities this is likely to cause a dramatic fall in the price of that security which, in turn, may lead to a wave of pessimism and a general lowering of security prices, engendering pessimism about the prospects for the economy as a whole. The 80 point drop in the Dow Jones Index during the week following July 4, 1986 was said to have occurred when the financial institutions (the pension funds, in particular) started to take their profits following the slow-down (or end) of the bull market of the previous twelve months. There is no doubt that this lowering of competitiveness has the effect of increasing the short-run volatility of the prices of financial claims.

The above argument can be taken and developed even further. For example, according to Wolanski

> There is a relatively small number of institutions which control the pension scheme assets. For example, the largest 20 life insurance companies manage some two-thirds of the total life office long-term funds. Similarly, there are probably less than 25 banks, brokers and others which manage the bulk of externally-managed pension scheme money and around 20 in-house managers looking after the investments of the larger pension schemes. In all, this suggests that around 65 organisations control the major part of 'pension power' and that they are

> accountable to part-time trustees whom they might meet on a quarterly, or less frequent, basis. (1979, pp.3-7)

Thus, although the pension funds' possession of such large quantities of financial claims may not necessarily be a cause for concern, the fact that the control of them is in comparatively few hands indicates a high degree of market concentration and, therefore, power. This is particularly the case with ordinary shares, where it is possible for the pension funds to wield a great deal of influence on the commercial and industrial policy of the country by using their voting rights at shareholders' meetings. This point is taken up by Cuthbert and Dobbins (1980), and with some vehemence and detail in the studies by Minns (1980) and Green (1982). Drucker (1976) considers the same issue (with reference to the United States) but comes to a rather different conclusion, which he summarises by coining the phrase "pension fund socialism"; via the pension funds the people own (most of) the means of production.

The influence of the pension funds on the industrial performance of the economy has been noted on grounds in addition to the concentration of market power they possess. For example, although it is often recognised that there are imperfections in the capital markets such that it is more difficult for small businesses to raise funds, it is also argued that this difficulty is furthered by the investment policies of the large financial institutions, and particularly the pension funds. Certainly there is an abundance of evidence, much of it anecdotal, which implies that the pension funds are loth to invest in smaller companies. The evidence from the pension funds' net acquisition data indicates in no uncertain terms that they are not significant providers of venture capital. Indeed, it was this point that was a major conclusion of the Wilson Committee, who also acknowledged that there had been some improvements in this area. Certainly the evidence of more recent years is that this criticism of the pension funds has been taken to heart, and they now exercise some degree of social responsibility in their investment behaviour, although perhaps not enough to entirely please (eg) the Trades Union movement.

It could be argued that all or many of these points could be considered by studying any of the financial institutions, and not just the pension funds. Nonetheless, there are several points against this line of thought. Firstly, it should be noted that in a monetary economy the most important financial intermediaries are probably the banks because of their rôle in facilitating the means of payment. But the study of banks does not lead to conclusions that apply equally to all financial intermediaries. There is a great deal of difference between the depository intermediaries (such as the banks) and the non-bank financial intermediaries. For example, the latter play almost no rôle in the means of payment within the economy. Additionally, they have typically been subject to less stringent governmental regulation, affording them a competitive advantage over the depository intermediaries. Having said that, then what criterion makes the pension funds more worthy of study than any other of the non-bank financial intermediaries? Perhaps the major reason that we shall see is that the pension funds play a more dominant rôle in the financial system than their sister non-bank financial intermediaries; they often purchase more assets, or are more active traders. A second reason worthy of consideration is that the purchase of the liabilities issued by a pension fund is much less the subject of choice than the purchase of the liabilities issued by the other non-bank financial intermediaries. How much choice did you have in deciding how much to contribute to your pension scheme? How much choice did you exercise in purchasing a life insurance policy, or putting your funds in a unit trust or investment trust? The impact of the 'compulsory' nature of saving through pension schemes on the aggregate level of saving is an important issue that has still not been entirely resolved. It has been argued by (eg) Threadgold (1978) that life assurance and pension fund saving is not neutral and, therefore, acts to increase the aggregate level of personal saving. This argument is based on the higher saving ratio experienced during the latter part of the 1970s compared to the early 1970s and the 1960s. Both the theoretical issue of the neutrality of pensions—ie, the substitutability of pension saving for other forms of saving— and some U. K. empirical evidence is considered in Section 1-3.

A final point worthy of note here concerns the issue of the ownership of pension fund assets. This was first brought to public attention some years ago by Harbrecht (1959), who noted that

> ...pensions are no longer gratuities, although they are not yet considered the property of the employees. The vital question at the moment is, therefore: To whom do they belong? They cannot be said in any proper sense to be "owned" by either the employer or the employee. In fact, no one actually "owns" them, although at the present time many of the prerogatives of ownership are being exercised by pension fund managers and financial institutions. (1959, p.271)

It is interesting to note that today, almost three decades later, the issue is still being debated, with perhaps the best study in this area being that by Bulow and Scholes (1984) in the voluminous work on U. S. pensions edited by Zvi Bodie and John Shoven. At the microeconomic level the issue of ownership presents problems for the balance sheets of employers who set up and pay contributions to pension schemes. This has been considered in some detail by David Fanning (1982a, 1982b), who concludes that employers need to take a more active role in the management of pension funds in their own best interests.

1.2 What is a Pension?

A glance at an English language dictionary reveals the etymological roots of the word "pension" as being French from the Latin *pensionem*, meaning "payment", from *pendere* meaning "to pay". The word "pension" itself is usually defined along the lines of "a periodical allowance for past services paid by the Government or an employer". A more lay definition of the word might be "retirement income", or "income paid to persons considered too old to work". Although this concept of a pension would seem to be fairly unambiguous, it is a useful procedure to attempt to be a little more rigorous, particularly in a work of this nature. Following Blinder (1983) we may care to think of a pension (or a pension plan) as a bank account with several peculiar characteristics:

(i) Workers usually cannot withdraw money from their accounts until they have reached a certain age ('retirement age').

(ii) Workers usually cannot withdraw money from their accounts unless they leave the firm (ie, they 'retire').

(iii) The amount of money that a worker may withdraw from their account may depend on several factors in addition to how much has been deposited. For example, it may also depend upon the worker's life-cycle time patterns of both wages and hours of work.[2]

(iv) Upon retirement the worker is not allowed to close her account by withdrawing the entire balance. Only a small fraction (sometimes zero) can be taken as a lump sum upon retirement. Most withdrawals take the form of annuity payments. Thus, the account may be considered as tied to the purchase of insurance against longevity.

(v) If a worker leaves his firm too soon, he may lose the entire balance in his account. (If this is the case the pension has not yet become 'vested'). This may even be the case where the worker is changing employer, in which the pension is said to be not 'portable'.

(vi) The individual worker typically has no input into the decision as to how much is deposited into their account.

As we shall see later on, although these six characteristics are not attributable to each and every pension paid in the United Kingdom, they are quite typical, and have some fairly obvious immediate implications. Firstly, characteristics (i), (ii) and (iv) suggest that this peculiar type of bank account (call it a 'pension fund') is uniquely suited to saving for retirement purposes: the wealth accrued cannot normally be used for bequests (except for the occasional transfer to a spouse); because of the limited access, it does not provide the worker with precautionary balances, neither will it confer 'King Midas benefits',[3] ie, the utility normally associated with the accumulation of wealth. Therefore, it is unlikely that private pension wealth can be regarded as a perfect substitute for other (fungible) wealth.[4] A second point relates to characteristic (v); this implies that pensions impose a cost of changing jobs that would not otherwise exist. Pensions may be seen, therefore, as contributing to labour immobility, something which is probably not accidental.[5] A final point might be to suggest that characteristics (ii) and (iii) could lead to the distortion of the life-cycle pattern of labour supply.

It is readily apparent from the foregoing that the six characteristics apply to the private provision of pensions. Indeed, comparison of these points with the details on the private provision of pensions in Chapter Two will confirm this conclusion. Additionally, it should be noted that these characteristics are also very largely applicable to the State-administered scheme, as comparison with the details of Chapter Four will reveal. It would seem to be the case, therefore, that there is a great deal of similarity between the private provision of pensions and that by the State.

1.3 Why Pensions?

The obvious, 'though rather facile answer to this question is: to provide individuals with an income during their retirement years. However, it should also be noted that in the frictionless world of neoclassical economic theory, where there are a complete set of efficient markets, pensions would simply be irrelevant. That is to say, workers would be indifferent between receiving all of their earnings now or having some fraction of their earnings deposited in a pension fund; for every Pound accumulated in the fund the worker would simply reduce his private wealth holdings by the same amount. Thus, it can be seen that in such a world pensions would be (in a sense) neutral. The proof of this 'neutrality of pensions' rests on five basic assumptions:

(i) There is no uncertainty.

(ii) There is no government intervention in the economy. Thus, there are no taxes, no government-imposed pension systems, and no laws regulating the provision of (private) pensions.

(iii) Capital markets are perfect.

(iv) Every worker is paid an amount equal to the value of their marginal product. Some of this is received now, in the form of explicit wages (w), while some of it is paid as contributions to a pension fund (p). Thus, $\mathbf{w} + \mathbf{p}$ = marginal product.[6]

(v) There is no compulsory retirement, neither is it necessary to retire to receive the pensionable benefits.

From the viewpoint of the firm, £1 in **w** and £1 in **p** are equivalent, the only difference being that the former is paid to the worker while the latter is paid into an account with the worker's name on it. Suppose that the worker will retire at age **R**, and is currently **t** years of age. Thus, each £1 now paid into the fund on his behalf will be worth $\mathbf{(1 + r)^{R-t}}$ at retirement, where **r** is the rate of interest. From the worker's viewpoint, with perfect capital markets and no uncertainty this will be compared to £1 of current wages by calculating its present value, which is precisely £1, of course.

To see that in this neoclassical world pensions do not affect savings we compare two workers, identical in all respects with the exception that Ms. A receives $\mathbf{W_t}$ in wages and has no pension while Ms. B receives $\mathbf{w_t}$ in wages and has pension contributions of $\mathbf{p_t}$. It follows from assumption (iv) that $\mathbf{W_t = w_t + p_t}$ in each year. So, while Ms. B is 'forced' to save a fraction of her earnings, $\mathbf{p_t}$, each year, Ms. A can save as little or as much as she pleases. Ms. B would be in the same position as Ms. A if she voluntarily withdrew an amount $\mathbf{p_t}$ of her personal savings each year, or borrowed it in the perfect capital markets at an interest rate of **r**, paying it back at age R when she receives $\mathbf{p_t(1 + R)^{R-t}}$ by way of pension, which is exactly how much will be needed to repay the loan. Thus, given the assumption of free capital markets this cannot affect Ms. B's behaviour, because in this world the desired pattern of consumption depends upon the present value of lifetime income. Because each of the two workers are receiving the same present value of lifetime income, the imposed pension scheme will not affect the desired pattern of consumption. Put simply in other words, non-pension saving will exactly offset pension saving on a pound-for-pound basis.

It can also be seen that in this neoclassical world pensions will not affect the work/leisure decision nor the retirement decision. It is well known that utility maximisation requires that the marginal rate of substitution between income and leisure be equated to the wage rate (which, traditionally is equivalent to the marginal product of labour). As we have seen, workers only consider the sum $w_t + p_t$ in their decision-making; they are not concerned with its division. Hence, their lifetime labour supply pattern, including their retirement decision, cannot be affected by the provision of pensions.

Obviously, the frictionless world of neoclassical theory is somewhat removed from reality. If we are to answer the question "Why Pensions?" we need to extend the theory to make it closer to the world we ourselves must inhabit. If our theory is to serve any useful purpose it should be able to answer the question under all circumstances; thus, it should not only be able to explain why private pensions exist currently, but also why they were very few and far between before the Second World War.[7]

1.3.1 Why Pensions Don't Exist

Under the assumptions outlined above we were able to show that both workers and firms were indifferent among all combinations of w_t and p_t, providing $w_t + p_t$ = constant. Graphically, this would give rise to indifference curves such as the straight line AB in Figure 1-2 (a). This will not be the case if the assumptions of the neoclassical model are violated. For example, consider the case of imperfect capital markets. One of the major imperfections in capital markets is when the interest rate earned by lending is less than that paid on borrowing. Another imperfection is the denial of credit to those below some lower (income) limit. We shall concern ourselves with the case of non-unique interest rates.

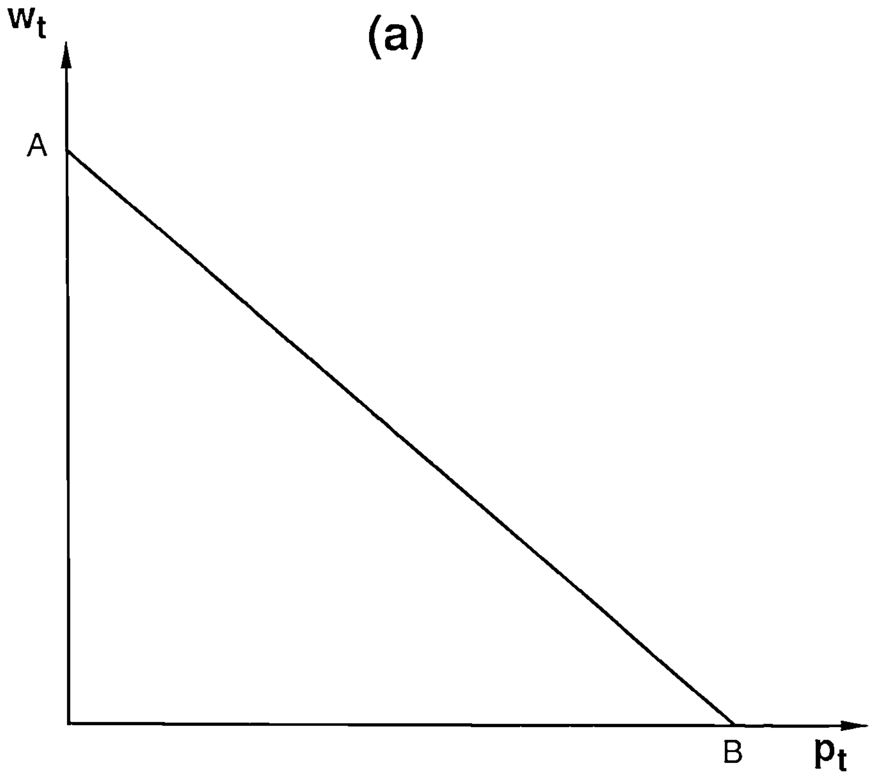
Recall Ms. B from our earlier example. Suppose she now wishes to borrow against the p_t deposited into her pension fund. She must now pay an interest rate r' which is higher than the rate at which the pension fund is accumulating (r). Thus, she will owe $p_t(1 + r')^{R-t}$ when the loan comes due, but will only receive $p_t(1 + r)^{R-t}$ from the pension fund upon retirement. Thus, Ms. B cannot duplicate the consumption pattern of a worker who has no pension, such as Ms. A. This is bound to detract from the desirability of Ms. B having a pension. Thus, we conclude that capital market imperfections can destroy the neutrality of pensions. But, we should also note that this is not necessarily the case.

It must be recognised that capital market constraints may not always be binding. Consider the case where the 'forced' pension savings are less than the amount which the worker would have saved anyway. Here the pension is irrelevant. The curve ACD in Figure 1-2 (b) shows the indifference curve for a worker subject to the borrowing constraints, such as Ms. B above. However, to the left of C the constraints are not binding. The conclusion here is that as the pension becomes larger the burden it places on consumption becomes larger, and so the less desirable it becomes. Thus, small pensions may be neutral, larger ones will not. For this reason, workers (in the course of negotiations) will shun pensions that push them beyond C.

Against this, it should be recognised that capital market imperfections also may increase the desirability of pensions. For example, (as we shall see in Chapter Two) pension funds can achieve lower transactions costs and more diversified portfolios than the individual. In fact, these capital market imperfections are one of the major *raisons d'étre* of pension funds and other financial intermediaries. So, when capital markets are imperfect, pensions may cease to be a perfect substitute for private financial assets, but this need not always be the case.

In the frictionless neoclassical world there is no need for pensions to be vested, funded or even portable because of the assumption of certainty. If we introduce uncertainty these factors come into play. Ignoring capital market imperfections and assuming risk neutrality, how does uncertainty affect pensions? First, pension assets assume three types of risk: the risk of death before receiving benefits, the risk of bankruptcy before benefits are vested and funded, and the risk of leaving the firm (quitting, or being fired) before benefits are vested. Therefore, from the worker's viewpoint, the expected value of a £1 contribution will be some number $\lambda < 1$. If firms have the same expectations as workers then λ will also represent the firm's expected cost of a £1 pension contribution, in which case uncertainty does not interfere with the neutrality proposition. This situation is shown graphically in Figure 1-3 (a), where AE rather than AB represents both the worker's indifference curve and the firm's isocost curve. Thus, to the worker pensions are less valuable than straight wages, while the firm finds pensions less costly than wages.

Figure 1-2: Why Pensions Don't Exist



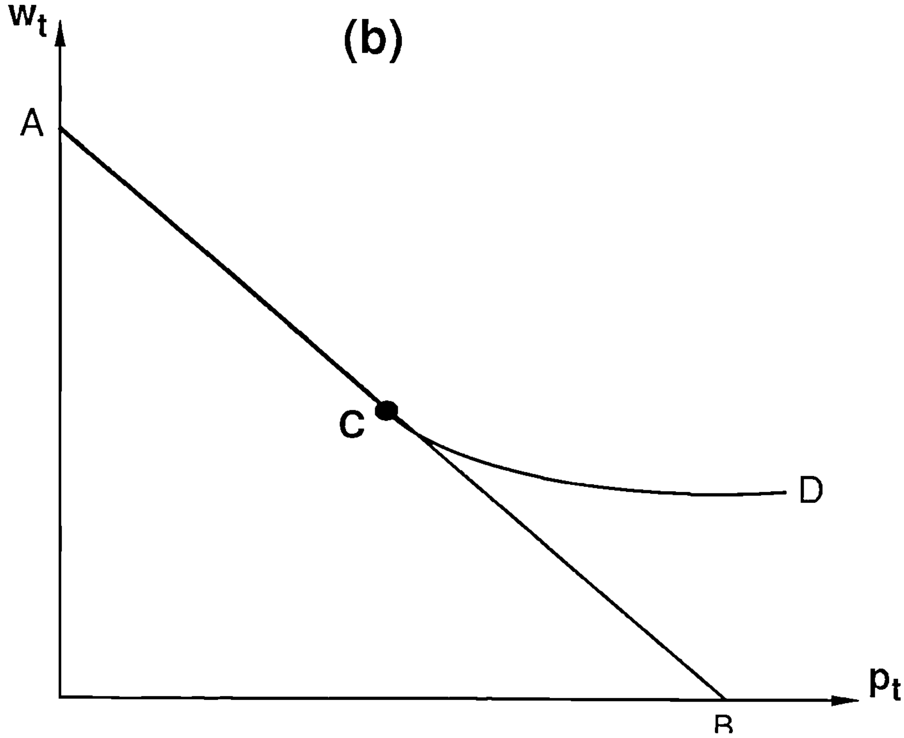
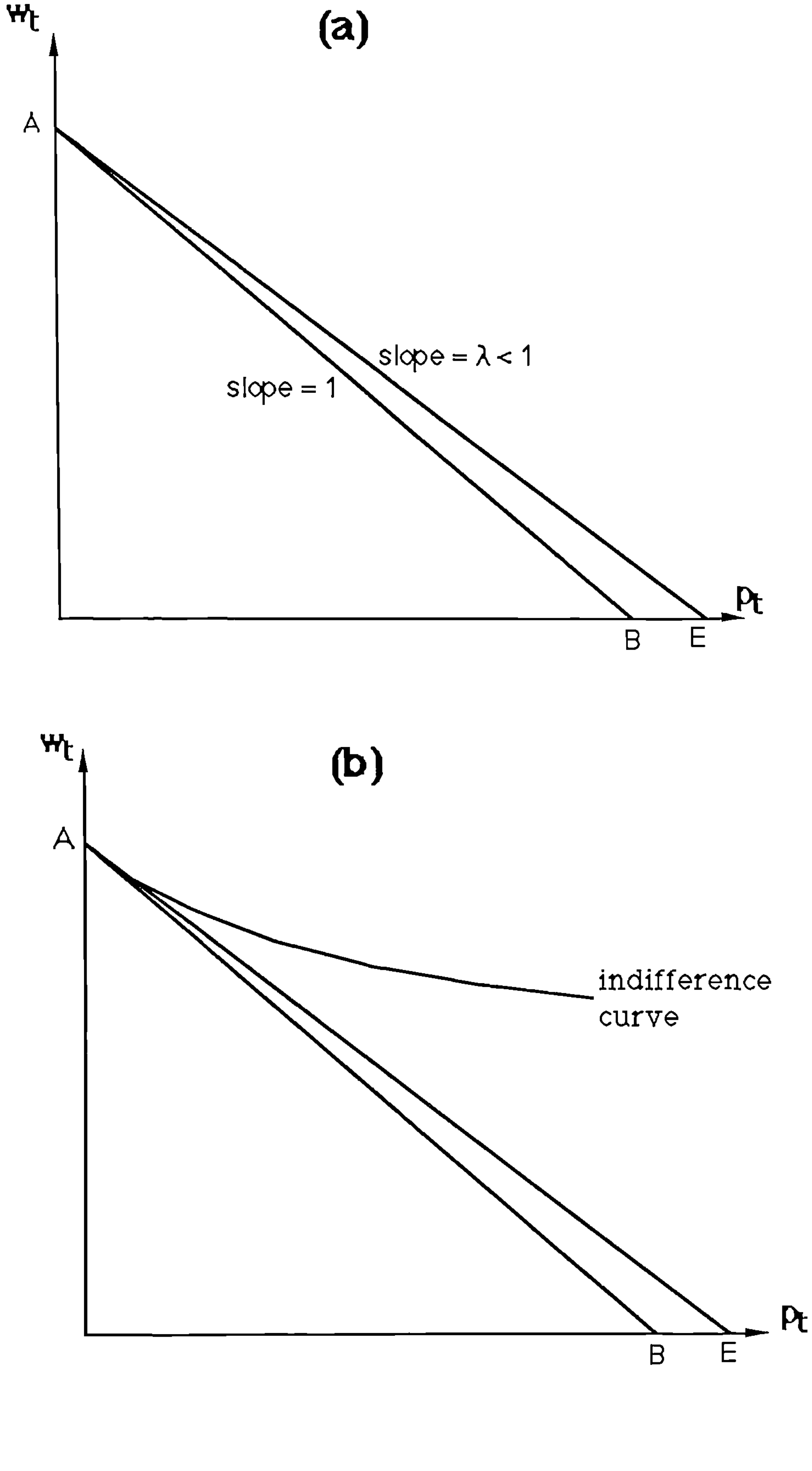


Figure 1-3: Why Pensions Exist



Suppose we now assume that workers are risk averse while firms are risk neutral.[8] Under this asymmetry firms still view λ as the cost of a £1 pension contribution, but now workers view its value as $\lambda_W = \theta\lambda$, where $\theta < 1$ represents a risk discount factor that increases with the size of the pension. Graphically, the worker's indifference curves will be convex as in Figure 1-3 (b). Thus, the contract curve will correspond to the vertical axis, and the optimal pension will be zero.[9] Blinder takes this point a stage further by relating it to his observations on the United States economy:

> One of the outstanding facts of macroeconomic history is that the business cycle has been far tamer in the postwar period than in the prewar period. The risk of bankruptcy must therefore have been lower in the postwar period. It would not surprise me if perceived bankruptcy risk fell steadily over the period, say, from 1950 to 1974. If so, then θ was probably rising. If these surmises are correct, then the principle reason for not having a pension plan was growing weaker over time. This may be one factor contributing to the postwar growth of pensions.
>
> (1983, p.13)

These stylised facts would seem to apply equally to the British economy over the same time period. Indeed, it might also account (at least in part) for the fact that many pension funds found themselves greatly underfunded during the recessionary periods following both oil crises, when the risk of bankruptcy was increased.

1.3.2 Why Pensions Do Exist

From the foregoing we were able to isolate some reasons why pensions should not exist, and it would seem that these have been in some decline over the course of the twentieth century, and particularly since 1945. We now turn our attention to look for some more positive reasons why workers and firms should desire the existence of pensions. One of the reasons cited for the growth of pensions in Chapter Three on the history of pensions' provision concerns the structure of taxation; how does this stand up to analysis?

Obviously, by placing a fraction of total compensation, p_t, into a pension fund, the worker can at least defer the payment of taxes on income. For workers who have quite some time prior to retirement this amounts to a considerable saving because it will accumulate at a tax-free rate of interest, r, while savings in other (non-pensionable) financial assets only accumulate at an after-tax rate of interest of $r(1 - \tau)$, where τ represents the rate of income tax. Thus, it can be seen that £1 of earnings that is taxed then placed in (eg) a bank account will grow to $(1 - \tau)[1 + r(1 - \tau)]^{R-t}$ at retirement. Compare this with £1 placed in a pension fund and taxed when it is withdrawn (at a rate τ'), giving a sum of $(1 - \tau')[1 + r]^{R-t}$, which is obviously preferable. A second point is that when the tax is finally paid at retirement no other taxes are due (eg, payroll taxes such as National Income contributions, etc), and most workers will be in lower tax brackets than they were during their best earning years. Thus, for most workers $\tau' < \tau$, and consequently not only is the tax deferred but also it is reduced. Blinder shows that these savings can be quite substantial by considering various values for r, τ, and $R-t$ under the assumption that $\tau' = \tau - 0.10$. We reproduce his findings here as Table 1-3.

Table 1-3: The Accumulated Value of £1 Saved in a Pension Fund Relative to that of £1 Saved Outside a Pension Fund*

Tax Rate:	r = 4%		r = 8%	
Years to retirement	t = .20	t = .40	t = .20	t = .40
10	1.22	1.36	1.31	1.58
20	1.32	1.59	1.52	2.12
30	1.42	1.86	1.76	2.87
40	1.53	2.17	2.05	3.89

* Computed as $\left[\frac{1 - \tau + 0.1}{1 - \tau}\right]\left[\frac{1 + r}{1 + r(1 - \tau)}\right]^{R-t}$

Taking the findings of the foregoing discussion into account, we find that the worker's marginal valuation of a £1 pension contribution increases to $\lambda_w = k\theta\lambda$, where sample values for the tax factor, k, are shown in Table 1-3. Now, since it is entirely possible to find $k > 1$ then it will also be the case that $\lambda_w > 1$ for workers who are relatively young or in high tax brackets. Indeed, it is very likely that $\lambda_w > 1$. Thus, demand for pensions will occur whenever $k\theta > 1$, which will be the case when workers are subject to relatively high taxation and are not particularly risk averse.[10] Graphical representation of the optimal pension is presented in Figure 1-4 (a). Previously, the worker's indifference curves were as AD, but with the introduction of the 'tax distortion' they become like AF. This is extended in Figure 1-4 (b) to present the resulting contract curve, which no longer lies along the vertical axis.

Again, applying some stylised facts from history to the preceding analysis we are able to arrive at some interesting explanations of the growth of pensions provision in the post-War period. For example, Blinder notes that

> Except for very high income workers, the tax distortions favoring pensions over straight wages were negligible prior to World war II simply because the income tax was negligible. ... In addition, typical marginal income and payroll tax rates on

earnings have increased over the postwar period, thus exacerbating the tax advantage. (1983, pp.15-16)

Blinder also observes that during the post-1945 period

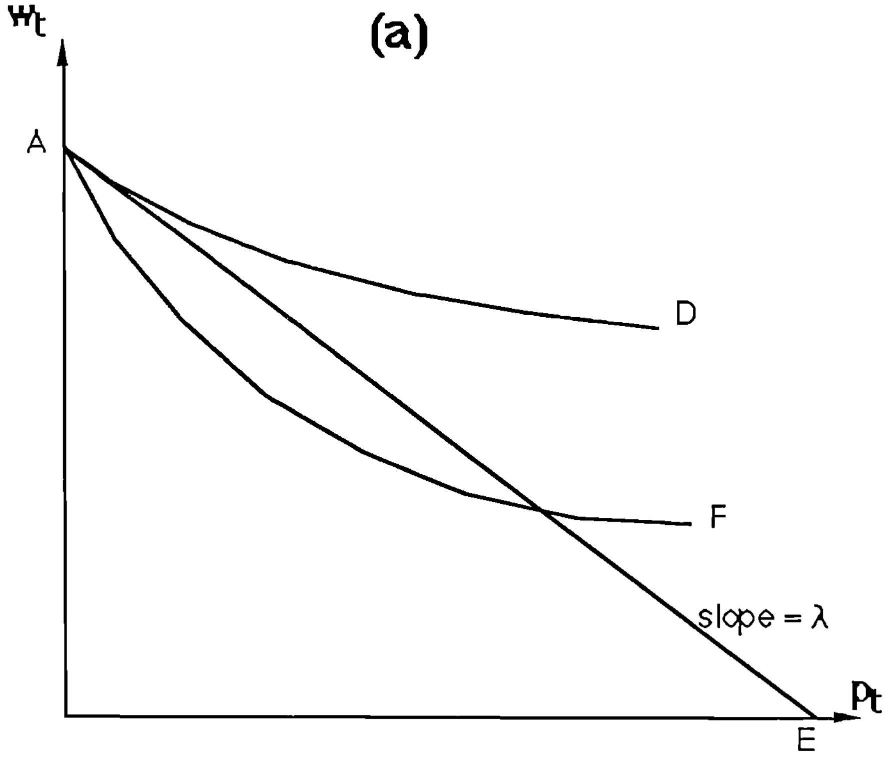
> ...nominal interest rates have increased phenomenally. You can see in Table 1 that the tax advantage of pensions is greater at higher nominal interest rates.
> (1983, page 16. Table 1 refers to Table 1-3 below)

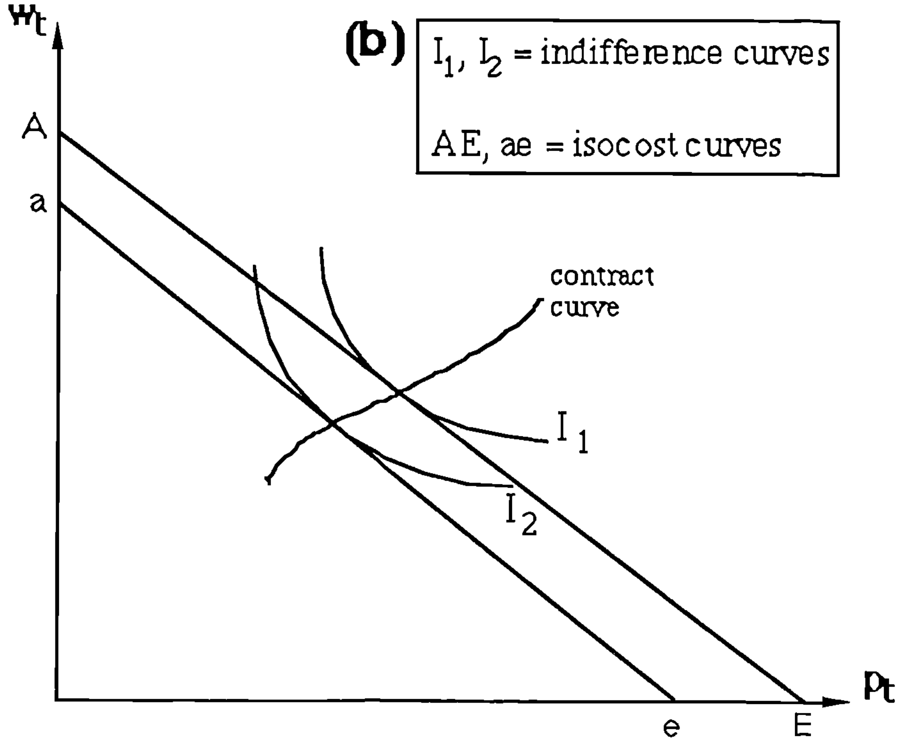
The reader will note that these economic circumstances seem to apply equally to the British economy as to the United States economy. More detailed confirmation can be found, once again, through the material covered in Chapter Three.

In the foregoing we have been able to illustrate some of the reasons why there has been a phenomenal growth in the provision of pensions in the post-1945 period, which was not exhibited in earlier epochs of history. Blinder (1983) takes this material much further by applying it to look at the various implications of pensions provision. Among the issues he considers are the impact of pensions on labour mobility, human capital development, savings decisions, retirement decisions, etc, as well as the private-versus-public provision of pensions debate. However, these issues do not fall within the focus of this particular study, so let us now consider the impact of pension funds on saving in the United Kingdom.

The importance of financial intermediaries in channelling savings into productive investments is considered in detail in Chapter Two. However, because the pension funds deal with funds of such a great magnitude, their ability to affect the macroeconomic performance of the domestic economy via their ability to affect domestic capital formation has become both an economic and a political issue. In recent years the economies of several developed nations, particularly the United States and the United Kingdom, have experienced quite dramatic reductions in their savings rates. While the savings rate of the economy is usually fare for specialists and the financial press, the declining savings rate has become a cause for concern of the "popular press". The neo-classical view takes the position that savings precedes investment; in other words, for an economy to experience growth via capital formation there must first be resources which are not being consumed, ie savings. One argument that follows from this is that if the pension funds employ their funds abroad, it reduces the amount of capital formation that can occur in the United Kingdom. This is not to suggest that if an economy has a high savings rate it will automatically experience high levels of investment (capital formation); but under this view it is the rate of interest that provides the equilibrating

Figure 1-4: Why Pensions Exist





mechanism for savings and investment. The alternative approach—often identified with Keynes or the post-Keynesians—takes the position that investment precedes savings. Under this view an increase in the level of investment will bring about increased Gross National Product which, in turn, will call forth the increased savings. Here it is GNP which is the equilibrating mechanism. This view applies to the monetary economies of the modern world; it cannot apply to an economy in which the only means of financing an investment is by the deferred consumption of real goods (ie, real savings). However, in a monetary economy, an economy in which there exists credit, investments can be undertaken without first deferring consumption, being financed through the credit mechanism. Under each of these views of the savings-investment process it is easy to see that there is a crucial rôle played by the pension funds. Under the neoclassical view the pension funds provide a repository for society's savings which they can then offer for use in financing productive investments. Under the post-Keynesian view, by offering financing at reasonable rate the pension funds can increase the economy's capital formation leading to economic growth and increased savings.

What then are the effects of pension funds on the level for savings in the economy? As we shall see below, the rigorous analysis of traditional microeconomic theory suggests that there should be zero impact; individuals would treat savings entrusted to the pension funds in the same manner they would treat more discretionary savings. In one of the earliest studies of this issue, George Garvy takes a slightly different view:

> ...there seems to be good reasons to expect that, on balance, the net effect of the spread of private pension plans will by itself result in an increase in personal savings, which, however, may possibly be offset to a small extent by a reduction of corporate savings. (1950, page 226)

He goes on to elucidate the conclusion reached by James Duesenberry in his *Income, Saving, and the Theory of Consumer Behavior* (1949), that the savings ratio had remained fairly constant over lengthy periods of time despite rather considerable changes in the institutional structure of the (U. S.) economy as well as other cultural and social changes.

More recently there have been a few published studies examining the influence of pension funds on the savings rate of the United Kingdom economy. Thus, in his 1982 article, Francis Green uses a model of the life-cycle hypothesis to consider

> "...the portfolio response of individuals who have to join occupational pension schemes as a condition of taking or keeping a job with particular employers." (page 136)

The results of Green's tests show that pension saving is not a substitute for other types of saving, a result that he suggests is generally consistent with the findings of Cagan's 1956 NBER occasional paper, *The Effect of Pension Plans on Aggregate Saving.*

In his February 1982 NIER paper, "The Measurement and Behaviour of the UK Saving Ratio in the 1970s", K. Cuthbertson is attempting to empirically determine the factors which affect the saving rate in the United Kingdom. Unlike the late 1980s, when commentators are worried about a low savings rate, the early 1980s saw high savings rates giving cause for concern, concern that the high rate would prevent or dampen economic recovery. From CSO data Cuthbertson establishes that "committed saving"—ie contractual saving primarily through life insurance and pension funds—accounts for the bulk of United Kingdom saving, about 70 to 80 per cent. Typically during the 1970s "committed saving" accounted for around 4 to 5 per cent of GDP, a figure which remained fairly stable. Cuthbertson, therefore, attributes the rise in personal saving in the late 1970s to increased discretionary saving. For Cuthbertson then, because of the stable nature of "committed saving" it is changes in the rate of discretionary saving that will bring about changes in the general level of economic activity. From this we might deduce that, provided the long-term financial intermediaries (insurance companies and pension funds) maintain a stable long-run pattern of financial investment behaviour, they are unlikely to bring about dramatic changes in the general behaviour of the British economy. However, it should also be recognised that this stable bulk of U. K. savings through the contractual financial intermediaries does provide a stable flow of funds to the financial sector, that in earlier periods of history did not exist. It might therefore be argued that the establishment of contractual savings through life insurance and pension funds has played a major rôle in the reduced business cycle fluctuations experienced by the British economy since World War II.

In a more recent paper, Christos Pitelis (1985) examines the effects of contractual saving on other savings in the U. K. economy. To a large extent this paper brings together the elements of the Green and Cuthbertson studies. Once again, use is made of the life-cycle hypothesis (LCH) to test the degree of substitutability between contractual and other forms of saving. Based on his econometric evidence, Pitelis concludes that

> Our results suggest that individuals do not take into account their contractual savings ... when framing their consumption-saving decisions. This result is ... in stark contrast to the implications of the LCH. (page 227)

Indeed, Pitelis finds that increases in the flow of funds into life insurance companies and pension funds tend to increase other forms of saving on a one-to-one basis. In other words, increases in the flow of funds to the contractual intermediaries generally tend to increase aggregate financial capital accumulation, but *ceteris paribus* may result in reduced consumption, reduced effective demand and a "typical Keynesian unemployment equilibrium", unless those funds remain invested domestically.

In summary, the evidence would appear to suggest that the British do not regard their contractual and discretionary savings as substitutes, somewhat in contradiction of neoclassical theory, and with important macroeconomic implications. These are issues best explored elsewhere, so let us now move on to an overview of the post-War growth of the pension funds in the United Kingdom.

1.4 The Growth of Pension Funds

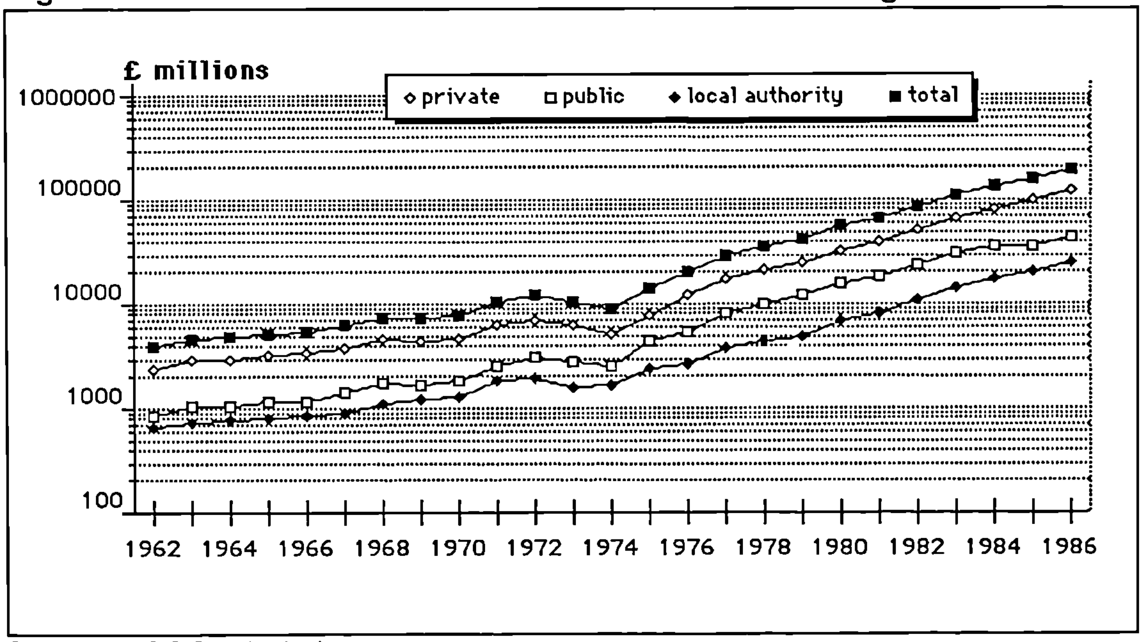
In Section 1.0 and Table 3-1 we have presented evidence that the life expectancy of an individual has increased during the course of this century. If an individual is living longer now than would have been the case in the past, then he will require an income for a longer period of time than his counterpart in previous generations. Consider for a moment the contemporary elderly person; what are the means by which he (or she) might obtain such an incremental income? The first option is for the individual to remain in employment during old age, and continue to work for a wage or salary. However, the possibility of this depends upon both the individual's ability to work—old age often brings with it infirmity—and the attitude of society towards the employment of the elderly. If, for either of these reasons, an elderly person could not obtain employment then a second option is for his (or her) family to keep him (or her). This option, however, depends upon the goodwill of the individual's offspring, etc, which for various emotive or practical reasons may not be forthcoming. A third possibility is that the elderly individual had both the foresight and wherewithal to save a portion of his income during his younger working days in order to finance his own retirement. This option has been analysed above. The fourth and final option is that the individual receives during his retirement years a pension from the State (or one of its agencies) or from one of the many private schemes in existence. In fact, this option is often nothing more than an institutionalised version of the third option, the individual using the State or a private pension plan as the vehicle by which he saves to finance his retirement.

In virtually every one of the so-called developed countries as well as in a goodly number of less developed countries (LDCs) the State operates a pension scheme for which all citizens are eligible. In addition, an individual often has the option of supplementing such a State pension by recourse to one of the many privately-administered occupational pension schemes. It is also often the case that the State pension offers an additional earnings-related supplement as an optional extra. This seems to be the case in most of the countries of western Europe as well as in the United States. In the United States (eg) the federal government operates and administers pensions ("social security" in U.S. parlance) under the Employee Retirement Income Security Act of 1974 (ERISA). In addition, there also exists a wide proliferation of retirement pension schemes operated by employers, both in the private and public (ie, State, federal and municipal) sectors, as well as by trades unions, fraternal associations, and so on. Individuals have also been encouraged by the 1981 Reagan tax reforms to provide for their own pensions by investing in an Individual Retirement Account (IRA) such as offered by many banks and thrift institutions.[11] As we shall see in later chapters, the system of pensions provision in the United Kingdom is not unlike that of the United States. Likewise, the pensions systems in France and West Germany are similar to that in the United Kingdom, although the methods of financing pensions in those European countries are quite different. We examine this issue in detail in Chapter Three.

Regardless of whatever country we shall be concerned with, or who is responsible for the administration of the retirement income scheme, the particular institutions responsible for the provision of pensions will be referred to hereafter as pension funds. This is in spite of the fact that in many cases there is not actually any fund in existence, as we shall see.

All things considered, the pension fund movement is far and away the largest form of institution in the United Kingdom geared to consider the needs and wants of the elderly. In fact, as the elderly have come to account for an increasing proportion of the population, the pension fund movement has also grown in size. Indeed, the increasing size of the pension funds has brought them more and more into the public eye. In Figure 1-5 (below) we illustrate the market value of administered pension fund assets over the period 1962-1984. This data is shown for all three sectors (private, local authority, and other public) both individually and aggregated together.[12] We can see that total pension fund holdings of assets has increased from around £4 billion in 1962 to over £190 billion in 1986. This upward trend in holdings seems to apply equally to all three groups of pension fund. What is also noticeable from Figure 1-5 is that this growth seems to have occurred without fail in almost every year, with the exception of those immediately following the first oil-price shock (1974, 1975).[13] This provides us with one rather dramatic view of the growth of the pension funds in the last twenty or so years.

Figure 1-5: Market Value of Pension Fund Holdings



Source: CSO tabulations

The rise and growth of the pension funds, especially in the latter part of this century, may be seen as directly attributable to the increasing population of elderly people. However, it would seem to be the case that their growth has been at an ever-increasing rate, outstripping even the growth in the elderly population. Indeed, because of their growth from such apparent obscurity, it is only in more recent years that we find the pension funds referred to as a separate independent body of financial intermediaries in either the academic liturgy or the financial press. Certainly prior to the 1970s the pension funds would almost invariably be aggregated together with the insurance companies.[14] Nowadays they increasingly warrant mention as a separate entity, even in the tabloids (the so-called 'popular press'). Consider by way of example the urban riots in Liverpool and Manchester, etc, in 1981, and that on

Broadwater Farm Estate, Tottenham in 1985. Following these disturbances there were frequent calls made by government officials and the press for large sums of money to regenerate the areas of inner city and urban decay; these pleas went out to the "...large financial institutions such as the pension funds and insurance companies."[15] Two of Britain's better financial journalists, Hamish McRae and Frances Cairncross (1985), refer to the pension funds as "a new barony". Like Blinder, they believe that a large factor underlying the growth of the pension funds has been the tax structure (page 102). However, they feel that the pension funds hide behind a legally-enforceable wall of non-information that limits their accountability:

> There is virtually no information about the size of most pension funds, their investment policies or their performance. Read through the Yearbook of the National Association of Pension Funds and you find that some funds give considerable detail...Others...merely offer the name and address of their registered office.
>
> Worse, there are often no adequate figures on performance available to the company's shareholders, sometimes even to the members of the pension scheme itself.
>
> The reason for this extraordinary lack of information is partly that legislation has not caught up with the growth of the pension funds as an important part of our financial system, and partly that there is no natural competition between the funds to try to deliver improved performance. (1985, page 106)[16]

They paint a picture of the growing power of the funds with a few well-chosen journalistic anecdotes that are also intended to convey the impression of a low degree of accountability:

> The people who invest these enormous sums for the giant public and private sector funds are—to put it mildly—not well known. They are honoured guests at stockbroker lunches, for the business of a large pension fund has been immensely profitable for the brokers under the fixed commission system. And they attend City seminars on investment policy. But most of the time they remain incognito, watching the millions roll across their desks and flow into investments around the world.
>
> On the rare occasions when they do appear in public, it is usually because they intend to make waves. Ralph Quartano, the donnish chief executive of the Post Office fund, will sometimes make a point in person at a shareholders' meeting. When he does so, he invariably chooses his words carefully to make sure that his views get maximum publicity; he was once a journalist himself. (1985, page 104)

Other examples abound:

> The National Coal Board's funds...were managed by Hugh Jenkins...The Coal Board's fund has occasionally made investments which have not been to the liking of the National Union of Mineworkers, but independence from the NUM (or indeed the NCB) was one of Hugh Jenkins' most fundamental tenets. The NUM took the Mineworkers Pension Fund to court in 1983 to try to stop Jenkins investing so much in the United States. It lost. (1985, pp. 104-105)

McRae and Cairncross are not lost for examples. But all of this remains scant and insubstantial evidence of the phenomenal growth of the pension fund movement; rather it is a reflection occasioned by it. Let us proceed from here and consider their growth in a more objective manner.

In an objective study of this nature it is important to see the growth of the pension funds in some perspective, and to this end we offer two particular angles. First, the growth of the pension funds should be seen as a response to the increasing demand for their services by an increasingly aging population. And second, the growth of the pension funds should be viewed as part and parcel of the secular growth in the financial sector as a whole. Let us consider these points in more detail:

1.4.1 Demographics

In Table 1-2 (above) we saw that in the United Kingdom in 1985 pensioners accounted for some 30 per cent of the workforce, a figure in excess of that for most other OECD countries. This figure represents the latest in a trend that has seen an increase in the number of pensioners in both absolute and relative terms, as evidenced by Figure 1-5 and the data in Table 1-4 (below).

Table 1-4:

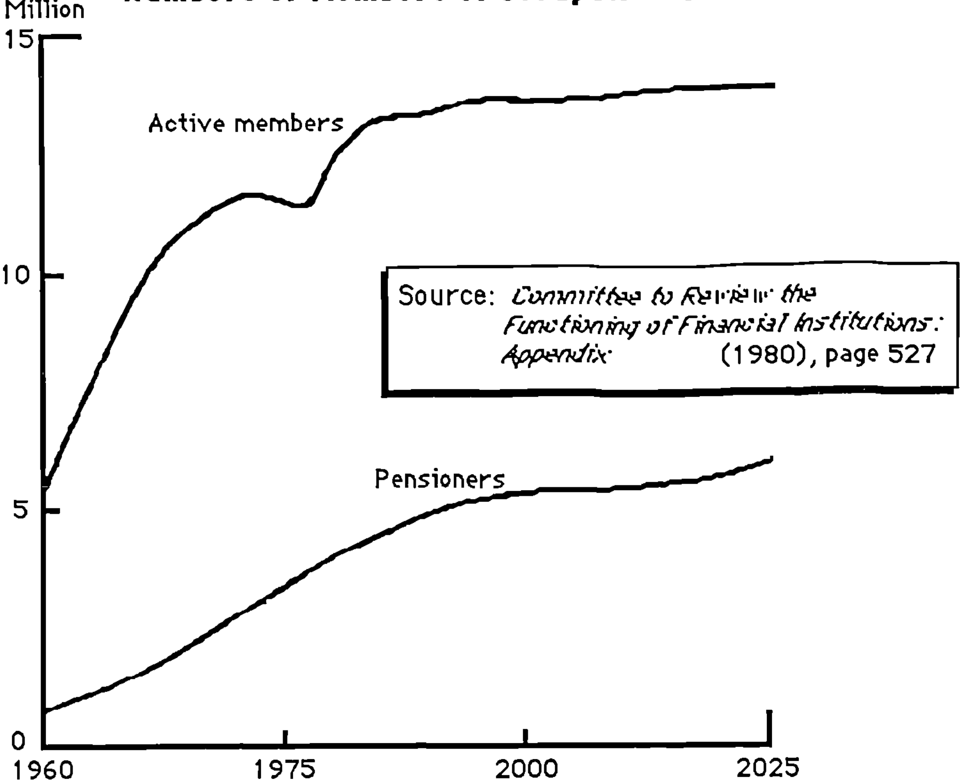
	Investment Funds	Total Income	Total Expenditure	Employees in schemes	Number of Pensions
	£m	£m	£m	m	
1955	2,200	300	260	7.7	1
1965	8,000	1,400	700	11	2
1975	21,200	6,200	2,700	11.5	3.4
1979	53,000	13,550	5,450	11.8	3.7
1982	86,907	12,856	5,443	n/a	n/a
1983	111,375	13,869	6,091	11.1	5

Source: *The Money Observer,* no. 15, October 1981.
CSO tabulations Government Actuary's reports

We can consider the evidence offered by Table 1-4 in much further detail by examining the data in greater depth. Firstly, consider the time-series data on the age and sex of the population of the United Kingdom in Table 1-5, as reproduced from the *Annual Abstract of Statistics* via the Wilson Report (1980). These figures show that the growth in the number of elderly has been at a slightly higher rate than for the population as a whole, and especially for the workforce.

Figure 1-6:

Numbers of Members of Occupational Pension Schemes



Further evidence is offered by data from both the Wilson Committee and the Government Actuary, which we reproduce here as Tables 1-6 through 1-7. Although, as we have seen, there has been a rise in the number of people of pensionable age, equally, their demand for pensionable benefits has also been on the increase over the post-War period. Table 1-6 shows that the numbers of active members (those enrolled and paying in contributions) of pension schemes has risen from some 2.6 million in 1936 to 7.7 million in 1955 and to over 11 million currently. This figure is expected to rise to almost 14 million by the turn of the century. Similarly, the numbers of pensions being paid show an upward trend, with some one million pensions being paid in 1955, up from 200,000 in 1936, compared to some five million currently. This is expected to increase by some 500,000 by the end of the century. In addition to the increasing numbers of pensioners, the Wilson Committee also believe that

> The explanation of the growth in pension funds, and in the pension business of the life assurance companies, lies largely in the improved level of benefits provided by occupational pension schemes—almost all schemes in the private sector, as well as those of the local authorities and most nationalised industries being funded. In particular, there has been a steady increase in the number of employees whose pension is related to their earnings at or near retirement, and there is an increasing

tendency to make some provision for raising pensions after retirement to compensate in whole or in part for the effects of inflation. (1980, page 92)

The increasing trends in the number of pensioners, the number of contributors, and the value of pensionable benefits manifest themselves in the pension funds' balance sheets. By way of illustrating the growth of pension funds via their balance sheets, Table 1-8 presents data on their income and expenditure for selected years. Here we can see that between 1967 and 1982 the pension funds' income rose from £1,745 million to £14,646 million, while their expenditure rose from £935 million to £5,674 million. Similarly, in the four years to 1986, income grew to £18,960 million while expenditure grew to £8,931 million, giving the pension funds a net growth of some £10,029 million during 1986.

Table 1-5: Population of the United Kingdom

(millions)

Sex	Age	1955	1965	1975	1980	1985	1990	1995	2000	2015
Men	15-24	3.4	4.1	4.1	4.5	4.7	4.3	3.7	3.6	4.3
	25-34	4	3.5	3.9	4	4	4.4	4.6	4.3	4.1
	35-44	4	3.6	3.2	3.3	3.7	3.8	3.8	4.3	3.4
	45-54	4	3.4	3.4	3.1	3.1	3.2	3.5	3.7	4.2
	55-64	2	3.1	2.9	2.9	3	2.7	2.7	2.8	3.2
	65-69	1	1	1.3	1.3	1.1	1.3	1.2	1.1	1.4
	70+	1	1.5	1.8	2	2.1	2.1	2.2	2.2	2.2
Women	15-24	3.3	3.9	3.9	4.3	4.5	4.1	3.5	3.3	4
	25-34	3.6	3.3	3.8	3.9	3.8	4.2	4.4	4	3.8
	35-44	3.6	3.6	3.2	3.3	3.7	3.8	3.8	4.1	3.3
	45-54	3.7	3.5	3.5	3.2	3.1	3.2	3.6	3.7	4.2
	55-59	1.6	1.8	1.6	1.7	1.6	1.5	1.5	1.6	1.8
	60-64	1.4	1.6	1.7	1.5	1.7	1.5	1.4	1.4	1.6
	65-69	1.2	1.4	1.6	1.6	1.4	1.5	1.4	1.3	1.6
	70+	2.2	2.7	3.2	3.5	3.7	3.6	3.7	3.7	3.5

Source: *Committee to Review the Functioning of Financial Institutions: Appendix* (1980) Table 5.10, page 539. Taken from Annual Abstract of Statistics; Population Projections 1977-2017, prepared by the Government Actuary, OPCS Series PP2, no. 9.

Table 1-6(a): Employees in Pension Schemes, 1936-1983

(millions)

	Private Sector		Public Sector		
Year	Men	Women	Men	Women	Total
1936	1.3	0.3	0.8	0.2	2.6
1954	2.5	0.6	2.4	0.7	6.2
1963	6.4	0.8	3.0	0.9	11.1
1967	6.8	1.3	3.1	1.0	12.2
1971	5.5	1.3	3.2	1.1	11.1
1975	5.0	1.1	3.7	1.7	11.5
1979	4.7	1.5	3.8	1.8	11.8
1983	4.4	1.4	3.4	1.9	11.1

Source: Government Actuary

Table 1-6(b): Employees in Pension Schemes, 1955-2000

(millions)

Year	Private Sector	Public Corporations	Local Government Schemes	Total Funded Schemes	Non-Funded Schemes	Total
1955	4.2	1.3	0.5	6.0	1.7	7.7
1960	6.0	1.4	0.6	8.0	1.8	9.8
1965	7.2	1.2	0.7	9.1	1.9	11
1970	7.0	1.7	0.7	9.4	2.2	11.6
1975	6.1	1.8	1.1	9.0	2.5	11.5
1980	7.0	1.9	1.1	10.0	2.6	12.6
1985	7.4	2.0	1.1	10.5	2.8	13.3
1990	7.5	2.0	1.1	10.6	2.8	13.4
1995	7.7	2	1.2	10.9	2.8	13.7
2000	7.7	2	1.2	10.9	2.8	13.7

Source: *Committee to Review the Functioning of Financial Institutions: Appendix* (1980), Table 5.8, page 538.

Table 1-7(a): Pensions in Payment, 1936-1983

(millions)

	Private Sector		Public Sector		
Year	Former Employees	Widows & Dependents	Former Employees	Widows & Dependents	Total
1936	0.1	-	0.1	-	0.2
1954	0.2	-	0.6	0.1	0.9
1963	0.6	0.1	0.9	0.2	1.8
1967	0.8	0.2	1.1	0.2	2.3
1971	1.1	0.2	1.3	0.3	2.9
1975	1.1	0.2	1.7	0.4	3.4
1979	1.2	0.2	1.8	0.5	3.7
1983	1.8	0.3	2.2	0.7	5.0

Source: Government Actuary

Table 1-7(b): Pensions in Payment (including widow pensioners)

(millions)

Year	Private Sector	Public Corporations	Local Government Schemes	Total Funded Schemes	Non-Funded Schemes	Total
1955	0.3	0.1	0.1	0.5	0.5	1.0
1960	0.5	0.3	0.1	0.9	0.6	1.5
1965	0.8	0.4	0.1	1.3	0.7	2.0
1970	1.2	0.5	0.2	1.9	0.8	2.7
1975	1.3	0.9	0.3	2.5	0.9	3.4
1980	1.6	1.0	0.3	2.9	1.1	4.0
1985	1.8	1.1	0.4	3.3	1.2	4.5
1990	2.1	1.1	0.4	3.6	1.4	5.0
1995	2.2	1.1	0.5	3.8	1.5	5.3
2000	2.3	1.0	0.6	3.9	1.5	5.4

Source: *Committee to Review the Functioning of Financial Institutions: Appendix* (1980), Table 5.9, page 539.

1.4.2 The Secular Growth of Financial Intermediation

The growth of the pension funds as part of a secular growth of financial intermediation *per se* can also readily be illustrated. The Wilson Committee believe that the growth of financial institutions (since the Radcliffe Committee)

> ...has resulted principally from the substantial rise in personal saving, which has been under way throughout the post-war years but has been particularly marked since 1973. (1980, page 19)

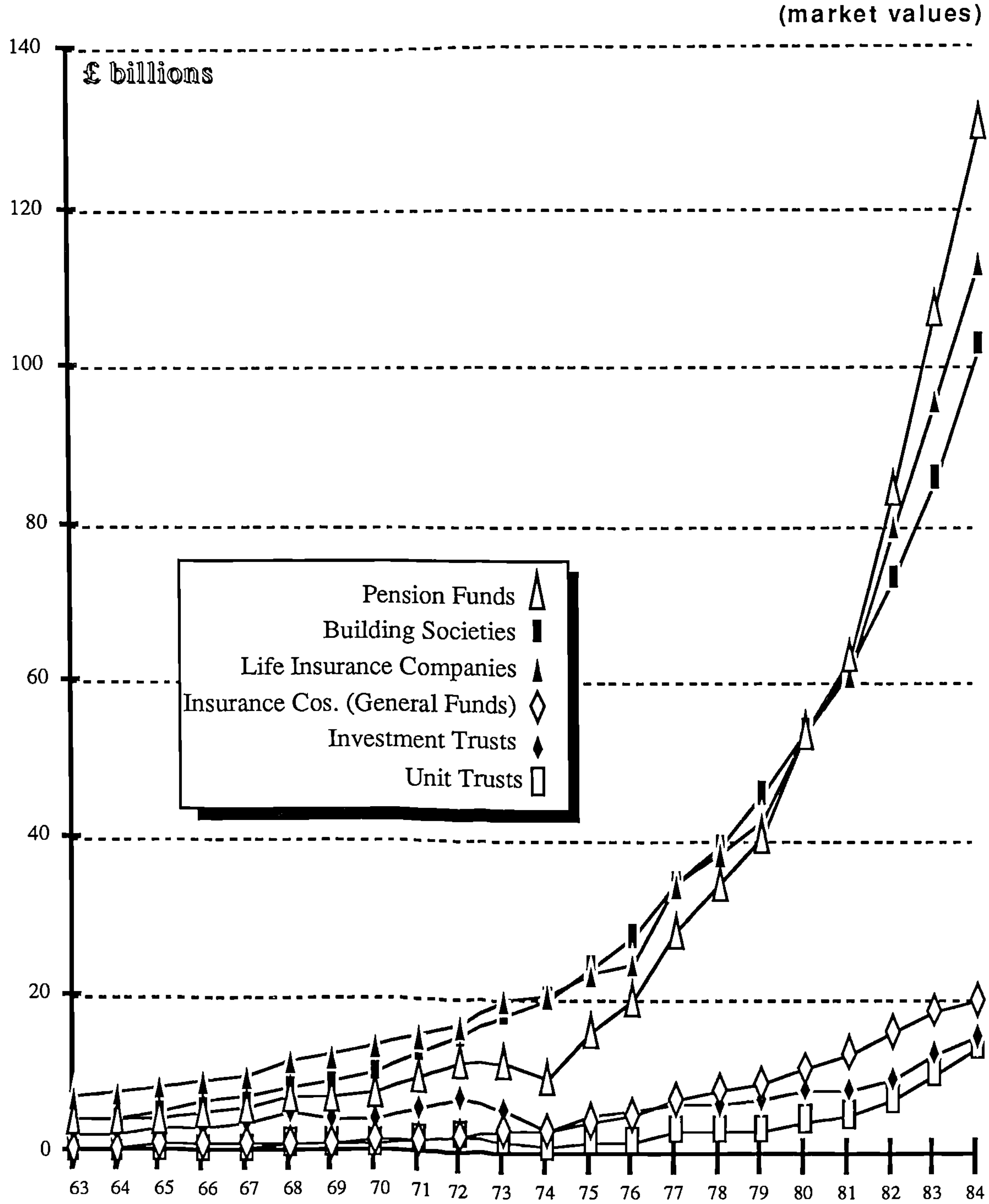
They also make the following observations:

> The changing pattern of saving within the economy over the past 20 years ... has greatly increased the role of the financial institutions in transferring funds from those in surplus to those in deficit. The amounts the financial institutions have borrowed from and lent to the non-financial sectors of the economy have grown substantially not only in money values but also in real terms. (1980, page 65)

They illustrate this point with reference to statistics which we reproduce here as Table 1-9. It can be seen that the flow of net savings to financial institutions rose from some 5.5 per cent of GDP in the years 1958-1962 to over 11 per cent in 1979. In absolute terms this can be seen as a rise from about £1.5 billion in 1958-1962 to £22 billion in 1979. A similar and more recent picture of the secular growth of financial intermediation is presented in Figures 1-7 and 1-8, where we can see the growth of many of the major financial intermediaries in terms of their year-end holdings and their net acquisitions of (financial) assets respectively. From Figure 1-7 we can confirm the almost monotonic trend of long-run growth of the financial intermediaries since 1962. However, it is noticeable that the trend for the investment intermediaries—the investment trusts and the unit trusts—seems to be rather more volatile than that of the contractual intermediaries—the insurance companies and pension funds. This can be attributed to the fact that the contractual intermediaries are guaranteed to receive savings from the public by contract (ie, pension contributions or life insurance premia) whereas the savings that are channelled to the investment intermediaries are more by way of voluntary actions on the part of savers. For example, when the economy is in recession savers are more likely to reduce the amount of savings they place with investment or unit trusts than to cease paying premia on a life policy in mid-term; it is almost impossible to reduce contributions to a pension fund, except in the case of redundancy.

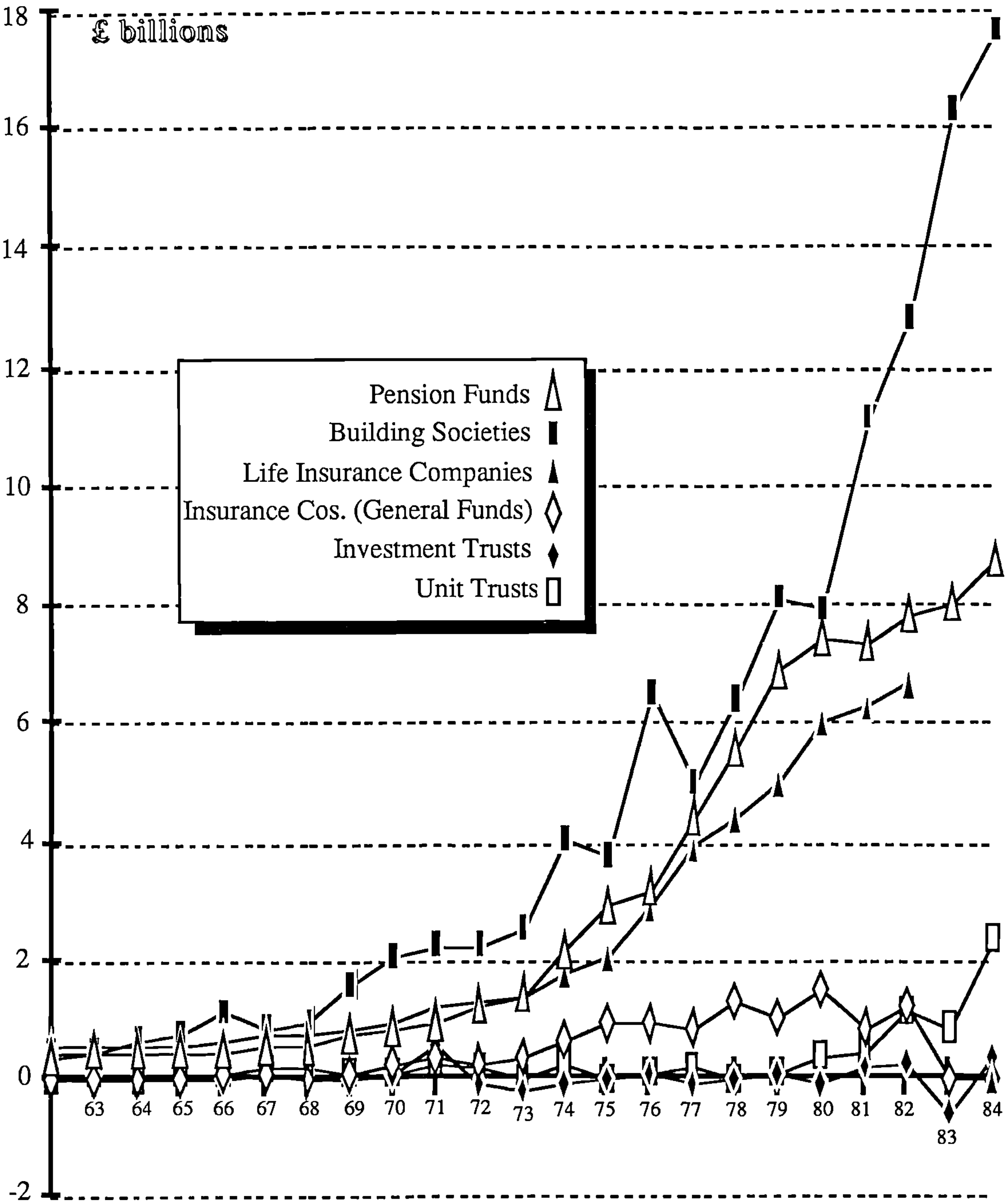
RY

Figure 1-7: Year-end Holdings of Financial Institutions



Source: *Annual Abstract of Statistics, Financial Statistics*

Figure 1-8: Annual Net Acquisitions of Financial Institutions (cash values)



Source: *Annual Abstract of Statistics, Financial Statistics*

Table 1-8: Income and Expenditure of Occupational Pension Schemes, selected years

(£ millions)

		1967	1975	1978	1982	1983	1984	1985	1986
Contributions:	members	345	1,200	1,800	2,183	2,250	2,288	2,451	2,603
	employers	920	3,150	4,500	6,613	6,806	6,894	6,749	6,585
Interest earnings (net)		480	1,850	2,700	5,850	6,593	7,939	8,763	9,772
	Total Income	**1,745**	**6,200**	**9,000**	**14,646**	**15,649**	**17,121**	**17,963**	**18,960**
Pensions:									
	retired employees	570	1,540	2,350	5,110	5,675	6,410	7,080	7,987
	widows & dependents		160	250					
Other benefits & expenses (net)		365	1,000	1,400	564	741	783	946	944
	Total Expenditure	**935**	**2,700**	**4,000**	**5,674**	**6,416**	**7,193**	**8,026**	**8,931**
	Net growth of funds	810	3,500	5,000	8,972	9,233	9,928	9,937	10,029

Sources: Government Actuary
D. Fanning (1981) (1978 estimates)
Business Monitor MQ5, 1983.III, Table 8, page 6
Business Monitor MQ5, 1984.III, Table 8, page 6 (see Table 7-1, Chapter 7 for details)
Business Monitor MQ5, 1987.II, Table 15, page 7

Table 1-9: Domestic Intermediation by the Financial Institutions, 1958-1979
(additions to liabilities* to domestic non-financial sectors) (Per Cent of GDP at market prices)

	1958-62	1963-67	1968-72	1973-77	1978	1979
Banking Sector	1.1	1.8	3	3.1	3.1	3.6
Savings Banks (investment accounts)	0.2	0.4	0.4	0.2	0.4	0.5
Building Societies	1	2	2.8	3.4	3	3.1
Finance Houses	-	0.1	0.1	-	-	0.1
Life Assurance Companies and Pension Funds	3.1	3.3	3.6	4.3	4.6	4.9
Unit Trusts	0.1	0.2	0.3	0.1	0.1	-
TOTAL	5.5	7.7	10.2	11.2	11.3	12.2

* Excluding issues of share and loan capital, a substantial but unquantified proportion of which is taken up within the financial sectors.

Source: *Committee to Review the Functioning of Financial Institutions: Report* (1980), Table 15, page 65, from:
Financial Statistics and Bank of England

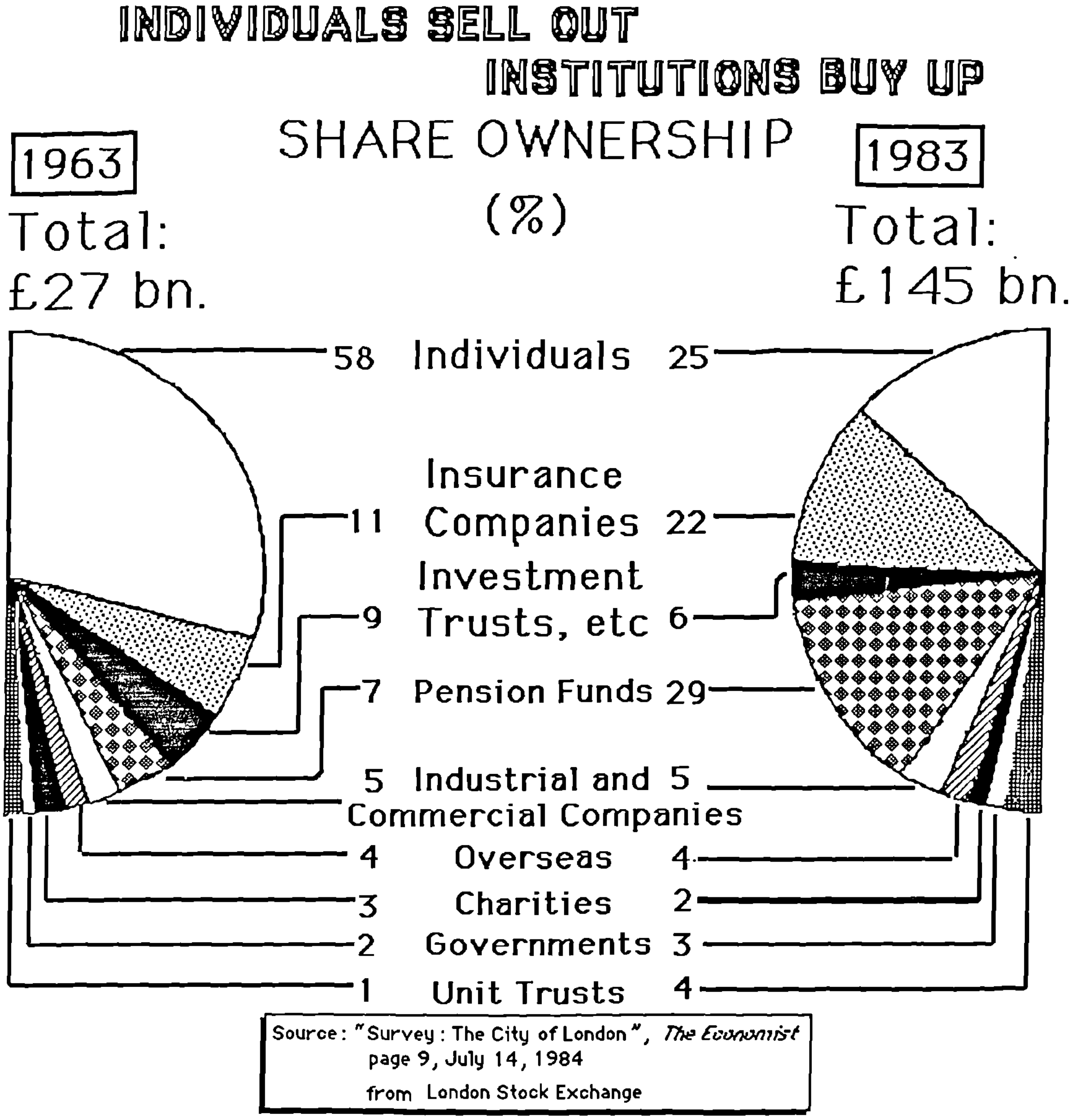
The same conclusion can be reached by considering the growth of financial intermediation by looking at their net acquisitions over the 1962-1985 period. Unsurprisingly, although this data shows much the same pattern of long-run growth, the trend is rather more uneven in almost all cases. For example, the building societies show quite dramatic decreases in their net acquisitions in the years 1968, 1976, 1978 and 1981. Again, the contractual intermediaries seem to be on a rather more stable growth path than their investment counterparts.

By way of a brief digression, it should be noted that the growth of financial intermediation is only partly attributable to an increasing savings ratio over the post-War era. It is also partly due to an increase in intermediation *per se*. That is to say, people choosing to place their savings with the financial intermediaries rather than invest them directly. Perhaps the most dramatic and easily obtained evidence relates to investment on shares. Figure 1-9 shows how the percentage of shares held directly by individuals has decreased from 58 per cent in 1963 to 25 per cent in 1983. At the same time it is readily apparent that the percentage of shares held by the financial intermediaries has grown, and combined with the increase in market capitalisation from £27 billion in 1963 to £145 billion in 1983, this makes for a substantial growth in the quantity of financial intermediation in the United Kingdom. These conclusions are backed up by the data presented in Table 1-10 (below). Here we can see that the pension funds increased their holdings of British quoted equities from a meagre 3.4 per cent in 1957 to a substantial 20.4 per cent in March 1978, and so on. Although we do not present them here, similar patterns emerge in the markets for almost all financial claims in the United Kingdom. By way of example, we reproduce here as Figure 1-10 a series of pi-charts from de Moubray and Taylor (1974), which provides an illustration of the growth of the pension funds between 1930 and 1970. Further details on the growth of the pension funds are presented and examined in Chapters Seven and Eight.

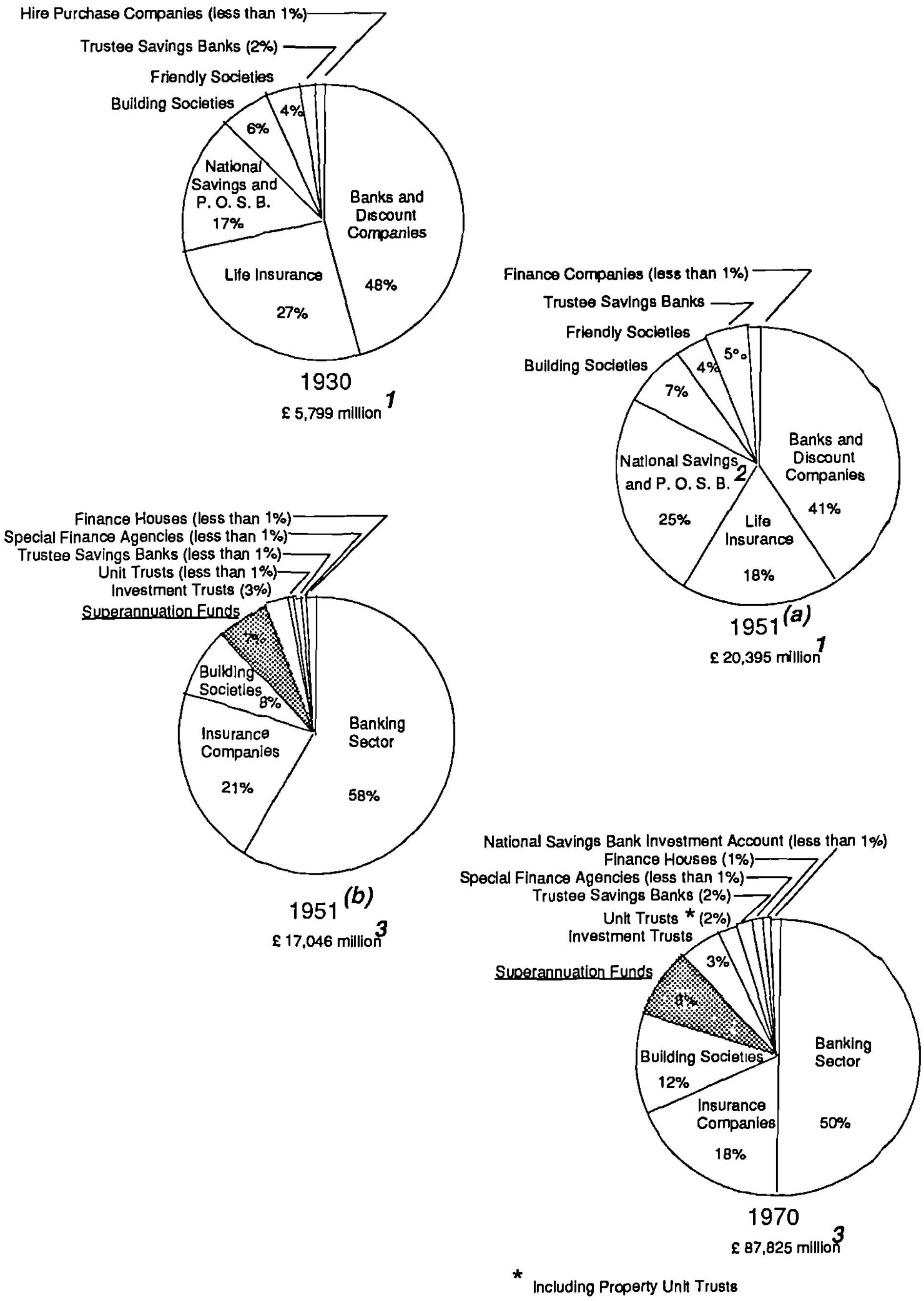
As with most economic agents, and particularly the financial institutions, the individual funds that make up the pension fund movement vary a great deal in terms of the number of members they have, the amount of funds they control, and so on. To illustrate this point, Table 1-11 presents a breakdown of the pension funds in the private sector by number of employees. In Table 1-12 we present a list of the (1980-1981) "Top Fifty" pension funds in terms of market value of asset-holdings. These figures are not as comprehensive as they might be, because in a few instances they relate to book value, due to data availability. It is readily apparent that the pension fund movement is dominated by the nationalised industries who fill eight of the top ten placings. The best position that the private sector funds can manage is seventh, with British Petroleum. Even in the top twenty only eight private sector funds get a look in! (Although, with the division of the Post Office and the privatisation of its telecommunications division, this 'League Table' probably looks a little different today). To put the size of these larger pension funds into some kind of perspective we note that the investment manager of the National Coal Board fund was responsible for some £1.5 million of assets in 1981; this was more than the gross total assets of the National Coal Board itself, a situation that reportedly still exists today. Similarly, according to *The Economist,*

> ...the Post Office pension fund is so large that it could take over the conglomerate Peninsular and Orient Steam Navigation, Vickers, and Pearl Assurance, with a single year's cash flow, were all three for sale at their present stock market prices.
>
> (November 4, 1978, p.11)

Figure 1-9:



Assets of Financial Institutions



[1] Source: *The Growth and Role of U.K. Financial Institutions* by David K. Sheppard. Methuen. Excludes U.K. business of overseas banks, assets of investment trusts, unit trusts, private trusts, superannuation funds and accepting houses.

[2] Excludes accrued interest on National Savings Certififcates

[3] Source: Economic Intelligence Department, Bank of England

Extracted from *Strategic Planning for Financial Institutions*, by G. de Moubray and B. Taylor (editors), page xxix

In March of 1979 the British Rail pension fund put a ceiling of £40 million on its purchases of fine art—just one of the more widely-publicised assets in its portfolio—shortly after the appointment of a new general manager, John Morgan. At that time from their incursions into the art market they had already purchased some 1,600 items costing around £28 million, the most famous being "Still Life with a Dish of Oysters and a Bottle" by Jean-Baptiste Chardin (National Gallery) and "Horses Watering at a Trough" by Gainsborough (Kenwood House). Although these art purchases seem substantial, it should be noted that they only accounted for some five per cent of the fund's cash flow in any year. To illustrate this point a breakdown of the holdings of the British Rail pension fund can be found in Table 1-13. One of the major issues we shall be trying to resolve in this study concerns where these percentages, and the absolute monetary values they represent, come from. For example, why does the British Rail pension fund hold more than half of its assets as equities rather than any other form of financial claim?

Table 1-10: Beneficial Ownership of British Quoted Equities

(per cent)

	1-Jul 1957	31 Dec. 1963	31 Dec. 1969	31 Dec. 1975	March 1978	31 Dec. 1981	31 Dec. 1984
Insurance Companies	8.8	10.0	12.2	15.9	17.2	20.5	22.0
Pension Funds	3.4	6.4	9.0	16.8	20.4	26.7	29.0
Investment Trusts	5.2	7.4	7.6	6.1	5.4	7.1	6.0
Unit Trusts	0.5	1.3	2.9	4.1	4.1	3.6	4.0
Banks	0.9	1.3	1.7	0.7			
Finance, Stock exchange and non-profit sector	4.4	6.1	10.6	6.7	6.6	2.2	2.0
Non-financial companies	2.7	5.1	5.4	3.0	4.1	5.1	5.0
Public sector	3.9	1.5	2.6	3.6	4.0	3.0	5.0
Persons, executors and trustees	65.8	54.0	47.4	37.5	33.2	28.2	23.0
Overseas	4.4	7.0	6.6	5.6	5.0	3.6	4.0
	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Capitalised market values (£ mn)	11,600	27,498	37,850	44,600	72,420	92,000	200,000

Sources: J. Moyle (1971)
Financial Statistics
Committee to Review the Functioning of Financial Institutions (1978)

Table 1-11: Scheme Coverage by Size and Sector of Employer, 1983

Sector	Contracted-Out Schemes	Contracted-Out Members	Not Contracted-Out Schemes	Not Contracted-Out Members	Total Schemes	Total Members
Private Sector: *		(thousands)		(thousands)		(thousands)
1 - 12	7,400	50	63,400	390	70,800	440
13 - 99	8,250	460	7,500	280	15,750	740
100 - 999	2,320	960	470	180	2,790	1,140
1,000 - 4,999	385	800	110	220	495	1,020
5,000 - 9,999	75	510	10	80	85	590
10,000 and over	70	1,710	10	150	80	1,860
Totals	**18,500**	**4,490**	**71,500**	**1,300**	**90,000**	**5,790**
Public Sector:	180	5,310	—	—	180	5,310
Totals	**18,680**	**9,800**	**71,500**	**1,300**	**90,180**	**11,100**

* by number of employees **Source:** Government Actuary

Table 1-12: The Top Fifty Pension Funds

(£ thousands, market values)

Post Office	* £ 1,760,000	Vauxhall Motors	£ 246,000
National Coal Board	* £ 1,486,792	Rolls-Royce	£ 242,401
British Rail	£ 1,151,000	Ford Motor Co.	* £ 233,817
British Steel	£ 1,100,000	Allied Breweries	£ 231,448
Electricity Supply	* £ 991,224	London Transport	£ 218,594
British Airways	£ 751,000	British Aerospace	£ 210,000
British Petroleum	£ 717,040	Bank of England	£ 200,531
British Gas	£ 661,700	Civil Aviation Authority	£ 200,000
ICI	* £ 639,652	W. Yorkshire Metropolitan CC	£ 200,000
Barclays Bank	£ 626,323	Philips Electronics	£ 194,000
Universities' Superannuation	£ 622,850	Sun Alliance	£ 186,000
Imperial Group	£ 615,000	Merseyside CC	£ 166,200
Shell	* £ 604,022	Esso Petroleum	£ 165,000
National Westminster Bank	£ 595,432	Courtaulds	£ 159,000
Unilever	£ 521,000	Tube Investments	£ 148,328
Lloyds Bank	£ 426,511	Distillers	£ 147,216
Merchant Navy Officers	£ 369,000	Grand Metropolitan	£ 144,900
Greater London Council	£ 365,000	Dunlop	* £ 142,000
National Water Council	£ 347,823	IBM UK	£ 138,000
BBC	* £ 340,000	S. of Scotland Electricity	£ 131,981
British Leyland	£ 300,000	Lancashire CC	£ 126,000
Greater Manchester Council	£ 299,420	S. Yorkshire CC	£ 126,000
Strathclyde Regional Council	£ 264,800	Kent CC	£ 113,565
W. Midlands County Council	£ 251,850	Tyne and Wear CC	* £ 110,405
Reed International	£ 250,000	Essex CC	£ 107,400

* relates to book value only

Source: *The Money Observer*, no. 15 (October 1981).

Table 1-13: British Rail Pension Fund Holdings at June 30, 1981

	(% of total value)
UK equities	56
UK property	17
UK fixed interest	13
Foreign securities	9
Foreign property	2
Works of art	2
Cash	1

Source: *The Money Observer*, no. 15 (October 1981)

1.5 The Wrap-Up

In this chapter we have presented an overview of some of the issues we shall be considering in this Thesis. We spent some time considering the theory underlying the existence of pensions, and briefly related it to some stylised facts. We have also considered a large body of stylised facts relating to the growth of the pension funds, and seen how this growth can be attributed to increasing longevity and the growth of financial intermediation that usually runs parallel to the economic development of a country. The illustrative highlights we have just presented also bring to mind a concern which will remain with us throughout this Thesis. It seems to be the case that most pension funds do not publish any detailed accounts of their activities, either for their members or for the general public. Although this is not true of all funds, it does seem to be only the very large funds, and predominantly those in the public sector, that publish anything that could begin to be described as comprehensive. Although the pension funds have been taken to task on this issue many times, not least by the Wilson Committee, it is only as of November 1, 1986 that they will be legally required to be more accountable, especially to those who pay contributions. This improvement in the rights of contributors is due to regulations embodied in the 1985 Social Security Act. Nonetheless, this does mean that much-needed information cannot be easily obtained for a study of this nature.

The major purpose of this Thesis is to investigate the factors which motivate the investment (and debt, where relevant) behaviour of the pension funds in the United Kingdom. From this investigation we would hope to construct a model that quantitatively reflects this. It is a belief of this author that such models are vital to understanding fully the complexities of the financial economy in which we live. Its more practical considerations lie in the ability to analyse the various policy actions of the government, the way in which they impinge on the financial institutions such as the pension funds, and the way in which the actions of the institutions affect the policies instituted by the government, and therefore our lives. We begin our investigation in Chapter Two by taking a look at the methods by which a pension fund may finance and organise its operations, as well as the role that they play in the economy. In Chapter Three we take an in-depth look at the history of pensions provision in the United Kingdom, with a special focus on the development of pension funds. We trace out the development of provision for the elderly from the "Poor Law" of Tudor England up to the present day system which attempts to integrate schemes in both public and private sectors. Then, in Chapter Four, we analyse the current position of pensions' provision in the United Kingdom from both the legal and institutional aspects as embodied in the 1975 Act of Parliament. In Chapters Five and Six we commence our move towards quantification by surveying the literature: Chapter Five examines the literature on the theory of investment decision-making; Chapter Six considers the literature on modelling the investment behaviour of various financial intermediaries in the United Kingdom. In Chapter Seven we analyse the flow of funds through the pension funds in detail, and in Chapter Eight we look at the role and position of the pension funds in the capital markets of the United Kingdom. In Chapter Nine we construct and estimate our model of the investment behaviour of the pension funds, and in Chapter Ten we draw all of our findings and afterthoughts together by way of conclusion.

Chapter One Endnotes

1 *The Economist*, June 14 1986, page 67. Further evidence on the aging of the population in the United Kingdom is reproduced in Table 3-1.

2 For an elaboration on this see the definitions of defined benefit and defined contribution pension plans in Chapter Four, page 4-8.

3 Blinder defines "King Midas benefits" as "...the power and psychological satisfaction that some people derive from accumulation of wealth." (1983, page 5)

4 If this point is true then we would not expect the level of savings for pensions' provision (ie, contributions) to have much of an effect upon the level of savings for other purposes. In other words, if there were an across-the-board increase in contributions levels to pension plans we would not expect there to be a commensurate decrease in other forms of savings, *ceteris paribus*. For further details and evidence on this point see (eg) Browning (1982) or Threadgold (1978).

5 Employers, in particular, often use pensions as a means of attracting and keeping employees. Certainly, in occupations where employers are undertaking the training and educating their workforce, one way of ensuring that they will reap the benefits themselves is to create hurdles that reduce the prospects of losing trained workers. The lengthy vesting of pensions is such a hurdle. For further analysis see Blinder (1983), page 16 *et seq*.

6 From this it follows and is therefore implicitly assumed that pensions are defined contribution and that the market for labour is a spot market.

7 The reader can confirm this for her- or himself by reading Chapter Three.

8 This is simply a strong form of the proposition that workers are more risk averse than firms, a proposition that would seem to be borne out by observation.

9 Note that here the cause of the non-existence of pensions is not uncertainty, but the asymmetric risk aversion of workers and firms. The literature on the organisation of the firm is replete with reasons why such asymmetries might and do exist.

10 Note that the age of workers is likely to have ambiguous effects. For example, although young workers tend to have a higher $\mathbf{k}$, *ceteris paribus*, they are also likely to be at a farther remove from the ages at which vesting and retirement occur, giving them lower θ.

11 Perhaps the best study of pensions in the United States is the book *Pensions in the American Economy* edited by Laurence J. Kotlikoff and Daniel Smith (1983). Also worthy of examination is Alicia Munnell's *The Economics of Private Pensions* (1982).

12 The reasons for adopting such a disaggregation are manifold: in the first place, it makes for much easier handling of the data, as this is the form in which it is found 'raw'. Secondly, as we shall discover in Chapter Three, there is quite a lot of difference between private sector pension funds and those in the public sectors. This is especially true of investment policy, where the local authority and other public sector funds tend to adopt a more cautious approach than their counterparts in the private sector. Other differences include the degree of participation; according to the Economist Intelligence Unit (1977) only two out of five private sector employees belong to pension schemes while in the public sector the figure is as high as 75 per cent. This division also reflects the historical development of the pension fund movement, as highlighted in Chapter Three.

13 This point is elaborated upon in Chapters Two and Seven, in particular.

14 This is not entirely surprising when one considers the major role played by the insurance companies in the administration and provision of pensions in the United Kingdom. See Chapter Three for details.

15 Indeed, as Wolanski (1979) commented in his survey of pension fund investment:

> ...Last year could well go down in the history books as the year in which the public was made aware of the enormous size and power of the pension funds. With Sir Harold Wilson acting as their main publicist, there was more newspaper comment about pension funds in 1978 than in previous years. (1979, p.3)

16 Data pertaining to the availability of information to pension scheme members is presented in Appendix 1-A.

Appendix 1-A: The Availability of Information to Pension Scheme Members, 1975

(thousands)

	Schemes	Private Sector Members	Public Sector Members
Detailed Rules:			
yes	14,130	5,340	5,300
no	150	110	-
n/a	60	100	-
no answer	9,160	230	10
Trust Deeds:			
yes	10,320	4,660	1,210
no	3,020	580	20
n/a	680	260	4,070
no answer	9,480	280	10
Annual Reports			
yes	4,170	3,390	2,200
no	5,020	1,160	-
n/a	4,600	920	3,100
no answer	9,710	310	10
Annual Accounts			
yes	5,120	3,860	3,370
no	5,480	1,180	-
n/a	3,240	390	1,930
no answer	9,960	350	10
Actuary's Reports on Valuations			
yes	2,500	1,630	3,590
no	5,660	2,750	430
n/a	5,660	1,030	1,280
no answer	9,680	370	10
Information about scheme investments			
yes	2,670	2,300	2,810
no	4,710	1,980	630
n/a	6,490	1,170	1,860
no answer	9,630	330	10
Total Number of Schemes[1] and members	23,500	5,780	5,310

[1] Schemes with 25 or more members

Source: *Committee to Review the Functioning of Financial Institutions, Report*, (1980), Table 48, page 321; reproduced from: *Occupational Pension Schemes 1975: Fifth Survey by the Government Actuary*, (1978) HMSO. (No similar table is published in the 1986 Government Actuary survey).

Chapter Two: Modus Operandi

2.0 Introduction

The main purpose of this chapter is to consider what a pension fund actually does, and how they go about doing it. In this way we would hope to be able to locate some of the major features which characterise the United Kingdom's pension fund movement. As the reader will ascertain, this is by no means an easy task, as there are numerous diverse ways in which a pension fund might organise itself, and most of these seem to be currently in operation in the United Kingdom. Furthermore, as we pointed out in Chapter One,[1] the pension fund industry may be disaggregated into three sectors—private, Local Authority, and other public sector—whose objectives and methods of organisation tend to differ. Nonetheless, in spite of such difficulties it is necessary, nay vital, that we locate those characteristics which appear to be common to all (or, at least a majority of) pension funds if we are to succeed in constructing a model that accurately represents their behaviour, as that is the task of this paper.

It is with these thoughts in mind that we embark on this chapter by first taking a look at the process of financial intermediation in general, the *raison d'etre* of financial intermediaries, the manifestations they assume, and so on. The latter part of this chapter will be devoted to a consideration of the methods by which a pension fund may organise and finance its operations, such as Pay-As-You-Go, funding, *et cetera.*

2.1 Financial Intermediation

2.1.1 Financial Intermediaries

The financial sector of an economy exists to fulfill an extremely important function, that is the allocation of capital among alternative uses. It is through the financial sector that the savings of one section of the economy are put to good use as the investments of another section. It has also been suggested on many occasions that the efficiency of the financial sector may influence the overall consumption-versus-savings decision of the public, and therefore the level of economic activity. But how do the component parts of the financial sector—the financial intermediaries—operate to allocate capital among alternative uses? And from where do they acquire this capital in the first place? These are the issues with which we now concern ourselves.

According to Herman E. Krooss and Martin R. Blyn, a financial intermediary is defined as

> ...an enterprise whose assets and liabilities consist almost exclusively of financial instruments. Su~h instruments would include loans and mortgages, stocks, and bonds, bank deposits, savings and loan shares, insurance and pension contracts, commercial paper, shares in investment companies, and so forth. The functions of financial intermediaries are associated with "savers," and their assets tend to define investors. (1971, p.3)

Such a description would appear to suit the pension funds in the United Kingdom admirably. They continue:

> Those who operate financial intermediaries do not produce or exchange goods. They are not farmers, manufacturers or tradesmen. They deal in paper—in evidences of debt and shares in equity. Consequently, it is easy for analysts to skip over them in their models of economic growth. Economic growth is ordinarily pictured as a process in which business entrepreneurs combine various amounts of labor and capital on a fixed piece of land to produce as many goods and services as they are able to. Financial intermediaries do not fit easily into this picture; yet few would deny that their role is important. Nevertheless, most writers seem to suggest that the financial system somehow adjusts passively to the needs of the real sector (1971, p.3)

That we avoid such a myopic view in this paper is paramount; our analysis of the function and role of financial intermediaries is best served by an initial consideration of a very primitive economy, and then an historical look (at least, schematically) at the different stages of development of a financial system.[2]

2.1.2 A Schematic History of the Financial System

Suppose that there were an economic system that had no financial assets at all; not even money. In such a simple society—let's call it a primitive economy—each individual (or family group) produces all they consume, and consumes all they produce; they have no occasion to exchange the products of their labours with others. The order of the day is self-sufficiency. Under such a system the level of economic activity is very small, barely subsistence, and thus there is almost no investment. This approximates to man's earliest existence on the planet. Now, if we consider a slightly more advanced system in which there is a small degree of specialisation in production, gains could be made according to David Ricardo's "Principle of Comparative Advantage".[3] However, under such a system the gains would be small owing to the inefficiencies of the barter system, and especially the required 'double coincidence of wants'. That is to say, if a fisherman desired furs, for example, he must have fish to trade and then find a hunter who desires fish and has furs to trade; they must then be able to come to an agreement as to how many fish a fur is worth, and vice-versa. Historically, even under the most highly developed forms of barter there was no adequate means of storing purchasing power. Thus such an economy would tend to have a very low level of investment, and even that would probably be misallocated. To illustrate: under a system with no financial assets, any individual would be obligated to invest in real goods whatever part of their current income was not consumed, which is that individual's savings.[4] Thus, no individual could invest in excess of their savings, there being no mechanism to finance such excess expenditures. Additionally, no individual could invest less than their savings, there being no financial assets in which to store such excess savings. Consequently, every individual is forced to maintain a balanced-budget position, with their savings being equal to their investment. This leads to relatively low levels of saving, and hence low levels of investment, which inhibits the growth of national product. Investment misallocation, therefore, is highly probable; some investments with high expected returns will not be undertaken because a single individual might be unable to finance such projects; other individuals with excess savings would be 'forced' to invest, possibly in projects with much lower expected returns than are otherwise available. (Inventories of real goods often carry a zero or negative return due to the opportunity costs of storage, etc). This type of economy approximates to man's pre- and early biblical eras.

The first real stage of development can be seen as originating with the general use of commodity money, such as cowrie shells, cattle, or the precious metals such as gold and silver. Objects such as these developed into a generally acceptable medium of exchange because of several attributes: their ease of recognition and measurability, their scarcity, their portability, and, in particular, their ability to retain their value, ie, to act as a store of value.[5] With a given object acting as a medium of exchange it became efficient to denote the prices of goods in terms of that medium, and so the medium of exchange quite naturally also became the numéraire, thus reducing the total number of prices with which traders needed to be familiar. In addition, because this medium of exchange possessed intrinsic value, it performed well as a store of value. Thus, the medium of exchange can be seen to possess all three of the traditionally defined functions of money: a generally acceptable medium of exchange, a unit of account, and a store of value. However, even in such a world of money, deficit-financing would not be possible. Economic units could now save in the form of money balances, and the removal of the inefficiencies of the barter system (especially the requirement of a double coincidence of wants for trade to occur) increases the potential growth of the system. Suppose we increase the sophistication of this system slightly by the introduction of government which issues money (legal tender, or perhaps "fiat money", that is to say money that has no intrinsic value) when it makes purchases; what happens? As with commodity money, individuals with promising investment projects can finance in excess of their current savings by drawing down upon previously accumulated money balances, while individuals with no currently favourable opportunities could add to their money balances in the hope of better times yet to come. By this method, investment misallocation is somewhat reduced, and could be reduced even further by the pooling of accumulated savings by groups of individuals wishing to undertake business on a 'partnership' basis. Due to the increase in both savings and investment, output growth will be generated, leading to an increased demand for money balances. Government can satisfy such demands by the further issue of money which increases government purchases of goods and services, ie, more resources are in the government's hands. The government can either increase social capital (ie, publicly-owned capital) or finance further private investment through transfer payments. Either method leads to increased savings and investment and, therefore, output.

The next major stage of the development of finance is when borrowing (and, equally, lending) begins to occur. This allows individuals with excess savings to lend their surpluses to those who desire to invest in excess of their own savings. Thus, deficit-financing becomes possible by allowing individuals to draw down on other people's accumulated money balances. The borrower achieves this by issuing an interest-bearing financial claim to the lender in the form of a bond, mortgage or loan; such claims are known as primary securities because they are issued by the ultimate borrower to the ultimate lender. In addition, savings are encouraged by means of the interest payment and even further funds can be called upon for investment purposes. Nonetheless, the issuing of a primary security is still very much dependent upon the existence of a 'double coincidence of wants', albeit of a highly specialised nature. The prospective borrower must seek out a lender who wishes to lend the same amount and they must then agree on the price of the loan, ie, the rate of interest. In this sense all loans are bilateral. Thus, although the issue of primary securities is likely to increase the level of savings and investment, it will not fulfill its potential without increased sophistication in the area of distributive techniques. This should manifest itself primarily through the broadcast of information to borrowers regarding lenders' asset preferences, and vice-versa. Such a development requires the bringing together of borrowers and lenders; we usually refer to such a congregation as a market. The development of markets in financial claims appears historically to have been contemporaneous with the issue of primary securities. This development greatly enhanced the desirability of primary securities to lenders because it increased the liquidity of any such financial claim; the lender no longer needed to hold the security until maturity. We can see, therefore, that the development of distributive techniques raises the level of saving and investment by increasing the marginal utility of the last pound's worth of financial claims to the lender, and reducing the marginal disutility of the last pound's worth of debt to the borrower. Such development also makes for increased allocative efficiency by making different investment opportunities compete for the available loanable funds.

There is also a second element to this development. The borrowing we have considered so far still leaves the ownership of the real capital (physical assets) in the hands of the borrower. The borrowing/lending process evolved further when the administration of businesses could be divorced from its ownership by the issue of equity securities. Lenders who obtained primary securities in the form of equities were entitled to a share of the profits of the business without having the problems of managing it on a day-to-day basis. With the introduction of Limited Liability (incorporation), equity-holders' liability was reduced to only that amount that they had subscribed in a business, thereby making equities a far less risky venture than they might otherwise have been. Because an equity implies ownership of physical assets, it also offers a good hedge against inflation. As with the market for primary securities such as bonds, the development of a market for equities, or stock exchange, further enhanced the liquidity of lenders.

Thus far everything in the garden appears rosy, but the story is still some way from ending. Certainly distributive techniques get primary securities distributed efficiently from borrower to lender and from lender to lender, but so far we have failed to take into account the fundamental conflict of objectives between borrowers and lenders. In general, this conflict comes about because borrowers prefer to 'borrow long' (ie, over a long period of time) while lenders prefer to 'lend short' (ie, over a short period of time) so that both borrowers and lenders reduce the amount of risk that they incur with the loan. It is to resolve this fundamental conflict that we find the development of financial intermediaries occurring. Financial intermediaries are institutions that place themselves between ultimate borrowers and ultimate lenders by purchasing the primary securities of borrowers and issuing claims against themselves to lenders; these claims are known as secondary or indirect securities. Thus, it can be seen that debt is the stock-in-trade of the financial intermediary; in contrast with the real assets that characterise the commercial or industrial firm's balance sheet, the assets of intermediaries are mainly composed of paper claims issued by non-financial borrowers. The margin between interest paid for loanable funds (from savers) and interest rates earned on loans granted (to borrowers) constitutes the intermediary's profits (or surplus).

The rôle of the financial intermediary is, therefore, two-fold: it eliminates the need for borrowers and lenders to seek each other out, thereby eradicating the 'double coincidence of wants' requirement; and, in addition, their existence goes a long way toward resolving the fundamental conflict between borrowers and lenders, this being via the issue of secondary securities that appear attractive to lenders and by allowing borrowers to issue primary securities that are well-adapted for their business requirements. Thus, like earlier distributive techniques, the introduction of financial intermediaries raises the marginal utility of the last pound's worth of financial assets to the lender and reduces the marginal disutility of the last pound's worth of debt to the borrower. In this way, intermediaries serve to raise the levels of saving and investment and to allocate scarce savings optimally among alternative investment options. This process is further enhanced by the fact that because intermediaries tend to specialise in certain markets they are able to obtain information at much lower costs than would be incurred by an individual due, eg, to economies of scale. Other risks are also reduced by the existence of intermediaries; for example, insurance companies provide 'risk pooling', while investment intermediaries allow individuals to invest in more widely-diversified (and, therefore, less risky) portfolios than would otherwise be possible. Nonetheless, again following Krooss and Blyn, we need to recognise that the evolution and development of the system of financial intermediation has not always occurred smoothly:

> It would be a mistake to imagine, however, that this process has been without disturbances, an automatic response of the financial system to the needs of deficit units. In most countries at some time, there have been long periods when the financial system has failed to adapt itself to the needs of deficit units. While it is legitimate partly to abstract from the problems of finance when we are looking at the basic working of the macro-economy and to concentrate on the fact that saving and investment are always identically equal, we should never forget that the levels of saving, investment and income which are realisable depend on the development of the financial system. (1971, p. 28)

Thus, it is conceivable that there have been periods of time when the excess funds of some surplus units in the economy were unable to find suitable employment in the hands of deficit units due to the inadequacy of the system of intermediation. This should hardly strike us as surprising as entrepreneurs usually respond to the demands of consumers with a lag, usually to see if the demands are transitory or more permanent. Such a lag is more likely to occur in the financial sector where the ability to sell depends much more on the confidence and trust of the public in the particular institution and its products.

The manifestations that financial intermediaries assume are usually determined historically; they reflect the financial system's adaptation to the needs of borrowers (deficit units), notwithstanding the fact that their needs are not always immediately catered to. Thus, for example, when there is a great demand for finance in order to build residential housing, we find the Building Societies beginning to appear on the scene. There are three major types of financial intermediary that are traditionally distinguished:

(i) depository intermediaries: the major characteristic distinguishing depository intermediaries (or, in Bank of England parlance, "deposit-taking intermediaries") is the high degree of liquidity of the liabilities they issue. Basically, depository intermediaries borrow funds on a short-term basis, ie, on a 'time' or 'demand' basis. In the United Kingdom the major depository intermediaries are the clearing banks and the building societies. Traditionally, the banks have been considered different from other financial intermediaries because of their ability to 'create' money via the multiplier. This ability existed because the liabilities issued by the banks have been considered to be a good medium of exchange by the public, to the point that many bank liabilities are now considered as being money rather than simply close substitutes. It is on this foundation that the 1979 Banking Act distinguished between banks and other "licensed deposit takers" (LDTs).[5A] This distinction has rapidly eroded, partly as a result of the general climate of deregulation of financial markets that occurred during the 1980s and partly as a result of the increasing moneyness of (eg) building society liabilities.

(ii) contractual intermediaries: these intermediaries are those which issue liabilities of a long-term or contractual nature. Thus, contractual intermediaries borrow funds on a long-term basis under contract to provide benefits at some point in the future. The major contractual intermediaries are the insurance companies and the pension funds.

(iii) investment intermediaries: whereas the public will deposit their funds with (eg) a bank to safeguard their liquid assets or with (eg) a pension fund to safeguard their retirement income, funds lodged with investment intermediaries are there solely to increase future consumption possibilities, ie, to be invested and increase the owner's wealth. The major types of investment intermediaries in the United Kingdom are the investment trusts and the unit trusts.

It is often the case in the British literature (and, therefore, British textbooks on the U. K. financial system) to lump together the contractual intermediaries with the investment intermediaries. This practice follows from the traditional distinction between banking and other (the non-bank) financial intermediaries in the United Kingdom. The separate categorisation of contractual and investment intermediaries seems to be far more common in the United States. In this Thesis, the latter approach is adopted because it seems to offer a more realistic set of groupings of contemporary financial intermediaries in terms of common assets/liabilities. It would seem to be the case that the liabilities issued by the contractual intermediaries are in return for funds from savers on a contractual basis; that is to say, there is an element of 'compulsion' attached to the inflow of funds. If a payment is not paid into a life insurance company or pension fund the saver is likely to find himself penalised heavily. With (eg) a unit or investment trust, the saver is not usually subject to a commitment of regular payments. However, because of the British practice, much of our quantitative analysis in later chapters will compare the activities of pension funds with those of both contractual and investment intermediaries.

In this paper our focus is on the pension funds, thus we shall largely be ignoring depository and investment intermediaries. The scenario for the introduction and development of pension funds is laid out in Chapter Three. That a pension fund is a financial intermediary is surely beyond doubt; their income consists primarily of the savings of individuals against which they issue a secondary security in the form of a pension contract—a promise to provide an individual's retirement income at some specified date in the future—and this income is used to purchase both the primary and secondary securities issued by both private sector borrowers and the various arms and agencies of the government.

2.2 Pension Fund Operation

Before commencing a survey of the methods of organisation and financing adopted by the various pension funds in the United Kingdom, it is worthwhile to give some consideration to those organisations responsible for running pension schemes. By such an approach we may be able to shed a little light onto the subject and locate common methods adopted by similar entities in the running of pension schemes. In the United Kingdom there are (and, almost always, have been) three basic categories of pension scheme operators: the State, the employer, and all others. Let us now look at each of these in turn:

The first, and perhaps major, operator of any type of pension scheme is, and always has been, the State.[6] As the governing power in the economy, pensions' provision under any form of State-run scheme typically forms part of a much wider system of social welfare benefits, or National Insurance as it is more commonly known in the United Kingdom. The pensions provided under these schemes are virtually under the direct control of the central government even though they are usually administered through existing governmental agencies such as the Post Office, etc.

The second operator of pension schemes is the employer who may be thought of as providing 'deferred wages' in the form of a pension to retired employees and/or their dependents. The employer in this category need not necessarily come from within the private sector. Where the provision of pensions is concerned, the employer is just as likely to take the form of a Local Authority or perhaps even the State, either *per se* or in the guise of a nationalised industry or Quango.[7] Nonetheless, this form of pension provision is not usually directly controlled by the employer, but rather by some form of Trusteeship set up by the employer.

The third and final category of pension scheme operators is the ubiquitous "all others". This category is likely to include Provident Funds, Friendly Societies, private schemes offered by the Insurance Companies, and so on. The kind of pension provided by institutions falling into this category are for those people who, acting as private individuals, wish to provide for themselves extra income during the period of their retirement. This would be similar to an individual providing for the care of their dependents in the event of their untimely demise via life insurance. The manner in which institutions providing pensions within this category tend to operate is very similar to that employed by pension funds within the second category. Indeed, as we shall see, many employers do not actually set up their own self-administered trust fund, preferring instead to employ the already-existing facilities of (eg) the insurance companies for pensions' provision.

The workings of the State-run scheme, both in the past and currently, as part of the wider system of social welfare benefits are covered in detail in the following two chapters. In this chapter we shall be more concerned with the methods of organisation and financing adopted by providers of pensions within the second and third categories outlined above.

The basic idea underlying any form of pension is the provision of income to an individual who, for various reasons, is considered to be above that age at which work is a "requirement".[8] Such a person is said to be retired from work. However, in order to provide such retired persons with a pension, a quantity of money is required, ie, the pensions have to be financed. It is to the various sources from which this financing may be obtained that we now turn our attention.

2.2.1 Pension Fund Financing: Sources

If we ignore, at least for the present moment, any income by way of return on investments, then any pension scheme will obtain the majority of its income from contributions.[9] We find that there are three possible sources from which such contributions may be obtained:

(i) contributions to the pension scheme may only be levied from the employees, ie, that individual who (or whose dependents) will eventually receive the pension benefits;

(ii) contributions to the pension scheme are paid solely by the employer for the later benefit of the employees. This type of scheme is called non-contributory as the beneficiaries are effectively not contributing to the scheme, although in effect the employer may actually be deducting employee contributions at source;

(iii) contributions to the pension scheme are paid jointly by both employer and employee, although not necessarily to the same degree. This case is probably the most common method employed by pension funds in the United Kingdom today. Even under the current State scheme, both employer and employee pay given percentages of the employee's wage/salary as National Insurance contributions.[10]

Just as there are three possible sources of contributions, there are also three possible methods of calculating the levels of such contributions:

(i) the contributions may be levied at a flat rate. Here contributors would pay a given amount each week regardless of all other circumstances;

(ii) contributions may be levied dependent upon salary range. In this case, contributions will be levied at a given rate if the employee falls within a particular salary range—the higher the salary range the higher the level of contributions;

(iii) contributions may be levied as a percentage of salary. This is usually the most common method employed, especially in schemes where benefits are graduated to relate to earnings. For example, under the State scheme contributions are levied as follows: 10 per cent of gross salary from the employer and 6.5 per cent from the employee.

Having established that the inflow of funds to any pension scheme will consist of contributions plus the return on any investments, we should now turn our attentions to a consideration of the possible ways that such a fund may be utilised. In other words, in what ways may a pension fund organise itself? As we shall see, there are several major methods available, many of which are currently in use, either in the United Kingdom or elsewhere.

2.2.2 Pension Fund Financing: Methods

The financing of a pension fund refers primarily to the regular inflow of funds (other than investment income) that is required to enable the retiring members of the scheme to receive their pensions and pay the administrative costs of running the scheme.

(i) Perhaps the simplest way for any pension scheme to operate would be to take in the current contributions from members, employers, etc, and from this immediately pay benefits to existing pensioners, with any residual after deducting administrative expenses being put into investments. Such a method of financing occupational pensions is known as **Pay-As-You-Go.** It involves an immediate transfer of savings from today's workers to provide retirement incomes to today's pensioners.

(ii) The major alternative form of financing occupational pensions is known as **funding**. In essence, funding is simply an institutionalised form of individual saving. When the savings resulting from abstinence are put into a pension fund, the "consumption later" will be as a result of the pension to be received. Pension funding may take several forms:

(a) Investment Funding: Here, the fund which has been built up from contributions, etc, is invested in assets outside the company involved. For example, if the Marks and Spencer Pension Fund were investment funded, then it would not hold any financial assets issued by the Marks and Spencer company, neither would it lease or rent any property from them. In other words, the pension fund would be completely independent from its parent company, except in the levying of contributions.

(b) Book Reserve Funding: this second method of funding is exactly the opposite of investment funding, in that the fund is wholly invested in the parent company. In effect, this approach means that there is not really an actual fund being run by an organisation independent of the company, but rather that the company operates and administers a pension scheme which it finances simply by recording in its accounts a liability for pensions. Usually, owing to the various tax reliefs obtainable, such a method means that a pension fund has effectively invested in its parent company.

It is interesting to note that the book reserves method is most common in West Germany, Pay-As-You-Go is most highly favoured by the French, while investment funding is the predominant method of financing occupational pensions in both the United Kingdom and the United States of America. This begs the question as to why there is such a divergence of methods employed, especially among the European countries? The most apparent reason for this divergence appears to be the hyper-inflationary experience of both France and Germany between the two World Wars. During this period, the investors of these two countries saw the values of their capital funds eroded into oblivion in a short period of time. This experience was not shared by the United Kingdom, however. Moreover, around the turn of the century, the United Kingdom possessed well-developed capital markets, vastly superior to those elsewhere, and so the British financial intermediaries were more able than their foreign counterparts to find suitable and adequate investment outlets with low risk levels.

Before moving on to a critique of the various methods of financing occupational pensions we have outlined, it would seem appropriate to point out that beyond this chapter, very little attention (if any) will be paid to the Pay-As-You-Go system; to quote Professor Jack Revell:

> ...we are concerned in this book only with those schemes which are funded, that is which have funds equivalent to the actuarial liability invested in income producing assets; unfunded schemes have no assets and cannot be counted as financial institutions. (1973, p. 406)

2.2.3 Pension Fund Financing: Evaluation

We have considered thus far three possible methods of financing operations that are available to a pension scheme. In deciding which method to adopt, the fund must take the following principal factors into account:

(i) the security of pension rights;
(ii) the cost;
(iii) inflation proofing;
(iv) demographic pressures; and
(v) savings and investment.

Many theoretical arguments can be found to justify adoption of each of the three methods of financing the provision of pensions. However, despite the evolution of various practices to meet some of the shortcomings of each method, there still appears to be certain defects which emerge as an intrinsic failing of that particular method. Therefore, we now consider each of the methods by evaluating them in terms of the five criteria above.

(i) the security of pension rights: At the present time in the United Kingdom there are about 65,000 separate pension funds. The principal factor behind their development is the security of pension rights. With the vast majority of schemes being investment funded, contributing members and existing pensioners still have their pension rights maintained in the event of the parent company being declared bankrupt or demising for any other reason. For those who remain in the employ of a single company for the whole of their working life, the investment funding method of financing occupational pensions provides good security (notwithstanding the ravages of inflation). Nonetheless, there are two major criticisms which can be levelled against the the security argument: firstly, although it appears very reasonable on a micro scale, when applied on a macro scale there would appear to be vast 'over-insurance' against the prospects of bankruptcy; secondly, due to its highly decentralised nature, the system in the United Kingdom has failed to guarantee adequately the pension rights of those employees who (eg) regularly change jobs, unless they are in the nationalised industries. This would appear to have been one of the major factors contributing to the low level of labour mobility among the British workforce. Under the current system—the Castle scheme[11]—much has been done to rectify this problem, although there is still much more that could be done. Both the Pay-As-You-Go and book reserve methods afford less security than the United Kingdom's investment funded method of financing occupational pensions. Under Pay-As-You-Go, workers (and, therefore, contributors) are dependent upon the goodwill of future generations for the provision of their pensions. On a micro scale, this might well lead to problems if, for example, a company got smaller, or on a larger scale if an entire industry experienced a decline. The French, who are the major exponents of the Pay-As-You-Go system, try to combat these problems by organising on a federated basis across industry groupings. This also helps to ensure the pension rights of those mobile workers who change jobs more frequently, as it is less likely that an employee would change industries when changing jobs. Thus, the mobile worker tends to be protected by remaining within the same federation. Nonetheless, the Pay-As-You-Go system still depends wholly on the will and ability of future generations to pay.[12]

Under the book reserve system the problem of the security of pension rights may be considered as a case of "putting all of one's eggs into one basket"! With the fund effectively invested in the parent company, the cash-flow of the parent company is greatly improved compared to that of (eg) a similar British counterpart. However, especially from the viewpoint of the prospective pensioner, there are all of the problems associated with non-diversification of investments, but in West Germany these have been combatted by the setting up of the Pension Security Institute (PSI). By paying a premium of 0.15 per cent of its per annum pensions liability to the PSI, a company effectively insures its employees' pension rights in the event of its own insolvency. On a macro scale this would appear to be a more effective and logical method of safeguarding the pension rights of workers. There are those who advocate this form of organising pensions on the grounds that the extra benefits due to the improved cash-flow experienced by firms (which improves their industrial performance and thus their competitiveness over the longer term, enabling society to provide better pensionable benefits) outweighs the increased costs imposed by 'self investment'. Evidence for this, however, remains scant and, at best, anecdotal, relying mainly on the (dubious) argument that this form of organisation of pensions' provision underlies the rather better performance of the West German economy than that of the United Kingdom over recent decades.

(ii) + (iii) the cost and inflation proofing: For obvious reasons the criteria of cost and inflation proofing must, to a certain extent, be linked, and so we shall consider them together. In a non-inflationary environment the difference in costs between a funded system (such as that used in the United Kingdom) and Pay-As-You-Go is partly one of time scale. In its early stages, a funded scheme will be the more expensive as the fund is being built up, but in the longer run, it becomes cheaper as the advantages of compound interest, etc, bear fruit. This would appear to contradict the currently popular misconception that, because a fund must somehow be built up, the U. K. funded system is more expensive than the Pay-As-You-Go system. However, let us look at what happens when inflationary conditions prevail. It is entirely because both France and West Germany have experienced hyper-inflation, and consequently, seen huge funds of assets eroded away in very short periods of time, that they are against using the funding system for their pension schemes. This is in direct contrast with the U. K. experience. Such an erosion of capital values is a prime cause of the concern that has arisen over the cost of funded pension schemes. With a Pay-As-You-Go system, inflation *per se* is not so important because (for example) 1985 pensions are being paid for with 1985 pounds (£s) from 1985 contributions, rather than with pounds accumulated over a working lifetime which are open to a high rate of depreciation.

Consequently the need for pensions to be inflation proofed has become one of the strongest weapons in the armoury of advocates of the Pay-As-You-Go system of financing occupational pensions. The ability of a funded scheme to guarantee inflation-proof pensions depends wholly on the real rate of return that the fund can obtain on its investments. In fact, as part of the Castle scheme, the United Kingdom government is required to provide inflation proofing once a fund's pensions are in payment up to the level of the guaranteed minimum pension (GMP).[13] Nonetheless, with everything considered, on a cost basis the Pay-As-You-Go system would appear to be preferable, particularly under inflationary conditions.

(iv) demographic pressures: When considering the impact of demographic pressures on the various methods of financing occupational pension schemes, it is clear that the funded method enjoys a distinct advantage over its Pay-As-You-Go rival. For example, if the population of a country were declining and, therefore, the proportion of dependent old people increasing—as is currently the situation in many western nations—then funding may be seen as a way of levelling out the increasing cost of providing pensions. On the other hand, Pay-as-You-Go creates an increasing burden on contributions, with a smaller working population supporting an increasing population of the elderly. A similar impact is, and has been, brought about by progressive reductions in the average age at which retirement begins. Under a much more stable demographic situation, such as where the age distribution of the population remains largely unchanged over time, Pay-As-You-Go would be far simpler to operate than a funded system because no (actuarial) assumptions would have to be made about future rates of return on investments, of retirement, of inflation, and so on. Indeed, perhaps the major advantage of the Pay-As-You-Go method of financing occupational pensions is that, even from its very beginnings, it can provide pensions for existing retired people, and also that improvements in benefits can be implemented and be immediately effective. Nonetheless, it must be remembered that demographic pressures do exist such that under current circumstances in the United Kingdom (the United States, too) the funded scheme is at a distinct advantage over its Pay-As-You-Go counterpart.14

(v) savings and investment: Although under many of the previous criteria we have considered Pay-as-You-Go appeared to enjoy a measure of superiority over funding as a means of financing occupational pensions, we find that when it comes to the savings/investment criterion "the boot is on the other foot"! Here we are looking at the overall economic impact of the way in which pension schemes are financed. Contributions to funded schemes are essentially additions to savings, and may be regarded as a transfer of resources between the personal sector of the economy and the corporate and public sectors through various financial intermediaries.15 The economic impact of pensions will be largely determined by the nature and extent of the various transfers of resources, but serious analysis requires a lengthy discussion which is more purposefully pursued elsewhere in this paper.16 If a pension scheme is investment funded then the contributions which go to make up the fund are free to be invested in whatever is likely to yield the greatest return, ie, to be efficiently allocated among competing investments. As is usually the case in the United Kingdom, these funds are thus invested in a whole spectrum of financial assets, property and so on. A funded scheme which operates along the lines of the West German book reserve system has its 'contributions' invested in the parent company. To judge which of these funded methods is the more efficient, it is necessary first to determine whether or not the parent company can internally generate a higher rate of return than it might obtain by investing the fund externally; we have seen earlier in this chapter how 'self-investment' might lead to a misallocation of resources. On a micro scale there might appear to be little to choose between the two types of funding, as the only effective difference lies in the mechanism for distributing the funds for investment purposes, but on the macro scale it can be seen that, under a savings/investment criterion, funding is much superior to Pay-As-You-Go, with investment funding being preferable to the book reserve method on grounds of allocational efficiency.

At this juncture in the narrative, it is convenient to pause for a brief consideration of those pension funds in the public sector. Most of these schemes, which are usually operated by the Local Authorities and public corporations, are funded and may therefore be incorporated into the overall analysis of occupational pension schemes considered earlier in addition to being separated out from the rest of public sector finance. However, there is a small group of pension schemes within the public sector which are said to be funded but essentially operate on a Pay-As-You-Go basis. These 'notionally funded' schemes include the 'funds' for school teachers, National Health Service staff, etc, and appear in public finance records by 'leading' the difference between their income and outgoings; this appears as a receipt in the public sector capital account. In the United Kingdom public sector there also are a number of non-contributory Pay-As-You-Go schemes (eg, the Civil Service, the Armed Forces, etc) and, as with all Pay-As-You-Go schemes, we must regard these in a very different light to funded schemes. To recall once again the thoughts of Professor Revell,[17] a pension scheme which operates as a Pay-As-You-Go system cannot in any way be considered as a financial institution; its existence does nothing to enhance the savings-investment process.

Chapter Two Endnotes:

1 See Chapter One, page six.

2 Much of what follows is based upon arguments expounded in the seminal work by J. G. Gurley and G. S. Shaw (1960), *Money in a Theory of Finance.*

3 According to Ricardo's "Principle of Comparative Advantage", even if one country (or individual) has an absolute advantage over another country in the production of all goods, it should specialise in the production of those goods in which it has a comparative advantage, ie, those goods in which its production is least inefficient compared to other countries (or individuals). Comparative advantage is usually measured in terms of lowest opportunity cost.

It can be shown that if countries specialise in producing goods in which they have a comparative advantage then total production will be increased. If trade then occurs some countries will be made better off, with all being at least as well off as before. Coverage of the Principle of Comparative Advantage, complete with numerical examples, can be found in almost every textbook on the basic principles of Economics.

4 Although it is theoretically possible for the borrowing and lending of real wealth to occur, it is unlikely to occur to any significant degree (eg, titles to real wealth are less easy to establish legally than titles to payment of debt) and we may, therefore, ignore it for the purposes of our analysis here.

5 According to Menger (1892) the main characteristic that creates a medium of exchange out of any particular commodity is its high degree of saleableness (*Absatzfahigkeit*). Alchian (1977) presents a similar argument, in that a commodity becomes used as a medium of exchange because most people are 'experts' in that commodity; ie, their costs of acquiring information about that commodity (its quality, etc.) are relatively low. Thus the medium of exchange reduces transactions costs. Brunner and Meltzer (1971) present a similar line of argument. All of these arguments can be seen at work in a very human way in Radford's famous article on the organisation of a prisoner-of-war camp during World War II (1945).

5A This legal distinction was later repealed under the 1987 Banking Act.

6 See Chapter Three for historical details, and Chapter Four for an analysis of the current position.

7 Quasi-Autonomous National Government Organisation. Basically an agency of the government that is, to all intents and purposes, autonomous in its decision-making.

8 For example, medical, social, cultural, etc.

9 This is most certainly true of any new scheme, even without putting investment income to one side.

10 See Chapter Four, page 4-4 and Tables 4-1 to 4-3.

11 See Chapter Four.

12 That this might be a problem can be seen by considering recent events in the United States concerning its ERISA program.

13 See Chapter Four for a fuller explanation of this point.

14 See Chapter Three, especially Table 3-1.

15 There are some who might argue that contributions to funded schemes are really a hidden form of taxation, because they are essentially 'compulsory'.

16 See Chapter Four.

17 See page 2-13.

Chapter Three: A History of the Pension Provisions Industry

3.0 Introduction

> "On the evening of the twelfth of April, just as I was about quitting my desk to go home, (it might be about eight o'clock), I received a summons to attend the presence of the whole assembled firm in the formidable back parlour. I thought, now my time is surely come; I am going to be told that they have no longer occasion for me. L-, I could see, smiled at the terror I was in, which was a little relief to me, when to my utter astonishment B-, the eldest partner, began a formal harangue to me on the length of my services, my very meritorious conduct during the whole of the time (the deuce, thought I, how did he find out that? I protest I never had the confidence to think as much). He went on to descant on the expediency of retiring at a certain time in life (how my heart panted!), and asking me a few questions as to the amount of my own property, of which I have a little, ended with a proposal, to which his three partners nodded a grave assent, that I should accept from the house, which I had served so well, a pension for life to the amount of two-thirds of my accustomed salary—a magnificent offer!"

In such a manner did Charles Lamb, in his essay "The Superannuated Man" (1825) describe a scene that must have been common (although perhaps not the outcome!) around the late eighteenth and early nineteenth centuries. It is a mark of how far we have come in our thinking towards social welfare that nowadays, unlike the subject of Lamb's essay, we regard the provision of a pension as something of a norm; a right rather than a privilege. By way of corollary to this norm lies public acceptance of the huge volume of funds managed by the various pension funds in the United Kingdom, currently estimated in excess of some £190 billions! Yet even a century ago—a mere three generations—the provision of pensions was regarded as an unexpected charitable gift, as so vividly illustrated by Charles Lamb (above). Pensions were a luxury for a very few lucky individuals only, and the small handful of pension funds that did exist at that time controlled but a mere pittance by way of funds. One of the objectives of this chapter is to trace out the development of the pension funds from their humble beginnings as local savings clubs to their current position, when they control funds in excess of the GDP of many small countries.* At the same time we shall be seeking to discover why there has been such a radical alteration in public attitudes towards pensions over such a relatively short space of time; indeed, even up to the Second World War pensions were generally regarded as a privilege rather than a right.

* Hong Kong's 1991 GDP forecast is US$79.5 billion; for New Zealand US$41 billion (*The World in 1991*). In 1985 the pension funds holdings were some £157 billion (Appendix A-1).

It has been suggested elsewhere on many previous occasions that the primary purpose of the pursuit of knowledge is to view the present in the light of the past so that we may draw some conclusions about the future. In keeping with this adage we shall, in this chapter, be bathing ourselves in the light of the past prior to a consideration of the current position of pension funds in the United Kingdom. We should then be in a position to construct a model of the past and the present and, hopefully, derive some conclusions about pension funds in the future.

As illustrated by the opening quotation to this chapter, the systematic provision by employers for the retirement and old age of their employees is by no means entirely a recent innovation, and has a very much longer history than many people might imagine. It would probably be fair to date the origins of pensions proper to the early Industrial Revolution years, although, no doubt, there were probably one or two schemes around even before this time. When one talks of pensions prior to the twentieth century, the reference is to provisions made for the care and upkeep of the aged. Demographic data shows that the proportion of the population considered to be elderly has been increasing (by and large) since Mediaeval times, and at a phenomenal rate in the current century. Table 3-1 (below) illustrates (for example) that the proportion of the population of England, Scotland and Wales over the age of sixty-five has increased from 5% in 1851 to 11.0% in 1951 and 15% in 1981. By turning back the clock we hope to obtain some ideas of the response of various institutions to the increasing needs of the growing population of the elderly prior to our own experience.

For the sake of clarity, the history of pensions provision presented here has been divided into six major eras, with the current situation being covered in detail in the chapter following. In addition, at the end of the chapter there is an Appendix in which the major developments in the provision of pensions in the United Kingdom are presented chronologically, including brief details of some of the more important legislation.

3.1 Scenario and Genesis

Before the reign of Queen Elizabeth I, any person who lived to an age that we would now regard as old (say sixty-five) was indeed a rare exception. Individuals constituting such exceptions would be totally reliant upon either continued health and mobility during old age or the goodwill of their family to

Table 3-1: Age Structure of the Population of England, Scotland and Wales

(figures in thousands)

Age	1851	%	1901	%	1951	%	1981	%	2001	%
0 - 4	2,720	*13%*	4,250	*11%*	4,189	*9%*	3,305	*6%*	3,899	*7%*
5 - 9	2,432	*12%*	3,980	*11%*	3,560	*7%*	3,578	*7%*	4,214	*7%*
10 - 14	2,231	*11%*	3,811	*10%*	3,199	*7%*	4,288	*8%*	4,232	*7%*
15 - 64	12,466	*60%*	23,226	*63%*	32,575	*67%*	35,077	*64%*	36,093	*64%*
65+	968	*5%*	1,734	*5%*	5,331	*11%*	8,139	*15%*	7,990	*14%*
	20,817		37,001		48,854		54,387		56,428	

Age Structure of the Population of England and Wales

(figures in thousands)

Age	1851	%	1901	%	1951	%	1981	%	2001	%
0 - 4	2,348	*13%*	3,717	*11%*	3,718	*8%*	2,980	*6%*	3,542	*7%*
5 - 9	2,092	*12%*	3,487	*11%*	3,162	*7%*	3,226	*7%*	3,819	*7%*
10 - 14	1,913	*11%*	3,342	*10%*	2,812	*6%*	3,858	*8%*	3,823	*7%*
15 - 64	10,743	*60%*	20,465	*63%*	29,241	*67%*	31,742	*64%*	32,799	*64%*
65+	830	*5%*	1,518	*5%*	4,825	*11%*	7,413	*15%*	7,287	*14%*
	17,926		32,529		43,758		49,219		51,270	

Age Structure of the Population of Scotland

(figures in thousands)

Age	1851	%	1901	%	1951	%	1981	%	2001	%
0 - 4	372	*13%*	533	*12%*	471	*9%*	325	*6%*	357	*7%*
5 - 9	340	*12%*	493	*11%*	398	*8%*	352	*7%*	395	*8%*
10 - 14	318	*11%*	469	*10%*	387	*8%*	430	*8%*	409	*8%*
15 - 64	1,723	*60%*	2,761	*62%*	3,334	*65%*	3,335	*65%*	3,294	*64%*
65+	138	*5%*	216	*5%*	506	*10%*	726	*14%*	703	*14%*
	2,891		4,472		5,096		5,168		5,158	

Sources: Mitchell, B. R. and Deane, P. (1962), *Abstract of British Historical Statistics*, pp. 12-13.
Central Statistical Office (1980)
Winter, J. M. (1982), "The Decline of Mortality in Britain 1870-1950" in
Barker, Theo, and Drake, Michael (eds.), *Population and Society in Britain, 1850-1980.*

provide for them in their twilight years. Of course, the social structure then was very much different from that of today, especially with regard to the family. Indeed, up until fairly recent times, it was not an uncommon practice for the whole of the extended family[1] to live together as a single unit, both socially and economically. Consequently, it was considered as a regularly accepted practice for the care of, and provision for, the elderly to be undertaken by their offspring and/or younger siblings. Cities then were much smaller and less prolific than now, with people being very much tied to the land by the Feudal system. However, for those elderly unable to fend for themselves and having no offspring (or, for one reason or another, having no contact with their families) there was no provision; they would remain as vagabonds and tramps, outcasts from society, searching for some remnant of food in somebody else's garbage—usually hopeless cases who died of neglect and starvation before too long. Yet this was not a destiny reserved exclusively for the elderly. With a much lower level of Gross National Product, and more inequitable distribution of income and wealth than today, poverty was rife in pre-Elizabethan England.

The economic policies of the immediate predecessors of Elizabeth I had left the English economy in tatters. Successive debasements of the coinage[2] by the monarchy had hit Tudor England hard, resulting in both high inflation and a high level of unemployment that left a large proportion of the population 'living' below subsistence level. The reforms instituted by Elizabeth I tried to remedy the situation and alleviate some of the misery that had befallen such large sections of the English populace. As well as outlawing debasement of the coinage, (a longer-term 'monetarist' remedy?) the Elizabethans also brought into being the institution of the "Poor Law". Part of the enactment of this law was the creation of the "Workhouse", an institution whose sole task was to provide its 'residents'—the poor, including the elderly poor—with (barely) subsistence levels of nourishment and clothing for which they would, in return, have to work at various tasks for an unbelievable number of hours each day, often in sub-human conditions. Life in the Workhouse was indeed wretched and often torturously hard, but nonetheless preferable to 'living' on the streets—just!

Although a significant proportion, it is indeed fortunate that, at this time, only a minority of the populace were afflicted by poverty and destitution, with most people able to obtain enough employment to (at the very least) scrape a living and prevent having to endure the misery of the Workhouse. However, even in those days of yore, it was realised that there was an age beyond which an individual could not, or should not be required to work and yet would still need the provision of an income. To reiterate, for centuries such provision had been considered a family responsibility, but the times they were a-changing—albeit slowly—with the Civil Service at the forefront of progress.

The first real recognition of the necessity of providing some form of income to 'worn out' employees came in the late seventeenth century. Initially H. M. Customs and Excise adopted a pensions system whereby any new recruit was forced to pay one-half of his salary to his predecessor; a very crude form of Pay-As-You-Go! However, the impracticability of this system had become very clear by the eighteenth century. Indeed, those employees at the lower end of the salary scale found this system rather overwhelming! In consequence, a new funded scheme was brought into operation. All customs officers in certain grades were charged a levy of 2.5 per cent of their salaries which went to make up the fund. The contribution rate was fixed on a straight, Pay-As-You-Go basis, although the burden was spread over the whole Customs and Excise workforce. Nonetheless, as the ratio of pensioners to contributors increased (ie, as more officers retired), the fund began to decline. This decline was initially being subsidised out of Exchequer revenues. However, by the middle of the eighteenth century the fund had become solvent and could be said to be on a funded basis in the modern sense of the word, although not adequately funded.

The scheme had spread slowly to other areas of the Civil Service, but by the latter part of the eighteenth century it was in a chaotic state. Thus it was in 1785 that a Commission was set up with the object of enquiring into the "fees, gratuities, perquisites and emoluments" of public office. Upon completion of their enquiries the Commissioners reported that they found wide abuse of the system of the payment of pensions. In particular, they had found pensions being given as favours to favoured officers, mistresses and the such-like. There was also little or no public accountability as to how the funds were spent. The outcome of all this was the first Act of Parliament to concern itself solely with pensions. The 1810 Superannuation Act made the pension scheme for Customs and Excise officials non-contributory, with benefits payable by the Exchequer. Three major motives accounted for the establishment of a scheme of this type in the public sector: firstly, there was a desire to prevent abuse and corruption; secondly, with the institution of pensions there was less reason to keep older, inefficient staff in employment and so efficiency would benefit; and thirdly, it was believed that the attraction of pensions would greatly reduce staff turnover, although this motive was not wholly adopted until the middle of the century when the next developments took place.

In 1834 a second Superannuation Act was passed by Parliament. This Act gave statutory definition to a non-contributory pension scheme for male Civil Servants. Benefits of up to two-thirds of salary were payable at age sixty-five after a qualifying period of forty-five years' service under the Act. However, this was just the beginning, as further developments were in the pipeline. In 1859 the basis of the Civil Service scheme was altered with the retirement age being reduced to sixty, and qualification for benefits changing to a system whereby for each year of service an employee became entitled to a benefit of 1/60th of salary, subject to a maximum of 40/60ths.

With the central government paying pensions to its employees, it was clear that this would be a practice that other employers would need to adopt if they were to compete for labour services. Many Local Authorities were quick to follow the Civil Service lead, setting up very similar schemes. And yet, it was not until 1874 that a scheme for the Armed Forces was set up; 1890 for the Police Force; 1898 for teachers; and as late as 1925 for the Fire Service. Not all of the public servants' schemes—or statutory schemes, as they are formally known—were established along the same principles as the Civil Service scheme. In those cases where employees were paid directly out of the Exchequer revenues there seemed to be no reason for not financing their pensions in the same manner. Equally, there was no need for these schemes to be funded on a "security of pension rights" grounds, as the security of the pension was dependent upon the Chancellor's ability to raise taxes.

Following not too far behind the public sector in the provision of pensions were a few of the more progressive concerns in the private sector (although still a tiny minority). Originally, as in the public sector, these concerns gave pensions on an *ex gratia* basis, ie, by employers acting in a spirit of benevolent paternalism.[3] Those few pension schemes that did actually exist in the nineteenth century tended to be confined to the banking and insurance industries, and to the railway companies. Yet, for the poor, such as the unemployed and especially the aged poor, the situation that had existed during the time of Elizabeth I, still prevailed now, in the reign of Queen Victoria. Indeed, things were perhaps worse as the public regarded the Poor Law and the Workhouse as an immutable part of everyday life in England.

3.2 The Victorian Era

The Victorian attitude towards poverty and the poor had been conditioned by several centuries' existence of the Poor Law, as well as the prevailing moral attitudes of the time. Thus, it would not be unfair to describe the Victorian attitude as being a "Poor Law mentality"; that is to say, that because the Poor Law and its attendant institution, the Workhouse, existed and had done so for many, many years, they were accepted as being correct—the norm. To compound this, the Victorian *mores* were such that poverty in old age was widely regarded as being the result of moral laxity during a person's working life; there could be no other cause! However, along with the Industrial Revolution and its attendant new technology, there was thrown up a new breed of social reformer determined to alleviate the misery and drudgery that had been created as a side-effect of industrialisation. And these reformers came from many different walks of life. For example, in addition to more radical, predominantly academic reformers such as Karl Marx and Friedrich Engels, there were also more 'commercial' writers such as Charles Dickens who would 'research' by living temporarily amongst the poor and needy, the old, and the down-and-outs. Appalled by what they saw and experienced, they would try to bring about changes by bringing these vile conditions—to which the poor were subjected often through no fault of their own—to the attention of the general public, usually via their written works.[4] These publications, aimed at increasing public awareness of contemporary social problems, would occasionally make people sit up and take notice, and sometimes led to more 'serious' work being undertaken to help the underprivileged and especially the aged poor.

Perhaps one of the more widely regarded authors of such serious research was Charles Booth who, in the late 1800s, produced voluminous reports on the prevailing social conditions in London. In his *Old Age Pensions and the Aged Poor*, published in 1899, he exposed the Victorian Poor Law mentality as the narrow-minded and self-righteous bigotry that it was. This exposé was achieved by proving that, at the lower end of the scale, wages were so low as to be insufficient for saving—below even the subsistence level described by Marx and Engels (1848) earlier—moral laxity did not even enter into the issue! However, as we have already seen, for those not on the bottom-most rung of the socio-economic ladder, various pension schemes did exist, although these were the exception rather than the rule. Consequently, Booth was prompted to write:

> Everywhere a good deal is done for old servants. Their care is a recognised charge on all industrial or commercial undertakings of character and long standing.

And also:

> There are many old people in the receipt of industrial superannuation allowances more or less charitable in their character, though very often given as an acknowledgement and recognition of past services.

This would be a fair representation of the general nineteenth century view of pensions provision—a benevolent charity on the part of the employer. Although such charity had become a fairly widespread practice, the security of any pension in the private sector relied solely upon the goodwill of the employer. Of course, for many years the Guilds and Friendly Societies had existed, organising collective protection against retirement as well as various pension schemes to provide for widows. However, for the most part these owed their existence to professional bodies of one kind or another, and did little or nothing to alleviate the plight of the aged destitute.

Both the lack of security of pensions provision in the private sector and a distaste occasioned by the system of Poor Law relief prompted Charles Booth to become one of the first and most tireless advocates of national superannuation—a State pension scheme. The type of scheme that he envisaged did not embrace the principle of universality—ie, he did not prescribe the automatic payment of an old age pension to all citizens. What, in fact, he did propose was a State pension that would be available to all citizens without the need for a plea of destitution or the possibility of commitment to the dreaded Workhouse. He suggested the scheme be non-contributory, financed out of general taxation, providing pensions of 7/- (35p) a week for men and 5/- (25p) a week for women, both payable from the age of seventy. Booth regarded a scheme of universal pensions as impracticable because it would place such a burden on the Exchequer as to prevent an adequate pension being paid to those who really needed it. He also rejected the idea of contributions as he felt that this would give contributors the impression that they had purchased the right to draw a pension, and also because he considered that the advantage of financial savings would be outweighed by the costs of collecting contributions and other administrative expenses. Booth hoped to limit the payment of the pension to those who needed it by use of social pressure, for he was most certainly not in favour of a means test. The right to draw a pension at the stipulated age was to be the right of every citizen, but Booth hoped that a man of means who actually drew the pension would be regarded as an offender against the good will of the community. Nonetheless, to bolster this he suggested that the pension be paid at a fixed time each week to the pensioner in person on attendance at the Post Office, proxy payments being made only on production of a medical certificate of inability to attend in person. The idea was that a lady or gentleman of wealth would be ashamed to be seen entering a Post Office to collect their pension whilst their carriage waited at the door.

Despite the fact that the work of Charles Booth and others was creating a changing attitude towards poverty, especially during old age, British politicians seemed slow to latch on to this newly emerging mood. Perhaps the only exception was Joseph Chamberlain who, like Booth, produced a scheme for the provision of old age pensions by the State. Chamberlain's proposals led to the creation of a Royal Commission to look into the plight of the Aged Poor. This led to a further enquiry, but Britain was already lagging behind Bismarck's recently united Germany, where the Law of Insurance against Old Age and Infirmity, passed in 1889, stood as a shining example of social welfare for the rest of the world to follow.

In the private sector, things were now progressing just a shade faster. Around the turn of the century, two notable large employers, Rowntrees and Lever Brothers, set up their own private contractual pension schemes. This should have been a spur for like-minded enterprises to follow suit, but it was not until shortly after the first World War that private sector pension schemes began to spread with any speed. However, throughout this period when employers were beginning to establish formal pension schemes, premiums paid by individuals towards life assurances or deferred annuity policies were exempt from tax by statute while, on the other hand, the exemption of payments of pensions by employers generally, and payments to pension schemes in particular, had no statutory definition for taxation purposes, and relied heavily upon their acceptance as trading expenses. In fact, this had been the case ever since 1853, and intermittently before that but subsequent to 1799, and may be regarded as one of the major factors which inhibited the growth of private sector occupational pension schemes at that time.

3.3 The Early Welfare State

The increasing complexity of industrial life, the rapid growth of the Labour movement and the Trades' Unions, and the example of the German experience all provided a stimulus to the already-changing attitude of the British public towards social welfare policies. In the private sector, as we have already seen, the disadvantages of a system which relied upon charity had been recognised by a number of employers. Other continuing developments took place by means of trust funds—schemes under which contributions were invested in insurance policies—and provident funds. The latter were usually financed by joint contributions (ie, from both employee and employer), although some were more in the nature of thrift clubs to which the employee was the sole contributor. However, the benefits provided by these schemes were invariably meagre, and usually took the form of a lump sum payable upon death, incapacity or retirement. Despite their inadequacy, however, such schemes were responsible for helping bring about enough of a change in public opinion to allow David Lloyd George to introduce in 1908 the Old Age Pension Act as part of an overall State programme of social welfare for the needy.

Immediately prior to the 1908 Act, the Local Authorities had been providing poor relief at an average rate of half-a-crown (ie, 2/6d, or 12.5p) per week to (about) one-third of the population above the age of seventy. Yet some two-thirds of these poor relief recipients would be included under a present-day definition of old-age pensioners. With Lloyd George's new law, a pension of up to 5/- (25p) a week was to be provided to each person over seventy years of age. But, against the earlier advice of Charles Booth, even this was subject to a means test. With an average weekly wage of £1-10/- (£1-50p) at the time, it is clearly obvious that the pension was still regarded as no more than a 'charitable' means of preventing absolute destitution—it was intended to supplement whatever could be provided by other means, such as savings, etc. The 'Poor Law mentality' still held sway.

A year later, in 1909, the Civil Service pension scheme was altered such that benefits at retirement became a pension of 1/80th of salary plus a cash payment of 3/80ths of salary for each year of service, subject to a maximum qualifying period of forty years. Simultaneously, a lump-sum death benefit of one year's salary was also introduced. There can be no doubt that this latter action, the effective commutation of part—approximately one quarter—of the pension as a tax-free capital sum was a most outstanding development in the field of pension schemes, and one which was to have important and wide-ranging repercussions on future legislation and pension scheme thinking in general.

In 1911, by which time the State pension scheme had been in operation for three years, there were more than 900,000 recipients of the State pension and a total of £12 million was being paid out of general taxation. With this increased burden on the Exchequer, and with an ever-increasing number of pensioners, the need to finance the scheme outside of general taxation revenues became greater. And thus, Lloyd George laid before Parliament a new Bill, which was duly passed. Again, following the lead of Bismarck's Germany, a system of National Insurance was set up. Under this system an obligatory deduction was made from each person's wage or salary by way of a National Insurance 'premium' to provide cover against ill-health and unemployment. Although it was not until 1925 that the National Insurance scheme was extended to cover widows, orphans and old age pensioners, the 1911 Act was a landmark which prompted further developments in other areas which enabled the private occupational pension schemes to perform more efficiently and, at the same time, made it more worthwhile for an employer to provide some form of pension scheme for his workers.

In 1916 the Finance Act made certain provisions concerning pension funds. Nonetheless, because of the First World War these provisions were not consolidated until the Income Tax Act was passed in 1918. Under this latter Act, limited tax relief was granted on premiums paid to secure either life assurance benefits or deferred annuities under a *bona fide* pension scheme. However, the scale of this tax relief, which is shown in Table 3-2, was subject to various restrictions: for example, no allowance was given in respect of any part of a premium paid towards an assurance securing a capital sum at death which was in excess of seven per cent of that capital sum; if the contract was for a deferred annuity, a further limit of £100 was placed upon the premium in respect of which an allowance may have been claimed. It is interesting to note that many of these restrictions were still in operation in the mid-1950s!

Table 3-2:

Amount of Annual Premium	Part of Premium Qualifying for Relief from Tax at Standard Rate
Up to £10	The Whole
£10 - £25	£10
Over £25	Two-fifths

Under the terms of the 1920 Finance Act, the operations of the 1918 Act were extended to include certain widows' and orphans' schemes. Tax relief on premiums paid to secure widows' and orphans' pensions under a compulsory scheme as a condition of employment was granted according to the scale shown in Table 3-3. However, these developments were of relatively minor importance unlike the changes that were about to unfold upon an unsuspecting British public!

Table 3-3:

Total Income of Contributor	Rate of Tax at Which Relief is to be Allowed
Not Exceeding £100	Half Standard Rate
£1,000 - £2,000	Three-quarters Standard Rate
Over £2,000	Standard Rate

3.4 Between the Wars

Following representations made to it by interested parties, the Royal Commission on Income Tax made certain recommendations in it's 1920 report which were implemented in the following year's Finance Act. As the Commission noted, there had been a gradual increase in the numbers of trust fund types of pension scheme, under which system contributions, whether made jointly or by the employee only, were invested under a trust, mainly in trustee securities, of course! However, such funds did not enjoy any special taxation privileges at that time and were, therefore, at a disadvantage in comparison with insured schemes, under which employees' contributions received some relief from tax. Section 32 of the 1921 Finance Act granted, *inter alia*, that both employers' and employees' contributions be given full relief from tax as allowable expenses. Furthermore, in cases where the fund was privately administered, its investment income in the hands of the trustees was freed from all liability to tax. However, in order to qualify for these concessions, a fund had to satisfy elaborate conditions, mainly:

(a) that the fund was a *bona fide* scheme, established under irrevocable trusts;

(b) that the sole purpose of the fund was for the provision of annuities for members, or for their widows, children, or other dependents;

(c) that the employer was a contributor to the fund; and

(d) that both the employer and the employees were aware of their rights and obligations in connection with the fund.

The following year saw Parliament pass the Local Government and Other Officers' Superannuation Act. This enabled Local Authorities to provide for the superannuation of their employees if they wished to do so. Following so closely behind the provisions of the 1921 Finance Act, there can be no doubt that this further legislation helped to spread a general interest in pensions' provision, and increasing numbers of properly constituted superannuation funds came into being. Initially, it seemed that insurance companies could play no part in the development of this budding industry, but some years later it was established that the trustees could invest in deferred annuity policies without affecting the employees' expense relief, provided that they had the option and were not compelled to do so. This initial uncertainty, coupled with the fact that, at the time, insurance companies were liable to tax on the accumulated funds representing such deferred annuities, doubtless postponed their entry into the pensions' provision industry.

While all of these major developments to improve the lot of those in occupational pension schemes were occurring, there were, however, no similar improvements in the pension arrangements for the majority of the elderly population, ie those reliant upon the State pension. Their benefits were still subject to the provisions of the 1908 Old Age Pensions Act and its 1911 amendments, but this was not to be the case for very much longer. In 1925 Parliament passed the Contributory Pensions Act, which extended the coverage of the National Insurance scheme to include widows, orphans and old age pensioners. This Act also introduced contributory State pensions for manual workers and others earning up to £250 per annum. With pensions increasingly becoming contributory in nature, the means test was discarded, and with it the conception of a pension as a privilege faded; the pension was beginning to acquire the status of a right. Fixed at 10/- (50p) a week, the State pension was payable to each and every person above the age of sixty-five years, irrespective of their contributions record. However noble, this system would not have been able to work if it had been financed solely from employers' and employees' contributions; a large subsidy from the Exchequer was still required to make it viable. Once again, the relatively low level of pension benefits indicates that, although the 'Poor Law mentality' had largely been eradicated, the pension was still regarded as only a basic protection against complete poverty and utter destitution—a safety net barely above the ground!

Worthy of note, but of not quite so much importance in regard to the provision of pensions, was the Trustee Act of 1925. This defined the range of investments permissible to a trustee in cases where no specific powers had been authorised undeı the terms of the trust. Nonetheless, the deed governing pension funds usually incorporated much wider investment powers than those specified in the Act.

With the alterations in the tax laws that had been passed in the early 1920s, there had been an ever-increasing number of pension funds springing up in both the public and private sectors of the economy. In response to their growing numbers, Parliament passed the Superannuation and Other Trust Funds (Validation) Act in 1927. This provided for the registration of pension funds which might otherwise have been declared invalid owing to the rule of law against perpetuities. As an alternative to registration, the Act gave pension funds the option of including in their trust deeds a clause limiting operations to a specific time period.

The next major landmark in the history of pensions' provision actually occurred outside the United Kingdom, but did not take too long to catch on here. This development was the introduction of the Group Life and Pension scheme (to use its British title) in the United States of America. This type of scheme was the first designed specifically to solve the problems of providing pensions for a group of employees via the medium of insurance. And it was as a result of such a scheme that the first major entry of insurance companies into the field of pension provision occurred. The Group Life and Pension scheme involved two separate contracts—one providing pension and the other life assurance benefits. The most important advance afforded by this scheme lay in the fact that benefits for a whole group of employees could now be secured under a single master policy, issued by the insurance company to the employer, whereas previously this would have taken the form of separate policies in the names of the individual employees. Thus, the insurance companies were able to make substantial savings in their setting-up costs, etc, enabling lower premium rates to be charged, whilst employers could also benefit by saving time and incurring less trouble.

Once an employer had decided to establish a Group Life and Pension scheme, they could seek legislative approval along two avenues. Firstly, they could seek approval of their pensions section as a superannuation fund under the provisions of the 1921 Finance Act. This could be achieved by simply setting up the fund on precisely the same lines as a privately administered fund, but also giving the trustees the option of investing in the purchase of deferred annuities on the lives of members from an insurance company. This would be in addition to the more usual investment powers relating to the stock exchange, securities, property, and so on. Approval under the 1921 Act ensured that any contributions by employees—and the Group Life and Pension scheme was almost inevitably installed on a contributory basis—would be allowed in full as an expense for taxation purposes.

The second alternative was for the employer to rely on the provisions of the 1918 Income Tax Act, allowing employees to claim the limited tax rebate attributable to life assurance premiums on the amount of their contributions. If this latter course of action were taken, then no specific approval of the scheme was required. It is worth noting that the general tendency was for schemes for higher-paid staff (ie, those earning around £500 per annum, or more) to be approved under the 1921 Act, while those for lower-paid staff and works' employees to be established under the 1918 Act. This was because it was generally considered that the question of tax relief was of little importance to those who paid little or no tax. A second factor related to any member who changed his employment and wanted a refund of his superannuation contributions. Under the 1921 Act, on such a refund, tax was liable at one-third of the standard rate of income tax (this was later amended to one-quarter in the 1930 Finance Act). The relative merits of the 1918 and 1921 Acts for different employee categories were fairly well understood by employers, and thus it was not uncommon to find two similar schemes operating within a single company—a 1921 Act fund for senior staff, and a 1918 Act fund for the remainder. In essence, of course, there was no fundamental difference save the tax relief on employees' contributions.

At this juncture in the narrative, it would appear convenient to consider briefly a further facet of the private occupational pensions movement in the 1930s. From its early beginnings, the Provident Fund had altered very little, except that quite a number were now instituted on the basis of insurance policies—usually endowment assurances. For the Provident Fund, the use of such policies was the only way in which tax relief could be secured for employees' contributions because uninsured Provident Funds were unable to claim tax relief under either the 1918 or 1921 Acts.

In the latter part of the 1930s another type of pension scheme based on endowment assurances began to gain in popularity. Whereas Provident Funds were only concerned with providing lump sum benefits, the new type of scheme carried a guaranteed annuity option at maturity. Thus, although under the new scheme the benefits could be taken as a lump sum, the insurance company underwriting the scheme would, at the time of the member's retirement, exchange the lump sum for a pension based on a rate of exchange guaranteed at the outset of the contract, if the member so desired. Known as Endowment Assurance Schemes, they were almost always non-contributory as they could not qualify for approval under the 1921 Act and, therefore, tax relief for employees' contributions, because of the lump sum death benefit which formed an intrinsic part of the contract.

In 1937 a further boost to pensions' provision came in the form of the Local Government Superannuation Act. This made it obligatory for Local Authorities to establish superannuation funds for all officials along specified lines. The detailed operation of such funds came to be governed by subsequent amending Acts and numerous prescribed Regulations.

And so, by 1938, in addition to the State scheme, pensions were being provided by funds set up by the Local Authorities as well as by private employers under various trusts and by the use of insurance schemes such as Group Life and Pension Endowment Assurance. Yet despite the vast improvements that had taken place between the two World Wars, the provision of pensions was still sadly lacking. For example, there was still a large proportion of the population not covered, and the benefits that were payable under any scheme were nearly always unsatisfactory. In 1938 there were 600,000 non-contributory pensions under the 1925 Act, with almost twenty-one million people paying compulsory National Insurance contributions, as well as an unknown number of people receiving benefits from private occupational schemes. But it was not until the end of World War II that we finally find a radical move away from the still-prevalent Poor Law mentality regarding the provision of pensions.

3.5 The Beveridge Era

It would be a perfectly natural course of action to assume that no further progress was made in terms of social welfare during the course of the second World War, all government efforts being directed towards the hostilities.

However, in June of 1941 the government of the United Kingdom set up a Committee under the chairmanship of Lord (then Sir William) Beveridge. Its task was to undertake a complete review and survey of all existing national schemes of social insurance, and to make recommendations. The document that this Committee produced a year later—the Beveridge report—suggested what it saw as a rationalisation of the whole system of National Insurance. Due to the War, these suggestions were not able to be implemented immediately, but following the cessation of hostilities they resulted directly in the 1946 National Insurance Act. Under the provisions of this Act, the means test was finally abolished and the principle of universality instituted for all social welfare schemes. All benefit levels (including that for old age pensions) were raised so that all contributors to National Insurance were guaranteed a minimum subsistence income as of right. The level of pension benefits were fixed—initially at 26/- (£1-30p) for a single person, and £2 for a married couple, payable immediately to existing pensioners, and to others after only a short period of contributions. As can be seen in Table 3-4, periodic adjustments were made to the level of benefits by successive governments, mainly to keep pace with inflation, but also to provide for a slight improvement over and above inflation. Payable at age sixty-five for men and sixty for women, the pension took no account of need if the person had retired from regular employment. If, however, part-time earnings in retirement exceeded a specified amount, a reduction was made in the level of benefits. The full pension was payable unconditionally at age seventy for men and sixty-five for women.

There are those who see the recommendations of Beveridge as the late bloom of the nation's social conscience following the traumatic horrors inflicted during the Great Depression.

Table 3-4:

	Weekly Pension Increase for:	
Date of Increase	Single Person	Married Couple
1948	26/-	42/-
1951	30/-	46/-
1952	32/6d.	54/-
1955	40/-	65/-
1958	50/-	80/-

Source: Pilch and Wood (1960) *Pension Schemes*

Naturally, as the level of pension benefits were increased, so were the rates of contribution. These rates were (and, indeed, still are) calculated by reference to the actuarial figure required to produce the given pension at age sixty-five for a young man commencing National Insurance payments at age sixteen. This has usually meant that the value of the benefits provided under this scheme have far and away exceeded the amount paid by any individual in contributions, and, with every increase in benefits and contributions, this margin was widened. Consequently, the cost of providing pensions under the 1946 Act was still being borne ultimately by the Exchequer out of general taxation revenues. This was because, although the term "insurance" was freely used in connection with the scheme, unlike an insured pension scheme, there was no question of the member's contributions being retained and accumulated in a fund to provide for his own benefits when he ultimately retired. No fund as such was built up, except for those occasions when the contributions paid in exceeded the pension benefits being paid out. Thus, although possessing the appearance of a funded scheme, the "Beveridge" State pension actually operated on a Pay-As-You-Go basis, with members' current contributions being used contemporaneously to pay the pensions of those currently retired.

With the adoption of the recommendations of the Beveridge report, Britain became a Welfare State proper, finally dispelling the remnants of the Poor Law mentality that still hung over from times past. During the late 1940s and early 1950s there existed a kind of 'official euphoria' due to the notion that, with the institution of Beveridge, Britain led the world in the provision of welfare benefits and services. Indeed, for a short time it probably did. However, by the mid-1950s the United Kingdom had slipped some way down the Welfare 'League Table', mainly due to official complacency, political haranguing and the relatively low growth rate of the United Kingdom economy, and so the problem of poverty in old age still had not been adequately solved. Under Beveridge, State pensions were only intended to provide a subsistence income, the individual being encouraged to provide extra for himself by means of private occupational schemes:

> The principle of the scheme is to ensure for everyone income up to subsistence level in return for compulsory contributions, expecting him to make voluntary provision for any income that he desires beyond that. (1944, p. 298)

In fact, as we have seen, both before the War and after there had been a flourish of new occupational pension schemes, but there still existed a large number of people whose only possible provision for old age was the State pension. For many people, and more particularly for salaried staff, economic conditions in post-War Britain had changed completely, in many cases for the worse. Higher rates of personal taxation had affected almost every section of the community, but the burden fell most heavily on the professional and managerial classes, and although it would be ludicrous to pretend that poverty or actual hardship was the case, their differentials had certainly been squeezed making them feel worse off. Relentless trade union pressure had brought wage-earners a standard of living well above that of pre-War days, with wages for unskilled labour being higher relative to prices than they had ever been before, in particular. However, for the middle classes there no longer appeared to be any margin between current expenditure and income after tax out of which they could save for retirement. This represented an opportunity which sympathetic managements were not slow to take. For, although salaries were not as competitive against wages as they had been in pre-War days, employers could at least make up this 'discrepancy' by funding in advance various pension schemes. The very factor which had prevented the employee from being able to save for his own retirement—namely, the higher rates of tax—encouraged the employer to save on his behalf, since the whole of any premium paid by an employer to a pension scheme was normally allowed as a charge against profits for tax purposes. Consequently, the net cost of setting up a pension scheme was proportionately less owing to the high rates of tax prevailing at the time. On top of all this, the post-War period saw successive governments pursuing policies designed to reach and/or maintain "full employment" leading (sometimes) to an excess demand for labour. Thus, an employer who could offer membership of a pension scheme as part of his conditions of employment had a distinct advantage over his competitors; it was generally recognised that a properly funded pension scheme represented prudent finance and good business for the employer.

The increasing ability of many employees to save for themselves and the correspondingly enhanced ability of employers to save on their behalf resulted in an important shift of emphasis in the objectives of a pension scheme. Prior to the War employers stressed that any pension scheme they operated was intended to supplement, not replace, any private pensions provision the employee had made for himself. After the War, many employers still openly expressed this sentiment, whilst their pension schemes were actually planned to operate on the assumption that they would provide substantially the whole of an employee's income at retirement, apart from any entitlement under National Insurance. Therefore, a new concept was gradually developed—that all remuneration could be divided into two parts:[5] the first, an immediate taxable portion, sufficient to provide for current expenditure; and the second, a deferred portion, to be accumulated free of tax to provide for a man's retirement, or for his dependents in the event of his death. In other words, the pension was coming to be regarded as "deferred wages", and the purpose of a pension scheme was to spread a man's earnings over the whole of his life rather than to confine them to his working years only. One result of this new conceptualisation was a trend in favour of non-contributory schemes. This was because contributions from employees could be more easily deducted at source rather than clumsily going through the motions of collecting contributions. With salaries adjusted, the whole of the cost of the pension scheme could be paid directly by the employer. Nonetheless, even with these improvements, it was still the case that the majority of the British population received nothing but the flat-rate State pension, as many employers did not realise the importance of pensions or did not possess the wherewithal to implement such schemes.

In the latter part of the 1950s all of the major political parties came to recognise the need for earnings-related benefits with regard to pensions' provision. It was argued that if such a scheme could be established, then pensioners would not have to suffer a sudden intolerable drop in their living standards upon retirement, as had been the case in the past. The major difficulty to overcome was to initiate a scheme that produced a satisfactory marriage between the State scheme and the already strong and still developing private occupational pensions movement.

3.6 Towards A Fully-Integrated Scheme

The first entry of the State into the provision of earnings-related pension benefits—previously the sole domain of the private sector—came with the passing of the 1959 National Insurance Act. Prior to looking at the provisions of this Act it is interesting to note the background that led to its introduction. As previously mentioned, the feeling in the mid-1950s was that the problem of poverty in old age had not been adequately solved. Indeed, this was borne out by the fact that about one-quarter of all pensioners at that time were also in receipt of National Assistance.[6] As a result of this, in 1957 the Labour party, then in opposition, published the booklet "National Superannuation", setting out their plans for pensions were they to find themselves in office. These plans included the provision of pensions of up to one-half of earnings, and threw out a political challenge which, rightly or wrongly, the Conservative government felt obliged to meet. Their reply was the Boyd Carpenter scheme, the embodiment of which was the 1959 National Insurance Act.

The 1959 Act set up a scheme whose effect was to superimpose on top of the existing basic pension a system of graduated benefits and contributions, both related to earnings. Both the additional contributions and the additional benefits applied to those earning £9 or more per week, with those earning in excess of £15 paying maximum contributions and receiving maximum benefits. The scheme also gave companies the option of "contracting out" of the earnings-related element of the pension if they themselves operated a satisfactory occupational pensions scheme. Considered in this way, the Boyd Carpenter scheme appears quite an attractive proposition and a definite improvement upon previous arrangements. However, the 1959 Act (which, incidentally, did not come into force until 1961) was actually more concerned with improving the financial position of the National Insurance scheme rather than with seriously assisting those not covered by occupational schemes. For, although the new scheme was not insured or funded, in the strict sense of the words, (as had been the case with all previous State schemes) due to the fact that higher contributions were being used to pay out a maintained level of benefits to existing pensioners, the element of Exchequer subsidy was very largely removed. It is therefore possible, and wholly justifiable, to view the Boyd Carpenter scheme as a politically astute vehicle for increasing contributions without immediately raising benefit levels! At the time this was considered a very important development as the cost of providing the State flat-rate pensions had been rising considerably under increasing demographic pressure.[7] The simple method of reducing this burden would have been to just levy higher contribution rates on better-paid employees, but to do this while maintaining only a flat-rate pension would have been difficult politically, especially for the then Conservative government. Consequently, earnings-related benefits became a feature of the State pension.

Initially, the benefits under the Boyd Carpenter scheme were fixed at extremely modest levels: for every joint contribution (contributed 50/50 by employer and employee) of £15 for men and £18 for women the graduated pension was 6d. (2.5p) a week, or £1-6/- (£1-30p) a year. In most cases this left the pensioner below the levels of reasonable subsistence set by the government via the Supplementary Benefits Commission, unless they possessed some other means of support, which was frequently not the case. This was a situation that persisted for the best part of ten years, for it was not until the emergence of the proposed "Crossman scheme" in the late 1960s that the government really developed plans to significantly improve upon the Beveridge scheme.

Developed by the Labour party's Richard Crossman, upon publication his proposals encountered virulent opposition from the growing private occupational pensions movement. Their criticisms were manifold and harsh, although in retrospect many of them appear justified as, in particular, the Crossman scheme failed to meet the challenge of adequately marrying the State scheme and the private occupational pensions movement. The scheme proposed by Crossman was of a highly complex nature, and the private pension funds felt unable to comply with its provisions which most certainly would not have been in their best interests. In many ways the Crossman scheme could be regarded as a nationalisation programme for the pensions' provision industry. For example, under the Crossman scheme there was little or no incentive for the member of an occupational scheme to "contract out" of the State scheme. This would have created a problem for the already existing private schemes, as well as imposing an increased financial burden on the State if it was to take over what had previously been in private hands. However, these criticisms soon became redundant when Labour was ousted from office by the election of a new Conservative government in 1970, and the Crossman scheme became another shelved set of proposals.

Although very much opposed to the proposals set out in the Crossman scheme, the Conservatives nonetheless recognised the need for Beveridge to be improved upon. So they set about developing their own plans for pensions' provision which resulted in the "Joseph scheme", and was later passed into law as the 1973 Social Security Act. The Labour opposition felt unable to support this scheme, which was due to come into operation in April 1975, and loudly voiced their criticisms. They felt that, in common with the earlier Conservative (Boyd Carpenter) pension scheme, the Joseph scheme did not provide adequate benefits for those who were not in private occupational schemes and it also leaned a little too heavily in favour of the private pensions movement. The Conservatives argued that the reason for the poor level of benefits under the Joseph scheme was that it was intended to fund the State Reserve scheme and, as this fund had to be built up from nothing, initial benefits had to be set at very low levels. But, once again, before the Joseph scheme could come into operation there was yet another change of government, with Labour taking office once more in 1974. As they had promised in their manifesto, the incoming Labour government swiftly repealed the Joseph scheme so that, by and large, the Beveridge scheme was still in operation nearly forty years after its inception!

During the early 1970s the United Kingdom economy was in a state of turmoil. Uncertainty was rife, and the twin evils of unemployment and inflation were at unprecedentedly high levels, and on an upward trend. The crescendo occurred in the winter of 1973, when the British public became subject to a three-day working week, power cuts due to the electricity workers' strike, lack of coal due to a mineworkers' strike, lack of transport due to a train drivers' strike, and goods from bread and candles to toilet rolls in short supply. This was all in addition to the four-fold increase in the price of oil and petroleum products due to the embargo imposed by O. P. E. C.[8] With such a vast number of problems to contend with (plus one or two others not mentioned here) the government was faced with a quandary. Various economic policies were attempted, both fiscal and monetary, but government always seemed to come back to a favourite of the 1960s, the incomes policy. Indeed, it would not be an exaggeration to categorise the decade of the 1970s as one of (almost) continuous incomes policies! One result of incomes policies was that it became very difficult for companies to offer high wage remuneration to attract labour or for trades unions to bargain for higher wages. For, although unemployment was at a post-War high, there remained (as still seems to be the case) a shortage of skilled workers of almost every description. Inability to compete or bargain in terms of wages due to incomes policies meant that the two sides of industry turned their attentions to collective bargaining in terms of other attractions and inducements. The perks (perquisites) of a job, such as a company car, longer holidays, etc, came to be advertised with as much, and often more, prominence than the pay. Included as one of the more lucrative perks were the pension arrangements. Indeed, almost as a direct result of incomes policies, pension arrangements for employees tended to improve dramatically, especially in the private sector. Many firms that had not previously offered pension plans began to do so. This was the final stage in pensions being recognised as deferred wages and, as such, a form of remuneration that managed to remain outside the scope of incomes policies. In fact, it was a rather dogged pursuit of incomes policy against the will of the voting public that helped create the turmoil of winter 1973, and which led to the eventual downfall of Edward Heath's Conservative government in 1974.

During its time in opposition in the early 1970s, the Labour party had had time to reflect and reconsider the Crossman scheme in light of the criticisms that had been levelled against it at the time of its publication. They agreed, in retrospect, that the criticisms had been justified and set about developing a new plan for pensions provision. This culminated in the 1975 "Castle scheme", which the Labour government adopted and won all-party support for; something which had eluded all previous schemes. The Castle scheme became law as the 1975 Social Security Pensions Act, which came into operation in April 1978. The major details of this scheme, which is currently still largely in operation, will be considered in the next chapter, but suffice it to say here that the Act was primarily concerned with eradicating the ever-widening divergence between the retirement incomes of those in good occupational schemes and those in either poor schemes or no scheme at all. This was achieved by the State offering a system of (optional) earnings-related benefits set at more adequate levels than before, without harming or infringing upon the domain of the private occupational pensions movement. Developed by the late Brian O'Malley (minister responsible for pensions under Barbara Castle), the 1978 Act represented a genuine compromise between a State scheme and the private sector schemes, and the much sought after improvement upon Beveridge.

By way of conclusion, the reader will no doubt have noticed that the Civil Service pension scheme has not been deemed worthy of mention for quite some time; indeed, since 1859! In fact, since the 1834 and 1859 Superannuation Acts this scheme has remained largely unchanged up to the present day, except for minor refinements such as the 1909 Act introducing death benefits, the 1949 Act granting widows' pensions, and various pensions' increases Acts, particularly the 1971 Act, which index-linked the Civil Service pension to protect it against the ravages of inflation.

Chapter Three Endnotes:

1 That is to say, a family spanning about three generations on average, and probably including 'horizontal' relatives, such as siblings of the head of household, etc.

2 A favourite policy of (eg) Henry VIII to finance his marital proclivities. Debasement of the coinage occurred when the government (usually the monarch) tried to extend their seigniorage by creating a larger nominal money supply by reducing the purity of the precious metal (gold or silver) content of the coinage by introducing lead into the new coins or shaving the edges of existing coins.

3 See the opening quotation to this chapter by way of example.

4 See, for example, *Oliver Twist*, *Bleak House*, *Hard Times*, etc.

5 That is to say, both wages/salaries and pensions. See Chapter One, section 1.2 for a theoretical analysis.

6 The forerunner of today's "Supplementary Benefits".

7 The number of old age pensioners in both absolute and relative terms was, and had been, rising rapidly.

8 The Oil and Petroleum Exporting Countries—a price-fixing international cartel of predominantly Third World countries. The oil embargo of 1973 - 1974 is often referred to nowadays as the first oil-price shock, a second shock occurring in 1981 following the Iranian revolution.

Chapter Four: The Current Position

4.0 Introduction

Although the main objective of this paper is to consider and analyse the investment behaviour of the pension funds in the United Kingdom, it is a necessary prerequisite for us to examine the environment in which they operate. We therefore commence this chapter by looking at the current position of the State scheme as defined under the 1975 Social Security Pensions Act and its subsequent amendments. Although the State-operated scheme technically does not merit inclusion as a pension fund the details of its operation under the 1975 Act (or the "Castle scheme", as it is sometimes known) are wholly relevant to the current activities of the pension funds in the United Kingdom.[1] Indeed, as we shall see, the Act also embodies legislation regulating the operations of the pension funds in such a way that the State scheme may be viewed as being the provider of the legal minimum in pensions' provision above which all other pension schemes are obligated to operate.

4.1 The Castle Scheme

Under the Castle scheme the State aims to provide a pension which consists of two elements: the first element is the basic State pension, which is every citizen's statutory right; the second element consists of an earnings-related supplement to the basic pension.[2] The former element provides a flat-rate pension which is intended to provide the pensioner with a (minimum) subsistence income, and operates on the Pay-As-You-Go principle as part of the system of National Insurance. Compulsory contributions for this are deducted from both employers and employees. The earnings-related element, as its title suggests, provides a graduated pension of an amount determined according to an individual's contributions record, in addition to the basic State pension. Further, the earnings-related element possesses the qualification of being optional for any individual who is already (or wishes to be) in a private or statutory pension scheme, providing such a scheme offers earnings-related benefits that are at least on a par with those offered by the State scheme. An individual who participates in the earnings-related element of the State scheme is said to be "contracted in"; an individual who chooses to opt out of the State's earnings-related scheme is said to be "contracted out". Unsurprisingly, the level of contributions that an individual pays by way of National Insurance depends upon whether they are contracted in or out. At its inception, for a person who had been earning at the level of the national average, the basic pension amounted to approximately twenty-five per cent of final earnings, while the earnings-related element (for a contracted-in individual) would bring the pension up to about forty-five per cent of final earnings; this assumes a fully paid-up contributions record of at least twenty years. Let us now proceed to consider the Castle scheme in greater detail.

4.1.1 The Castle Scheme—The Main Provisions

As previously mentioned, the major aim of the Castle scheme was to narrow the divergence of retirement incomes between those in statutory or good private occupational schemes and those in poor schemes or no scheme at all. The Castle scheme as embodied in the 1975 Act also seeks to achieve a sense of balance between the State scheme and the various statutory and private schemes in the United Kingdom. Furthermore, the Act also embodies legislation which sets out to ensure that the benefits offered by the statutory and private schemes at least match the benefits on offer in the State scheme. To this end the Act set up the Occupational Pensions Board (OPB) to effect the Act's regulations on the control of pension schemes. Like many other Acts of Parliament the 1975 Social Security Pensions Act is a highly complex piece of legislation. Nonetheless, one is able to distil from it seven main provisions concerning the system of pensions' provision in the United Kingdom:

1) Equal Access: one of the major principles underlying the operation of the State scheme is that it should be available to both men and women on equal terms. That is to say, men and women will earn basic and earnings-related pensions and will contribute at the same rate.[3] Consequently the same is required of occupational pension schemes; as the Act states, "membership of the scheme is open to both men and women on terms which are the same as to age and length of service needed for becoming a member and as to whether membership is voluntary or obligatory." As we shall see, this provision can affect the finances of contracting out and, additionally, means that in deciding whether to contract in or out schemes cannot discriminate other than by nature of employment. Thus it is wholly possible, for example, to contract out manual staff and contract in white-collar workers, but it is not possible to contract out only male staff with female staff being contracted in.

2) The Basic Pension: all contributors with an adequate record of contributions[4] are entitled to a basic flat-rate pension.[5] This acts as the lower earnings limit of the scheme, and is to be annually increased to keep it constant in real terms.

3) The Additional Earnings-Related Pension: this optional element of the State pension relates to earnings between the lower limit (as defined above) and the upper earnings limit, which is approximately one and a half times the national average earnings level, or about seven times the lower limit. For those retiring after April 1978 benefits were set at the rate of 1/80th of earnings per year of contributions; only post-1978 contributions apply. It was originally intended for an employee with a record of more than twenty years' contributions to have their additional earnings-related pension calculated on the basis of their best twenty years' revalued earnings; this was abolished before it ever became pertinent. As with the basic pension, the earnings-related element is to be increased annually to account for inflation.

4) Married Couples' Pensions: if a pensioner's spouse does not have sufficient contributions for their own basic and additional earnings-related State pensions, they will still be entitled to a supplement of about half the fully-contributing spouse's basic pension.

5) Widows' and Widowers' Pensions:

(i) **death in retirement:** in this case the widow receives the husband's basic and additional earnings-related pensions plus whatever her own contributions entitle her to, subject to the maximum payable on an individual's contributions record. Naturally, the same conditions apply to a widower.

(ii) **death in service:** provided the widow is over fifty years of age, she receives her husband's basic and additional earnings-related pensions earned by his contributions up to a year before he died. At age sixty she will receive the full basic single person's pension plus the aggregate additional components earned by both herself and her husband, again subject to the maximum payable on an individual's contributions record. If the widow is less than fifty years of age the benefits are reduced proportionately until she reaches age sixty. This applies similarly to widowers.

6) Contributions: contributions are paid by both employer and employee at the rate of ten and 6.5 per cent of salary respectively. This is supplemented by an Exchequer subsidy of some eighteen per cent of the combined contributions. These contributions only apply between the two earnings limits defined above.

7) Contracting Out: the basic element of the pension is compulsory for all employees. However, an employee may contract out of the earnings-related element of the State scheme, their contributions being lowered accordingly, if they are in an occupational pension scheme which has obtained its "contracting-out certificate" from the Occupational Pensions Board (OPB) upon meeting certain minimum requirements, which we now examine.

4.1.2 OPB Contracting Out Requirements

If an occupational pension scheme wishes to enable its members to contract out from the earnings-related element of the State pension scheme—as presumably it does—then it must first obtain a contracting-out certificate from the Occupational Pensions Board (OPB). In order to obtain this certificate the pension fund must be operating subject to a series of six minimum requirements:

1) Benefits: to contract out a scheme must pass two basic tests with respect to employees' pension benefits:

(i) the requisite benefits test: to pass this the scheme must be providing an annual pension accruing at the rate of at least 1/80th of final pensionable pay per year of contracted out service. For this purpose it is permitted to use average annual pay over the whole period of contracted out service rather than final pay; indeed, each year's earnings may be revalued in line with the increase in general earnings up to the year of retirement. The definition of what constitutes pensionable pay is subject to annual approval by the OPB, but need not be total earnings.

(ii) the guaranteed minimum pensions (GMP) test: to pass this test the scheme must never pay a pension less than that which would have been provided via both components of the State scheme, had the employee been contracted in. This has to be related to total earnings between the upper and lower earnings limits. Consequently GMP may exceed the minimum requisite benefits if the scheme does not recognise total earnings. In calculating GMP the "best twenty years" rule does not apply; this is for administrative reasons. However, the contracted-out employee does not lose out because, if they would have earned a higher pension than the GMP, any extra pension that would have arisen under a "best twenty years" rule is provided by the State.

These two requirements, taken either individually or together, illustrate quite clearly that pension plans in the United Kingdom are legally required to be defined benefit plans (see Section 4.2 below).

2) Widows' Pensions: any contracted-out scheme must pay widows' pensions for death in service and in retirement. Widow's GMP is set at one-half of that which accrued to the spouse. As with employee benefits, both GMP and requisite benefits tests must be satisfied. Here the requisite benefit is 1/60th of spouse's pay per year of service at time of death. Again, if widow's GMP is higher than the requisite benefit then the widow's pension will be based on GMP.

3) Inflation Protection: for any GMP already in the course of payment, responsibility for protection against the ravages of inflation lies with the State. If a member leaves a contracted-out scheme having paid more than five years' contributions then GMP must be preserved; it may be revalued in one of three ways:

(a) in line with the Retail Price Index (RPI);
(b) at a fixed rate of 8.5 per cent per annum; or
(c) at a maximum rate of five per cent per annum plus payment of a special premium to the State to cover any revaluations in excess of five per cent.

If a member leaves a contracted-out scheme having paid less than five years' contributions, a "contributions equivalent premium" can be paid by the scheme to buy them back into the State scheme. This amount is equal to the difference between the member's paid-up National Insurance contributions and those the member would have paid had they not been contracted out. This effectively buys the individual back into both elements of the State pension—almost as if they had never contracted out—and the employer's liability then ceases. Thus, in essence, all contributors to pension plans in the United Kingdom have vested benefits.

4) Contributions: for a scheme that is contracted out the full rate of 16.5 per cent applies on earnings up to the lower limit. For earnings above the lower limit and below the upper limit there is an abatement of contributions to the State scheme, but only on the earnings-related element.

5) Consultation: as a condition for contracting out, employers are required to give at least three months' notice to employees and their Trades' Unions that they are seeking to contract out. During this period the employer must consult with all independent Trades' Unions recognised for collective bargaining on behalf of the employees concerned. This does not mean that negotiations must take place; rather that consultation is seen to have occurred by the OPB.

6) No Discrimination: any contracted-out scheme cannot discriminate on grounds of age, sex or levels of pay. Only discrimination on the grounds of the nature of employment is permissible.

If a pension fund, therefore, satisfies the above six conditions it may operate a contracted-out scheme if it desires. In fact, the majority of pension funds which operated occupational pension schemes prior to the introduction of the Castle scheme soon satisfied the OPB and were granted their contracting-out certificates.

To summarise, then, the Castle scheme offered a good compromise in many respects after years of political controversy in the field of pensions' provision. Equally, while the State provision of pensions to those not well-covered by occupational schemes is a vast improvement over previous provisions, it is not punitive to those who are contracted out. However, the State scheme still only promises a modest level of benefits and is, therefore, unlikely to appeal to those who are able to participate in good occupational schemes.

The State scheme also has one or two other shortcomings which are not necessarily shared by the private schemes. For example, only twenty years' service counts, and this must be in the post-1978 period. The pension accrual fraction is only 1/80th in the State scheme whereas many private and statutory schemes operate using 1/60th. No lump-sum benefits are payable on either death or retirement under the State scheme, again unlike many private and statutory schemes. Similarly, criticisms have been levied at the lower and upper earnings limits which are a feature of the State scheme usually not found elsewhere. Finally it should be borne in mind that although the Castle scheme places many restrictions on pension funds (some of which did not previously exist), they are still less stringent than those under which the insurance companies operate. For example, there is no obligation for any pension fund to produce a set of annual accounts, thereby divulging how it has disposed of its funds. This is still an area where pressure may yet bring further legislation, although nothing seems to have materialised in the wake of the recommendations of the Wilson Committee (1980).

4.1.3 Modifications Since 1978

By the Summer of 1986 no major modifications to the Castle scheme had been implemented. Inevitably, there have been some minor modifications especially in terms of the level of benefits, mainly to reflect changes in the underlying economic conditions. In April 1986 the Conservative government of Margaret Thatcher proposed making changes to the Castle scheme that would have largely left the State flat-rate pension unchanged while making it more attractive for people to contract out of the State earning-related scheme, into either an occupational pensions scheme or one of the private schemes for individuals being offered through banks, etc. The tax provisions of the 1986 Budget made it more attractive for financial institutions such as banks to offer these "Personal Pensions" to individual members of the public as a financial service. These proposals, like earlier Conservative pension proposals such as Boyd Carpenter and the Joseph scheme, would have shifted the weight of pensions' provision more into the private sector, in line with general 'market oriented' ideology traditionally espoused by the Conservative party. These ideas came more fully to fruition within Chancellor Nigel Lawson's 1989 Budget.

Under the taxation provisions of the 1989 Budget the existing broad framework for treatment of pensions remains largely unchanged. However, the Chancellor proposed a number of significant alterations which are described below. He also suggested that he (and therefore presumably the rest of the government) had no plans for further significant alterations following implementation of the 1989 changes.

One result of the 1989 Budget is that employers are now able to provide "top-up" schemes without all the usual tax advantages. Such schemes can provide more generous benefits than the tax rules allow. However, the tax treatment of these schemes broadly follow from existing legislation. Consequently, contributions to a funded scheme are taxed as the employee's income. Benefits from unfunded schemes are taxed only upon payment.

The 1989 Budget provided for a ceiling on the total tax relief available for occupational pension schemes. For new schemes (set up on or after 14 March 1989) and new members of existing schemes (those joining on or after 1 June 1989) the maximum pension payable from a tax-approved occupational scheme is £40,000 a year (ie, two-thirds of £60,000). As before, some of this may be commuted for a tax-free lump sum, subject to a ceiling of £90,000. The £60,000 will be increased annually to account for inflation.

The Chancellor also allowed for pension schemes to be simplified. In particular, subject to completion of twenty years' service, the employer may pay a maximum of two-thirds final salary to employees between the ages of 50 and 70. Additionally, the maximum tax-free lump sum can be the greater of 3/80 of final salary for each year up to 40 years or 2.25 times the amount of pension before commutation.

The Chancellor also simplified the procedure for paying Free-Standing Additional Voluntary Contributions (AVCs). For payments up to £2,400 a year, the AVC provider will make a few simple checks without involving the employer, and for larger amounts the employer's scheme will need to provide the employee with information. Further checks before retirement will not usually be required.

Upon retirement, any 'excess' benefits above the allowed limits will be returned to the employee, but subject to a tax charge broadly corresponding to the tax relief received on contributions and the build-up of funds. This applies to all excess AVCs.

Personal Pensions are subject to change. It will be easier for those in such schemes to have a greater say in where their funds are invested. Additionally, new contribution limits took place from 6 April 1989; based on a £60,000 earnings limit, these are as follows:

Age on 6 April	% of earnings	Cash Limit (£)
below 36	17.5	10,500
36 - 45	20	12,000
46 - 50	25	15,000
51 - 55	30	18,000
over 55	35	21,000

The tax-free lump sum which may be taken at retirement from a Personal Pension changed from 25% of the total fund build-up including any "protected rights" to 25% of the total fund build-up exclusive of protected rights but inclusive of dependants' benefits.

Finally, the 1989 Budget introduced new rates of National Insurance contributions as illustrated below:

	Employee Rate		Employer Rate	
Weekly Earnings	Not contracted out	Contracted out	Not contracted out	Contracted out
£43 - £74.99	5.00%	3.00%*	5.00%	1.20%*
£75 - £114.99	7.00%	5.00%*	7.00%	3.20%*
£115 - £164.99	9.00%	7.00%*	9.00%	5.20%*
£165 - £324.99	9.00%	7.00%*	10.45%	6.65%*
over £325	9.00% £29.25 per week (maximum)	9.00% £23.61 per week (maximum)	10.45%	£23.24 per week plus 10.45% on earnings over £325 per week

* Note that the contracted-out rate applies only to that portion of earnings between the lower and upper earnings limits (£43 and £325 respectively). Contributions on earnings below the lower limit or above the upper limit are assessed at the not contracted out rate.

Under the provisions of the 1989 Budget, these rates only apply until 5 October 1989, when the structure of employees' contributions (only) are changed as shown below:

	Employee Rate	
Weekly Earnings	Not contracted out	Contracted out
£0 - £42.99	NIL	NIL
£43 - £325	2% up to £43 9% from £43 to £325	2% up to £43 7% from £43 to £325
over £325	£26.24 per week (maximum)	£20.60 per week (maximum)

4.2 Pension Fund Characteristics

Elsewhere in this paper we have considered the various methods by which a pension fund may organise and finance its activities, while in this chapter we have devoted our attentions thus far to considering the legal implications of the 1975 Act for the liabilities and contribution income of a pension fund. We now continue by looking at the other characteristics of occupational pension schemes in the United Kingdom. These may be divided into three categories:

(i) the nature of contributions;

(ii) the nature of benefits; and

(iii) the nature of the investment portfolio.

By considering these in turn we would hope to be able to derive a picture of the 'typical' British pension fund, which might be used for modelling purposes in a later chapter. Because its analysis comprises a major part of this paper in its own right we devote the whole of Chapter Seven to a consideration of the nature of the pension funds' investment portfolio. However, before proceeding it is also best to mention that we shall not be dealing with the statutory schemes in this chapter; most of the details pertaining to their activities have already been covered in Chapter Three. The remainder of this chapter focuses primarily upon the private sector pension funds, and draws heavily upon the findings of the various surveys by the Government Actuary, as well as those organised by the National Association of Pension Funds (NAPF). Because these surveys have employed samples of widely differing sizes and composition, direct comparisons are tenuous and this should be borne in mind when the reader is considering the likely trends indicated by the survey statistics.

Over the years concern has often been voiced about the financial soundness of the United Kingdom pension funds. This concern deals with the relationship between the three characteristics mentioned above, with the investment portfolio providing the link between contributions and benefits. In general terms there may be said to be two basic pension types: **defined benefit** and **defined contribution**. A pension plan may described as defined contribution when the employer's obligation is completed when it makes contributions to the pension fund (or other retirement investment vehicle) in trust for the employee. Although in many cases the employee may have some input into the investment decision, it is the employee who bears the entire risk of the performance of the investment portfolio. The amount of pension to be received by the employee upon retirement therefore depends upon the investment performance of the pension fund. Thus, defined-contribution plans are always fully funded by definition. A defined-benefit plan, on the other hand, consists of a (corporate) promise to pay pensionable benefits based upon the retiring employee's historic earnings levels and number of years of employment. These benefits may be surrendered if the employee leaves the company, but more often are guaranteed if employment continues beyond a minimum number of years. When benefits are thus guaranteed they are said to have become "vested". Employers are thus obligated to set aside funds (usually tax-deductible) to meet these future pension liabilities. The vested accrued pension liability of a firm is considered an enforceable legal claim, while in some cases this is also true of the unvested portion. In a defined-benefits plan the employer may be able to reduce his contributions if the fund has an impressive investment performance, although he may equally be called upon to increase his contributions (ie, "top up" the fund) if the fund is not yielding adequate returns on its investments. Under a defined benefits plan the risks, therefore, are borne predominantly by the employer.

In the United Kingdom it is the case that almost all pension plans are defined-benefit, as evidenced by recent outcries against pension fund surpluses,[6] as well as by gripes by employers when pension funds required "topping up" during the 1980-1983 recession. For comparison purposes, in the United States in 1980 some 65 per cent of plans were defined contribution, but the defined-benefit plans tended to be much larger and covered some three-quarters of pension plan participants.[7]

4.2.1 The Nature of Contributions

To reiterate, a pension fund is said to be contributory in nature when the employee is contributing into the fund. The usual case, such as occurs with the State-run scheme, is for both employee and employer to contribute. Of course, it is possible for an employer (technically) to deduct an employee's contribution prior to payment of their gross earnings, thereby giving the pension scheme the appearance of being non-contributory. Although many occupational pension schemes in the United Kingdom are contributory this is by no means true of all schemes. However, it is interesting to note that since 1967 the number of non-contributory schemes appear to have gone into a rapid decline leaving less than twenty-five per cent of all schemes currently operating on a non-contributory basis. Further analysis reveals that, by and large, non-contributory schemes have tended to be operated for white-collar workers rather than manual staff and are typically far more prevalent in the public than the private sector. Such divergence between the types of scheme operated for blue- and white-collar workers even appears to pervade the nature of the employers' contributions, as illustrated in Table 4-1. It used to be suggested that differences between the remuneration levels of various employment categories were the prime cause of such a divergence, but the evidence, such as in Table 4-2, suggests that employers tend to treat manual staff less generously with regard to pensions than staff employees at the same salary levels.[8] For completeness Table 4-3 shows the absolute levels of employer contributions to pension funds between 1967 and 1983.

Table 4-1: Employer Contributions in Respect of Those Earning £3,000+ *per annum*

	% of salary
Contributory schemes:	
staff	9.7
all	8.0
Non-contributory schemes:	
staff	14.1

Source: *NAPF Survey,* 1975

Table 4-2: Aggregate Contributions in Respect of Those Earning £3,000+ *per annum*

	staff	manual	all
Contributory:			
employer	9.7	5.2	8.0
employee	5.0	3.7	4.7
aggregate	14.7	8.9	12.7
Non-contributory schemes:			
aggregate	14.1	6.5	11.1

Source: *NAPF Survey,* 1975

Table 4-3: Employer Contributions to Pension Funds, 1967 - 1983

(£ millions)

	1967	**1968**	**1969**	**1970**	**1971**	**1972**	**1973**	**1974**	**1975**	**1976**	**1977**	**1979**	**1983**
Public Sector	91	102	115	170	190	300	396	492	763	1,048	960	3,210	5,700
Local Authorities	62	63	66	73	97	114	148	171	296	413	401	*	*
Private Sector	265	305	342	375	420	460	560	780	1,015	1,058	1,233	3,580	6,224

* included with Public Sector

Source: CSO Tabulations, Government Actuary

Table 4-4: Nature of Members' Contributions in the Private Sector

	% of schemes					% of members						
	1955	1963	1967	1971	1975	1956	1963	1967	1971	1975	1979	1983
Contributory	73	70	70	65	79	63	65	65	75	83	78	82
Flat Rate	13	17	20	9	7	11	21	15	9	8	-	-
Dependent upon Salary Range	40	27	20	20	23	21	10	10		3	2	1
Percentage of Salary	17	15	25	34	72	21	12	35	46	69	76	79
Other Basis	3	11	5	2	8	11	5	10		2	-	2
Non-contributory	27	30	30	35	21	37	35	35	25	17	22	18

Sources: Government Actuary Survey Reports, 1956, 1963, 1967, 1971, 1986
NAPF Survey, 1975

There are a number of ways of calculating the amount to be levied by way of contributions, and these may be categorised under three broad headings:

(i) flat rate;
(ii) dependent upon salary range; and
(iii) percentage of salary.

These categories are fairly self-explanatory, and Table 4-4 above shows the trend in popularity for each of these methods since 1956. As can be seen, the flat-rate contribution has been in decline since 1963, being levied upon only nine per cent of all members of occupational pension schemes in 1971. It is a method that finds more favour with the smaller pension funds who, no doubt, find it administratively superior. The salary range method is also more widely used by the smaller pension funds and especially curries favour amongst the insured schemes. However, in recent years there has been a waning desire for insured schemes, and this undoubtedly accounts for the declining popularity of the salary range method of levying contributions.

The percentage of salary method appears to be the most common and is steadily increasing in popularity. The most common percentage levied is between five and six per cent of salary. However, over the last two decades or so the rate of contribution has increased on average from 3.1 to 4.7 per cent in 1977 to between 5 and 7 per cent in 1983.[9] Amidst all this it should still be borne in mind that about forty per cent of schemes operated in the public sector are non-contributory while, except for annual workers who pay flat-rate contributions, all other schemes are operated on a percentage of salary basis.

Finally, it should be recognised that the increase in the contribution rate, for both employer and employee, has occurred over the years mainly in response to the increase in benefits, and it is to this area of pensions' provision that we now turn.

4.2.2 The Nature of Benefits

The ultimate aim of any pension fund is the provision of benefits to its membership, and we can consider best the nature of benefits provided by occupational pension schemes in the United Kingdom by categorising them under eleven broad headings, ranging from pensionable age to transferability:

1) Pensionable Age: schemes in the public sector usually have a normal retirement age of sixty, whilst the private sector typically adopts sixty-five for men and sixty for women.[9A] According to the 1975 NAPF Survey about ninety-one per cent of schemes had a provision allowing for early retirement for reasons other than ill-health, usually on a pension that has been reduced *pro rata*.[10] Similarly, most schemes allow for late retirement, paying an increased pension when it is eventually claimed. About ninety per cent of schemes in the private sector do not take contributions after normal retirement age, although no such distinctions are typically made in the public sector.

2) Pension Basis: pension benefits in the United Kingdom have generally accrued under one of four basic formulae:

(a) **final salary basis:** benefits here are equal to a proportion of the average of the last few years' salary times the number of years of service;

(b) **salary range basis:** here benefits accrue according to the member's salary over their whole career. This is achieved by linking pension accrual in any year to the salary range pertaining to that year;

(c) **flat-rate basis:** a self-explanatory category whereby a constant level of benefits accrues per year of service;

(d) **money purchase basis:** here benefits are calculated on the amount directly purchased by contributions, with very few guarantees provided.

Over the years the final salary method (a) of calculating benefits has become increasingly more popular, whereas the flat-rate (c) and money purchase (d) methods, which were previously prevalent among manual workers' schemes, have almost completely disappeared. Due to the impact of inflation it has become increasingly apparent that, in nearly every case, anything other than a pension which is linked to salary in the final years of service is likely to be inadequate. Table 4-5 below illustrates this trend beyond any shadow of a doubt:

Table 4-5: Numbers of Private Sector Members According to Pension Formula

Pension Formula	Contracted-out	Not Contracted-out	Total
Final salary	4,370	860	5,230
Revalued average salary	110	—	110
Unrevalued average salary	—	20	20
Fixed amount per year of service	—	60	60
Money purchase	—	240	240
Other basis	10	80	90
No pension	-	40	40
Totals	4,490	1,300	5,790

Source: Government Actuary Survey Report, 1986

3) Level of Pension Benefits: under the Castle scheme all contracted-out pension schemes must calculate benefits on a final salary basis. This was already the predominant method employed in the public sector, where the accrual rate is 1/80th of salary per year of service plus a lump sum of 3/80ths of salary per year of service. In fact, most private schemes pay pensions accruing at between 1/80th and 1/60th of salary per year of service.[11]

4) Integration with the State Scheme: in order to take account of the State pension many schemes calculate final pensionable benefits after having deducted either the amount of the State pension or an amount of about £300 - £400 (in 1978) £200 - £500 (in 1983).

5) Ill-Health Retirement Benefits: despite improvements over many years, the private sector has tended to lag behind the public sector. In most public sector schemes the full accrued pension to the time of retirement is paid. While this was also true of nearly all private sector schemes in 1983,[12] they have typically been less generous even though they virtually all provided ill-health benefits of one kind or another. Indeed, by 1983 private sector schemes covering some 20 per cent of members were providing ill-health pensions based on full potential service, ie, without reduction for early payment of the pension.

Death in Service: this is one aspect of pension benefits that had ıproved considerably in the years before the Castle scheme, yet there still is nple room for improvement. In the private sector widows' pensions have en, for the most part, an innovation of the 1970s; in 1971 only thirty-nine per nt of all male members of occupational schemes had widows' pensions ıtitlements for their spouses, yet by 1975 this figure had increased to fifty-ree per cent, a trend which has continued. By 1979 this figure had climbed to per cent, and to 90 per cent in 1983. Of this, some two per cent returned the ember's contributions with the pension, twenty-six per cent offered a lump ım and return of contributions, whilst thirty-three per cent offered just a lump ım. Average widow's benefits in 1975 were approximately one-half of the ember's pension. Under the Castle scheme, contracted-out pension funds are oliged to offer as widow's pension 1/160th of final pay per year of the eceased member's service. By 1983 some 44 per cent of women were in rivate sector schemes which provided for widowers on the same basis as they rovided for widows.

) **Death in Retirement:** this is not so very different from the case above. ı the public sector most schemes provide for unconditional widows' pensions n death during retirement and, indeed, have done so for many years. In the rivate sector things have taken a bit longer, with only ten per cent of schemes ffering unconditional widows' pensions in 1971, these being predominantly ie larger schemes. By 1975 this figure had risen substantially to seventy-four er cent. Once again the average widows' benefits were approximately one-ıalf of the member's pension. By 1983 some 98 per cent of male members were n schemes containing some provision for a widow's or dependent's pension n death after retirement.

) **Commutation:** this is the process whereby a member of a pension cheme can obtain part of their pension benefits in the form of a lump sum. Many public sector schemes have offered lump-sum benefits unconditionally or many years, while the 1970s has seen a dramatic increase in the number of rivate sector schemes offering commutation (see Table 4-6 below). In fact, the nland Revenue imposes a maximum limit of 3/80ths of final salary times forty ears' service on any lump-sum benefits.[13] In 1983 the average lump sum paid was around £6,000. Of course, it should be noted that the State earnings-elated scheme does not offer any form of commutation.

Table 4-6: Numbers of members According to Lump Sum Benefits at Retirement (private sector)

	1975	1979	1983
Lump sum in all cases	0.3	0.5	0.4
Commutation option	4.2	5.1	5.0
Neither of the above	1.3	0.5	0.4
Totals	5.8	6.1	5.8

Source: Government Actuary Survey Report, 1986

Dynamism: this is the term used to indicate an increase in benefits ıring the course of the pension being in payment. Such facilities are usually fered as a means of offsetting the ravages of inflation, and was first troduced into public sector schemes in the 1971 Pensions Increase Act. In the ·ivate sector this was becoming rapidly introduced by the vast majority of hemes prior to the advent of the Castle scheme, under which inflation-:oofing of contracted-out pensions already in payment is the responsibility of ιe government. Under the legislation in force in 1983 there was no ɛquirement for preserved pensions to be increased to allow for inflation. 'onetheless, according to the 1986 Government Actuary's survey, in 1983 two-ıirds of pensioners in private sector schemes received increased pensions in 983, the increase being "slightly in excess of the increase in the cost of living" ›age 3). However, "this was because many schemes were making up for less enerous increases in previous years when the rate of inflation was much igher" (page 3).

0) **Conditions of Entry:** there are three common conditions of entry to ıost occupational schemes:

a) **minimum entry age:** in the public sector this is usually less than twenty-one, as is the case with the Civil Service scheme. In the private sector things are usually more restrictive, and we find that for men the normal age of entry is twenty-one while for women the most common age of entry was twenty-five, but this was only true for some fifty-five per cent of schemes in 1971. Table 4-7 below shows the situation in 1983:

Table 4-7: Numbers of Members by Minimum Entry Age

(thousands)

Age	Private Sector	Public Sector	Total
16 (or none)	1,720	1,750	3,470
18	900	3,190	4,090
20	790	290	1,080
21	1,530	10	1,540
24	210	30	240
25 and over	590	40	630
At discretion	50	—	50
Totals	**5,790**	**5,310**	**11,100**

Source: Government Actuary Survey Report, 1986

) **qualifying period of service:** in most public sector schemes there is no qualifying period of service; the exception is the Civil Service scheme, where a minimum of ten years' service must be completed in order to qualify for any normal retirement benefits. In the private sector the details of this condition are subject to wide variations from scheme to scheme. However, the most common qualifying period of service for both men and women is one year or less. Table 4-8 below shows the situation in 1983:

Table 4-8: Numbers of Members by length of Service Required Before Entry

(thousands)

Service	Private Sector	Public Sector	Total
None	3,350	4,990	8,340
Up to 1 year	940	250	1,190
More than 1 year, but less than 2	1,160	40	1,200
Over 2 years	300	30	330
Other	40	—	40
Totals	**5,790**	**5,310**	**11,100**

Source: Government Actuary Survey Report, 1986

:) **compulsory/voluntary membership:** with the exception of new schemes which cannot be made compulsory for existing employees, most employers tend to make membership of the pension scheme a condition of employment. This is especially true in the public sector where the membership of the relevant pension scheme is compulsory as soon as eligibility conditions have been met. According to the 1975 NAPF Survey in the private sector some eighty-five per cent of schemes for men had compulsory membership, as did seventy-one per cent of schemes for women. Table 4-9 below shows the situation in 1983:

Table 4-9: Numbers of Schemes and members by Sector and Conditions of Entry

Entry Condition	Private Sector Schemes	Private Sector Members (thousands)	Public Sector Schemes	Public Sector Members (thousands)	Total Schemes	Total Members (thousands)
Compulsory	19,000	4,340	120	5,310	19,120	9,650
Voluntary	15,000	960	—	—	15,000	960
By invitation	53,000	440	—	—	53,000	440
Closed to new members	3,000	50	—	—	3,000	50
Totals	90,000	5,790	120	5,310	90,120	11,100

Source: Government Actuary Survey Report, 1986

11) Transferability and Exit From Schemes: this is an area likely to be of concern to anyone in the position of changing employment, for it is likely that as a result they will desire to leave the pension scheme offered by their erstwhile employer in favour of that offered via their new employment. As a result of the Castle scheme, all schemes must offer at least a frozen pension, ie, benefits payable upon retirement based on record up to exit from the scheme. Furthermore, these benefits must be either index-linked or increased at annual rate of 8.5 per cent. Prior to 1980 a pension fund could alternatively offer to refund a member's contributions (net of tax, of course). It is now illegal for a scheme to offer a member no benefits whatsoever upon their withdrawal from the scheme.

4.3 Conclusion

This completes our consideration of the nature of contributions and benefits provided by the pension funds in the United Kingdom. Most of the restrictions placed upon the operations of a pension fund from external sources come from legislation and, more specifically, currently from the 1975 Act We may perceive of a pension fund having two basic sources of income—contributions and investment income—and one major use of outgoings—pension benefits. The legislation places certain constraints upon contribution income and pension benefits which are bound to reveal themselves in the way the fund obtains its investment income, ie, the manner in which it allocates its funds among various alternative investment outlets to obtain the optimal returns. It is the solution of this which is the major objective of this paper—to explain the investment behaviour of the United Kingdom pension funds.

Chapter Four Endnotes:

1 This point is dealt with in both Chapter One and Chapter Two.

2 In recent years this second element has become familiarly known as **serps**, which is simply the acronym for state earnings related pension.

3 This provision does not extend (at least, at the time of writing) to provide for the retirement of men and women at the same age; women can retire at sixty whilst men must work until sixty-five years of age.

4 See category 6 below (page 4-4).

5 This was set initially in 1978 at £15.30p for a single person.

6 See (eg) *The Financial Times*, Wednesday 29th May, 1986, page 15.

7 See Zvi Bodie and John B. Shoven, "Introduction" in Bodie, Zvi and Shoven, John B. (editors), *Financial Aspects of the United States Pension System*, (1983).

8 More recent studies of occupational pension schemes, such as the 1986 Government Actuary's survey (based on 1983 data) make no distinction between various categories of employee.

9 These figures, like most of the data in this chapter, are taken from various editions of the Government Actuary's reports on occupational pension schemes. These survey reports provide a greater breakdown of the data for interested parties.

9A The disparate treatment of men and women has been under scrutiny for some time and could alter at any moment (literally). One result of the 1986 Sex Discrimination Act was to make it illegal for women to be "forced" out of employment earlier than men. Further, the case of Barber versus the G.R.E. (European Court of Justice) concluded that, because under Article 119 of the Treaty of Rome pensions are regarded as part of payment to labour, men and women should be treated equally when made redundant prior to retirement age. This ruling was to be "not retrospective". Nonetheless, there has been a trend towards equal treatment of men and women in pensions' provision. According to Mike Brown, Director of Information Services, National Association of Pension Funds, some forty-three per cent of private funds now offer both sexes retirement at age 65.

10 The 1986 survey by the Government Actuary suggests that the early retirement option is almost universal. Thus, for example:

> Most private sector schemes have provision for retirement on immediate pension for any member over a certain age (eg, 50), or within a certain period of he member's normal retirement date (eg, five years). Such early retirement may require the consent of the employer. Some schemes have special provisions for early pensions on redundancy. ...(page 54)

11 See Chapter 7 of the 1986 Government Actuary's survey of occupational pension schemes for further details.

12 See Chapter 8 of the 1986 Government Actuary's survey.

13 See page 4-9 for the changes introduced in the 1989 Budget.

Chapter Five: The Pure Theory of Portfolio Selection

5.0 Introduction

The primary objective of this chapter is to provide an illustration of how the literature has approached the problem of investment portfolio selection from a purely theoretical standpoint. In particular, we shall be concentrating on those ideas which have left the deepest impression, all the while keeping in mind that any one of the theories considered here may provide us with a suitable vehicle for modelling the portfolio behaviour of the United Kingdom pension funds—our ultimate objective. However, at this stage in the proceedings no explicit judgments will be made as to any theory's suitability for the task in hand; nonetheless, in order to fully understand the nature of the modelling process finally adopted, it is absolutely necessary to view it in light of its competitors. This requires a fairly complete (if not totally rigorous) survey of the relevant literature. Therefore most of what follows is presented in terms of a schematic history of the literature on portfolio selection theory.

5.1 Opening Comments

The area of economics known as portfolio (selection) theory[1] is still both young and rapidly developing; indeed, although earlier works do exist, it was the publication of Markowitz's seminal work (1959) that opened up portfolio theory as a major area for research. Following a similar approach to that of Markowitz, Baumol (1952) and Tobin (1958) laid the foundations for what has become known as the inventory approach to portfolio selection. In some quarters these works are regarded as the formalisation of a line of inquiry first begun by Sir John Hicks in his famous paper, "A Suggestion for Simplifying the Theory of Money" (1935). However, in more recent years this approach has come in for much heavy criticism, leading to a debate in the literature which has stimulated further growth and expansion in the field of portfolio theory. Prior to embarking on our journey through the literature there are one or two points worthy of note. Firstly, it should be remembered that the theory of portfolio selection is a fairly small part of the wider field of decision-making under uncertainty; according to Hicks, the theory of portfolio selection

> ...may be defined as that part in which the chooser is taken to be operating upon a perfect market -- in the 'perfect competition' sense that the prospect of return on a unit of money placed in a given manner is taken to be independent of the number of units of money that are so placed. (1967, p.103)

Of course, at first glance this may appear to be a somewhat unreasonable assumption, especially in view of the fact that the United Kingdom pension funds (and other financial institutions) hold such substantial proportions of the market for many financial assets.[2] However, at this early stage it is an essential assumption if we are to derive any worthwhile conclusions from the theory of portfolio selection. Indeed, as we find ourselves able to increase the degree of sophistication of our approach we may even reach a point where we can relax this seemingly unreasonable assumption, but for the present we shall let it be.

A second point of note is to recall that investments can be of two major types: real and financial.[3] When considering the investments made by the United Kingdom pension funds we should bear in mind that they are almost exclusively financial in nature, and therefore it is this type of investment portfolio selection with which we shall be concerned for the most part in this chapter. By way of a corollary to this we should add that all investments are demanded as a means to an end. They are not demanded for their own sake, hence the demand is indirect or derived. All investments are demanded because of the future income (or other benefits) that they are expected to yield to their owner. As a result of this indirect nature of investment demand, it is apparent that any utility gained from an investment will be indirect; the utility coming from the increased future consumption possibilities that the yield on the investment (hopefully) brings about. This may turn out to be an especially important point, as the consideration of a problem which falls under the general heading of decision-making under uncertainty usually involves the adoption of the basic maximising rule—ie, the expected utility maxim as originally developed by Bernouilli (1738), and promulgated by Ramsey (1927) and, in more recent years by von Neumann and Morgenstern (1947).[4] Indeed, because the final outcome of any investment is uncertain, its undertaking is bound to involve risk to some degree.[5] Consequently, in this chapter we shall only concern ourselves with those methods of portfolio selection which take risk and uncertainty into account. Such elementary Discounted Cash Flow methods as Net Present Value and Internal Rate of Return (Marginal Efficiency of Investment) will not be considered.

Finally, it would be remiss to leave this section without making mention of that other seminal work which gave rise to the modern theory of portfolio selection, Lord Keynes' *The General Theory of Employment, Interest and Money*, (1936). Indeed, the works of such as Tobin would appear to owe rather more to this source than to Markowitz. For our own purposes the most relevant area of *The General Theory...* is that on Liquidity Preference, to which we turn shortly. Before that, however, we commence our survey with a brief glance at some of the more heuristic methods of portfolio selection.

5.2 Naïve and Early Approaches

Most of these approaches involve the use of the concept of the time value of money, and frequently appear in various texts on Capital Budgeting. The basic premise underlying these approaches is that, to a rational individual £1 today is not worth the same as £1 next year, even in a non-inflationary environment. Indeed, the £1 today will usually be preferred because (in the extreme) its receipt today is relatively certain, whereas the likelihood of its receipt next year is less certain due to (eg) death. Because of this "time preference" for money, the rate of interest is called into being, and this provides a reinforcing effect for the time-preference phenomenon.[6] A financial investment may be regarded as if it were a loan involving the payment of interest. In what follows in this section, all investments are considered solely in terms of outlay and income, with little or no attention being paid to risk. We shall consider the investment decision under conditions of risk in the section following. We now consider some of the early approaches to making the investment decision:

(a) payback period: using this criterion, those investments which recover the principal (ie, the initial capital outlay) in the shortest period of time are selected. The payback period criterion is usually criticised as a method of investment appraisal because it fails to take into account the time value of money. However, in practice it is often combined with (eg) a discounted cash flow technique as a risk filtering device.

(b) the finite horizon criterion: this involves the setting of a terminal date beyond which any prospective developments are neglected. The major rationale behind this approach is that not only is the future uncertain, but the greater is that uncertainty the further into the future one attempts to delve. Both this and the payback period criterion depend heavily on an arbitrarily chosen period of time and are, therefore, likely to lead to some rather peculiar and often indefensible conclusions.

(c) the risk-discounting approach: this approach is an extension of the simple Net Present Value (Discounted Cash Flow) method of investment appraisal. Whereas under the latter all costs and revenues are discounted by the investor's required rate of return (often the market rate of interest is used), this method involves discounting the cash flow by the sum of the required rate of return plus a risk factor. This risk factor may be determined by various means, such as using a statistical measure of the dispersion of historic returns, although in practice it is often subjectively determined. This subjective determination forms the major grounds for criticism of this approach.[7]

(d) the Bernouilli criterion: also known as the expected utility maxim, this approach postulates an individual to behave as if:

(i) they assign estimates of utility to each alternative in their opportunity set, and

(ii) they choose that alternative (or group of alternatives) that maximises their expected utility.

The major problem with this criterion lies with the first postulate, which requires the probability distributions of asset returns to be known (either objectively, or subjectively with perfect certainty). Furthermore, without making specific assumptions about the shape of the probability distributions of the returns (eg, whether normally distributed, etc) or the nature of the utility function (eg, quadratic), the Bernouilli criterion is likely to lead to unacceptable results. A nice exposition of this criterion can be found in Baumol (1977).

(e) Liquidity Preference: although primarily a theory of the demand for money, Keynes' theory of Liquidity Preference is included here for two reasons. Firstly, it is the starting point for much work on portfolio selection *per se*, and secondly, it treats the demand for money as being synthetical to the demand for other financial assets, which Keynes aggregates together under the "bonds" banner. This applies mainly to Keynes' speculative demand for money, whereby (part of) the demand for money is inversely related to the rate of interest. This is because there exists two substitute financial assets: money, which bears no interest but is riskless, and bonds, which bear interest but involve risk, particularly that of capital gain/loss. Further, money possesses an immediate command over goods and services (ie, it possesses liquidity) which bonds do not. Therefore, the rate of interest represents the opportunity cost of holding money, whilst liquidity is the opportunity cost of holding bonds. Hence, a fall in the rate of interest is likely to bring about an increase in the demand for money relative to the supply. The major problem with this line of approach is that it implies (Keynes explicitly postulates) that every individual has some idea as to what the "normal" rate of interest should be; if the actual rate deviates from this, the logical outcome is that an individual investor will hold a portfolio of all money or all bonds accordingly. Obviously, this contrasts with the diversified portfolios we observe as everyday phenomena. Nonetheless, one should recognise that the kinds of problems which Keynes was addressing in using Liquidity Preference are very different from the kinds of problems that we are examining in this Thesis.

5.3 The Mean-Variance Approach

5.3.1 Tobin [8]

In his famous 1958 article, "Liquidity Preference as Behavior Towards Risk", Tobin sets out to show that the basic assumption underlying Keynes' Liquidity Preference schedule was that of risk aversion. Indeed, there are many who regard this work as an extension of Keynes' theory of Liquidity Preference. Following Keynes, Tobin divides an individual's total money balances into two broad categories: transactions balances and investment balances, which broadly correspond to Keynes' $L_1(Y)$ (transactions and precautionary demands) and $L_2(r)$ (speculative demand) respectively. Similarly, Tobin regards the influence of interest rates on transactions balances as existing but being negligible. Yet this is not the case for investment balances, which have a non-zero interest elasticity of demand. The alternative forms to cash in which savings may be held are considered to possess a variable market yield; they are obligations to pay stated cash amounts at future dates with no risk of default. Tobin refers to these as "other monetary assets", and suggests that Liquidity Preference theory

> ...takes as given the choices determining how much wealth is to be invested in monetary assets and concerns itself with the allocation of these amounts among cash and alternative monetary assets.. (1958, Section 1.2)

Thus, there is a sequential decision-making procedure, with the savings-versus-consumption decision being made first,[9] and followed by a decision as to how savings should be held, in "money" or "alternative monetary assets".[10] According to Tobin, there are two possible sources of Liquidity Preference, and these are not mutually exclusive: they are inelasticity of expectations of future interest rates, and uncertainty about future interest rates. Following Tobin, we shall consider each of these in turn, but first we need to clarify a few basic notational definitions which he employs.

Like Keynes, Tobin assumes the existence of only a single monetary asset besides cash, which he takes to be a Consol; that is to say, for every $1 invested today the Consol promises to pay the sum of $r per 'annum' in perpetuity. The yield of cash is defined as being zero. If the investor's cash balance is A_1 and his Consol balance is A_2, then the decision (A_1, A_2) fixes the portfolio for a 'year'.

(i) **inelastic expectations:** given inelastic expectations of future interest rates, two types of inelasticity may be distinguished: firstly, they may be perfectly inelastic, in which case we have fixed expectations; alternatively, expectations may be only relatively inelastic, which gives the case known as "sticky" expectations.

(a) **perfectly inelastic expectations:** let r^e be the rate of interest on Consols that the investor expects to prevail at the end of the year. This expectation is held with perfect certainty. Note that r^e is independent of the prevailing rate of interest, r. Consequently, over the course of the 'year', the investor expects with certainty that for $1 invested in Consols he will earn $r in interest plus a capital gain (or loss) of $g, where:

$$g = (r/r^e) - 1$$

The conclusion is that if $(r + g) > 0$ then the individual invests totally in Consols, holding no cash; alternatively, if $(r + g) < 0$ only cash will be held. This condition can be expressed in terms of a critical rate of interest, r_c, where:

$$r_c = \frac{r_e}{1 + r_e}$$

If $r > r_c$ then the investor will hold only Consols, and if $r < r_c$ then he will hold only cash.

(b) **"sticky" expectations:** under fixed expectations r^e was assumed to be independent of r; with sticky expectations this assumption is modified such that $r^e = \Psi(r)$. Correspondingly, Tobin now derives a new critical rate of interest:

$$r_c = \frac{\Psi}{1 + \Psi}$$

Figure 5-1 reveals that this function has only one intersection with the 45^o line, at which its slope is less than unity. Under these assumptions, the intersection determines a critical rate of interest, r_c, such that if $r > r_c$ the investor holds no cash, whilst if $r < r_c$ the investor holds no Consols.

Thus it would seem that the portfolio held by the investor with inelastic expectations (either fixed or "sticky") of the future rate of interest consists of either only cash or only Consols; such an investor does not hold a diversified portfolio.

(ii) future interest rate uncertainty: under this possible source of Liquidity Preference, uncertainty implies the proposition that an individual is not certain of the future rate of interest on Consols; that is to say, he does not possess perfect foresight! This is a very different animal to the 'uncertainty' that Keynes used to explain Liquidity Preference in *The General Theory...*, (1936) where

> ...the greatest emphasis is on the notion of a "normal" long-term rate, to which investors expect the rate of interest to return. When he refers to uncertainty in the market, he appears to mean disagreement among investors concerning the future of the rate rather than subjective doubt in the mind of an individual investor.
>
> (1958, Section 2.6)

For Tobin, however, uncertainty denotes subjective doubt about the future rate of interest in the mind of an individual investor. Thus, any investment in Consols involves the risk of a capital loss (equally, there is the 'risk' of a capital gain). Hence, the greater is the amount invested in Consols, ie, A_2, the greater is the risk that the investor assumes, but also the greater is the investor's expected return. Previously, for any given rate of interest, r, the investor had a definite expectation of g from investing $1 in Consols (see Figure 5-1). However, now the investor has uncertain expectations of g and, therefore, bases his actions on his estimate of the probability distribution of g. Tobin assumes that this probability distribution has an expected value (mean) of zero, and is independent of the level of r. Thus, because by definition $A_1 + A_2 = 1$ and both A_1 and A_2 are non-negative, the return on the portfolio is:

$$R = A_2(r + g) \qquad \textbf{(5-1)}$$

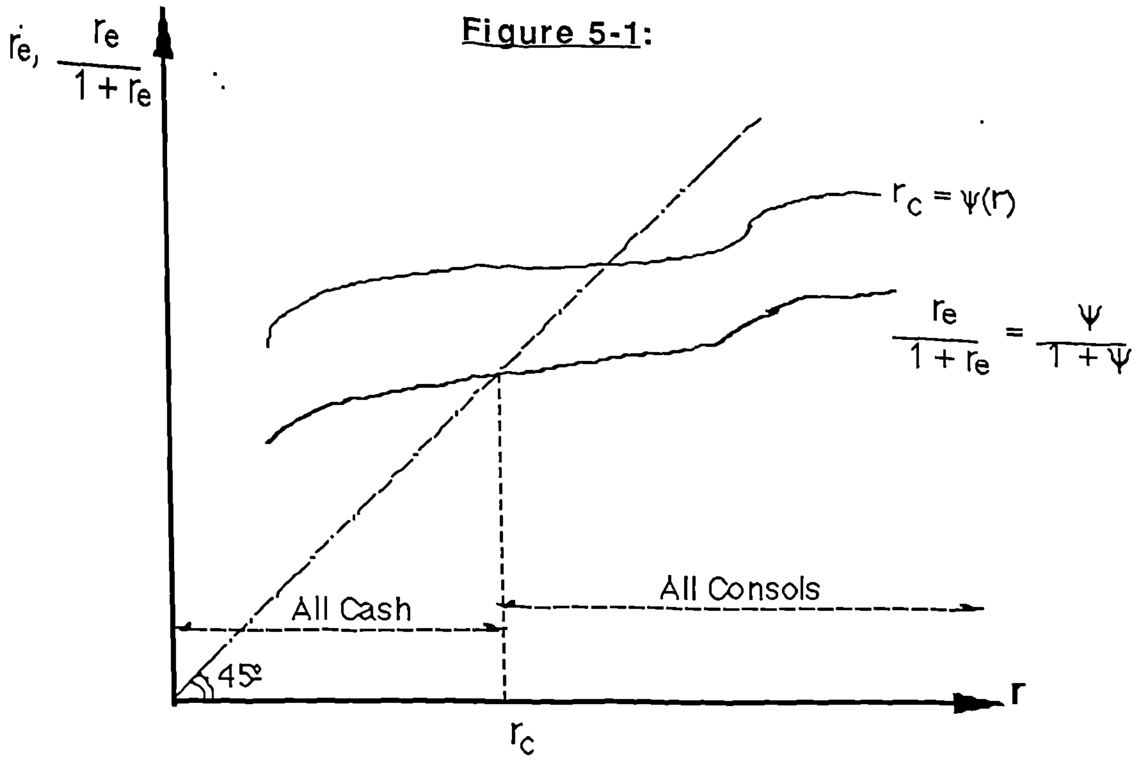
Because g is a random variable with zero mean, the expected return on the portfolio is given by:

$$E(R) = \mu_r = A_2 r \qquad \textbf{(5-2)}$$

The standard deviation of the return, σ_R, is used as a measure of the risk involved in investing in Consols.[11] A high σ_R implies high risk; a σ_R of zero implies no risk, ie, a certain prospect, such as would be the case with money. The standard deviation of the return on the portfolio is defined as

$$\sigma_R = A_2 \sigma_g \qquad \textbf{(5-3)}$$

Figure 5-1:



Thus, it can now be seen formally that A_2 determines both μ_r and σ_R. By use of (5-2) and (5-3) the terms on which an investor can obtain a greater expected return at the expense of assuming greater risk can be derived:

$$\mu_R = (r/\sigma_g)\sigma_R \tag{5-4}$$

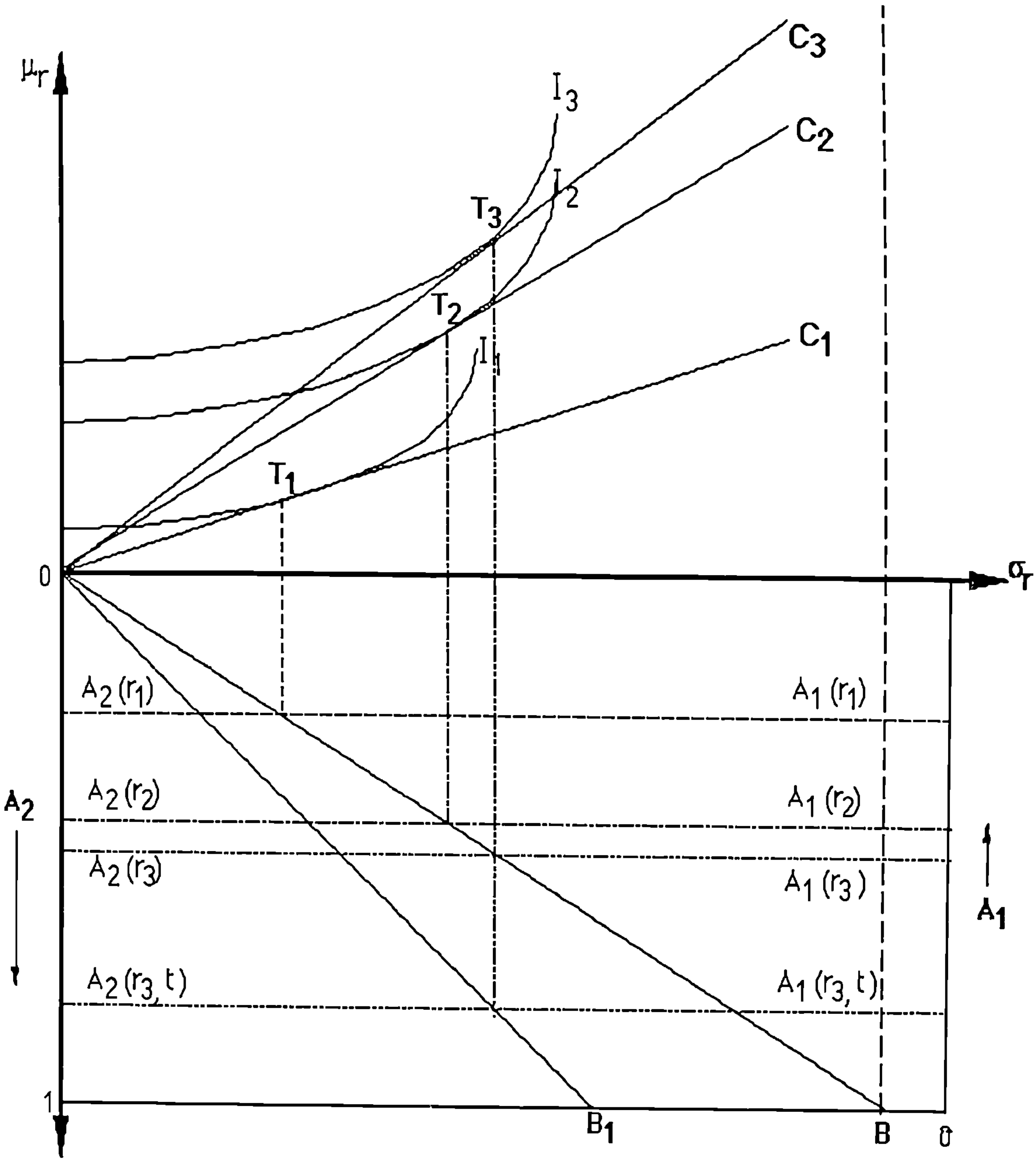
where $0 \leq \sigma_R \leq \sigma_g$. Tobin plots this inverse relationship between risk and return on an "opportunity locus" such as the various OC curves depicted in Figure 5-2. In this diagram OC_1 is the relevant opportunity locus when the prevailing rate of interest is r_1. At a higher rate of interest, such as r_2, the relevant opportunity locus would be OC_2, and so on for r_3, etc. The slope of any opportunity locus OC_i is simply the ratio r_i/σ_g. The relationship between the level of risk assumed and the percentage of the portfolio invested in Consols, ie, equation (5-3), is illustrated by the line OB.

Tobin makes the reasonable assumption that an investor will possess a scale of preference between risk and expected return; in particular, for any given level of risk he assumes that an investor will always prefer a greater expected return to a smaller. As with standard consumer theory, these preferences may be represented by a utility function and hence by indifference curves.[12] These appear as I_1, I_2 and I_3 in Figure 5-2. Tobin distinguishes between two broad categories of investor: the **risk-lover** and the **risk-**

-

-

Figure 5-2:

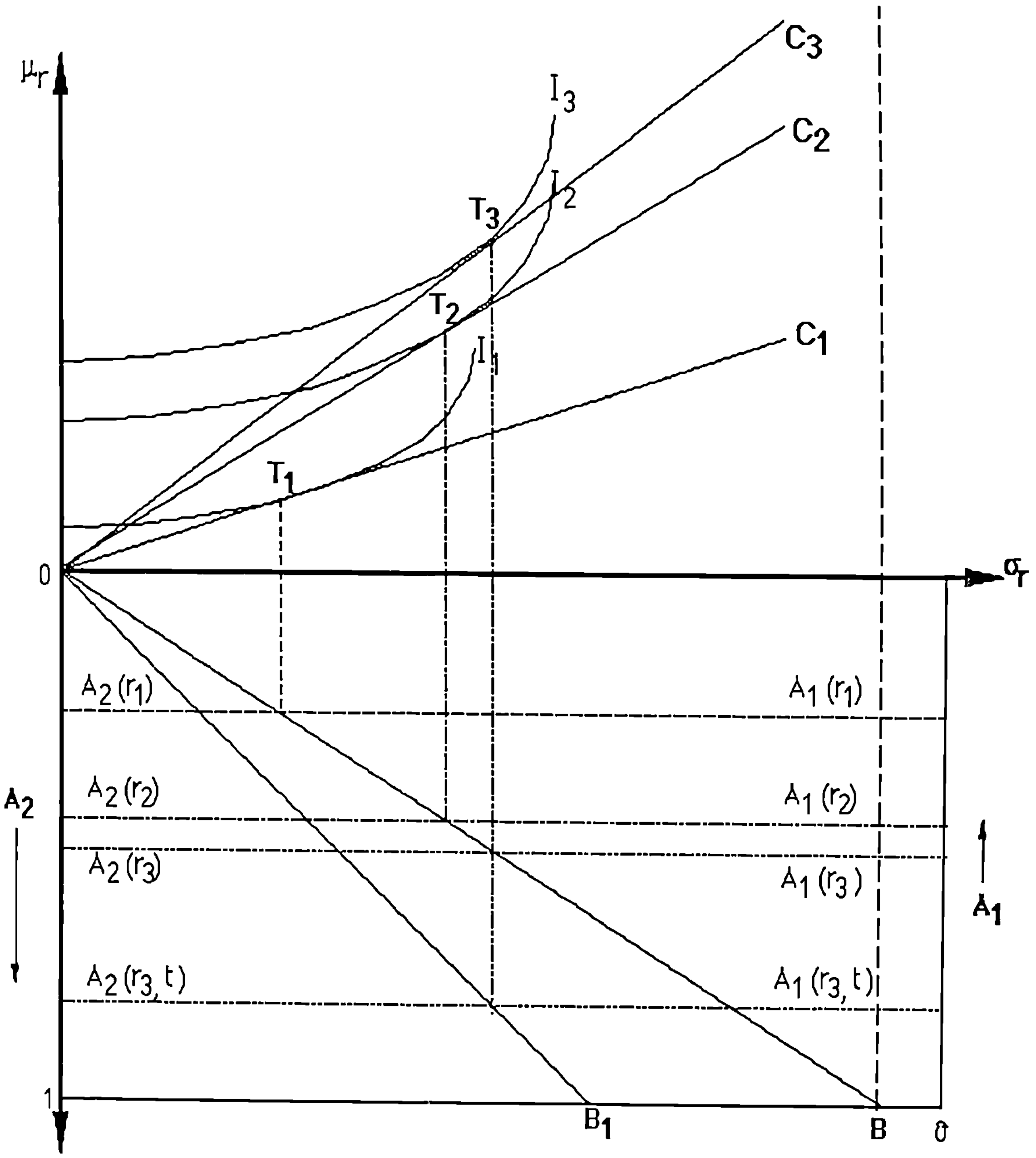


μ_r
C_3
I_3
C_2
I_2
T_3
T_2
I_1
C_1
T_1
0
σ_r
$A_2(r_1)$
$A_1(r_1)$
A_2
$A_2(r_2)$
$A_1(r_2)$
$A_2(r_3)$
$A_1(r_3)$
A_1
$A_2(r_3, t)$
$A_1(r_3, t)$
1
B_1
B

-

-

Figure 5-2:



μ_r
C_3
I_3
C_2
I_2
T_3
T_2
I_1
C_1
T_1
0
σ_r
$A_2(r_1)$
$A_1(r_1)$
A_2
$A_2(r_2)$
$A_1(r_2)$
$A_2(r_3)$
$A_1(r_3)$
A_1
$A_2(r_3, t)$
$A_1(r_3, t)$
1
B_1
B
ϑ

averter. The former category consists of those investors who are willing to accept a lower value of expected return for the chance of a higher capital gain; their preferences will be represented by negatively-sloped indifference curves. The latter category of investor may be one of two types, both of which possess positively-sloped indifference curves. If, as illustrated in Figure 5-2, the indifference curves have a concave shape then the risk-averter will be a **diversifier**, holding a combination of both cash and Consols in his portfolio. However, if the investor's indifference curves are linear or convex then a corner solution will obtain. Such an investor is termed a **plunger** and holds a portfolio consisting entirely of cash or entirely of Consols. In fact, Tobin is able to demonstrate that a risk-averter's indifference curves must be concave thereby eliminating the possibility of the existence of plungers.[13]

Thus far, the rate of return, $R = A_2(r + g)$, has been considered with g possessing a subjective probability distribution with zero mean and a standard deviation of σ_g. However, in the absence of restrictions on these subjective probability distributions, the relevant distribution parameters are found by considering the restrictions imposed on the utility function. Tobin shows that two parameters are determined by the choice of scale for the utility function; if the specification of the utility function requires no additional parameters then all the relevant information in the probability distribution can be summarised by one parameter. For example, if a linear scale was chosen for the utility function, such as $U(R) = R$, then $E\{U(R)\} = E(R)$. This implies a maximum return in a certain world. However, if the utility function required one additional parameter then the subjective probability distribution will require two. Which parameters these turn out to be is entirely dependent upon the exact form of U(R); for example, a focus on the mean and standard deviation of the return is justified by a quadratic utility function such as:[14]

$$U(R) = (1 + b)R + bR^2 \tag{5-5}$$

If $0 < b < 1$ then the investor is a risk-lover; for a risk-averter $-1 < b < 0$. However, because the marginal utility of return, U'(R), must be non-negative, then $(1 + b) + 2bR \geq 0$. This gives the following conditions:

$$R \geq \frac{1+b}{2b} \qquad b > 0 \qquad => \qquad \text{risk-lover}$$

$$R \leq \frac{1+b}{2b} \qquad b > 0 \qquad => \qquad \text{risk-averter} \tag{5-6}$$

Tobin extends this simple analysis to the case when there exists many financial assets as well as cash. Suppose that, in addition to cash, an investor may hold a combination of up to m other financial assets in his portfolio. If x_i ($i = 1, 2, 3, \ldots, m$) is the amount invested in asset i, and x_i is always non-negative, then $\sum x_i = A_2 \leq 1$. If r_i is the expected yield on asset i, and g_i is the capital gain/loss per dollar invested in asset i, then $E(g_i) = 0$ for all i. The covariance between capital gains/losses on any two distinct assets is defined as:

$$
\begin{aligned}
V_{ij} &= \mathrm{cov}(g_i, g_j) \\
&= E(g_i g_j)
\end{aligned}
\tag{5-7}
$$

Consequently the over-all expected return on the portfolio is:

$$
\begin{aligned}
\mu_R &= A_2 r \\
&= \sum_i x_i r_i
\end{aligned}
\tag{5-8}
$$

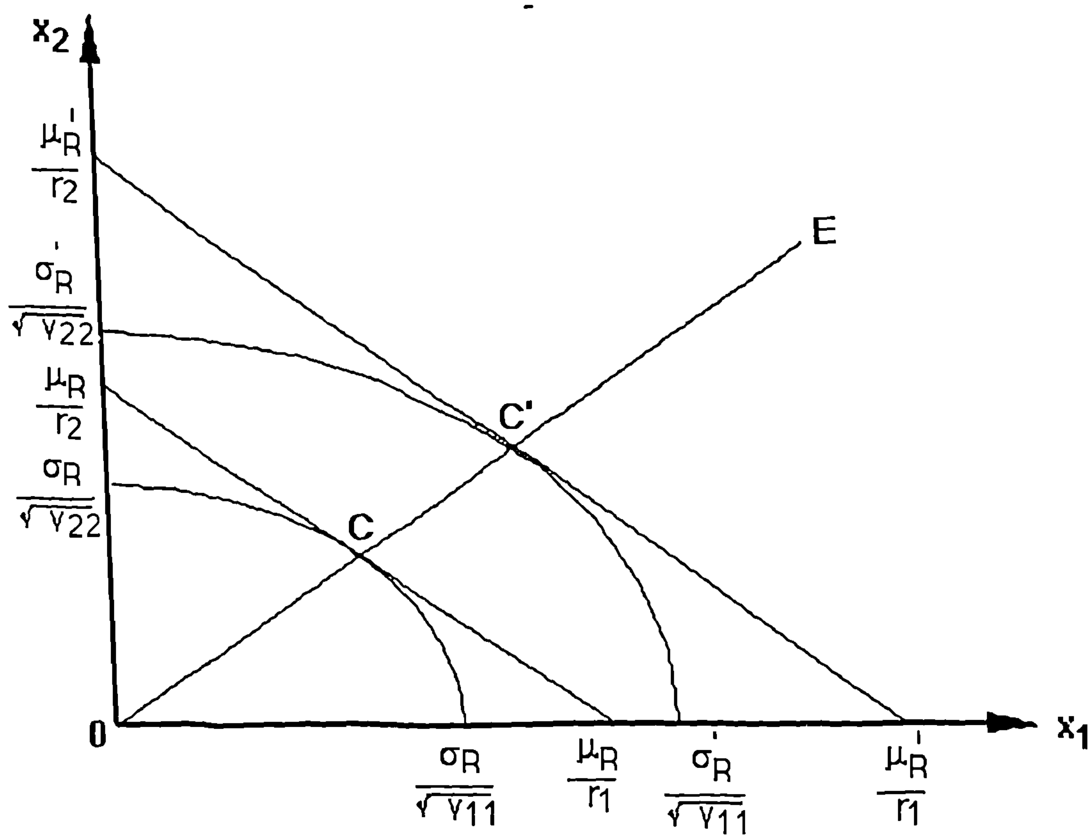
Similarly, the over-all variance on the portfolio return is:

$$
\begin{aligned}
\sigma_R^2 &= A_2^2 \sigma_g^2 \\
&= \sum_i x_i x_j v_{ij}
\end{aligned}
\tag{5-9}
$$

As with the simple cash/Consols case, Tobin constructs a constant-return locus, consisting of those x_i points such that $\sum x_i r_i$ is constant. He also constructs along similar lines a constant-risk locus, consisting of those x_i points such that σ_R^2 is constant. On the assumption that i = 2 (ie, there are only two alternative financial assets to cash), these loci can be shown in diagrammatic form, such as in Figure 5-3. The line from μ_R/r_1 to μ_R/r_2 through C is a constant-return of μ_R locus. For a higher return, say μ_R', the locus runs from μ_R'/r_1 to μ_R'/r_2 via C', and is parallel to the first constant-return locus.

Unlike the constant-return loci, the constant-risk loci turn out to be ellipsoidal in shape rather than linear. For a risk level of σ_R, the constant-risk locus runs from $\sigma_R/\sqrt{v_{22}}$ to $\sigma_R/\sqrt{v_{11}}$ via C. Similarly, for a higher risk level, σ_R', the locus runs from $\sigma_R'/\sqrt{v_{22}}$ to $\sigma_R'/\sqrt{v_{11}}$ via C'. The points of tangency, C and C', exemplify the dominant combinations of x_1 and x_2; ie, the highest levels of expected return for any given level of risk. Note that all dominant sets lie on

Figure 5-3:



the ray through the origin, OCC'E. At some point along this ray, eg, point E, holdings of non-cash assets will exhaust the investor's balances. Thus, at E no cash is held and $\sum x_i = 1$. However, between O and E the ratio between cash and non-cash assets is shown by the ratio of distances such as OC and OE. The implication is that the mix of non-cash assets held by the investor is independent of their aggregate share of the investment balance—a separation theorem of sorts.

Despite the conceptual elegance of his analysis, Tobin's approach suffers from a major drawback in not going into any detail of the determination of the non-cash assets segment of the portfolio. Of course, it should be recognised that his prime objective was to examine closely the factors which underlay Keynes' theory of Liquidity Preference rather than an examination of the investor's portfolio selection decision *per se*, and so consideration of how an investor would distribute his investment balances among the various non-cash assets requires us to look farther afield, which we now do.

5.3.2 Markowitz

In many respects the approach of Markowitz to portfolio selection is very similar to that of Tobin. However, although Markowitz's seminal work in this area did not appear until 1959, a large proportion of it is an elaboration of his 1952 article in the *Journal of Finance.* Perhaps the major difference between the work of Markowitz and that of Tobin is that the latter does not consider how an investor selects the combinations of non-cash assets that make up his portfolio (as we have just seen). Markowitz, on the other hand, examines this in great detail by the use of programming methods, which we now examine.

According to Markowitz, the process of selecting a portfolio can be divided into two stages. The first stage involves the formation of beliefs about the future performance of the various securities available. These will be based on the investor's observations and experience. The second stage is the actual selection of the portfolio; the choosing of the various securities that go to make up the portfolio. This will be determined by the investor's beliefs about future performance. Because of the uncertain nature of the future, the formation of beliefs about future performance is an entirely subjective process. Thus, the return associated with any security (or portfolio) will be an expected return, as will the associated levels of risk. Thus, if x_i is the quantity of security i in the portfolio, and r_i is the return associated with with security i, then the return on the portfolio, R, will be defined as:

$$R = \sum_{i}^{n} x_i r_i$$

when there are n securities, and the expected return on the portfolio is:

$$E(R) = \sum_{i=1}^{n} x_i . E(r_i)$$

Markowitz points out that because the r_i's are uncertain events rather than random variables, the various operators (such as E, variance, covariance, etc) are based on probability beliefs rather than on objective probabilities. Because of this there will not be a zero covariance between any two securities. Hence, diversification will only serve to minimise risk, and not eliminate it entirely. With a portfolio being defined as a combination of securities, Markowitz then considers the concept of an **efficient** portfolio.

A portfolio is defined as being **inefficient** if it is possible to obtain a higher expected return with no greater variance (ie, at no greater risk), or obtain a greater certainty of return with no less expected return. Consideration of the simple case of a three-security portfolio enables diagrammatic illustration. If X_i is the fraction of the portfolio invested in security i, then $X_1 + X_2 + X_3 = 1$. Standard portfolio analysis also requires that no short sales be allowed, ie, $X_i \geq 0$ for all i. Now, because $X_3 = 1 - X_2 - X_1$, all legitimate portfolios can be shown geometrically. These are represented by the shaded area  in Figure 5-4. Portfolios that lie within the shaded area but not on the boundaries contain all three securities. Thus, it can be said that the choice of portfolio is constrained by legitimacy. However, Markowitz shows that it is possible to impose additional constraints. For example, suppose that due to the investor's probability beliefs there is a minimum income requirement from the portfolio of 0.003. Then, if the current incomes for the three securities are 0.04, 0.02 and 0.03 respectively, there is a further legitimacy constraint of:

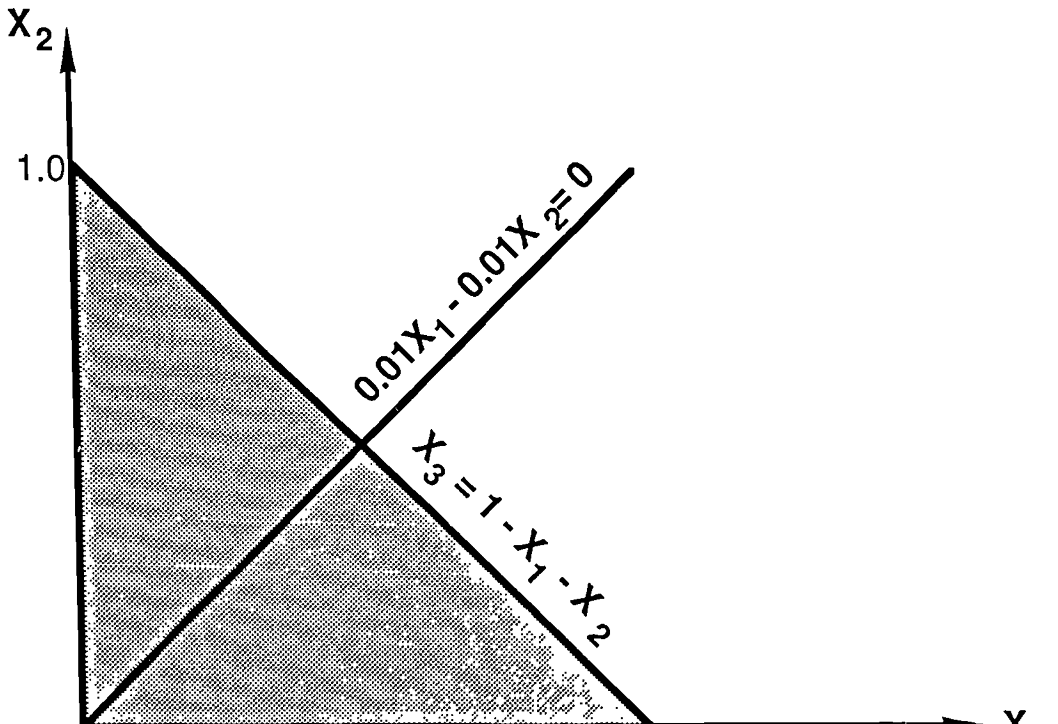
$$0.04X_1 + 0.02X_2 + 0.03X_3 \geq 0.03$$

Using $X_3 = 1 - X_2 - X_1$, this becomes:

$$0.01X_1 - 0.01X_2 \geq 0$$

which is illustrated in Figure 5-4. So, with this additional constraint, legitimate portfolios are to be found in the shaded area below the line $0.01X_1 - 0.01X_2 = 0$.

Figure 5-4:



In addition to the notation used above, Markowitz introduces the following:

E = the expected return on the portfolio

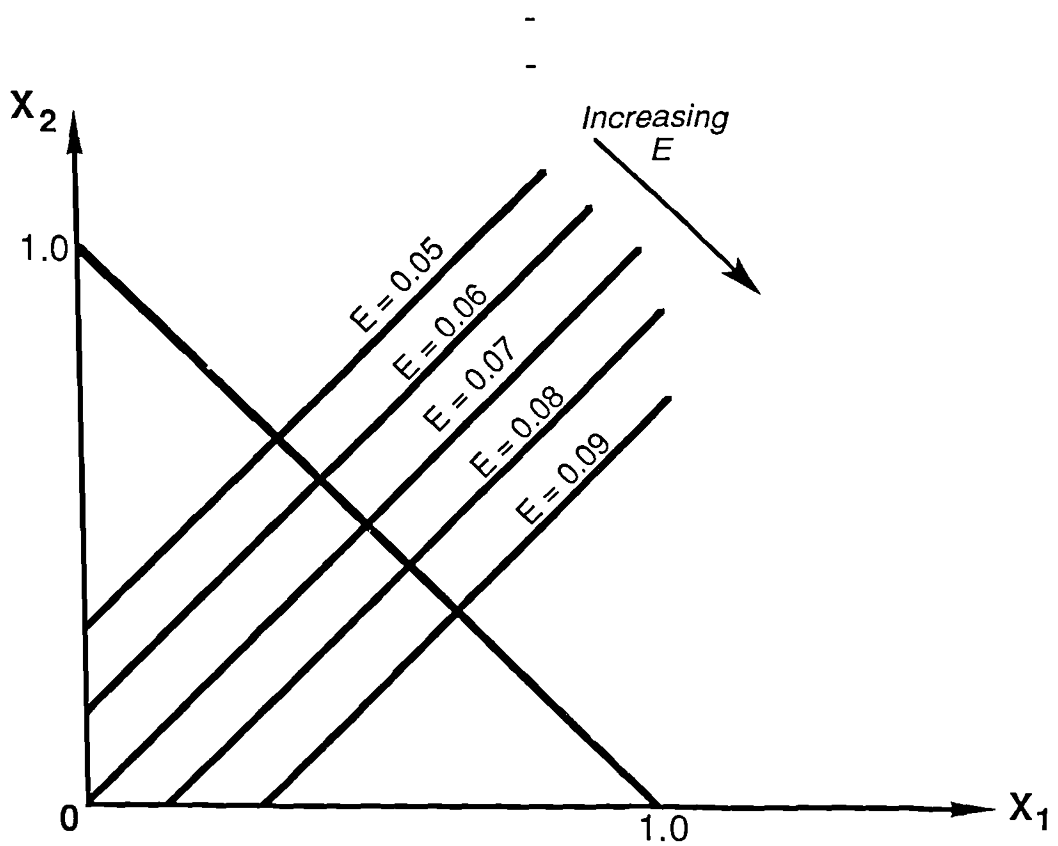
μ_i = the expected return on security i

V = the variance of the return on the portfolio

σ_{ij} = the covariance between returns on securities i and j.

It is, therefore, apparent that $E = X_1\mu_1 + X_2\mu_2 + X_3\mu_3$. Using $X_3 = 1 - X_2 - X_1$, this becomes $E = X_1(\mu_1 - \mu_3) + X_2(\mu_2 + \mu_3) + \mu_3$. By way of example consider the case where $\mu_1 = 0.1$, $\mu_2 = 0.05$ and $\mu_3 = 0.07$. Then $E = 0.03X_1 - 0.02X_2 + 0.07$. If the investor required $E = 0.08$ then an iso-mean line[15] of $0.01 = 0.03X_1 - 0.02X_2$ will occur. Providing that the μ_i's are not equal a system of parallel iso-mean lines will obtain, as illustrated in Figure 5-5.

Figure 5-5:

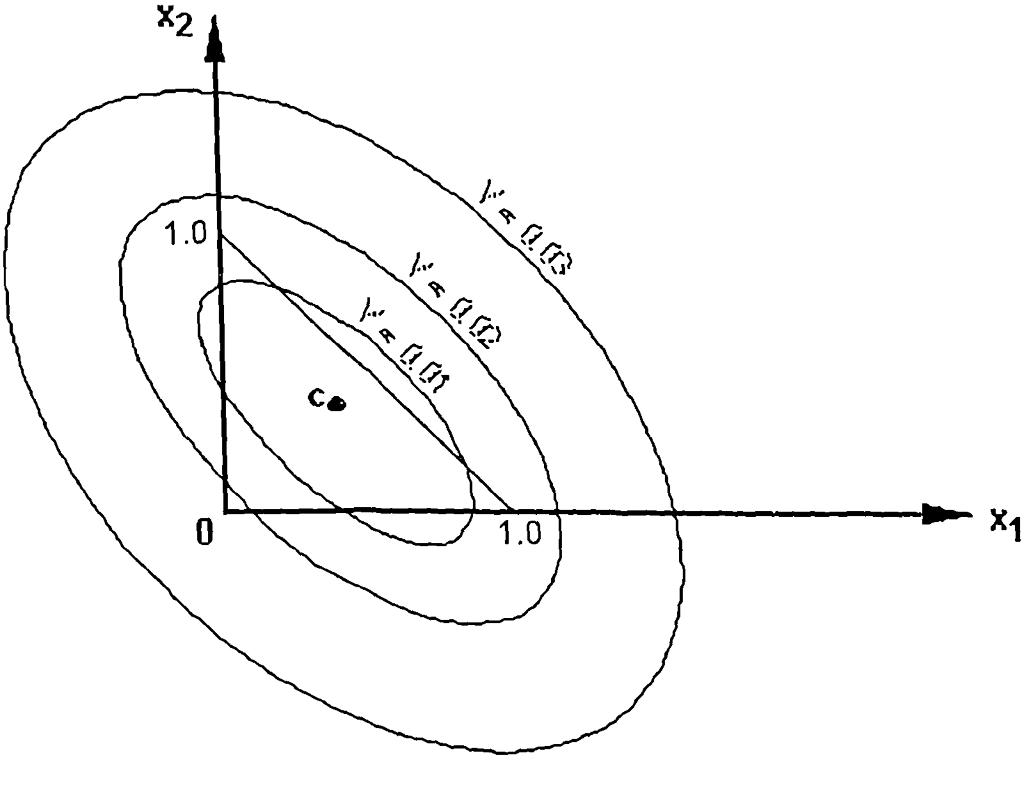


In a similar manner Markowitz derives the following formulation for the variance of the return on a portfolio:

$$V = X_1^2(\sigma_{11} - 2\sigma_{13} + \sigma_{33}) + X_{22}(\sigma_{22} - 2\sigma_{23} + \sigma_{33}) + 2X_1X_2(\sigma_{12} - \sigma_{13} - \sigma_{23} - \sigma_{33}) +$$
$$2X_1(\sigma_{13} - \sigma_{33}) + 2X_2(\sigma_{23} - \sigma_{33}) + \sigma_{33}.$$

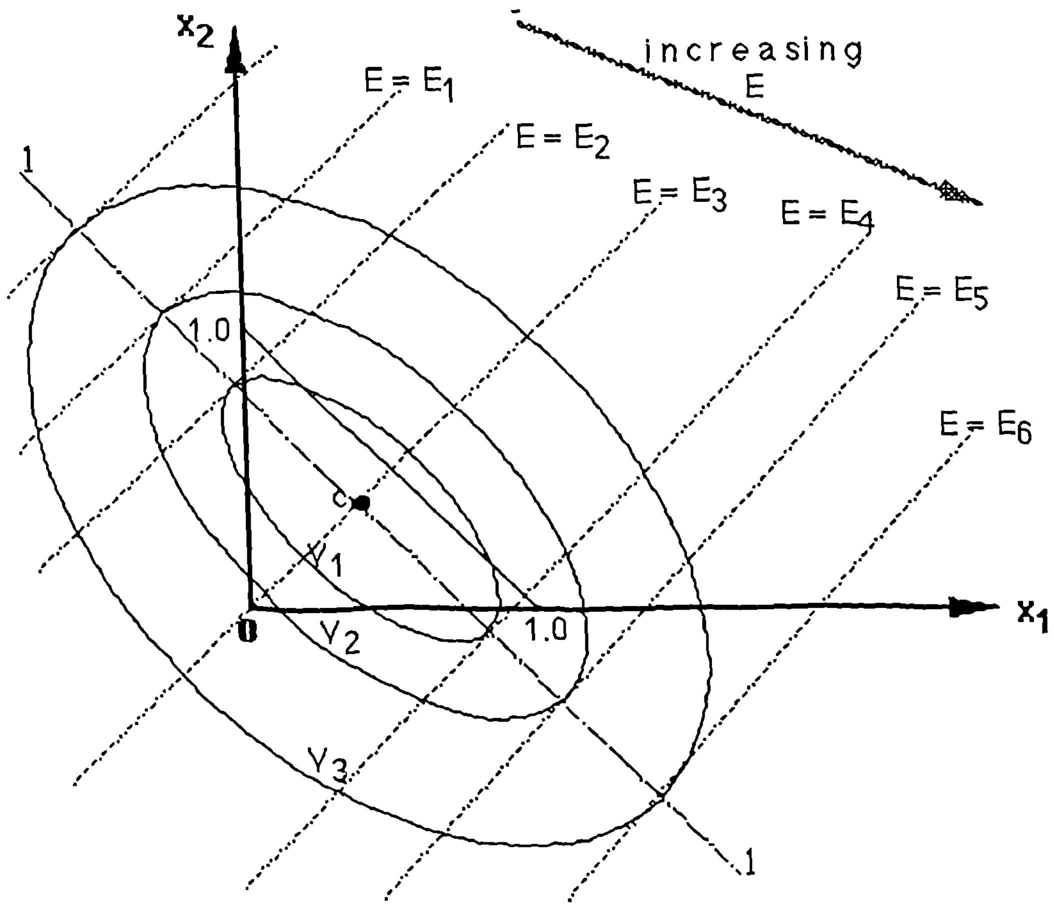
If we consider an example such that $\sigma_{11} = \sigma_{22} = 0.01$, $\sigma_{33} = 0.04$, $\sigma_{12} = 0.005$ and $\sigma_{13} = \sigma_{23} = 0$, then we obtain $V = 0.05X_1 + 0.05X_2 + 0.09X_1X_2 - 0.08X_1 - 0.08X_2 + 0.04$. If the investor required (say) $V = 0.01$ then we would find that $0.05X_{12} + 0.05X_{22} + 0.09X_1X_2 - 0.08X_1 - 0.08X_2 + 0.03 = 0$ which is an iso-variance ellipse[16] such that $V = 0.01$. It is possible for an iso-variance ellipse to be a circle,[17] but regardless, all iso-variance ellipses will have the same centre (point c in Figure 5-6), the same orientation and the same ratio of longest to shortest diameter. Point c represents that portfolio with minimum possible variance (ie, least risk) and may be either legitimate or illegitimate.

Figure 5-6:



By superimposing the iso-variance curves onto a map of iso-mean lines Markowitz obtains Figure 5-7. Ignoring legitimacy temporarily, there are a series of points of tangency between the two sets of curves. Markowitz calls the locus of these points, ll, the critical line. Such a locus is the set of all points which minimise variance among portfolios with the same expected return, and may or may not pass through the set of.legitimate portfolios.

Figure 5-7:



Markowitz uses the critical line to illustrate the concept of efficient portfolios. He defines an efficient portfolio, P, as being such that:

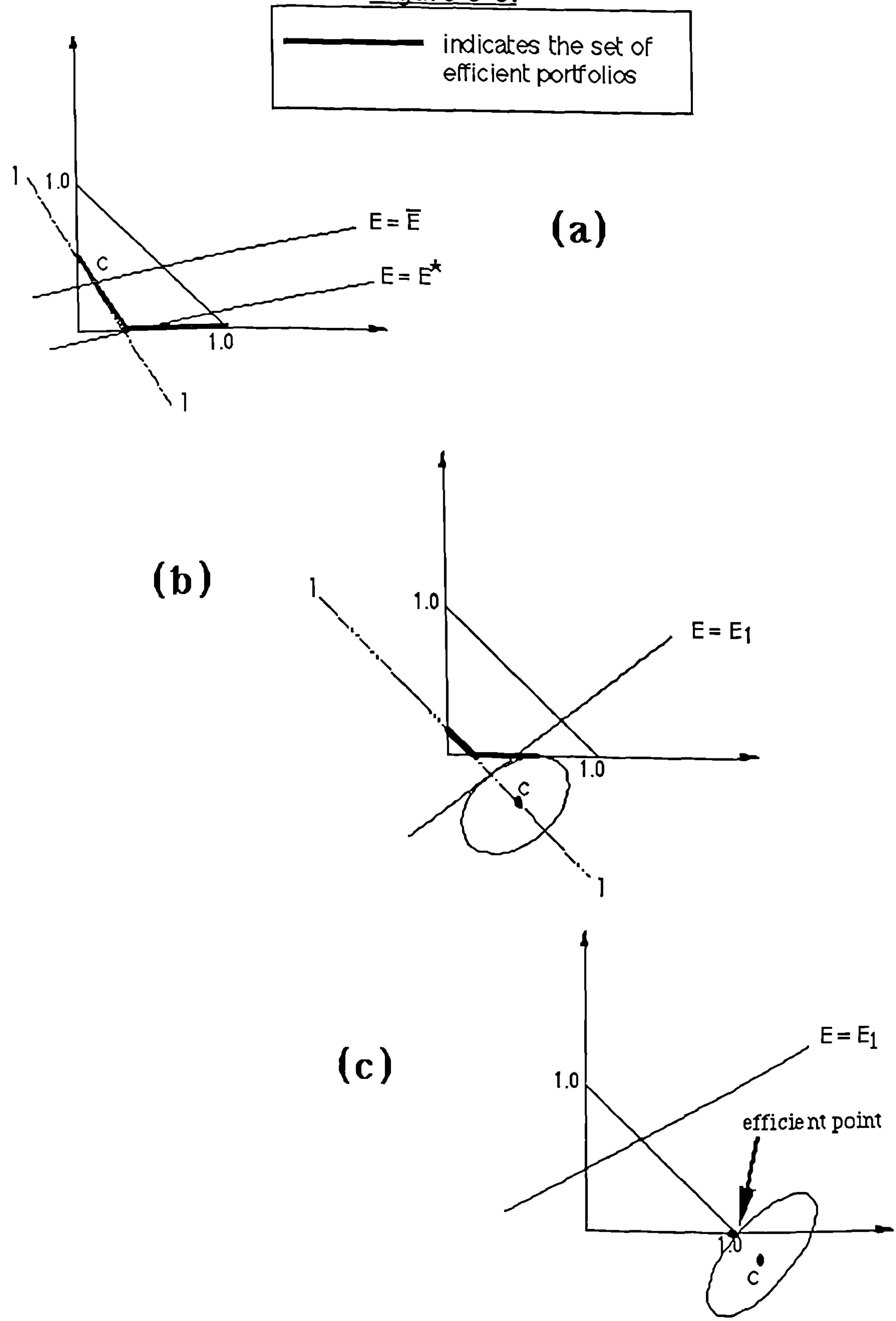
(1) P is legitimate,

(2) if there is another legitimate portfolio with greater E it must also have greater V, and

(3) if there is another legitimate portfolio with smaller V it must also have smaller E.

Examples of sets of efficient portfolios are illustrated in Figure 5-8.

Figure 5-8:


indicates the set of efficient portfolios
1.0
E = $\bar{E}$
E = E^*
C
1.0
1
1
(a)
(b)
1.0
E = E_1
1.0
C
1
1
(c)
1.0
E = E_1
efficient point
1.0
C

Of course, such a diagrammatic illustration of the derivation of efficient portfolios (using the mean-variance criterion) is a sizeable abstraction from reality where a portfolio may consist of many more than three securities. It is possible to extend this illustrative analysis to the case of four securities by use of "three-dimensional" diagrams and, in fact, Markowitz does this, replacing critical lines with critical sets and so on. We shall not consider this here,[18] preferring instead to concentrate our attentions on Markowitz's use of programming methods to derive a set of efficient portfolios in the more general case when there are n securities. This is done by use of matrix algebra.

By using the "critical line/set" method of deriving efficient portfolios one is effectively processing the means, variances and covariances of a number of securities to find the set of efficient portfolios. Following Markowitz, we now show that this process can easily be shown algebraically. The portfolio is represented by:

$$X = \begin{bmatrix} X_1 \\ \vdots \\ X_n \end{bmatrix}$$

such that $X_i \geq 0$ for all i, and also:

$$\begin{array}{ccccccccc} a_{11}X_1 & + & a_{12}X_2 & + \ldots + & a_{1n}X_n & = & b_1 \\ \vdots & & \vdots & & \vdots & & \vdots \\ \vdots & & \vdots & & \vdots & & \vdots \\ \vdots & & \vdots & & \vdots & & \vdots \\ a_{m1}X_1 & + & a_{m2}X_2 & + \ldots + & a_{mn}X_n & = & b_m \end{array}$$

This second set of constraints can be represented more easily as $AX = b$. The expected return on the portfolio, $E = \sum X_j \mu_j = \mu' X$ where $\mu' = (\mu_1, \mu_2, \ldots, \mu_n)$. The variance of return on the portfolio, $V = \sum\sum X_i X_j \sigma_{ij} = X'CX$ where $C = [\sigma_{ij}]$ and is symmetric. Define M as an (m+n) by (m+n) symmetric matrix such that:

$$M = \begin{bmatrix} C & A' \\ A & 0 \end{bmatrix}$$

Define $R' = [0, b]$ and $S' = [\mu, 0]$. Markowitz also defines a **Unit Cross** as an intersecting column and row with zeros everywhere except for a unit at the intersection. A similar definition applies for a **Zero Cross**.

Now, the set of efficient portfolios is composed of segments from the critical lines. Associated with any critical line will be a set of variables which are "in", ie, those securities held in the portfolio. The formula for a critical line is:

$$\widetilde{M}\begin{bmatrix} X \\ \lambda \end{bmatrix} = R + \widetilde{S}\lambda_E \qquad \textbf{(5-10)}$$

where: $\widetilde{M}$ = M with rows and columns corresponding to "out" variables being replaced by unit crosses.[19] Also, $\widetilde{M}$ is assumed to be non-singular (ie, its inverse, $\widetilde{M}^{-1}$, exists).

$\widetilde{S}$ = S with zeros corresponding to out variables.

λ_E is a number (not a matrix).

If λ_E is specified then (5-10) can be solved for X. Rewrite (5-10) as:

$$\begin{bmatrix} X \\ \lambda \end{bmatrix} = (\widetilde{M})^{-1}R + (\widetilde{M})^{-1}\widetilde{S}\lambda_E \qquad \textbf{(5-11)}$$

Define N(i) as $\widetilde{M}^{-1}$ with zero crosses in out positions, and rewrite (5-11) as:

$$\begin{bmatrix} X \\ \lambda \end{bmatrix} = N(i)R + N(i)S\ \lambda_E \qquad \textbf{(5-12)}$$

This is now the formula for the critical line. Replacing $\widetilde{M}^{-1}$ by N(i) means that S can now be used instead of $\widetilde{S}$.

At this point we shall not be going into full detail of Markowitz's procedure for computing efficient portfolios by the mean-variance criterion, save to make the following points.[20] The basic procedure adopted by Markowitz involves the application of linear programming techniques. This means using an algorithm which moves around the set of efficient portfolios, considering one critical line at a time, until it arrives at that portfolio which, for a given expected return, minimises the risk involved. This iterative procedure begins by locating that efficient portfolio which, regardless of risk, has the greatest expected return. By moving along the critical lines the algorithm trades off risk for lower expected returns until the most efficient portfolio in terms of both risk and return is located.

In addition to the variance Markowitz also considers other statistical measures of risk, such as the semi-variance, but rules them out of the reckoning on the grounds of cost, convenience and familiarity. By way of example, it should be recognised that the procedure which uses the semi-variance is not so very different from that which uses the variance as a measure of risk, and for this reason we do not consider it in this paper. He goes on to consider in more detail the basis on which his portfolio selection procedure is founded, ie, rational behaviour in the face of risk and uncertainty. In much the same way as Tobin, Markowitz considers (and rejects) the maximisation of expected return rule and then proceeds to look at the expected utility maxim. Like Tobin, he finds that if the utility function has quadratic form then the investor will select a portfolio which is efficient by mean-variance criterion. Yet it must be pointed out that there is no inevitable connection between the mean-variance and expected utility approaches. In extending the basic expected utility approach to a multi-period analysis Markowitz finds that the same (substantive) results are obtained as from a sequence of single time-period analyses.

The high degree of similarity between the work of Markowitz and that of Tobin is obvious. However, a major difference is that the Markowitz approach offers a detailed consideration of the procedure for selecting the various non-cash assets. Yet it is striking that his results do not differ vastly from those obtained by Tobin, given that both authors began by considering different problems; while Tobin was concerned with finding an underlying explanation for Keynes' theory of Liquidity Preference, Markowitz was more directly concerned with explaining the observed phenomenon of the holding of a diversified portfolio.

Before moving on to consider some of the criticisms which have been levied against the mean-variance approach to portfolio selection, as well as more recent work in this area, we shall first consider some measures of risk aversion.

5.3.3 Risk Aversion

We commence this section with a consideration of the Bernouilli criterion, ie, the expected utility maxim. Although not explicitly dealt with in this paper, it is an accepted proposition that if an investor obeys a particular set of axioms then she acts to maximise the expected utility of (uncertain) wealth,[21] ie:

$$\text{maximise } E[U(Y)]$$

where Y is wealth (a random variable), U( ) is the investor's utility function and E is the expectation operator. Any analysis of the nature of risk aversion must involve a discussion of the form of the investor's utility function. We shall continue to assume that it is (at least) twice continuously differentiable, bounded, and that utility increases with wealth.

(i) **certainty equivalent wealth:** the certainty equivalent wealth, Y_C, is that level which, if received with certainty, is such that the individual is indifferent between Y_C and the uncertain prospect Y. That is to say:

$$E[U(Y)] = U(Y_C)$$

We can now say that an individual is:

a) risk-averse if $E(Y) > Y_C$

b) risk-neutral if $E(Y) = Y_C$

c) risk-loving if $E(Y) < Y_C$

The implications of these three possibilities for the form of the utility function are now examined. We begin by expanding U(Y) in a Taylor's series about $\overline{Y}$, dropping all terms higher than of second order:

$$U(Y) = U(\overline{Y}) + U'(\overline{Y})(Y-\overline{Y}) + 0.5U''(.)(Y - \overline{Y})^2$$

Taking expectations:

$$E[U(Y)] = U(\overline{Y}) + 0 + 0.5E[U''(.)(Y - \overline{Y})^2]$$

Using $E\{U(Y)\} = U(Y_C)$ we obtain:

$$U(Y_C) - U(\overline{Y}) = 0.5E[U''(.)(Y - \overline{Y})^2]$$

Hence if:

$U''(.) > 0$ then $U(Y_C) > U(\overline{Y})$ implying $Y_C > \overline{Y}$ ==> risk-lover

$U''(.) = 0$ then $U(Y_C) = U(\overline{Y})$ implying $Y_C = \overline{Y}$ ==> risk-neutral

$U''(.) < 0$ then $U(Y_C) < U(\overline{Y})$ implying $Y_C < \overline{Y}$ ==> risk-averse

Thus an individual who is risk averse for all $Y > 0$ will have a (strictly) concave utility function. Conversely for a risk lover, etc.

(ii) **absolute risk aversion:** this is a local measure of risk aversion widely used throughout the literature, and is defined as follows:

$$R_a(Y) = -\frac{U''(Y)}{U'(Y)}$$

If we assume that the investor is holding a risky security, the outcome of which is represented by the random variable z, and that $E(Z) \equiv \overline{Z} = 0$, with σ_Z^2 being finite, then the certainty equivalent wealth, Y_C, is defined as before:

$$E\{U(Y + Z)\} = U(Y_C)$$

The risk premium of absolute change, π_a, is defined as that amount which an investor would be willing to pay to rid himself of the risk associated with holding the security with outcome z when he holds wealth Y; ie:

$$\pi_a = Y - Y_c$$

It is easy to show that π_a is approximately proportional to σ_z^2. Begin by expanding U(Y + Z) about the level of initial wealth, Y:

$$U(A + Z) = U(A) + U'(A)Z + 0.5U''(A)Z^2$$

Taking expectations:

$$E\{U(A + Z)\} = U(A) + 0 + 0.5U''(A)\sigma_z^2 \qquad \textbf{(5-13)}$$

Similarly, expanding about Y:

$$U(Y_c) = U(A) + U'(A)(Y_c - Y)$$

ie,

$$U(Y_c) = U(A) - U'(A).\pi_a$$

Taking expectations:

$$E\{U(Y + Z)\} = U(A) - U'(A).\ \pi_a \qquad \textbf{(5-14)}$$

Combining (5-13) and (5-14) we obtain:

$$-U'(Y)\ \pi_a = 0.5U''(Y)\sigma_z^2$$

or

$$\Pi_a = \frac{-U''(Y)}{U'(Y)}\frac{\sigma_Z^2}{2} = R_a(Y)\frac{\sigma_Z^2}{2}$$

From this we deduce that for an investor's given subjective assessment of σ_z^2, the larger is $R_a(Y)$ then the larger will be the risk premium; that is to say, the greater is the wealth the investor would be willing to give up to avoid bearing risk.

(iii) relative risk aversion: like absolute risk aversion, this is a local measure widely used throughout the literature, and is defined as:

$$R_r(Y) = \frac{-U''(Y)}{U'(Y)}.Y = Y.R_a(Y)$$

Consider an individual whose entire current wealth, Y, is subject to risk. Also let Q be a random variable taking on only positive values such that $E(Q) = \overline{Q} =$

1 and σ_Q^2 is finite. The certainty equivalent wealth, Y_C, is defined as being such that:

$$E\{U(YQ)\} = U(Y_C)$$

The risk premium of proportional change, π_r, is defined as the percentage of current wealth that the investor would be willing to pay to get rid of the risk imposed by Q when he has the wealth Y. Ie:

$$\Pi_r = \frac{Y - Y_C}{Y}$$

By a method exactly analagous to that used for absolute risk aversion we obtain:

$$\Pi_r = \frac{-U''(Y).Y.}{U'(Y)}.\frac{\sigma_Z^2}{2} = R_r(Y)\frac{\sigma_Z^2}{2}$$

From this we deduce that for an investor's given subjective assessment of $\sigma_Z{}^2$, the larger is $R_r(Y)$ then the larger will be the risk premium of proportional change; that is to say, the greater is the percentage of his current wealth that the investor would be willing to give up to avoid bearing risk.

It should be borne in mind that the two measures of risk aversion are not independent, because $R_r(Y) = R_a(Y).Y$. However, they do describe slightly different characteristics of the utility function. For example, while $dR_a/dY \geq 0$ implies $dR_r/dY \geq 0$, it is entirely possible to have both $dR_a/dY < 0$ and $dR_r/dY > 0$. Arrow (1965, pp. 96-97) put forward two hypotheses relating to risk aversion:

a) **increasing relative risk aversion**, ie, $dR_r/dY > 0$, and

b) **decreasing absolute risk aversion**, ie, $dR_a/dY < 0$.

Without going into any detail here, Arrow claims this to be closely related to the boundedness of the utility function. Some of the more commonly assumed functions are dealt with in Appendix 5-2. However, we now move on to consider some of the criticisms which have been levied against the mean-variance criterion for portfolio selection.

5.3.4 The Critics

Many of the criticisms levied against the mean-variance approach to portfolio selection stem from what both Markowitz and Tobin point out as being restrictions upon the approach. For example, it is often cited that to use the variance (or standard deviation) as a sole proxy for risk ignores the possibility that the distribution of returns may well be skewed. Yet, although other measures of risk do exist, Markowitz (eg) rules them out on grounds of "cost, convenience and familiarity." Other critics point out that the mean-variance approach is dependent upon the probability distributions of security returns being normal; some do not accept the existence of indifference curves in the risk-return (mean-variance) plane. Two of the better critiques of Tobin-Markowitz mean-variance analysis both appeared in the January 1969 edition of the *Review of Economic Studies*, and we now consider each of these in turn.

(i) K. Borch: "A Note on Uncertainty and Indifference Curves":

If x is a series of stochastic variables representing monetary gains, with distribution functions $F_1(x), F_2(x), \ldots, F_i(x), \ldots$, then the investor's problem is the establishment of a preference ordering over all of these distribution functions. If this preference ordering is consistent (in the sense defined by von Neumann and Morgenstern (1947)), then it can be represented by a utility function, $U(x)$, such that:

$$\int_{-\infty}^{\infty} U(x).\partial F_i(x) > \int_{-\infty}^{\infty} U(x).\partial F_j(x)$$

if and only if $\qquad F_i(x) > F_j(x)$

If the initial set is a family of distributions, $F(x, a_1, a_2, \ldots, a_n)$, completely determined by n parameters, then the problem is to establish a preference ordering over the set of vectors $(a_1, a_2, \ldots, a_n)$. This may be represented by $U(a_1, a_2, \ldots, a_n)$ and analysed by regular economic analysis. This is the foundation of the theory of risk. Apart from degenerate cases, there is a one-to-one correspondence between $a_1, a_2, \ldots, a_n$ and the first n moments, $m_1, m_2, \ldots, m_n$, of the distribution. We can therefore assume the preference to be represented by $U(m_1, m_2, \ldots, m_n)$. This represents the 'old' approach to the economics of uncertainty, under which heading comes the Tobin-Markowitz method of portfolio selection. Combining this with a (von Neumann-Morgenstern) consistent preference ordering over a family of distributions, Borch shows that there exists $U(x)$ such that

$$U(m_1, m_2, \ldots, m_n) = \int_{-\infty}^{\infty} U(x).dF(x, m_1, m_2, \ldots, m_n)$$

However, this can only be satisfied if and only if $U(x)$ is a polynomial of degree n and $U(m_1, m_2, \ldots, m_n)$ is linear,[22] ie:

$$U(x) = x + c_2x^2 + c_3x^3 + c_nx^n$$

$$U(m_1, \ldots\ldots, m_n) = m_1 + c_2m_2 + c_3m_3 + \ldots\ldots + c_nm_n$$

where $c_2, \ldots\ldots, c_n$ are constants.

Now, according to Borch, if U(x) represents the utility of money, one would expect U'(x) to be positive and U"(x) to be negative, but this contradicts U(x) being a polynomial. Thus, the 'old' approach to the economics of uncertainty (and therefore mean-variance analysis) must violate either the von Neumann-Morgenstern consistency conditions or the usual assumptions about the utility of money. This contradiction should have acted as a discouragement to following the 'old' approach, instead of which expected utility was analysed in its simplest form, ie, when n = 2. Some approaches used a first approximation, implying U(x) to be a polynomial with U'(x) > 0 and U"(x) < 0 valid at certain intervals, thereby establishing a consistent preference ordering based on the moments of distribution functions concentrated on those intervals. If this is not possible then only contradictions will result.

For the case where n = 2 one obtains $U(x) = x + cx^2$ and $U(m_1, m_2) = m_1 + cm_2 = E + cE^2 + cS^2$, where $E = m_1$ = expected gain, and $S^2 = m_2 - m_1^2$ = variance of the gain. This implies that the indifference curves in the mean-standard deviation (E-S) plane are concentric circles centred on the S-axis. This is obviously not accepted by either Markowitz or Tobin. Borch goes on to show that by use of *"préférence absolue"*—a condition of von Neumann-Morgenstern consistency—E-S indifference curves cannot exist.

(ii) M. S. Feldstein: "Mean-Variance Analysis in the Theory of Liquidity Preference and Portfolio Selection":

According to Feldstein, the objectives of his paper were to correct three assertions made by Tobin, these concerning (1) that a risk-averse investor's (mean-standard deviation) indifference curves are concave downwards, (2) the ranking of risky and riskless assets in terms of such indifference curves, and (3) the general possibility of mean-variance analysis without further qualification.

Feldstein believes that Tobin over-simplifies by stating that preferences among portfolios can be represented in terms of expected return and its standard deviation. He suggests that this can only be justified if the underlying utility function is quadratic, or if the (subjective) probability distributions pertaining to all possible portfolios are members of a two-parameter family with finite mean and variance. From here he goes on to deny the existence of quadratic utility functions on the grounds that they contradict the Arrow hypothesis of decreasing absolute risk aversion.[23] Feldstein suggests that decreasing absolute risk aversion would lead to non-convex indifference curves, despite Tobin's proof of the convexity of a risk-averse investor's indifference curves (1958, Section 3.3.1). Feldstein is keen to point out that the Tobin[24] proof assumes that any two-parameter probability distribution $f(x; \mu, \sigma)$ can be put into a "standard form" such as $f(z; 0, 1)$, where $z = (x - \mu)/\sigma$. In fact, this is not possible for all two-parameter probability distributions, only some. For example, this procedure could not be adopted for probability distributions such as the beta or lognormal. Therefore, continues Feldstein, Tobin does not prove that risk aversion implies convex indifference curves. He suggests that this will only be the case in that area of the mean-standard deviation plane where σ/μ is less than $(0.5)^{0.5} = 0.7071068$; everywhere else they will be concave. It therefore follows that if indifference curves are not convex, then there is little rationale for holding a diversified portfolio; a bonds-only portfolio may well be optimal. Feldstein shows that this will be the case if $(\sigma/\mu)^2 \leq \mu - 1$.

Feldstein continues by pointing out in Section 3 of his paper that if there is more than one risky asset (ie, an asset with strictly positive variance) then it is not possible to define a preference ordering on portfolios only in terms of means and standard deviations.[25] Feldstein argues the case that money cannot be regarded as a riskless asset, and so there is more than one risky asset. Consequently, with two risky assets no preference ordering can be obtained. Excluding the cases of linear and quadratic utility functions, a preference ordering can be defined if and only if

> ...each asset has a distribution such that any linear combination of these variables (assets) has a distribution with only two independent parameters. (1969, Section 3)

This is a very restrictive requirement, but it is satisfied by (eg) normal distributions. Other distributions, such as the beta or lognormal, are inadmissible. The implication of all this is that if there is more than one risky asset then it is impossible for the von Neumann-Morgenstern framework of utility theory to be used as a basis for portfolio selection via the mean-variance criterion. Thus, the only other possibilities are quadratic utility—which, for reasons already cited, is highly restrictive—or the existence of normally distributed returns—a possibility that would appear contrary to the available evidence. Therefore, Feldstein concludes, the only hope for a truly general theory of portfolio selection is a modification of the von Neumann-Morgenstern consistency conditions.

Bearing in mind the foregoing criticisms we may then summarise that there are three possible rationalisations for specifying portfolio theory in terms of means and variances of returns; these are:

1) quadratic utility,
2) normally distributed returns, or
3) asset returns that have "compact" distributions; ie, those with "small" variances.

Samuelson (1970) has shown that even if (1) and (2) don't hold, mean-variance analysis may still be used owing to (3). This possibility arises because the smaller are the variances then the better is mean-variance analysis as an approximation. With the restrictions imposed upon the use of mean-variance analysis by these rationalisations in mind, we now press on and consider portfolio theory in the case where there are many risky assets.

5.4 Portfolio Theory—Many Risky Assets

Thus far we have only considered portfolio theory under the assumption that there are only two assets, one of which has a certain return while the other is risky.[26] We have also explicitly assumed that for decision-making purposes there is only a single time period. Thus, it is as if the assets are purchased at the beginning of that period and mature at the end, with no other time horizon taken into consideration. Common experience informs us that such a one-period analysis is wholly unrealistic, partly because different assets are possessed of different maturities, and because in practice the problem of timing investment purchases is often considered as important (if not more so) than the asset selection problem. Nonetheless, as a first step it provides a convenient simplification. To break down the single-period assumption we must first consider the assumption concerning the existence of a mutual fund, which we do in this section. We begin by characterising the optimal portfolio.

Consider an individual investor who faces a set of assets with a (gross) rate of return of θ_i on asset i in state θ (where i = 1, 2,..., n).[27] The individual possesses an initial wealth of W_0, of which a_i represents the proportion invested in asset i. So, $\sum a_i = 1$. The usual assumptions relating to the maximisation of expected utility are made, and also:

i) short sales are permitted; ie, $a_i \lessgtr 0$;
ii) the returns from any security cannot be dominated by a linear combination of any of the remaining securities, otherwise the

individual would believe it possible to attain terminal wealth with probability one;[28]

iii) there is one asset which yields the same rate of return in each and every state of nature. Thus, $\rho_1(\theta) = \rho_m$ for all θ. This asset is denoted as "asset number one" and is called "money".[29]

Now, the terminal wealth that arises in state θ is:

$$W(\theta) = \sum_{i=1}^{n} a_i \rho_i(\theta).W_0$$

$$= (1 - \sum_{i=2}^{n} a_i)\rho_m W_0 + \sum_{i=2}^{n} a_i \rho_i(\theta) W_0 \tag{5-15}$$

where $(1 - \sum a_i)\rho_m W_0$ corresponds to money (ie, the safe asset) and $\sum a_i \rho_i(\theta).W_0$ corresponds to the set of risky assets. This can be simplified to obtain:

$$W(\theta) = \left[\rho_m + \sum_{i=1}^{n} a_i\left[\rho_i(\theta) - \rho_m\right]\right] W_0$$

Now, let π_θ represent the (subjective) probability of state θ occurring. Then the investor chooses the a_i's to maximise his expected utility of terminal wealth, ie:[30]

$$\text{maximise } E\left\{U[W(\theta)]\right\}$$

$$\equiv \sum_{\theta} U\left[W(\theta)\right] \Pi_\theta$$

Also

$$E\left[U\left[W(\theta)\right]\right] = E\left[U\left[\left[\rho_m + \sum_{i=1}^{n} a_i\left[\rho_i(\theta) - \rho_m\right]\right] W_0\right]\right] \tag{5-16}$$

Differentiating this expression with respect to the a_i's we obtain the following first-order conditions for an optimal portfolio:

$$E\left\{U'\left\{W(\theta)\right\}.\left\{\rho_i(\theta) - \rho_m\right\}\right\} = 0$$

for i = 2, 3, ..., n. Given this characterisation of the optimal portfolio we move on to look at Separation or Mutual Fund Theorems; that is simply to say, under what conditions are the $a_i / \sum a_j$ independent of the level of initial wealth, W_0? These conditions will be either restrictions on the utility function, or restrictions on the structure of returns.

The restrictions that must be imposed upon the utility function for separation to hold are:

(i) $U'(W) = (a + bW)^c$, where a, b and c are parameters;[31] or

(ii) $U'(W) = ae^{bW}$.

In either case the demands for securities, a_iW_0, are all linear in initial wealth; ie:

$$a_iW_0 = \beta_i + \gamma_iW_0$$

for all i = 1, 2,...,n, and $\beta_i\gamma_j = \beta_j\gamma_i$ for all $i \neq j$. The implication of this is that, regardless of the nature of returns, aggregates of risky assets can be formed (ie, separation holds) by imposing restrictions on the utility function alone.

What, then, are the restrictions that must be imposed upon the structure of returns for separation to hold? Or, in other words, what class of distributions of asset returns permit separation? Because a portfolio is defined as a linear combination of assets, it is only necessary to consider those distributions which are such that any linear combination of random variables (ie, asset returns) with such distributions is a member of the same class. The only class for which this turns out to be true is that of the Pareto-Levy distributions. Indeed, the only member of this class which has a finite variance is the normal distribution.[32] The implication of this is that, regardless of the utility function, separation holds by imposing restrictions on the structure of returns.

In summary, the three rationalisations for specifying portfolio theory in terms of means and variances are as seen on the top of page 144. We now proceed to a consideration of a separation theorem for mean-variance analysis.

As usual, we define the parameters of the investor's utility function as being the expected return, μ_W, and the variance of the return, σ_W^2, where W represents terminal wealth. The investor's objective function, therefore, is $V(\mu_W, \sigma_W^2)$. Defining $W(\theta)$ as in equation (5-15), we therefore have that $\mu_W = E[W(\theta)]$ and $\sigma_W^2 = E\left\{\{W(\theta) - E[W(\theta)]^2\}\right\}$. We assume V_1 to be positive and V_2 to be negative,[33] and also the objective function to be concave. Similarly, defining $\rho_i(\theta)$ from (5-15), we may now define:

$$E[\rho_i(\theta)] = \mu_i$$

$$\sigma_{ii} = E\left\{\{\rho_i(\theta) - \mu_i\}^2\right\} \qquad \text{and}$$

$$\sigma_{ij} = E\{\{\rho_i(\theta) - \mu_i\}\{\rho_j(\theta) - \mu_j\}\}$$

for all i, j = 2, 3,...,n, and $i \neq j$. Using these definitions we may obtain:[34]

$$\mu_W = \left[\rho_m + \sum_{i=1}^{n} a_i[\mu_i - \rho_m]\right] W_0$$

and[35] $\sigma_W{}^2 = W_0\sigma^2.$

For V to be a maximum the following first-order conditions must obtain:

$$V_1 W_0[\mu_i - \rho_m] + V_2 W_0^2 \sum_{j=2}^{n} a_i \sigma_{ij} = 0$$

for all i = 2, 3,..., n.[36] Writing the chosen or optimal a_i as a_i^* we derive:

$$a_i^* = K \sum_{j=2}^{n} \boldsymbol{\upsilon}_{ij}[\mu_j - \rho_m]$$

where $[\boldsymbol{\upsilon}_{ij}] = \Omega^{-1}$ and $K = -V_1/V_2W_0$. Now, consider the ratio of any two asset holdings, a_i^* and a_k^*, where $i \neq k$:

$$\frac{a_i^*}{a_k^*} = \frac{\sum_{j=2}^{n} \boldsymbol{\upsilon}_{ij}[\mu_j - \rho_m]}{\sum_{j=2}^{n} \boldsymbol{\upsilon}_{kj}[\mu_j - \rho_m]}$$

From this it is apparent that all risk-averse investors with utility functions expressed solely in terms of means and variances will hold the same relative proportions of risky assets in their optimal portfolios.

5.5 Portfolio Theory—The Multi-Period Case

In much the same way as the single risky asset case was thought to be unrealistic and requiring further investigation, the same is true of the single-period portfolio analysis with which we have contented ourselves thus far. Given that the ultimate motivation for investment is to increase future consumption, the single-period analysis we have considered may be thought of as modelling an investor who plans to make no changes in his portfolio between the date of the original investment and the date of resulting future consumption, ie, as if the investor were pursuing a "buy and hold" policy. This might be seen as an obvious and, perhaps, over-simplified application of the single-period approach. However, a brief glance at (eg) Chapters Seven and Eight reveals that the pension funds, in common with other financial institutions, rarely hold a portfolio that is fixed over any length of time,[37] and so a multi-period approach is called for. It should be borne in mind that any decision to change the portfolio will not be costless. The major costs perceived by (eg) a financial institution will be the transactions costs, such as brokers' fees, commissions, etc, although costs in the wider sense (opportunity costs) should also be taken into consideration. Naturally, if the costs of altering the portfolio are seen to outweigh the benefits then an unchanged portfolio will result. As a result of these costs the length of time within which portfolio changes are uneconomical will be different for different investors. For example, larger investors may be able to reduce costs as a result of exploiting economies of scale in financial transactions; their size alone may make for easier access to the various capital markets. The investor's valuation of the costs of portfolio shifts will be implicit in their utility function. Consider by way of example an investor of a similar nature to a pension fund; such an investor will possess a long time-horizon and, therefore, his relevant choices will be among various portfolio sequences rather than among simple portfolios. This implies that the choice is about investment flows rather than investment stocks. If the planned liquidation of the portfolio is, say, fifteen years hence, then the utility function will represent valuation of the various consumption prospects fifteen years from now. The risks, returns and expectations can all be valued over that fifteen years. Because this approach requires dealing with sequences each of the possible portfolio sequences will have a probability distribution of (in this case) a fifteen-year return. From this the relevant expectations and risk may be derived. In an analogous manner to the single-period case, the investor chooses that portfolio sequence with the highest expected utility.

However, it is not usually the case that any investor holds a portfolio so that at the end of the time-horizon (only) increased consumption may occur. The case where an investor selects a portfolio with which they remain until it matures is a distinct possibility in the Arrow-Debreu-Hahn world, where there are a complete set of efficient markets, but is much less likely in the world in which we have to live. In this world it is more likely that the investor hopes to increase his consumption along the whole period up to the time-horizon, not solely at the portfolio's terminal liquidation. In the Arrow-Debreu-Hahn world this can be achieved by borrowing from the complete set of efficient markets, but for most of us in this world this prospect is not readily available. These comments apply equally to the individual or institutional investor. For example, in the case of pension funds, partial liquidations would not be regarded as occurring for (direct) consumption purposes, but rather for the payment of current liabilities such as pensionable benefits. Hence it is necessary to explicitly include consumption in an extension of portfolio theory to the multi-period case. Thus, we begin by including consumption into a single-period model and then extending the model to the multi-period case.[38]

In the single-period model with consumption, the investor begins with an initial wealth of A of which an amount C is used for current consumption. Of the remainder, an amount a is invested in a risky asset (ie, "bonds"), each unit of which has a net rate of return of X, and an amount m is held in a safe asset (ie, "money").[39] Thus:

$$Y = A - C + aX \qquad \textbf{(5-17)}$$

We define the proportion of the portfolio invested in bonds as $\omega = a/(A - C)$. The proportion of the portfolio invested in money is, therefore, $(1 - \omega)$. The investor possesses a utility function, V, such that:

$$V(C, Y) = U(C) + H(Y)$$

where V is a concave function which is strictly increasing in both arguments, and is (at least) twice continuously differentiable. The decision variables for the investor are C and a, which are chosen to maximise the expected value of utility, ie:

$$\text{maximise } E[V(C, Y)]$$

$$= U(C) + E[H(Y)]$$

ie,

$$\text{maximise } \left\{U(C) + E[H(A - C + aX)]\right\} \qquad \textbf{(5-18)}$$

Differentiating with respect to the decision variables the following first-order conditions are obtained:

$$U'(C) = E[H'(Y)] \qquad \textbf{(5-19)}$$

$$E[H'(Y)X] = 0 \qquad \text{[40]} \quad \textbf{(5-20)}$$

When considering the multi-period model there are two simplifications which aid the exposition. These are:

(i) $H(Y) = \alpha.U(Y)$, where α is a (subjective) discount factor, and
(ii) $U(Y) = (1/\gamma)Y_{\gamma}$, ie, constant relative risk-aversion.

Substituting these into the one-period model gives:

$$E[V(C, Y)] = (1/\gamma)C^{\gamma} + (\alpha/\gamma)(A - C)^{\gamma}.E[(1 + \omega X)^{\gamma}] \qquad \text{[41]} \quad \textbf{(5-21)}$$

Due to the assumption of iso-elastic utility, ω is independent of C, and is chosen to

$$\text{maximise } E[(1+\omega X)^{\gamma}] \tag{5-22}$$

Accordingly, the first-order conditions are:

$$E[(1+\omega X)^{\gamma-1}X] = 0 \tag{5-23}$$

If ω^* is defined as the optimal value of ω (ie, that value which solves (5-23)), and we define

$$\xi = [(1+\omega^* X)^{\gamma}] \tag{5-24}$$

then the consumption choice problem becomes:

$$\text{maximise } [(1/\gamma)C^{\gamma} + (\alpha/\gamma)(A - C)^{\gamma}.\ \xi]$$

Here the first-order conditions are:

$$C^{\gamma-1} - \alpha(A - C)^{\gamma-1}\xi = 0 \tag{5-25}$$

ie,

$$C = (\alpha\xi)^{(1/\gamma-1)}(A - C) \tag{5-26}$$

$$C = \frac{(\alpha\xi)^{(1/\gamma-1)}}{1+(\alpha\xi)^{(1/\gamma-1)}}A \qquad \equiv \Theta A \tag{5-27}$$

defining Θ implicitly. Therefore, under iso-elastic utility the following results are obtained:

(a) the portfolio decision is independent of the consumption decision;[42] and

(b) the consumption function is proportional in wealth, but the factor of proportionality depends on ω^*, the optimal proportion of the portfolio invested in bonds.

As we shall see shortly, both of these results carry over to the multi-period model. However, before we move on to that model, a final comment is warranted concerning the expected utility function, E[V(C, Y)]. It should be noted that this may be written as a function of initial wealth, A, as follows:

$$J(A) \equiv \text{maximise } E[V(C, Y)]$$

$$= (1/\gamma)\Theta^{\gamma}A^{\gamma} + (\alpha/\gamma)(1-\Theta)^{\gamma}A^{\gamma}.\xi \tag{5-28}$$

$$= (1/\gamma)[\Theta^{\gamma} + \alpha(1-\Theta)^{\gamma}\xi]A^{\gamma} \tag{5-29}$$

This function is also iso-elastic.

We now extend the model to the multi-period case. The notation remains essentially the same, save for the introduction of the suffix t = 0, 1, 2,..., T to indicate the relevant time-period, where 0 indicates the current period. Now the investor's utility function is:

$$V(C_0, C_1, \cdots, C_T) = \sum_{t=0}^{T} \alpha^t . U(C_t)$$

where U is a concave, monotonically increasing function of C. Once again the investor's objective is to maximise his expected utility subject to his "inter-period budget constraint". Expressed formally this appears as:

$$\text{maximise } E[V(C_1, \ldots, C_T)]$$

$$\text{subject to } W_{t+1} = (W_t - C_t)(1 + \omega_t X_t) \text{ for all t.}$$

W_0 is taken as given historically. Obviously, $(W_t - C_t)$ is equivalent to the investor's savings during period t, while $(1 + \omega_t X_t)$ gives the gross rate of return on those savings during period t. In common with the single-period model, the investor's decision variables are consumption, $(C_0, C_1, \ldots, C_{T-1})$, and the proportion of the portfolio invested in bonds, $(\omega_0, \omega_1, \ldots, \omega_{T-1})$. At time t = 0 the investor has to decide on his consumption and portfolio allocation knowing the value of W_0, but facing the uncertain prospects $(X_0, X_1, \ldots, X_{T-1})$.[43] In order to characterise the solution to this intertemporal decision problem it is necessary to invoke the use of a dynamic programming technique. This involves commencing at the termination of the investor's time-horizon and working backwards through the sequence of time-periods up to the current decision. We begin, therefore, at the start of period T-1.

At the start of time-period T-1 the investor chooses C_{T-1} and ω_{T-1}. The solution to this is exactly the same as for the one-period model we considered previously. Therefore, analogously to (5-18), the investor chooses C_{T-1} and ω_{T-1} to maximise his expected utility, ie:

$$\text{maximise } \left\{U(C_{T-1}) + \alpha . E[U(W_T)]\right\} \qquad \textbf{(5-30)}$$

where $W_T = (W_{T-1} - C_{T-1})(1 + \omega_{T-1} X_{T-1})$. The first-order conditions here also are analogous to (5-19) and (5-20) yielding solution values of C_{T-1}^* and ω_{T-1}^*. Substituting these into (5-30) gives:

$$J_1(W_{T-1}) \equiv U(C_{T-1}^*) + \alpha\, E\left\{U[(W_{T-1} - C_{T-1}^*)(1 + \omega_{T-1}^* X_{T-1})]\right\} \qquad \textbf{(5-31)}$$

Now, by the envelope theorem:[44]

$$J_1'(W_{T-1}) = \alpha . E\left\{U'[(W_T)]\right\} = U'(C_{T-1}^*) \qquad ^{45} \quad \textbf{(5-32)}$$

This characterises the solution to the decision problem for the ultimate time-period, ie, that time-period immediately prior to liquidation. The decision problem for the penultimate time-period involves a decision on C_{T-2} and ω_{T-2}, and may be framed as:

$$\text{maximise} \left\{U(C_{T-2}) + \alpha.E[\, J_1(W_{T-1})]\right\} \qquad \textbf{(5-33)}$$

where $W_{T-1} = (W_{T-2} - C_{T-2})(1 + \omega_{T-2}X_{T-2})$. Expressed in this form, the two-period problem[46] has been reduced to a one-period type problem. This simplification is achieved by recognising that $J_1(W_{T-1})$ embodies the implications of the fact that optimising actions were taken in the final period. That is to say, that all information required for the decision to be made in period T-2 is summed up in terms of a knowledge of W_{T-1} and the functional form of J_1. Hence, once again (5-33) may be treated as a basic single-period problem and the corresponding first-order conditions, etc, written down for each and every time-period.

It follows from the foregoing that the individual's implicit one-period problem corresponding to any period, t, may be set up as follows:

$$\text{maximise} \left\{U(C_t) + \alpha.E[\, J_{T-t-1}(W_{t+1})]\right\} \qquad \textbf{(5-34)}$$

where $W_{t+1} = (W_t - C_t)(1 + \omega_t X_t)$. The corresponding first-order conditions are:

$$U'(C_t) = E[\, J_{T-t-1}'(W_{t+1})] \qquad \textbf{(5-35)}$$

$$E[\, J_{T-t-1}'(W_{t+1}).X_t] = 0 \qquad \textbf{(5-36)}$$

To interpret (5-35) substitute it into (5-32) as applied to the relevant time-period, t:

$$U'(C_t^*) = E[U'(C_{t+1}^*)] \qquad \textbf{(5-37)}$$

In other words, the individual equates his marginal utility from current consumption to the (discounted) expected marginal utility of his consumption in the next time-period.

Thus far the main implication has been that the individual's multi-period consumption/investment decision problem may be interpreted as a sequence of one-period problems, thereby simplifying the general problem substantially. However, much of this simplification is more apparent than real as typically the J(.) function will depend on the period in question; that is to say, the sequence of single-period problems applies to an expected utility function which changes from period to period.

By way of a final simplification, one further assumption may be introduced, viz:

$$U(Y) = (1/\gamma)Y^{\gamma} \tag{5-38}$$

The implications of assuming constant relative risk-aversion are clear if we refer back to the one-period framework:

i) $\omega_0^* = \omega_1^* = ... = \omega_{T-1}^* = \omega_T^*$. This is due to (5-23), remembering that identical probability distributions exist for the X_t in every period;

ii) the level of consumption is proportional to the level of wealth, the factor of proportionality being dependent upon the time-period;

iii) the $J_\tau(.)$ function is iso-elastic for all time-periods, $\tau = 1, 2,...,T$.[47] Once again the factor of proportionality is dependent upon the time-period;

iv) it can, therefore, be seen that the individual acts as if he were a single-period expected-utility-maximiser with an iso-elastic utility function.

Before concluding this look at multi-period portfolio theory there are one or two generalisations that should be borne in mind. Like the standard Tobin-Markowitz model of portfolio selection, this model assumes only two assets. That is to say, it is assumed that separation holds. However, for purists the extension of the multi-period model to explicitly include choice among multiple risky assets is very similar to that extension of atemporal portfolio theory. Additionally, although thus far we have assumed a stationary distribution of asset returns, this model can be adapted to allow for the influence of past asset prices on the distribution of current returns. Although the conditions are derived easily enough, interesting results appear to be non-existent. It is also possible to introduce a non-additive utility function,[48] under which the individual acts as if she is only interested in current consumption and next period wealth if, and only if, her lifetime utility function is concave.[49] An uncertain period of liquidation may also be introduced; this induces a "state dependency" into the utility function. A final generalisation might be the inclusion of labour income into the model. Of course, if such an income stream is certain this becomes a trivial case. It is interesting to note that generalisation to the case of uncertain labour income does not yet appear to have been researched.

5.6 The Capital Asset Pricing Model (CAPM)

The Capital Asset Pricing Model represents a step nearer the original work of Markowitz. Indeed, it is derived directly from the mean-variance approach to portfolio selection. Recall that under this approach, to select a portfolio it is necessary first to estimate the variance-covariance matrix for the set of possible investments. Thus, if there are n different securities there will be (n/2)(n-1) covariances. However, in his two articles W. F. Sharpe (1963, 1964) presents an approach that vastly reduces the time and effort required to obtain the variance-covariance matrix. Under the Sharpe method, instead of directly calculating the large number of covariances, it is assumed that the return on each and every security is related to the level of a general market index.[51] In such a manner only the covariance of a security's return with that of the market need be calculated, a total of only (n + 1) covariances.

As with the Markowitz model, Sharpe assumes investors to be consistent, risk averse, single-period expected utility maximisers. Thus, an investor will require additional expected return to induce him to undertake more risk. If μ_i is the expected return on asset i, and σ_i quantifies the uncertainty associated with asset i, then the riskiness of asset i is measured by the coefficient of variation, σ_i/μ_i. According to Sharpe, this risk has two components: **unsystematic risk** refers to that element of risk that can be (at least partially) eliminated by Markowitz diversification; and **systematic risk**, which is that element of risk still present in an efficient portfolio and, therefore, reflects how investments in the portfolio are correlated with the market.

Sharpe defines the Market Portfolio to be that which exactly models the market. Thus, if the ordinary shares of company Z represented 0.0125 per cent of the value of the equity of all companies, then 0.0125 per cent of the Market Portfolio would consist of ordinary shares in company Z. It is further assumed that the prices of all securities in the market have adjusted so that an investor could not earn a higher return for the same or a lower risk-level in some other form of investment.[52] Finally, it is assumed that there exists some (government-issued) security which does not involve any risk of default, a characteristic which distinguishes it from all other securities. Such a security is referred to as the risk-free or riskless asset.

Following Sharpe, we now consider a portfolio which is composed of both the riskless security and the Market Portfolio, the fractions being $(1 - \alpha)$ and α respectively. The following notation is used:

r_f = the rate of return on a riskless security maturing in the next period

$\bar{r}_m$ = the expected return from \$1 invested in the Market Portfolio

σ_m = the standard deviation of the return on the Market Portfolio

$\bar{r}_p$ = the expected rate of return on that portfolio consisting of both the riskless security and the Market Portfolio

σ_p = the standard deviation of r_p

Using this notation we obtain an expression for the return on the portfolio:

$$\bar{r}_p = (1 - \alpha)r_f + \alpha\bar{r}_m \tag{5-39}$$

ie,

$$\bar{r}_p = r_f + \alpha(\bar{r}_m - r_f) \tag{5-40}$$

The risk attached to the portfolio and the Market Portfolio are related in the following manner:

$$\sigma_p = \alpha.\sigma_m \tag{5-41}$$

Solving (5-41) for , and substituting into (5-40) gives:

$$\bar{r}_p = r_f + \left[\frac{\bar{r}_m - r_f}{\sigma_m}\right]\sigma_p \tag{5-42}$$

This illustrates the relationship between the expected return of a portfolio, $\bar{r}_p$, and its standard deviation, σ_p, which is illustrated in Figure 5-9. Here AD is called the Capital Market Line. If the portfolio consisted entirely of the risk-free asset (ie, $\alpha = 0$) then the expected return on the portfolio would be exactly r_f, with a standard deviation of return of $\sigma_p = 0$. This corresponds to point A. On the other hand, if all funds were held in the Market Portfolio with none in the risk-free asset (ie, $\alpha = 1$) there would be an expected return on the portfolio of $\bar{r}_m$, with a standard deviation of return of σ_m. This corresponds to point C. Obviously if the value of a lies between 0 and 1 then the portfolio is a combination of the risk-free asset and the Market Portfolio, as illustrated by points such as B. For points on the line beyond C, such as D, to be held an investor must be able to borrow funds at a rate of r_f.[53]

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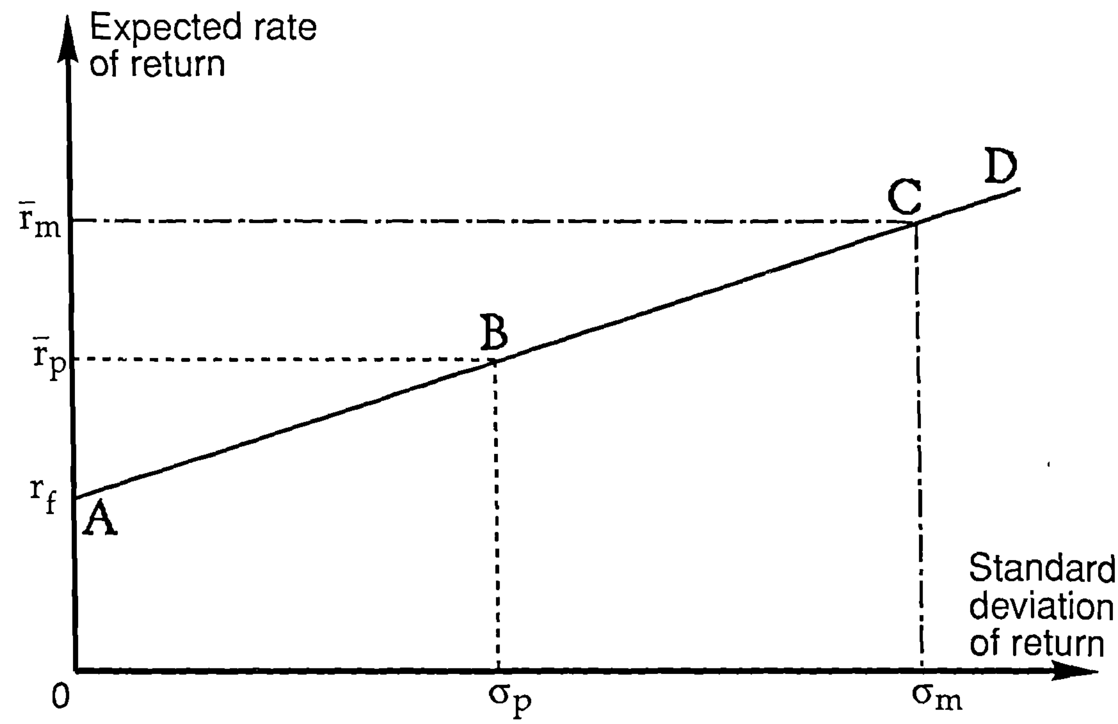
Figure 5-9:



It must be borne in mind that the Capital Market Line applies only to that very special category of portfolios consisting entirely of combinations of the Market Portfolio and the risk-free asset. Yet it is plausible that an investor might obtain a better combination of risk and expected return by altering his holdings of a particular risky asset. If this were at all possible the implication would be that the market was not in equilibrium. Thus, if v is the equilibrium price of a particular security, then the rate of return earned by holding that security for one period would be:

$$r^* = (w/v) - 1 \qquad (5\text{-}43)$$

where w is the sum of dividends received plus the end-of-period value of the security. Similarly:

$$\bar{r}^* = (\bar{w}/v) - 1 \qquad (5\text{-}44)$$

where $\bar{r}^*$ is called the **required rate of return**. If the market is in equilibrium then $\bar{r}^*$ must satisfy the following:

$$\bar{r}^* = r_f + \left[\frac{\bar{r}_m - r_f}{\sigma_m^2}\right] \mathrm{cov}(r^*, r_m) \qquad (5\text{-}45)$$

Because Sharpe's objective is to compare the cov(r^*, r_m) for a particular security with the variance of the return on the Market Portfolio he takes the ratio, defining:

$$\beta = \frac{\text{cov}(r^*, r_m)}{\sigma_m^2} \qquad \text{(5-46)}$$

The ratio, β, is known as the **beta coefficient** for that particular security. Substituting (5-46) into (5-44) gives:

$$r^* = r_f + (\bar{r}_m - r_f)\beta \qquad \text{(5-47)}$$

Thus, it can be seen that if a security has a beta coefficient of unity it will have the same systematic risk as the Market Portfolio. A security with a beta coefficient greater (smaller) than one will be more (less) risky than the Market Portfolio. By this method the number of calculations necessary for mean-variance portfolio selection are greatly reduced, and the beta coefficient is introduced as a new measure of risk.

By way of a closing note it should be added that the use of beta coefficients as a tool for reviewing investments is, and has been, becoming increasingly popular, especially among the institutional and professional investors. They have been in use in the United States for many years and are a familiar part of Wall Street's institutional set-up. In the United Kingdom, however, things have proceeded at a much slower pace. In December 1978, City stockbrokers Rowe Rudd began offering the beta coefficient method of risk analysis to its clients, following swiftly behind the service offered by the London Business School. According to Mr. Jason McQueen, Rowe Rudd's risk analysis department manager,

> ...if the pension fund manager takes advantage of what modern portfolio theory has to offer by way of evaluation of risk he will find that with a small part of his fund, say ten per cent, he can, in fact, take a much greater risk than any he has contemplated so far and still not expose the fund to a greater aggregate risk than at present. [54]

It is suggested that by being rigorous about risk, quantifying it, identifying it, and evaluating it, fund managers could enlarge the scope of their investments in those areas where out-performing the market is more likely, such as the smaller, more innovative companies operating in (eg) high technology industries where high risk exists. If such a change in institutional investment policy were to take place the consequences for the economy would be considerable, but analysis of this is a task best left for another occasion. Finally a warning: lest the reader should be left with the impression that beta coefficients are the greatest thing since sliced bread, one should remember that the Capital Asset Pricing Model is essentially a derivative of the Tobin-Markowitz approach to portfolio selection and is, therefore, subject to the same shortcomings and criticisms to which that was subject. In particular, it should be noted additionally that because the CAPM emphasises default risk it should be the case that the distribution of returns should have a cut-off point at the point of default, whereas in fact the CAPM is built on the assumption of normally distributed returns. Nonetheless, in practice the CAPM does appear to have established quite a good track record in its application to the investment portfolio selection decision.

Chapter Five Endnotes

1 In many places this field of study is referred to as the theory of finance, itself now a major area of concentration.

2 See Chapter Eight for details.

3 Real investment refers to an increase in the (productive) capital stock, whereas a financial investment simply refers to the purchase of a financial claim. See Chapter Two for further details.

4 In recent years the use of expected utility maximisation as a basis for decision-making under uncertainty has been called into question. Perhaps the first person to question the validity of the approach was Maurice Allais in his 1953 article *"Le Comportment de l'Homme Rationnel Devant le Risque; Critique des Postulats et Axiomes de l'Ecole Americaine"*, (*Econometrica*, volume 21, pp. 503-546). In short, the validity of expected utility maximisation as a basis for decision-making under uncertainty rests on three essential axioms concerning preferences: ordering, continuity and independence. Experiments performed by Allais in 1953, and more recently (1979) by D. Kahneman and A. Tversky ("Prospect Theory: An Analysis of Decision Under Risk", *Econometrica*, volume 47 pp. 263-291) show that in practice people have a tendency to violate the independence axiom. This has led researchers into alternative theories of decision-making under uncertainty, such as "disappointment theory" and "regret theory". For an elegant summary of some of these approaches see Robert Sugden (1986) "New Developments in the Theory of Choice Under Uncertainty", (*Bulletin of Economic Research*, 38:1, pp.1-24). More complete surveys of this literature can be found in M. Machina (1983) "The Economic Theory of Individual Behavior Toward Risk", *Technical Report No. 433*, Institute for Mathematical Studies in the Social Sciences, Stanford University, California, and P. Schoemaker (1982) "The Expected Utility Model: Its Variants, Purposes, Evidence and Limitations", *Journal of Economic Literature*, volume 20, pp. 529-563.

5 For an elaboration on this point and definitions of the terms see Chapter Seven.

6 If I wish to borrow £1 from another individual who, presumably, prefers £1 today to £1 next year, then I must offer them more than £1 next year to entice them to lend me that £1 today. The extra amount above the £1 that I pay the lender is the interest payment.

7 It is possible to estimate the risk premium using some statistical measure of the distribution of the investment's historical returns, but there is no consensus as to which statistical measure is optimal, neither is there agreement on the degree to which past distributions are a good reflection of future distributions.

8 Similar results to those of Tobin were also obtained by A. D. Roy in his 1952 paper, "Safety First and the Holding of Assets". In that paper, Roy "...considers the implications of minimising the upper bound of the chance of a dread event, when the information available about the joint probability distribution of future occurrences is confined to the first- and second-order moments." Although taking a very different line of approach in this less well-known article, Roy ends up with what is essentially a Tobin-Markowitz mean-variance model of portfolio selection.

9 This sequential decision-making procedure differs greatly from the approach postulated by Friedman in (eg) "The Quantity Theory of Money: A Restatement" (1952), where decisions are essentially taken simultaneously. For Friedman there is no separation theorem.

10 This implies aggregation in a manner which requires the validity of a Separation Theorem, an issue to which we shall return later in this chapter. See also Appendix 5.2.

11 The standard deviation is a statistical measure of the spread of a probability distribution; the greater the spread the higher the standard deviation. It also provides a measure of how likely it is that a variable will deviate from its mean (or expected) value. Thus, with a

distribution of (potential) rates of interest, the standard deviation provides a measure of the likelihood that the actual rate will differ from the expected rate, ie, the riskiness of the investment. It is worth noting that the standard deviation is not the only possible statistical measure of risk, rather that it is arguably the most convenient and practical measure.

12 An indifference curve is a locus of points (μ_R, σ_R) along which expected utility is constant.

Under given postulates it can be shown that an individual's choice among probability distributions can be represented by maximisation of the expected value of a utility function. Such a utility function has to be (at least) twice continuously differentiable, bounded, concave, and unique up to a linear, increasing (affine) transformation. See (eg) J. von Neumann and O. Morgenstern (1947).

13 This stems from the assumption of declining non-negative marginal utility of return; ie, $U'(R) > 0$ and $U''(R) < 0$. See Section 3.3.1.

14 A point to which we shall return in this chapter on more than one occasion.

15 This corresponds to Tobin's constant-return locus.

16 This corresponds to Tobin's constant-risk locus.

17 An iso-variance ellipse will not be an ellipse if one or more of the following conditions hold:

(i) $\sigma_{11} - 2\sigma_{13} + \sigma_{33} = 0$, ie, $(r_1 - r_3)$ has zero variance;

(ii) $\sigma_{22} - 2\sigma_{23} + \sigma_{33} = 0$, ie, $(r_2 - r_3)$ has zero variance;

(iii) $(r_1 - r_3)$ and $(r_2 - r_3)$ have a correlation coefficient of +1.

(i) occurs when $\sigma_{11} = \sigma_{33} = 0$, or when r_1 and r_3 are perfectly correlated. Similarly for (ii).

18 See instead Appendix 5-1, section I.

19 Ie, those variables corresponding to securities not held in the portfolio.

20 This is dealt with in Appendix 5-1, section II.

21 For full details see J. Marschak and R. Radner, *Economic Theory of Teams*, Chapter One.

22 If U(x) is not a polynomial of degree n, then the preference ordering depends on distribution properties not described by the first n moments.

23 See Appendix 5-2, section I.

24 Recall that Tobin uses $f(R; \mu_R, \sigma_R)$ in his notation.

25 Up till now we have been assuming that the risky assets may be aggregated and treated as if they were a single risky asset.

26 The mean-variance approach of both Tobin and Markowitz did allow for a large number of risky assets. However, much of their analysis proceeds on the assumption that there is a Separation Theorem, ie, that (under certain conditions) a single mutual fund of these risky assets can be formed and analysed as if there were a single risky asset.

27 This is analogous to the method used by (eg) Markowitz, whereby each asset is characterised by a probability distribution of its returns. Here we consider a possible return on asset i as ρ_i. The future will bring with it one of a number of possible "states of nature" (or "states of the world" as they are also known). Associated with each of these possible states will be a (gross) rate of return. Thus, $\rho_i(\theta)$ denotes the (gross) rate of return on asset i in state θ.

28 This is a technical assumption which guarantees an interior solution.

29 This assumption can be relaxed without unduly affecting the conclusions.

30 This assumes that there are only a finite number of states of nature. If there were an infinite number of states then Σ would be replaced by $\int$.

31 Special cases of this restriction occur when:

(a) $c = 1$. Here $U'(W) = a + bW$; ie, the utility function is a quadratic.

(b) $a = 0$. Here $U'(W) = bW^c$; ie, there is constant relative risk aversion. In this case the demand for each security, including money, is proportional to initial wealth. This restriction may be compared with the Hyperbolic Absolute Risk Aversion utility function shown in Appendix 5-2.

32 Thus, if all portfolios differ only in terms of means and variances, then because variances are assumed to be finite, a normal distribution is implicitly assumed when using mean-variance analysis.

33 That is to say, we assume $\partial V/\partial \mu_W > 0$ and $\partial V/\partial \sigma_W^2 < 0$.

34 See equation (5-16).

35
$$\sigma_W^2 = W_0^2 . E\left[\left[\sum_{i=2}^{n} a_i \rho_i(\theta) - \sum_{i=2}^{n} a_i \mu_i\right]^2\right]$$

$$= W_0^2 . E\left[\left[\sum_{i=2}^{n} a_i\left[\rho_i(\theta) - \mu_i\right]\right]^2\right]$$

$$= W_0^2 . E\left[\sum_{j=2}^{n}\sum_{i=2}^{n} a_i a_j\left[\rho_i(\theta) - \mu_i\right]\left[\rho_j(\theta) - \mu_j\right]\right]$$

$$= W_0^2 . \sum_{j=2}^{n}\sum_{i=2}^{n} a_i a_j \sigma_{ij}$$

$$= W_0{}^2 . \sigma^2$$

where $\sigma^2 = a'\Omega a$, $\Omega = [\sigma_{ij}]$, and $a = [a_2, a_3, \ldots, a_n]'$.

36 Note that these are linear equations.

37 This is particularly apparent from the evidence presented to the Wilson Committee. See the Appendix to Chapter Seven.

38 This model, and the multi-period version which follows, owe more than a little to Samuelson's 1969 article, "Lifetime Portfolio Selection by Dynamic Stochastic Programming".

39 The rate of return, X, is considered to be a random variable.

40 Compare this with equation (5-2-2) in Appendix 5-2.

41 This is because $Y = (A - C)(1 + \omega X)$. Now ω replaces a as a decision variable.

42 This does not occur with other specifications of the utility function.

43 At this stage it is necessary to assume that the (subjective) probability distributions for all X_t's are stationary. In other words, the probability distribution of X_τ is independent of the outcomes on X_t for all $t \neq \tau$, and also that the probability distribution of X_t is identical for all t.

44 See Samuelson's *Foundations of Economic Analysis*, (1947) page 34. Put simply (sic!), the derivative of the optimised value of the objective function, $J_1(W_{T-1})$, with respect to a parameter (here W_{T-1}) is equal to the partial derivative of that function; ie, we may ignore the fact that $C_{T-1}{}^*$ and $\omega_{T-1}{}^*$ may depend on W_{T-1}.

45 The second equality follows from the first-order conditions of (5-19) as applied to (5-30).

46 That is, periods T-2 and T-1.

47 This follows directly from (5-29).

48 See E. F. Fama (1970), "Multiperiod Consumption-Investment Decisions".

49 See also E. J. Elton and M. J. Gruber (1974), "The Multiperiod Consumption and Investment Problem and Single Period Analysis".

50 See Fama (1970).

51 For example, the Financial Times ordinary share index, Dow Jones industrial average, Hang Seng index, etc.

52 That is to say, the market is assumed to be efficient, with prices adjusting swiftly to account for new information. Additionally, it should be noted that the risk level associated with the Market Portfolio may be too high (or low) for any individual investor.

53 If such a case existed, and the investor (eg) was willing to take up a level of risk corresponding to a value of $\sigma_p = 2\sigma_m$, then the investor would be buying $2 worth of the Market Portfolio for every $1 of equity he owned, obtaining the necessary funds by borrowing an amount equal to his equity. In other words, he would be buying the Market Portfolio on a fifty per cent margin at an interest rate of r_f.

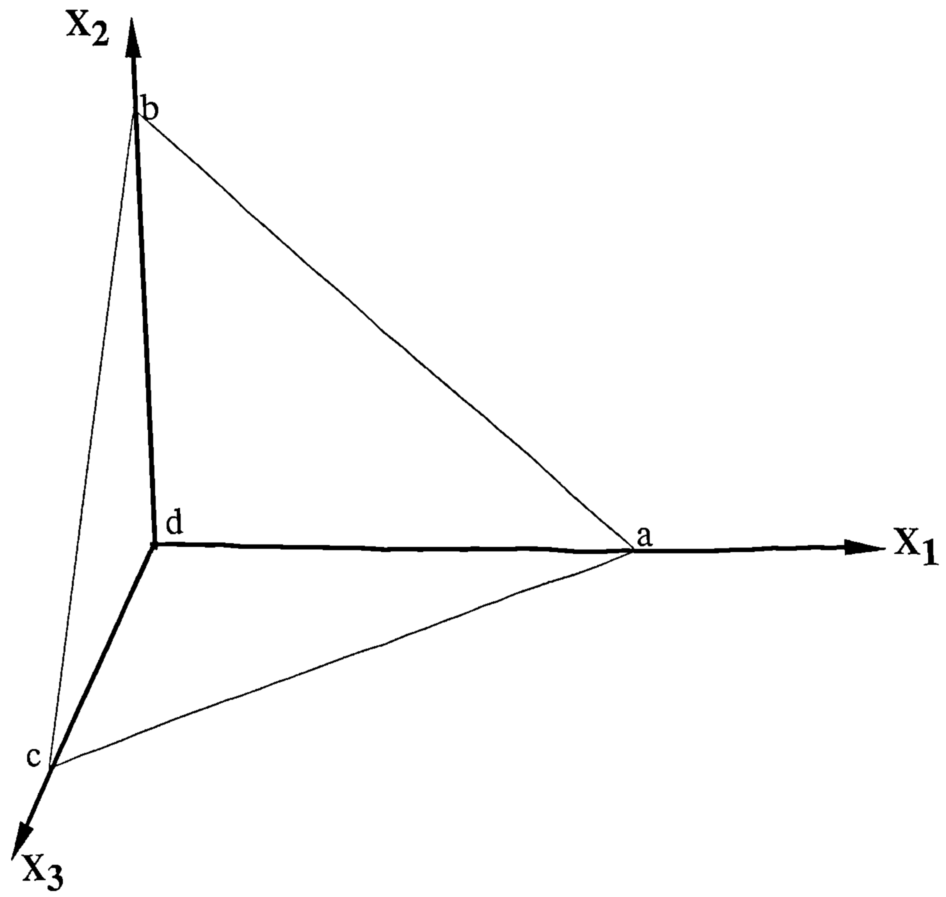
54 See *Financial Weekly*, 23rd March, 1979, page 26.

APPENDIX 5-A: The Markowitz Mean-Variance Approach to Portfolio Selection

I) The Four Securities Case:

This is essentially nothing more than an extension of the three-securities case presented in the main body of the chapter. We can still represent the analysis in geometric form by use of "three dimensional" diagrams, and using $X_4 = 1 - X_3 - X_2 - X_1$. Instead of a triangle, the legitimate set is now a tetrahedron as shown by abcd in Figure 5A-1.

Figure 5A-1:



A subset of portfolios is now a subspace, defined without regard to the constraint $X_j \geq 0$ for all j. We consider only those portfolios such that $X_1 + X_2 + X_3 + X_4 = 1$. We define a subspace $S_{1.2.4}$ such that the following conditions are satisfied:

1) $X_3 = 0$;

2) $X_1 + X_2 + X_3 + X_4 = 0$;

Similarly for (eg) $S_{2.3.4}$:

1) $X_1 = 0$;

2) $X_1 + X_2 + X_3 + X_4 = 0$;

and so on. Altogether there are fifteen possible subspaces which may be summarised as follows:

A) $S_{1.2.3.4}$ = a 3 dimensional subspace (hyperplane);

B) $S_{1.2.3}, S_{2.3.4}, S_{1.2.4}, S_{1.3.4}$ = 2 dimensional subspace (plane);

C) $S_{1.2}, S_{1.3}, S_{1.4}, S_{2.3}, S_{2.4}, S_{3.4}$ = 1 dimensional subspace (line);

D) S_1, S_2, S_3, S_4 = 0 dimensional subspace (point).

Analogous to the critical line used in the three-security case, we now use a critical set which is defined using the notation above. For example, $l_{1.2.3}$ is the critical set associated with the subspace $S_{1.2.3}$. To pursue the analysis we need to assume that the iso-variance sets will be ellipsoids.*

The nature of $l_{1.2.3.4}$ will depend on whether:

1) $\mu_1 = \mu_2 = \mu_3 = \mu_4$, ie, all securities have the same expected return. Thus, $l_{1.2.3.4}$ will be a point representing that portfolio (not necessarily legitimate) with minimum variance; or alternatively

2) at least two μ's have different values. Here it is possible to find portfolios with any level of expected return (again regardless of legitimacy). We need to find values of X_i for all i which satisfy $E = \mu_1X_1 + \mu_2X_2 + \mu_3X_3 + \mu_4X_4$ for any value of E. So we define $l_{1.2.3.4}$ as the locus of all points, P, which satisfy the following:

(i) P is in $S_{1.2.3.4}$; ie, $X_1 + X_2 + X_3 + X_4 = 1$;

(ii) of all portfolios in $S_{1.2.3.4}$ with the same E as P, P has minimum variance. These conditions apply whether or not the μ's are equal. If they are equal then the locus consists of a single point.

Similarly, $l_{1.2.3}$ will be those points, P, such that:

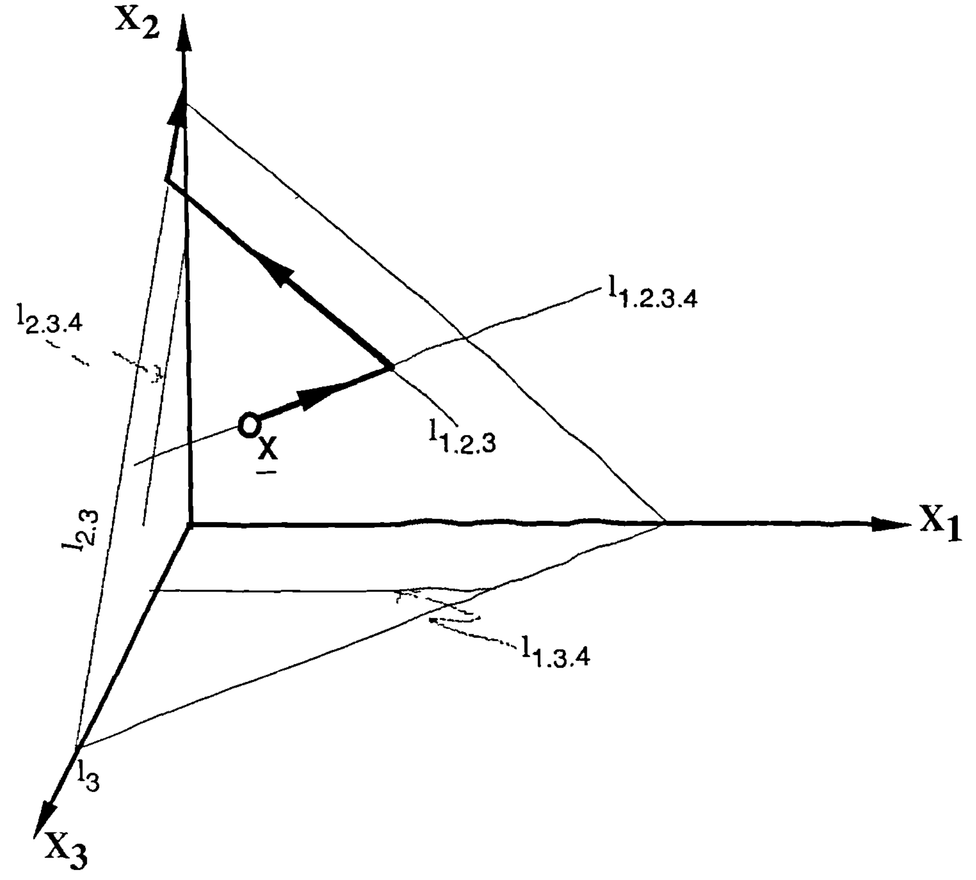
1) $P \in S_{1.2.3}$, and

2) of all portfolios in $S_{1.2.3}$ with the same E as P, P has minimum variance. Similar conditions apply for all $l_{1.2}$, $l_{2.3}$, etc. Figure 5A-2 illustrates the critical sets system.

---

* This corresponds to the technical assumption that the covariance matrix of (r_1-r_4), (r_2-r_4) and (r_3-r_4) is non-singular.

Figure 5A-2:



Let X be that legitimate portfolio with minimum variance. If c is legitimate, then X ≡ c. Every efficient portfolio is on some critical line; the converse is not true. The computing procedure begins at X and travels along the critical lines in the direction of increasing E. When an intersection of two critical lines is reached, the critical line is changed and movement continues in the direction of increasing E. This process goes on until the point X, with maximum E, is reached. Every point passed through is an efficient portfolio.

It is apparent that this is simply an extension of the three securities case. We can extend it even further to include many more securities, although beyond this stage diagrammatic representation would not be possible. The basic features required are the definitions of, and notations for subspaces and critical lines, and the tracing of the set of efficient portfolios along the critical lines.

We now turn our attention to the Markowitz computing procedure for the derivation of portfolios which are efficient by the mean-variance criterion. An example is used for illustrative purposes.

II) The Computing Procedure:

The computing procedure takes means, variances and covariances and processes them to calculate a set of efficient portfolios. Using the three securities case and those definitions given in Chapter Five we have:

$$\mu = \begin{bmatrix} 0.062 \\ 0.146 \\ 0.128 \end{bmatrix} \quad C = \begin{bmatrix} 0.0146 & 0.0187 & 0.0145 \\ 0.0187 & 0.0854 & 0.0104 \\ 0.0145 & 0.0104 & 0.0289 \end{bmatrix}$$

$$\text{and hence, } M = \begin{bmatrix} 0.0146 & 0.0187 & 0.0145 & 1.000 \\ 0.0187 & 0.0854 & 0.0104 & 1.000 \\ 0.0145 & 0.0104 & 0.0289 & 1.000 \\ 1.000 & 1.000 & 1.000 & 0 \end{bmatrix}$$

$$\text{Also, } R = \begin{bmatrix} 0 \\ 0 \\ 0 \\ 1 \end{bmatrix} \quad \text{and } S = \begin{bmatrix} 0.062 \\ 0.146 \\ 0.128 \\ 0 \end{bmatrix}$$

Step 1: This finds the efficient portfolio, $X^{(1)}$, with maximum expected return. Because the only constraints are $X_j \geq 0$ for all j and $\sum X_j = 1$, this portfolio will consist entirely of that security with the greatest expected return. Thus we have:

$$X^{(1)} = \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}$$

When the constraints are of the more general form AX = b the relevant method used is that of linear programming.

Step 2: At present the only security in the portfolio is the second; ie, j = 2 is the IN variable. Thus, j = 1, 3 are OUT. We now proceed to find the formula of the critical line associated with the portfolio $X^{(1)}$. Thus $M\begin{bmatrix} X \\ \lambda \end{bmatrix} = R + S\lambda_E$ is:

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 0.0854 & 0 & 1 \\ 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \\ X_3 \\ X_4 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \\ 1 \end{bmatrix} + \lambda_E \begin{bmatrix} 0 \\ 0 \\ 0.146 \\ 0 \end{bmatrix}$$

Using the method described in Chapter Five we derive:

$$(M)^{-1} = \begin{bmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & -0.0854 \end{bmatrix}$$

$$\text{and thus, } N(1) = \begin{bmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & -0.0854 \end{bmatrix}$$

$$\text{Now, } T(1) = N(1).R = \begin{bmatrix} 0 \\ 1 \\ 0 \\ -0.0854 \end{bmatrix} \text{ and } U(1) = N(1).S = \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0.146 \end{bmatrix}$$

$$\text{And} \begin{bmatrix} X \\ \lambda \end{bmatrix} = T(1) + \lambda_E.U(1) = \begin{bmatrix} 0 \\ 1 \\ 0 \\ -0.0854 \end{bmatrix} + \lambda_E. \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0.146 \end{bmatrix}$$

Step 3: Having found the formula for the critical line associated with $X^{(1)}$, we now need to find those values of λ_E at which the critical line intersects those critical lines with the properties:

(1) all IN variables are also IN on the first line;

(2) one additional variable is IN; and

(3) all other variables are OUT.

As our first critical line was l_2 we are looking for values of λ_E when l_2 intersects $l_{1.2}$ and $l_{2.3}$. We consider these intersections in turn:

$l_2/l_{1.2}$ intersection: here we have $\sigma_{11}X_1 + \sigma_{12}X_2 + \sigma_{13}X_3 + \lambda_1 = \mu_1\lambda_E$ and also

$$\begin{bmatrix} X \\ \lambda \end{bmatrix} = T(1) + \lambda_E.U(1)$$

Combining we get $$[\sigma_{11}, \sigma_{12}, \sigma_{13}, 1][T(1) + \lambda_E.U(1)] = \mu_1\lambda_E \qquad \textbf{(5A1)}$$

$$\text{ie, } [\, 0.0146 \quad 0.0187 \quad 0.0145 \quad 1.000 \,] \begin{bmatrix} 0 \\ 1 \\ 0 \\ -0.0854 \end{bmatrix} + \lambda_E. \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0.146 \end{bmatrix} = 0.062\lambda_E$$

$$0.0187 - 0.0854 + 0.146\lambda_E = 0.062\lambda_E$$

Hence, $$\lambda_E = 0.794.$$

$l_2/l_{2.3}$ intersection: here we have $\sigma_{31}X_1 + \sigma_{32}X_2 + \sigma_{33}X_3 + \lambda_3 = \mu_3\lambda_E$.

Using the same method by which we obtained (5A-1) we find:

$$[\, 0.0145 \quad 0.0104 \quad 0.0289 \quad 1.000 \,] \begin{bmatrix} 0 \\ 1 \\ 0 \\ -0.0854 \end{bmatrix} + \lambda_E. \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0.146 \end{bmatrix} = 0.128\lambda_E$$

$$-0.075 + 0.146\lambda_E = 0.128\lambda_E$$

Hence, $\lambda_E = 4.166666.$

Using these calculated values for λ_E we only consider that intersection for which it has the greatest value; in this case that is $l_2/l_{2.3}$. Thus we are moving from critical line l_2 to $l_{2.3}$. This means that j = 3 is now an IN variable and so we proceed to compute the formula for the new critical line.

Step 4: Because j = 3 is now IN we need to move from N(1) to N(2). To do this we must first establish a few additional definitions:

Let c_{j_0} be the j_0th column of M. Then, $B = N(i).c_{j_0}$, $b = B'c_{j_0}$ and $c = m_{j_0j_0} - b$, where $m_{j_0j_0}$ is the (j_0j_0)th element of M.

Now, if $f_{ij} \in N(i)$ and $g_{ij} \in N(i+1)$ then $g_{j_0j_0} = 1/c$

$$g_{ij_0} = g_{j_0i} = -b_i/c, \text{ for all } i \neq j_0,\ [b_i] = B$$

$$g_{ij} = f_{ij} + (b_ib_j/c), \text{ for all } i \neq j_0 \text{ and for all } j \neq j_0.$$

Applying these definitions to our example we obtain:

$$B = \begin{bmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & -0.0854 \end{bmatrix} \begin{bmatrix} 0.0145 \\ 0.0104 \\ 0.0289 \\ 1.000 \end{bmatrix} = \begin{bmatrix} 0 \\ 1 \\ 0 \\ -0.075 \end{bmatrix}$$

$$b = \begin{bmatrix} 0 & 1 & 0 & -0.075 \end{bmatrix} \begin{bmatrix} 0.0145 \\ 0.0104 \\ 0.0289 \\ 1.000 \end{bmatrix} = -0.0646$$

$$c = 0.0289 + 0.0646 = 0.0935$$

Applying the definitions for the various g_{ij} we obtain:

$$N(2) = \begin{bmatrix} 0 & 0 & 0 & 0 \\ 0 & \frac{1}{0.0935} & \frac{-1}{0.0935} & 1 - \frac{0.075}{0.0935} \\ 0 & \frac{-1}{0.0935} & \frac{1}{0.0935} & \frac{0.075}{0.0935} \\ 0 & 1 - \frac{0.075}{0.0935} & \frac{0.075}{0.0935} & -0.0854 + \frac{(-0.075)^2}{0.0935} \end{bmatrix}$$

$$N(2) = \begin{bmatrix} 0 & 0 & 0 & 0 \\ 0 & 10.695187 & -10.695187 & 0.1978609 \\ 0 & -10.695187 & 10.695187 & 0.802139 \\ 0 & 0.1978609 & 0.802139 & -0.0252395 \end{bmatrix}$$

Now, $T(2) = N(2).R = \begin{bmatrix} 0 \\ 0.1978609 \\ 0.802139 \\ -0.0252395 \end{bmatrix}$ and also $U(2) = N(2).S = \begin{bmatrix} 0 \\ 0.1925133 \\ -0.1925133 \\ 0.1315614 \end{bmatrix}$

The formula for the critical line is $\begin{bmatrix} X \\ \lambda \end{bmatrix} = T(2) + \lambda_E\, U(2)$, hence:

$$\begin{bmatrix} X \\ \lambda \end{bmatrix} = \begin{bmatrix} 0 \\ 0.1978609 \\ 0.802139 \\ -0.0252395 \end{bmatrix} + \lambda_E \begin{bmatrix} 0 \\ 0.1925133 \\ -0.1925133 \\ 0.1315614 \end{bmatrix}$$

When $\lambda_E = \lambda_E(1) = 4.166666$ then we find (approximately) that $X_1 = X_3 = 0$ and $X_2 = 1$. As the value of λ_E declines, X_2 will also decrease and X_3 will increase. The points generated by the critical line formula are efficient for $\lambda_E = 4.166666$ down to that value of λ_E at which the present critical line intersects another (or $\lambda_E = 0$).

Step 5: This finds the first critical line which intersects the present critical line as the value of λ_E declines. Currently we are on critical line $l_{2.3}$, whence we arrived from l_2, so we only need to consider the intersections with l_3 and $l_{1.2.3}$:

$l_{2.3}/l_3$ intersection: $X_2 = 0.1978609 + 0.1925133\lambda_E = 0$,

ie, $\lambda_E < 0$.

$l_{2.3}/l_{1.2.3}$ intersection: here we have $[\sigma_{11}, \sigma_{12}, \sigma_{13}, 1\,][T(2) + U(2).\lambda_E] = \mu_1\lambda_E$

$$-0.0099084 + 0.1323699\lambda_E = 0.062\lambda_E$$

Hence, $\lambda_E = 0.1408044$

So the first critical line to intersect the current critical line is $l_{1.2.3}$ at a value of 0.1408044 for λ_E. The portfolio at this intersection will be such that:

$$\begin{bmatrix} X \\ \lambda \end{bmatrix} = T(2) + U(2)\,\lambda_E(2)$$

$$\text{ie, } \begin{bmatrix} X_1 \\ X_2 \\ X_3 \\ 1 \end{bmatrix} = \begin{bmatrix} 0 \\ 0.1978609 \\ 0.802139 \\ -0.0252395 \end{bmatrix} + 0.1408044 \begin{bmatrix} 0 \\ 0.1925134 \\ -0.1925134 \\ 0.131564 \end{bmatrix} = \begin{bmatrix} 0 \\ 0.2249676 \\ 0.7792563 \\ -0.006715 \end{bmatrix}$$

Thus, when $\lambda_E = \lambda_E(2) = 0.1408044$ we have a portfolio consisting of (approximately) twenty-two per cent of X_2 and seventy-eight per cent of X_3, with no X_1 being held.

Step 6: Using the same method as Step 4 we proceed to calculate the formula for the critical line $l_{1.2.3}$. Now j = 1 is IN, so we move from N(2) to N(3):

$$B = \begin{bmatrix} 0 & 0 & 0 & 0 \\ 0 & 10.695187 & -10.695187 & 0.1978609 \\ 0 & -10.695187 & 10.695187 & 0.802139 \\ 0 & 0.1978609 & 0.802139 & -0.0252395 \end{bmatrix} \begin{bmatrix} 0.0146 \\ 0.0187 \\ 0.0145 \\ 1.000 \end{bmatrix} = \begin{bmatrix} 0 \\ 0.2427806 \\ 0.7572193 \\ -0.0099084 \end{bmatrix}$$

$$b = \begin{bmatrix} 0 & 0.2427806 & 0.757192 & -0.0099084 \end{bmatrix} \begin{bmatrix} 0.0146 \\ 0.0187 \\ 0.0145 \\ 1.000 \end{bmatrix} = 0.0056112$$

$$c = 0.0146 - 0.0056112 \;=\; 0.0089888$$

$$N(3) = \begin{bmatrix} 111.24955 & -27.00923 & -84.24031 & 1.102313 \\ -27.00923 & 17.252504 & 9.756726 & -0.0697573 \\ -84.24031 & 9.756726 & 74.483575 & -0.0325476 \\ 1.102313 & -0.0697573 & -0.0325476 & -0.0143174 \end{bmatrix}$$

Thus, $T(3) = N(3).R = \begin{bmatrix} 1.102313 \\ -0.0697573 \\ -0.0325476 \\ -0.0143174 \end{bmatrix}$ and also, $U(3) = N(3).S = \begin{bmatrix} -7.8286351 \\ 2.0931542 \\ 5.7354803 \\ 0.0539927 \end{bmatrix}$

The formula for the critical line is $\begin{bmatrix} X \\ \lambda \end{bmatrix} = T(3) + \lambda_E U(3)$, hence:

$$\begin{bmatrix} X \\ \lambda \end{bmatrix} = \begin{bmatrix} 1.102313 \\ -0.0697573 \\ -0.0325476 \\ -0.0143174 \end{bmatrix} + \lambda_E \begin{bmatrix} -7.8286351 \\ 2.0931542 \\ 5.7354803 \\ 0.0539927 \end{bmatrix}$$

Step 7: Here we repeat the method of Step 5 to find the first critical line to intersect our current critical line as λ_E declines from 0.1408044. At present we are on $l_{1.2.3}$ whence we arrived from $l_{2.3}$, thus:

$l_{2.3}/l_3$ **intersection:** $X_2 = -0.0697573 + 2.0931542\lambda_E = 0$,

ie, $\lambda_E = 0.0333264$.

$X_3 = -0.0325476 + 5.7354803\lambda_E = 0$,

hence, $\lambda_E = 0.0056747$.

So the first critical line intersection occurs when $\lambda_E = \lambda_E(3) = 0.0333264$, and the next efficient set lies along $l_{1.3}$. The portfolio at this intersection will be:

$$\begin{bmatrix} X_1 \\ X_2 \\ X_3 \end{bmatrix} = \begin{bmatrix} 1.102313 \\ 0.0697573 \\ -0.0325476 \end{bmatrix} + 0.0333264 \begin{bmatrix} -7.8286351 \\ 2.0931542 \\ 5.7354803 \end{bmatrix}$$

$$= \begin{bmatrix} 0.8474127 \\ -0.0000000058692 \\ 0.1585953 \end{bmatrix} \cong \begin{bmatrix} 0.8414127 \\ 0 \\ 0.1585953 \end{bmatrix}$$

Step 8: Here we proceed as we did with Steps 2, 4 and 6 to find the formula for the critical line $l_{1.3}$. The first task is to calculate N(4). Because j = 2 is no longer IN a zero cross will appear in the second row and second column. In addition, as no new variable is IN, we cannot define c_{j_0}, hence we require a new formula to calculate N(4); this appears as:

$$g_{ij} = f_{ij} + \left\{ \frac{f_{ij_0} . f_{j_0 j}}{f_{j_0 j_0}} \right\}$$

From this we obtain:

$$N(4) = \begin{bmatrix} 68.965919 & 0 & -68.965919 & 0.9931027 \\ 0 & 0 & 0 & 0 \\ -68.965919 & 0 & 68.965385 & 0.0068984 \\ 0.9931027 & 0 & 0.0068984 & 0.014599 \end{bmatrix}$$

Thus, $T(4) = N(4).R = \begin{bmatrix} 0.9931027 \\ 0 \\ 0.0068984 \\ 0.014599 \end{bmatrix}$ and also $U(4) = N(4).S = \begin{bmatrix} -4.5516636 \\ 0 \\ 4.5517244 \\ 0.0624553 \end{bmatrix}$

The formula for the critical line is $\begin{bmatrix} X \\ \lambda \end{bmatrix} = T(4) + \lambda_E U(4)$, hence:

$$\begin{bmatrix} X \\ \lambda \end{bmatrix} = \begin{bmatrix} 0.9931027 \\ 0 \\ 0.0068984 \\ 0.014599 \end{bmatrix} + \lambda_E \begin{bmatrix} -4.5516636 \\ 0 \\ 4.5517244 \\ 0.0624553 \end{bmatrix}$$

Step 9: Following Steps 5 and 7 we are looking to find the first critical line to intersect the current critical line ($l_{1.3}$) as λ_E declines from 0.0333264. However, as we move along $l_{1.3}$ in the direction of the declining value of λ_E, we find that λ_E reaches zero before we reach the next critical line intersection (ie, λ_E is negative at the next intersection). Thus our efficient set ends at:

$$\begin{bmatrix} X \\ \lambda \end{bmatrix} = T(4) + 0.U(4) = T(4)$$

This implies that T(4) gives us that portfolio from the efficient set which minimizes the variance of the portfolio. In this case we find that

$$[X] = \begin{bmatrix} 0.9931027 \\ 0 \\ 0.0068984 \end{bmatrix}$$

Thus, by using the Markowitz selection procedure we have selected that portfolio which consists of (approximately) ninety-nine per cent of security X_1, nothing is held by way of X_2, and one per cent of security X_3. Obviously the three-securities case is a limited example, but provides a useful vehicle for showing the selection procedure; an example using more securities would only result in a lengthier, more tedious Appendix along similar lines. So, our three securities example should have maximised the reader's understanding while minimising the effort required to achieve such an understanding!

APPENDIX 5-B: Portfolio Selection — A General Mathematical Approach

I) A Secure and a Risky Asset:

In this section we assume that there are only two assets which may be held in the portfolio: bonds, which bear interest and are a risky proposition, and money, which bears no interest but is a safe prospect (ie, its return is certain).

Notation:

A	= initial wealth (denominated in money terms)
a	= amount invested in bonds; so, $0 \leq a \leq A$
m	= amount invested in money; so, $m = A - a$
X	= net rate of return on bonds
$(1 + X)a$	= terminal value of bonds
Y	= terminal wealth; so, $Y = m + a(1 + X) = A + aX$.

The Model:

The investor's objective is to maximise $E[U(Y)]$, where U is a monotonically increasing, concave utility function; ie:

$$\text{maximise } E[U(Y)] = E[U(A + aX)] \equiv W(a) \qquad \textbf{(5B-1)}$$

First order conditions: $W'(a) = E[U'(Y).X]$

Second order conditions: $W''(a) = E[U''(Y).X^2] < 0$, since $U'' < 0$ **(5B-2)**

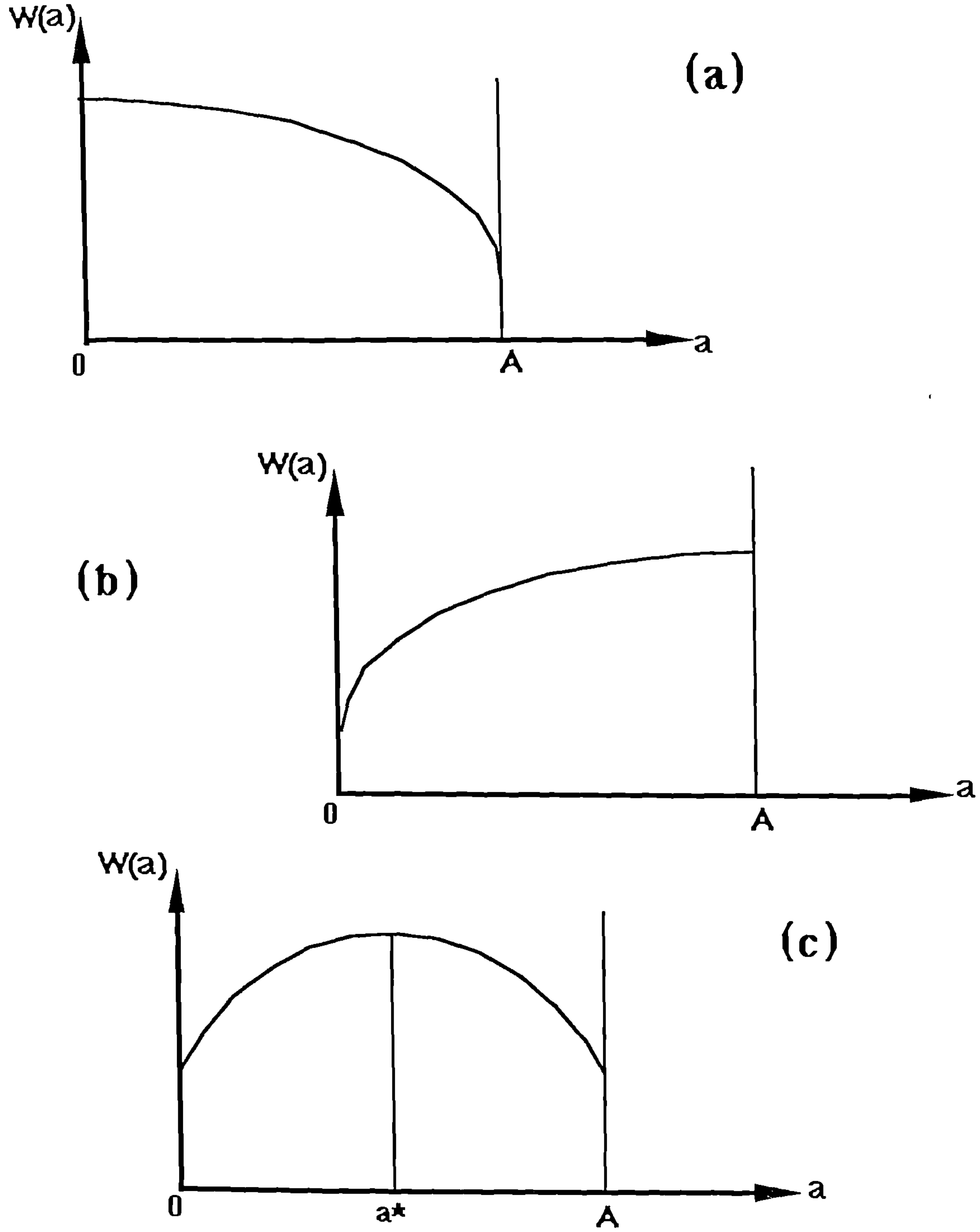
Three possible optima exist:

i) maximum occurs at $a = 0$. Here we find $W'(0) \leq 0$, as illustrated in Figure 5B-1(a), and $W'(0) = E[U'(A).X] = U'(A).E(X)$. So, $a = 0$ iff $E(X) \leq 0$.

ii) maximum occurs at $a = A$. Thus, only bonds are held—a plunger—as illustrated in Figure 5B-1(b), and $W'(a) \geq 0$.

iii) interior maximum, ie, $0 \leq a \leq A$. Here the investor holds a diversified portfolio, as illustrated in Figure 5B-1(c), so $E[U'(Y)X] = 0$.

Figure 5B-1:



We now consider some special cases—in terms of the form of the utility function—which lead to an interior maximum and, therefore, a diversified portfolio:

(1) **Quadratic Utility:**

$$U(Y) = Y - (b/2)Y^2, \text{ where } 0 < Y < 1/b.$$

First order conditions: $E[U'(Y).X] = E[(1 - bY)X]$

$= E[(1 - bA)X - abX^2] = 0$

Define $\mu_X \equiv E(X)$ and $\sigma_X^2 \equiv E\{[X - E(X)]^2\} = E(X^2) - [E(X)^2]$. Thus, the first order conditions become:

$$(1 - bA)\mu_X - ab(\sigma_X^2 + \mu_X^2) = 0$$

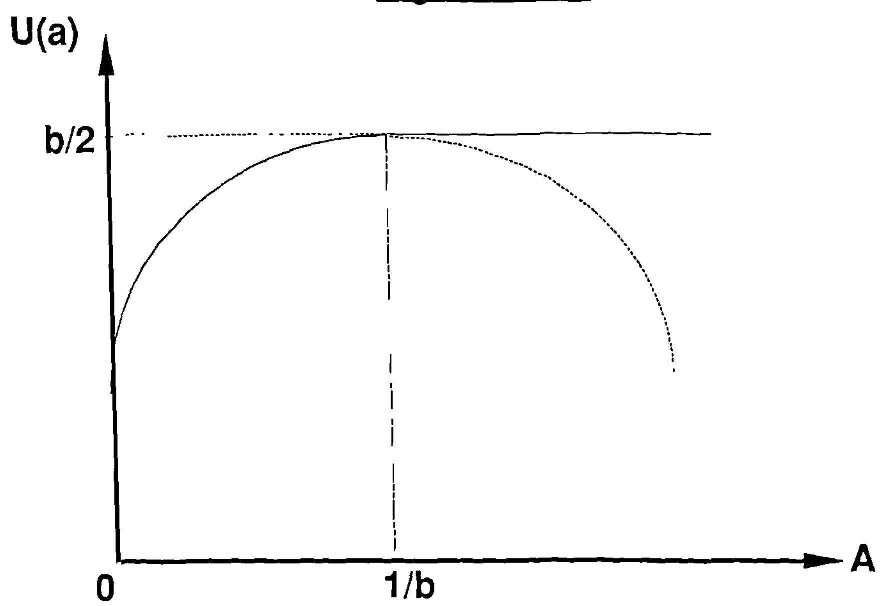
This is tantamount to the mean-variance approach, and we obtain

$$a = \frac{(1 - bA)\mu_X}{b(\sigma_X^2 + \mu_X^2)} > 0 \text{ iff } A < \frac{1}{b}$$

According to this, the greater the initial wealth the lower will be the investment in bonds. Also, the riskier the bonds the lower the investment in bonds. If $\sigma_X^2 > \mu_X^2$ then an increase in expected return will lead to an increased investment in bonds. Conversely, if $\sigma_X^2 < \mu_X^2$ then an increase in expected return will lead to a decreased investment in bonds.

For completeness it is often assumed that when $Y \geq 1/b$ the utility function takes the form $U(Y) = b/2$. This quadratic utility function is illustrated in Figure 5B-2. If we consider the measures of absolute and relative risk-aversion referred to in Chapter Five we find $R_a(A) = b/(1-bA)$. Note that this violates the Arrow hypothesis of decreasing absolute risk-aversion. However, dR_a/dA is positive—$dR_a/dA = b^2/(1 - bA)^2 > 0$—which is consistent with Arrow's hypotheses.

Figure 5B-2:



(2) **Iso-Elastic Marginal Utility:**

$$U(Y) = (1/\gamma)Y^{\gamma}, \text{ where } \gamma < 1 \text{ and } \gamma \neq 0,$$

$$U(Y) = \log A \text{ where } \gamma = 0.$$ [1]

This is illustrated in Figure 5B-3. The first order conditions are:

$$E[U'(Y).X] = E[X(A + aX)^{\gamma-1}] = 0$$

Writing the proportion of initial wealth invested in bonds as $w = a/A$, the first order conditions become:

$$E[X(A + \omega AX)^{\gamma-1}] = A^{\gamma-1}.E[X(1 + \omega X)^{\gamma-1}] = 0$$

From this we can see that ω is independent of the level of A. This is the simplest case of a class of propositions known as **Portfolio Separation Theorems**. Considering only those cases where $\gamma < 1$, we obtain the following for absolute and relative risk aversion measures:

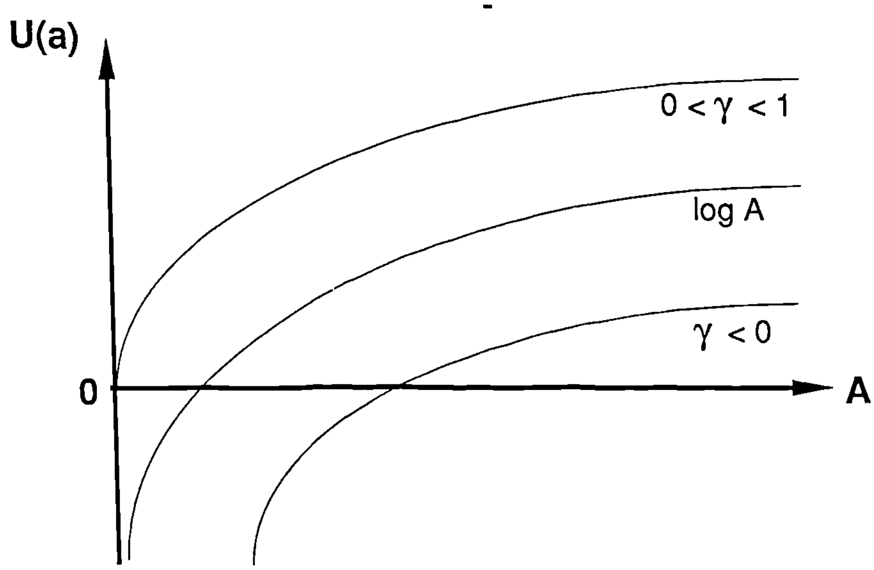
$$R_a(A) = (1 - \gamma)/A$$

This implies decreasing absolute risk aversion, which is consistent with Arrow's hypotheses; and also:

$$R_r(A) = 1 - \gamma$$

This implies constant relative risk aversion, contradicting the Arrow hypotheses.

Figure 5B-3:



[1] For a further consideration of this point see L'Hôpital's rule.

(3) Exponential Utility:

$$U(Y) = (-1/\eta)e^{-\eta Y}$$

This is illustrated in Figure 5B-4. The first order conditions are:

$$E[U'(Y).X] = E\{X.e^{-\eta(A + aX)}\} = e^{-\eta A}.E\{e^{-\eta AX}.X\} = 0$$

Here, the amount investea in bonds, a, is independent of the level of initial wealth, A. This is closely related to another of the class of Portfolio Separation Theorems. The following measures of absolute and relative risk-aversion are obtained:

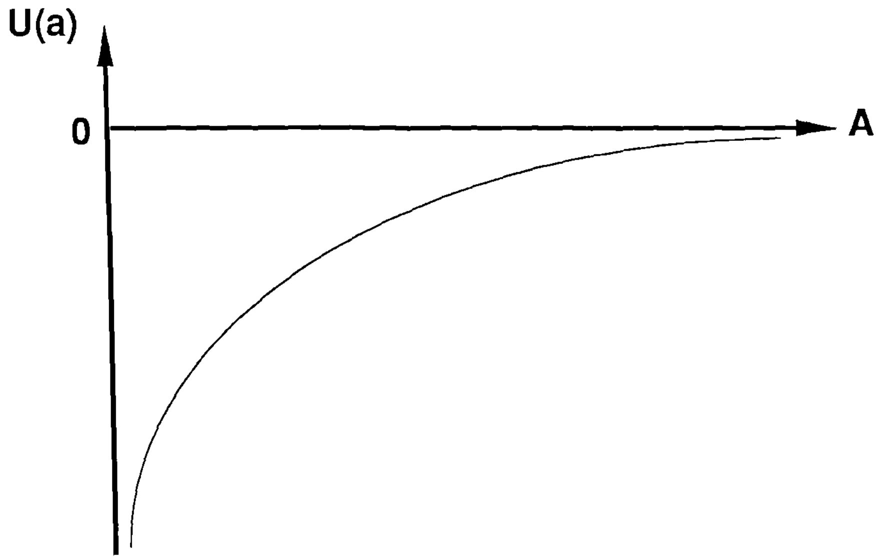
$$R_a(A) = \eta > 0$$

This implies constant absolute risk aversion, in contradiction of the Arrow hypotheses; and also:

$$R_r(A) = \eta A$$

which implies increasing relative risk aversion, which is consistent with the Arrow hypotheses.

Figure 5B-4:



(4) Hyperbolic Absolute Risk-Aversion (HARA) Utility:

$$U(a) = \frac{1-\gamma}{\gamma}\left\{\frac{\beta\alpha + \eta}{1-\gamma}\right\}^{\gamma}$$

where $0 < \gamma < 1$ and η, $\beta > 0$. This utility function exhibits both increasing relative risk aversion and decreasing absolute risk aversion, and is wholly consistent with the Arrow hypotheses, which appear:

$$R_a(A) = \frac{1}{\left[\frac{A}{(1-\gamma)} + \frac{\eta}{\beta}\right]}$$

$$R_r(A) = \frac{1}{\left[\frac{1}{(1-\gamma)} + \frac{\eta}{\beta\alpha}\right]}$$

Although this utility function is of a general nature, it does have the following special cases:

(i) if $\eta = 0$ then HARA reduces to the iso-elastic marginal utility function;

(ii) if $\gamma = 1$ is permitted then U(A) is only well-defined for $0 < A < \frac{(\gamma - 1)\eta}{\beta}$.

Then if $\eta = 1$ and $\gamma = +\infty$, HARA reduces to the exponential utility function;

(iii) as with (ii) above, if $\eta > 0$ and $\gamma = 2$, then HARA reduces to the quadratic utility function.

Chapter Six: The Theory Applied (or The Literature So Far)

6.0 Introduction

In the previous chapter we surveyed a number of the more highly regarded works in the area of portfolio selection theory. We propose, in this chapter, to extend that survey, and hence move nearer our ultimate objective, by considering those works concerned with the application of the portfolio selection theory to the investigation of the investment behaviour of financial institutions. The reasons for separating a chapter on portfolio theory from its application to financial institutions are numerous. Firstly, traditional portfolio (or asset-holding) theory of the Markowitz-kind is usually concerned with the selection of individual assets within broad asset-groupings (classes), whereas we shall be more concerned with the wider issue of the selection across asset classes. However, traditional portfolio theory of the Tobin-kind is concerned with portfolio selection across asset-groupings for, as we have seen, such theories frequently assume the existence of two broad asset classes: money and fixed interest securities ("bonds"). These theories attempt to explain the behaviour of investors possessing positive net wealth, who desire to maximise the net return (in terms of yield and capital gain) at a given target date in the future (often one 'period' hence). The individual's investment behaviour is hypothesised as being influenced by his net wealth, the relative yields and expected future prices of assets, and the individual's degree of risk-aversion (ie, the degree of certainty with which these expectations are held). However, this type of theory is not always directly applicable to the portfolio decisions of financial institutions because they face different circumstances from those assumed for the individual investor.[1] As an example, we might highlight the assumption that any individual may purchase or sell unlimited quantities of any asset without any significant influence on its price. Clearly, this assumption does not hold for financial institutions who frequently dominate certain financial markets.[2] A third reason for the existence of this chapter is that traditional portfolio theory talks about desired and expected levels of asset demand, yields, rates of interest, etc, whereas it may be more desirable to concern ourselves with their rates of change; after all, as we note elsewhere in this Thesis, the pension funds do tend to accept their existing portfolio as if it were historically given, and move toward their desired portfolio by the allocation of incoming new monies.

Also in this chapter we shall, for the most part, be limiting ourselves to consider only that part of the literature on the portfolio behaviour of financial institutions that directly concerns itself with the United Kingdom. This decision has been taken in spite of the fact that there exists a large body of literature on financial institutions in other countries.[3] Yet we shall not completely ignore this "outside literature"; indeed, a large amount of it has been responsible for stimulating much of the domestic research that we shall be surveying in this chapter, while many of the ideas and concepts that we shall come to use owe a great debt to this body of outside literature. Nevertheless, because the pension funds (and, indeed, all other financial institutions in the United Kingdom) operate in a rather different environment—in terms of history, legality, custom, etc—from those faced by their counterparts in other countries,[4] it is important for us to concentrate our attention on those works directly concerned with the United Kingdom.

In Chapter Five one of the most striking features of the literature surveyed was its relatively contemporary authorship. Yet, as we shall see, although portfolio selection theory is a new and developing area of study, its application to the behaviour of British financial institutions is even more recent, for the most part having been published in the past decade or so.[5] Despite not being as prolific as its American counterpart, there is a substantial body of British literature on the behaviour of financial institutions and like many other areas of Economics it divides rather neatly into two broad approaches, which we have chosen to label the "Essex School" and the "Sheffield School", on the basis of their geographical origins.

It is worth digressing for a moment or two to speculate upon the reasons why financial institutions were not considered either important or interesting enough for economists to investigate in depth before the 1960s, by which time many of them had been in existence for a century or more. One possible argument is that no work on the behaviour of financial institutions could occur until some breakthrough had been made in portfolio selection theory. As we saw, this did not occur in earnest until 1958. Yet an equally convincing case could be made for the view that had the financial institutions been regarded as important or interesting enough to study earlier in history, because of the very nature of their operations we might well have seen an earlier breakthrough in portfolio selection theory than that of Markowitz (or Roy). It is also noteworthy that despite the fact that behavioural studies of financial institutions did begin to appear shortly after the beginnings of their rapid growth in the post-War period, this is not to be regarded as the prime factor that opened up this area of research. The major impetus would appear to be more truly attributable to two publications around the turn of the 1950s: in the United Kingdom the report of the Radcliffe Committee (1959), and in the United States the seminal work of Gurley and Shaw (1960).[6] In brief, this impetus occurred because these two works brought about a whole new sense of the importance attaching to the concept of liquidity.[7] Because financial institutions were regarded as possessing a direct influence on the liquidity of the economy, their degree of importance (and interestingness!)[8] rapidly grew, bringing with it a wave of work in this newly-opened area for research.

Perhaps the first piece of work in this area is the 1962 Clayton article, "British Financial Intermediaries in Theory and Practice", which in many respects may be regarded as being almost a direct consequence of the Radcliffe Report (and, to a lesser extent, Gurley and Shaw). In this article Clayton compares and contrasts the ability of banks and other financial intermediaries to 'create' credit via the multiplier, and thereby their ability to affect the degree of liquidity in the U. K. economy. Unlike later articles, which examine the underlying motivations for the investment behaviour of British financial institutions, the major focus of this article was a concern as to how monetary policy might be affected by the behaviour of financial institutions. Nonetheless, it is apparent that this work laid the foundation of academic interest in the study of financial intermediary behaviour for Clayton (and later the Sheffield school, as well as others), for shortly afterward he was again in print, this time as a co-author with F. P. R. Brechling, investigating the portfolio behaviour of the commercial banks (1965).[9] It is, therefore, entirely warranted to view Radcliffe and Gurley and Shaw as being directly responsible for the growth of literature on the economics of financial institutions. As a footnote of interest, it is also worth noting the coincidental timing of these earlier publications with the seminal works of Markowitz, Roy, *et al*, on portfolio theory, thereby giving a two-pronged impetus to research work on financial intermediation.

Although by 1970 the work of Clayton on financial intermediaries was only just gathering momentum, the impetus of Radcliffe had not yet waned and a new approach appeared on the scene. This was the "Essex school" which, under the guidance and leadership of Michael Parkin, established a different approach to investigating the investment behaviour of financial institutions. Whereas the Sheffield approach had been predominantly empirical, the asset demand functions to be tested being constructed from the observed behaviour of the institutions under investigation, the Essex school adopted a more rigorous theoretical foundation, with the explicit statement of an institution's objectives and constraints from which the relevant asset demand functions to be tested were derived. Fisher (1978, Chapter Five) shows how the basic Essex school approach is really an extension of the Tobin mean-variance model of portfolio selection.

Publications on the investment behaviour of financial institutions by the Essex school continued up to the mid-1970s (at which time Parkin had moved on elsewhere, both academically and geographically), when the work of the Sheffield school was still very much in its stride. Under the guidance and leadership of Clayton, the Sheffield approach remained somewhat more *ad hoc* than that of Essex, an issue to which we shall return later. For most of the late 1970s and the 1980s there has been very little work in this area, although publications are increasingly appearing on a more regular basis largely, it seems, as a response to the apparent failure of the "monetarist experiment" of the Thatcher government.

During the course of the 1970s the impetus and influence of the Radcliffe Report and Gurley and Shaw waxed and waned, partly as a result of the incoming "monetarist counter-revolution", but mostly as a result of the normal movement of academics, both geographically and intellectually. By the mid-1970s the Essex school had come to a close while the Sheffield school became far less prolific in its output. Since those heady days few other discernible sources of research in this area have really emerged. We now turn our attentions, therefore, to survey many of the works of these two schools in some detail. The remainder of this chapter is devoted to this task, and is divided into sections corresponding to the type of financial institution being investigated. This enables us better to compare and contrast the two approaches. In what follows, then, there is a brief review of each of the papers being surveyed, followed by a critique and comparison at the end of each section.

6.1 Banks

6.1.1 Clayton and Brechling (1965)

As already mentioned, the first major work to appear investigating the portfolio behaviour of banks was the 1965 article by Brechling and Clayton. In many respects this work appears to be a detailed extension of Clayton's earlier work on financial intermediaries (1962), not least because they share a common concern for the effects of the behaviour of financial intermediaries upon the effectiveness of monetary policy. By contrast however, the Brechling-Clayton paper is primarily concerned with explaining the considerable variations to which the asset holdings of the commercial banks are subject. This they do by presenting a theoretical and empirical analysis of the factors believed to influence the banks' choice of assets.

The authors commence by presenting a simple theoretical model of the portfolio behaviour of the commercial banks; simple because there only exists a single rate of interest, which the banks are unable to influence by their actions. The model is extended later in the paper. The following choice variables are defined for the banks:

$$L = L'/D \qquad I = I'/D \qquad A = A'/D$$

where L' represents the level of liquid assets (ie, cash, money at call, and Treasury bills), I' the level of investment (ie, predominantly government bonds), A' the level of advances, and D the level of deposits, with L, I and A being the corresponding ratios. The crucial assumption of the paper is that the level of liquid assets, L', is exogenously given to the banks; that is to say, it is fixed ('though not immovable) by the monetary authorities. The banks are then hypothesised as performing a two-stage, simultaneous decision process. Firstly, the bank chooses a liquid assets ratio, L, which, because L' is taken as given, determines the level of deposits, D. Secondly, it must choose I and A to determine the distribution of its non-liquid assets. The outcome of this decision is three desired asset ratios, L^*, I^*, and A^*. Because of the existence of various constraints, these may well differ from the actual asset ratios, L, I and A.

According to Brechling and Clayton, these desired asset ratios possess four major determinants: the single rate of interest, i, accruable on both investments and advances; the level of economic activity, approximated by the level of National Income, Y; the first difference of the rate of interest, Δi; and finally, L'. They then proceed to discuss the *a priori* effects expected upon the desired asset-ratios due to changes in the parameters. However, we shall not pursue that discussion here, save from noting that the parameter Δi is included by way of a proxy measurement for the expected future rate of interest. This relationship is considered to take the following form:

$$i_{t+1} = i_t + \alpha\Delta i$$

where i_{t+1} is the expected future rate of interest, α is some constant, and Δi is a recent change in the rate of interest.

The constraints which may prevent the banks from attaining their desired asset ratios may be either government- or market-imposed. The latter do not affect investments, as the banks are assumed to be able to buy or sell investment assets in unlimited quantities without affecting their price (i). This is not the case for advances, however. These may well be constrained by the demand side of the market, ie, the public's demand for loans. This public demand for loans, $Ap^{*\prime}$, is postulated as taking the following form:

$$Ap^{*\prime} = f(i, \Delta i, Y)$$

Because this needs to be compared with the banks' desired asset ratios, Brechling and Clayton also define:

$$\begin{aligned} Ap^{*} &= Ap^{*\prime}/D \\ &= \{1/D\}.f(i, \Delta i, Y) \end{aligned}$$

The government-imposed type of constraint is considered to have not affected investments historically. However, because there does not exist any measure of the degree of severity of government constraints (G) upon advances, Brechling and Clayton adopt a proxy, using both i and Δi, believing G to be positively associated with both.

Brechling and Clayton proceed by using market diagrams for the three choice assets, L, I and A, to analyse the possible positions of the two constraints. To find out which (if any) of the constraints are binding, the authors estimate the relationships between the three asset ratios and the four exogenous variables over the period 1951.I to 1963.III using ordinary multiple regression. Most of the data they use is self-explanatory; however, for the single rate of interest, i, an average of short-, medium- and long-term rates is used, while first differences in the bill rate was used for Δi. In addition, a simple time-trend, t, was used as an exogenous variable to eliminate the time-trend from the National Income time series, Y. Finally, a series of dummy variables, Q2, Q3 and Q4, were used to eliminate the influence of seasonal fluctuations, each assuming the value 1 in its quarter and 0 elsewhere; the constant being appropriate for the first quarter and altered by the dummy variables elsewhere. The results of the estimation are reprinted here as Table 6-1. Most of the evidence from the results tends to confirm Brechling and Clayton's *a priori* expectations, apart from the coefficients on the Δi being predominantly insignificant. [10]

Table 6-1: The Brechling-Clayton Estimates

Equation	6	7	8	9	10	11
Dependent Variable	L	I	A	L	I	A
Constant	14.154	88.522	-0.079	8.068	127.32	-27.9
	(1.645)	(9.049)	(8.567)	(3.244)	(17.505)	(17.105)
Y	-0.00243	-0.00338	0.00645	-0.00064	-0.01475	0.01461
	(0.205)		(0.001)	(0.001)	(0.005)	(0.004)
i	1.278	0.102	-1.964	1.222	0.456	-2.218
	(0.205)	(1.126)	(1.066)	(0.198)	(1.070)	(1.045)
Δr	-0.2341	-0.815	1.187	-0.2939	-0.434	0.9138
	(0.157)	(0.861)	(0.816)	(0.153)	(0.825)	(0.807)
L'	0.00114	-0.00162	0.00015	0.0011	-0.00131	0.00007
				(0.001)		
t				-0.151	0.965	-0.692
				(0.070)	(0.380)	(0.372)
Q2	-0.039	1.23	-1.04	-0.57	2.41	-1.88
	(0.300)	(1.660)	(1.580)	(0.300)	(1.640)	(1.600)
Q3	0.12	3.93	-2.99	-0.02	4.78	-3.6
	(0.350)	(1.910)	(1.810)	(0.340)	(0.830)	(1.790)
Q4	-0.94	6.23	-5.55	-1.22	8.02	-6.83
	(0.430)	(2.370)	(2.240)	(0.430)	(2.340)	(2.290)
R2	0.89	0.77	0.81	0.9	0.8	0.83

Brechling and Clayton then extend their analysis by introducing three rates of interest in place of the previous one. In particular, they distinguish the Treasury Bill rate (r), the short-term rate on government bonds (R) and the Bank Rate (ρ). These rates are meant to proxy the yields on liquid assets, investments and advances respectively. The relationships postulated in the simple model are then re-estimated with the incorporation of the three rates of interest into the set of exogenous variables. However, the results that emerge from this do not differ greatly from those obtained via the simple model. Perhaps the only result of interest that does emerge from the expanded model is the lack of any significant relationship between the Bank Rate and any of the asset ratios. Finally, it should be noted that the expanded model indicates that those relationships revealed by the simpler model are of a stronger nature than originally revealed. In particular, strong relationships emerge between the asset ratios and the Bill rate (r), the bond rate (R), and changes in the Bill rate

(Δr). Brechling and Clayton proceed by suggesting a theoretical explanation of these new relationships prior to discussing the implications of their findings for the conduct of monetary policy (an issue with which we are not concerned here).

6.1.2 Parkin, Gray and Barrett (1970)

Perhaps the major distinction between this 1970 paper (hereafter PGB) and that by Brechling and Clayton, is that the former adopt a more rigorous theoretical approach to the problem of portfolio selection by financial institutions. Like most work in this area (including this Thesis!), PGB commence with a brief review of previous work of a similar nature, which, at the time of publication consisted wholly of the Brechling-Clayton paper. (Some of their criticism of Brechling-Clayton is to be found at the end of this Section). PGB compare the work of Brechling and Clayton with similar work on the commercial banks in the United States, but they find these even more wanting in terms of their lack of theoretical foundations. Motivated by the shortcomings of earlier attempts, the PGB model has its foundations in a rigorous theoretical explanation of commercial bank portfolio behaviour. They set out to construct for a (typical) individual bank a set of structural equations based upon the bank's optimisation of a given objective subject to various constraints. These are then manipulated to obtain a set of reduced form equations for the individual bank which are then aggregated over all banks and empirically tested.[11]

Following Bernouilli and others,[12] PGB assume that each bank has as its objective the maximisation of its expected utility. Utility is represented as a Freund (exponential) utility function of the form:[13]

$$U = a - ce^{-b\Pi}$$

where U is the level of utility per decision-period, Π represents the real profit per decision-period, and a, b and c are parameters such that a $\gtrless 0$ and b, c > 0. Further, the length of the decision-period is assumed to be fixed but is not specified.[14] Drawing upon the work of both Markowitz and Tobin, PGB assume Π to be a normally-distributed stochastic variable with a mean value of μ and a variance of σ^2. PGB formally state the typical bank's objective as the maximisation of:

$$E(U) = a - c\left\{-(\tfrac{b}{2})\mu + (\tfrac{b}{2})^2\sigma^2\right\}$$

This can be shown to be equivalent to maximising $W = \mu - (b/2)\sigma^2$, so the bank may be regarded as if it were maximising W.[15]

Now, the level of actual profit per decision-period, Π, will be the sum of the products of each asset (or liability - measured negatively) level and its relevant yield (or borrowing rate). PGB write this as:

$$\Pi = m'v$$

where m' is a (1 x k) vector of yields and borrowing rates, and v is a (k x 1) vector of assets and liabilities.

Because each bank bases its portfolio selection policy according to values of expected yields which determine the expected or desired levels of asset holdings, PGB write:

$$m = \widehat{m} + u_m \qquad \text{and} \qquad v = \hat{v} + u_v$$

where $\widehat{m}$, $\hat{v}$ are (k x 1) vectors of expected yields and asset/liability levels respectively, and u_m and u_v represent the relevant vectors of forecast errors. Using these PGB write:

$$\Pi = (\widehat{m} + u_m)'(\hat{v} + u_v)$$

ie, $$\Pi = \widehat{m}'\hat{v} + \widehat{m}'u_v + \hat{v}'u_m + u_m'u_v.$$

Thus: $$\mu = E(\Pi) = \widehat{m}'\hat{v} + \widehat{m}'E(u_v) + \hat{v}'E(u_m) + E(u_m'u_v).$$

PGB assume that $E(u_v)$ and $E(u_m)$ are both equal to zero, with u_m and u_v being independently distributed.[16] This gives:

$$\mu = E(\Pi) = \widehat{m}'\hat{v} \qquad \textbf{(6-1-1)}$$

Now, by definition the variance of profit is given by:

$$\sigma^2 = E\left\{[\Pi - E(\Pi)]^2\right\}$$

$$= E\left\{(\widehat{m}'u_v + \hat{v}'u_m + u_m'u_v)^2\right\} \qquad \textbf{(6-1-2)}$$

Given the PGB assumptions regarding the distributions of u_m and u_v, this reduces to:

$$\sigma^2 = \widehat{m}'E(u_v u_v')\widehat{m} + \hat{v}'E(u_m u_m')\hat{v} + E(u_m u_m' u_v u_v')$$

ie, $$\sigma^2 = \widehat{m}'C_{vv}\widehat{m} + \hat{v}'C_{mm}\hat{v} + \gamma$$

where $C_{vv} = E(u_v u_v')$ and $C_{mm} = E(u_m u_m')$ are covariance matrices, and $\gamma = E(u_m u_m' u_v u_v')$.

Before proceeding further with their analysis, PGB partition the assets/liabilities vector, v, between those which are in the bank's choice set and those which are exogenous. To do this they first define the elements of v:

$$v' = (L, T, C, B, A, S, R, Z, -D^D, -D^T)$$

where L (call loans), T (Treasury bills), C (commercial bills) and B (government bonds) are the assets in the bank's choice set, while A (advances), S (special deposits), R (notes, coins and banker's deposits), Z (other items), $-D^D$ (current account deposits), and $-D^T$ (deposit account deposits) are exogenous.[17] Formally, this appears as follows:

$$\hat{v}' = (\hat{L}, \hat{T}, \hat{C}, \hat{B} \;\vdots\; \hat{A}, \hat{S}, \hat{R}, \hat{Z}, -\hat{D}^D, -\hat{D}^T) = (\hat{v}'_N \;\vdots\; \hat{v}'_X)$$

$$u'_v = (u_L, 0, 0, 0 \;\vdots\; u_A, u_S, u_R, u_Z, u_D, u_T) = (u'_{v_N} \;\vdots\; u'_{v_X})$$

$$\widehat{m}' = (\widehat{m}_l, \widehat{m}_t, \widehat{m}_c, \widehat{m}_b \vdots \widehat{m}_a, \widehat{m}_s, 0, 0, 0, \widehat{m}_d) = (\widehat{m}'_N \;\vdots\; \widehat{m}'_N)$$

$$u'_m = (u_l, u_t, u_c, u_b \;\vdots\; u_a, u_s, 0, 0, 0, u_d) = (u'_{m_N} \;\vdots\; u'_{m_X})$$ [18]

At this point it is worth noting that the value of L is not deterministically selected; rather, it adjusts to that level which takes up the departure of the actual values of the exogenous items from their expected levels. Thus, the bank's portfolio selection problem is to maximise $W = \mu - (b/2)\sigma^2$ subject to the following constraints:

$$\text{(i)} \quad i'_N\hat{v}_N + i'_X\hat{v}_X = 0 \qquad \textbf{(6-1-3)}$$

ie, Σ assets = Σ liabilities [19]

$$\text{(ii)} \quad \hat{R} = \beta(\hat{D}^D + \hat{D}^T) \qquad \textbf{(6-1-4)}$$

$$\text{(iii)} \quad \hat{S} = \delta(\hat{D}^D + \hat{D}^T) \qquad \textbf{(6-1-5)}$$

$$\text{(iv)} \quad \hat{R} + \hat{L} + \hat{T} + \hat{C} = \psi(\hat{D}^D + \hat{D}^T) \qquad \textbf{(6-1-6)}$$

This last constraint is the "liquidity constraint", as R, L, T and C are regarded as the bank's liquid assets. Constraint (6-1-6) was disregarded by PGB because upon examination of the balance sheets of eleven London clearing banks it was found never binding. With special deposits (S) and notes, coins and banker's deposits (B) also being exogenous, the bank's portfolio choice problem reduces to:

given $\hat{v}_X$, $\widehat{m}$, C_{vv}, and C_{mm}, choose that $\hat{v}_N$ which maximises $W = \mu - (b/2)\sigma^2$

subject to $i'_N\hat{v}_N + i'_X\hat{v}_X = 0$.

To solve this problem PGB first set up the following Lagrange function, partitioning the terms in the choice variables:

$$W^* = \left[\widehat{m}'_N \;\vdots\; \widehat{m}'_X\right]\begin{bmatrix} \hat{v}_N \\ \hat{v}_X \end{bmatrix} - (b/2)\widehat{m}C_{vv}\widehat{m} + \left[\hat{v}'_N \;\vdots\; \hat{v}'_X\right]\begin{bmatrix} C_{m_N m_N} & C_{m_N m_X} \\ C_{m_X m_N} & C_{m_X m_X} \end{bmatrix}\begin{bmatrix} \hat{v}_N \\ \hat{v}_X \end{bmatrix}$$

$$+ \lambda\left[i'_N \;\vdots\; i'_X\right]\begin{bmatrix} \hat{v}_N \\ \hat{v}_X \end{bmatrix} \qquad \textbf{(6-1-7)}$$

where λ is the Lagrange multiplier. The conditions for W to be maximised are:

$$\partial W^*/\partial v = \widehat{m}_N - b\{C_{m_N m_N}\hat{v}_N + C_{m_N m_X}\hat{v}_X\} + \lambda i = 0$$

$$\partial W^*/\partial \lambda = i_N'\hat{v}_N + i_X'\hat{v}_X = 0 \qquad \textbf{(6-1-8)}$$

and the principal minors of the bordered Hessian $\begin{bmatrix} -bC_{m_N m_N} & i_N \\ i_N' & 0 \end{bmatrix}$

alternate in sign, starting positive. **(6-1-9)**

Using (6-8) the solution vector is obtained as:

$$\begin{bmatrix} \hat{v}_N \\ \lambda \end{bmatrix} = \begin{bmatrix} -bC_{m_N m_N} & i_N \\ i_N' & 0 \end{bmatrix}^{-1} \begin{bmatrix} \widehat{m}_N - bC_{m_N m_X} v_X \\ i_X'\hat{v}_X \end{bmatrix}$$

Because the required criteria[20] are fulfilled for the block inversion of $\begin{bmatrix} -bC_{m_N m_N} & i_N \\ i_N' & 0 \end{bmatrix}$ then the following solution for v is obtained:

$$\hat{v}_N = (1/b)G\widehat{m}_N - GC_{m_N m_X}\hat{v}_X - Hi_X'\hat{v}_X \qquad \textbf{(6-1-10)}$$

where $G = [C_{m_N m_N}]^{-1} - \dfrac{[C_{m_N m_N}]^{-1} i_N i_N' [C_{m_N m_N}]^{-1}}{i_N'[C_{m_N m_N}]^{-1} i_N}$

and $H = \dfrac{[C_{m_N m_N}]^{-1} i_N}{i_N'[C_{m_N m_N}]^{-1} i_N}$. Because $C_{m_N m_N}$ is a covariance matrix, it can be deduced that G is symmetric with zero column and row sums. Similarly, the vector H has a column sum of zero. Thus, from (6-10):

$$GC_{m_N m_X}\hat{v}_X \equiv G[C_{m_N m_a} \vdots C_{m_N m_s} \vdots \underset{\sim}{0} \vdots \underset{\sim}{0} \vdots \underset{\sim}{0} \vdots C_{m_N m_d}] \begin{bmatrix} A \\ S \\ R \\ Z \\ -D^D \\ -D^T \end{bmatrix}$$

where $C_{m_N m_j}$ (for all j = a, s, d) is a vector of covariances between forecasting errors of interest rates in m_N and the j^{th} interest rate in m_X. Therefore, PGB now write:

$$GC_{m_N m_X}\hat{v}_X = GC_{m_N m_a}\widehat{A} + GC_{m_N m_s}\widehat{S} + GC_{m_N m_d}\widehat{D}^T \qquad \textbf{(6-1-11)}$$

Also, from (6-1-10) they write:

$$Hi_X'\hat{v}_X = H\hat{A} + H\hat{S} + H\hat{R} + H\hat{Z} - H\hat{D}^D - H\hat{D}^T \qquad \textbf{(6-1-12)}$$

Using (6-1-11) and (6-1-12), PGB rewrite the latter two terms of (6-1-10) as:

$$-GC_{m_N m_X}\hat{v}_X - Hi_X'\hat{v}_X =$$

$$-(GC_{m_N m_a} + H)\hat{A} - (GC_{m_N m_s} + H)\hat{S} - H\hat{R} - H\hat{Z} + H\hat{D}^D - (GC_{m_N m_d} + H)\hat{D}^T.$$

PGB now define the following:

$$H^* \equiv \left[(GC_{m_N m_a} + H) \vdots (GC_{m_N m_s} + H) \vdots (GC_{m_N m_d} + H) \vdots H\right]$$

and
$$v_X^{*\prime} \equiv (\hat{A}, \hat{S}, -\hat{D}^T, \hat{Z}^*)$$

where $\hat{Z}^* = \hat{R} + \hat{Z} - \hat{D}^T$, and then rewrite (6-1-10) in full as:

$$\hat{v}_N = \left[\frac{1}{b}\right] G\hat{m}_N + H^*\hat{v}_X^* \qquad \textbf{(6-1-13)}$$

This gives a set of reduced form equations relevant to the individual bank.[21] However, to obtain empirically implementable equations PGB find it necessary to aggregate over all banks.[22] This step can only be taken by making the assumption that each and every bank has the same interest rate expectations and the same covariance matrix of forecast errors.[23] PGB suggest that there are n banks, and define:

$$\hat{V} \equiv \sum_{i=1}^{n} \hat{v}_{Ni}, \quad \hat{V}^* \equiv \sum_{i=1}^{n} \hat{v}_{Xi}, \text{ and } b^* \equiv \sum_{i=1}^{n} (1/b_i)$$

Thus, aggregating over all n banks, PGB obtain:

$$\hat{V}_N = b^* G\hat{m}_N + H^*\hat{V}_X^* \qquad \textbf{(6-1-14)}$$

To move closer to their final model for estimation, PGB now hypothesise that $\hat{m}_N = \overline{m}_N$, where $\overline{m}_N$ represents the quarterly averages of actual yields centred on the date of observation of the balance sheet. This, then, gives:

$$\hat{V}_N = b^* G\overline{m}_N + H^*\hat{V}_X^* \qquad \textbf{(6-1-15)}$$

Because $v_X^* = \hat{v}_X + u_{v_X^*}$, it must also be the case that $\hat{v}_X^* = v_X^* - u_{v_X^*}$ which, summing over all banks, gives $\sum\hat{v}_X^* = \sum v_X^* - \sum u_{v_X^*}$. Defining $V_X^* = \sum v_X^*$ and postulating forecast errors in the aggregate to be zero (ie, $\sum u_{v_X^*} = 0$), PGB obtain:

$$\overline{V}_N = b^* G\overline{m}_N + H^* V_2^* \qquad \text{(6-1-16)}$$

This describes the ideal behaviour of the banks. It is posited that their actual behaviour will depart from this stochastically, so that:

$$V_N = b^* G\overline{m}_N + H^* V_2^* + \varepsilon \qquad \text{(6-1-17)}$$

where ε is a vector of normally distributed random variables with zero means. The authors then allow for "seasonality" by modifying (6-1-17) to:

$$V_N = b^* G_{\overline{m}_N} + H^* V_2^* + JD + \varepsilon \tag{6-1-18}$$

where J is a (4 x 4) matrix of coefficients, D is a (4 x 1) vector of dummy variables such that $i'J = \underset{\sim}{0}'$ and $Ji = \underset{\sim}{0}$. So now the equations (6-1-18) represent the commercial bank asset demand functions, in which the coefficients b* G, H*, and J are directly estimable. The estimation procedure adopted by PGB takes advantage of the strong *a priori* specifications in order to gain efficiency. This is considered especially important in view of the multicollinearity that inevitably arises in regressions involving large numbers of in erest rate variables. The restrictions which may be imposed are:

1) symmetry of G;
2) $i'G = \underset{\sim}{0}$;
3) $i'H = -1$;
4) $i'J = \underset{\sim}{0}'$;
5) $Ji = \underset{\sim}{0}$.

Taking (4) and (5) together, there are some eight restrictions of which only seven are independent. So, in all there are twenty-one independent restrictions. PGB use the extraneous information as follows: First, they rewrite (6-1-18) as:

$$\begin{bmatrix} T \\ C \\ B \\ L \end{bmatrix} = b^* \begin{bmatrix} g_{11} & g_{12} & g_{13} & g_{14} \\ g_{21} & g_{22} & g_{23} & g_{24} \\ g_{31} & g_{32} & g_{33} & g_{34} \\ g_{41} & g_{42} & g_{43} & g_{44} \end{bmatrix} \begin{bmatrix} \overline{m}_t \\ \overline{m}_c \\ \overline{m}_b \\ \overline{m}_l \end{bmatrix} + \begin{bmatrix} h_{11} & h_{12} & h_{13} & h_{14} \\ h_{21} & h_{22} & h_{23} & h_{24} \\ h_{31} & h_{32} & h_{33} & h_{34} \\ h_{41} & h_{42} & h_{43} & h_{44} \end{bmatrix} \begin{bmatrix} D^T \\ S \\ A \\ Z^* \end{bmatrix}$$
$$+ \begin{bmatrix} j_{11} & j_{12} & j_{13} & j_{14} \\ j_{21} & j_{22} & j_{23} & j_{24} \\ j_{31} & j_{32} & j_{33} & j_{34} \\ j_{41} & j_{42} & j_{43} & j_{44} \end{bmatrix} \begin{bmatrix} d_1 \\ d_2 \\ d_3 \\ d_4 \end{bmatrix} + \begin{bmatrix} \varepsilon_t \\ \varepsilon_c \\ \varepsilon_b \\ \varepsilon_l \end{bmatrix} \tag{6-1-19}$$

The data generated by this model may be represented as:

$$\widetilde{T} = \left[\widetilde{M} \;\vdots\; \widetilde{V}_X^* \;\vdots\; \widetilde{D}\right] \beta_t + \varepsilon_t$$
$$\widetilde{C} = \left[\widetilde{M} \;\vdots\; \widetilde{V}_X^* \;\vdots\; \widetilde{D}\right] \beta_c + \varepsilon_c$$
$$\widetilde{B} = \left[\widetilde{M} \;\vdots\; \widetilde{V}_X^* \;\vdots\; \widetilde{D}\right] \beta_b + \varepsilon_b$$
$$\widetilde{L} = \left[\widetilde{M} \;\vdots\; \widetilde{V}_X^* \;\vdots\; \widetilde{D}\right] \beta_l + \varepsilon_l$$

where $\widetilde{T}$, $\widetilde{C}$, $\widetilde{B}$, and $\widetilde{L}$ are (τ x 1) vectors of observations on the levels of the choice assets ($\tau = 53$), $\widetilde{M}$ is a (τ x 4) matrix of observed interest rates, $\widetilde{V}_X^*$ is a

(τ x 4) matrix of observed asset/liability levels, $\tilde{D}$ is a (τ x 4) matrix of (seasonal) dummy variables, β_t, β_c, β_b and β_l, are (12 x 1) vectors of coefficients (which are the elements of b*, G, H*, and J), and ε_t, ε_c, ε_b and ε_l are (τ x 1) vectors of disturbances. These equations may be stacked to produce the following single regression model:

$$\underset{(4\text{x}1)}{\begin{bmatrix} \tilde{T} \\ \tilde{C} \\ \tilde{B} \\ \tilde{L} \end{bmatrix}} = \underset{(4\text{x}48)}{\begin{bmatrix} [\tilde{M} \vdots \tilde{V}_X^* \vdots \tilde{D}] \vdots \underset{\sim}{0}\ \underset{\sim}{0}\ \underset{\sim}{0} & \vdots 000 \vdots 000 \\ 000 \vdots [\tilde{M} \vdots \tilde{V}_X^* \vdots \tilde{D}] \vdots \underset{\sim}{0}\ \underset{\sim}{0}\ \underset{\sim}{0} & \vdots 000 \\ 000 \vdots 000 \vdots [\tilde{M} \vdots \tilde{V}_X^* \vdots \tilde{D}] \vdots \underset{\sim}{0}\ \underset{\sim}{0}\ \underset{\sim}{0} & \\ \underset{\sim}{0}\ \underset{\sim}{0}\ \underset{\sim}{0} \vdots 000 \vdots 000 \vdots [\tilde{M} \vdots \tilde{V}_X^* \vdots \tilde{D}] & \end{bmatrix}} \underset{(48\text{x}1)}{\begin{bmatrix} \beta_t \\ \beta_c \\ \beta_b \\ \beta_l \end{bmatrix}} + \underset{(4\text{x}1)}{\begin{bmatrix} \varepsilon_t \\ \varepsilon_c \\ \varepsilon_b \\ \varepsilon_l \end{bmatrix}} \qquad \textbf{(6-1-20)}$$

and the vector $b = \begin{bmatrix} \beta_t \\ \beta_c \\ \beta_b \\ \beta_l \end{bmatrix}$ is estimated subject to the restriction Rb = r, where R is a (21 x 1) vector, the elements of which are known and arranged to impose the five sets of restrictions mentioned earlier. Rewriting (6-1-111) as y = Xb + ε, and choosing β to minimise $\varepsilon'\varepsilon$ subject to Rb = r, yields as an estimator for β^*:

$$\hat{\beta} = (X'X)^{-1}X'y + (X'X)^{-1}R'[R(X'X)^{-1}R']^{-1}[r - R(X'X)^{-1}X'y]$$

The restricted least squares estimates of the asset demand functions thus obtained are presented here in Table 6-2. It is immediately noticeable that the only significant "own-rate" coefficient is that pertaining to Treasury Bills. The own-rate coefficient in the bond equation, although not significantly different from zero at the conventional level, does have a t-ratio of 1.86 and a positive coefficient. This result is contrary to one of the major Brechling-Clayton (1965) empirical findings—that the response to bond rate changes might be perverse—a phenomenon whose concern was also expressed by various witnesses to the Radcliffe Committee (1959). From the results obtained, PGB calculate mean elasticities for each of the assets and find call loans and government bonds to be complementary, as are commercial bills and Treasury Bills, while Treasury Bills and government bonds, Treasury Bills and call loans, and commercial bills and government bonds are found to be substitutes. Finally, PGB consider the proximate effects of government policy upon the behaviour of the commercial banks, an avenue which we shall not explore here.

Table 6-2: Restricted Least Squares Estimates of London Clearing Banks' Asset Demand Functions

	Call Loans	Treasury Bills	Commercial Bills	Bonds
Call loan rate	31.387	-95.192	-6.931	70.736
	(1 030)	(3.630)	(0.360)	(4.010)
Treasury Bill rate	-95.192	71.115	64.484	-40.407
	(3.630)	(2.240)	(3.100)	(2.370)
Commercial bill rate	-6.931	64.484	8.265	65.818
	(0.360)	(3.100)	(0.360)	(4.170)
Short bond rate	70.736	-40.407	-65.818	35.489
	(4.010)	(2.370)	(4.170)	(1.860)
Time deposits (negative)	-0.137	-0.21	-0.018	-0.635
	(3.970)	(6.090)	(0.510)	(18.900)
Special deposits	0.307	0.142	-0.098	-1.351
	(2.650)	(1.220)	(0.850)	(11.750)
Advances	0.078	-0.441	0.113	-0.751
	(3.350)	(18.927)	(4.850)	(32.370)
Z *	0.005	-0.403	0.045	-0.648
	(0.320)	(25.510)	(2.870)	(41.270)
Data dummy	-102.3	236.297	-41.522	-92.465
	(3.630)	(8.450)	(1.500)	(3.270)
Q1	2.966	-89.823	-2.412	89.27
	(0.300)	(8.990)	(0.240)	(8.940)
Q2	-25.875	-7.214	-2.353	35.432
	(2.560)	(0.720)	(0.230)	(3.510)
Q3	-32.096	51.537	-2.353	-17.088
	(3.220)	(5.160)	(0.240)	(1.710)
Q4	54.966	45.5	7.119	-107.614
	(5.440)	(4.510)	(0.710)	(10.670)
R2	0.85	0.95	0.8	0.99

( ) = t-statistic

Z * = notes and other items minus demand deposits

6.1.3 Comments

The major criticism that must be levied at the Brechling-Clayton paper is that at no time do the authors state what they perceive to be the banks' objective(s). Hence it is not clear as to why the banks should choose between investments and advances in allocating their non-liquid assets. This is in direct contrast to the approach taken by PGB. In similar vein, the process by which Brechling and Clayton select their explanatory variables appears to be virtually *ad hoc*, although in many respects it is directly analogous to the approach of standard demand theory, with the exception that prices are now rates of interest, while the level of deposits proxies for income. However, the demand for assets to hold does not occur simply because their holding adds to the holder's utility, unlike consumption in traditional demand theory.[24] Furthermore, because of the existence of uncertainty there is a need to consider expectations in a more satisfactory manner than that adopted by Brechling and Clayton, but such a step is not possible without an explicit statement of the banks' objective(s). A similar criticism on the modelling of expectations could also be levied at PGB; both papers do little more than take the prevailing value by way of proxy for its future expected value.

Thus, we can see that methodologically the PGB approach is less likely to be subject to criticism than that of Brechling and Clayton. However, the methodology of positive economics tells us that economic models are not to be judged so much by the realism of their assumptions, but rather by the accuracy of their predictions. A comparison of Tables 6-1 and 6-2 reveals that neither model outperforms the other; the relative merits of the two models is virtually the same, especially as measured by the R^2 statistic. Thus, in spite of (or, perhaps because of) the more rigorous theoretical approach taken by PGB, a set of reduced form equations very similar to those used by Brechling and Clayton are obtained. Were a cost-benefit approach to be applied to the two methodologies at this juncture, then a clear preference for the Brechling-Clayton approach would emerge. This is particularly ironic as the PGB approach is more readily identifiable with the "monetarist/positive economics" camp, while Brechling and Clayton would more normally be associated with the "Keynesian" approach.

6.2 Discount Houses

The Discount House is a feature unique to British capital markets, and this probably accounts for there having been virtually nothing written about them outside the shores of the United Kingdom. Their first appearance on the English capital market was around the middle of the eighteenth century. From that day to this the rôle of the Discount House has, unlike some other financial intermediaries, evolved and adapted to the changing economic climate. Despite being peculiar to the United Kingdom, they are considered important to the British financial system for two reasons: firstly, they make up a large part of the market for short-term financial assets, such as Treasury and commercial bills, short loans and bonds; and secondly, they are the only institutions to which the authorities make "last resort" loans. The Discount Houses specialise in operations in the discount markets, often alongside other less specialised institutions performing a similar role. Currently, there are some eight Discount Houses, all members of the London Discount Market Association.*

The major functions of the Discount Houses are to borrow short-term funds from the commercial banks and other institutions, and then lend these funds against four broad classes of security: U. K. Treasury bills, commercial bills, U. K. government bonds and "other assets".[25]

Published work on the Discount Houses is not abundant, and what does exist tends to be descriptive rather than analytical. Perhaps the only exception of note comes from the pen of Michael Parkin, and is the immediate antecedent of the PGB paper (1970) on the debt and investment behaviour of the commercial banks which we have just considered. The two works have a common approach, both beginning with a set of structural equations based upon the institution's optimisation of a given objective function subject to various constraints. These are manipulated to give a set of reduced form equations for a (typical) individual institution, which are then aggregated prior to empirical estimation.

6.2.1 Parkin (1970)

As before, each individual Discount House is assumed to possess a Freund (exponential) utility function of the form: [26]

$$U = a - ce^{-b\Pi} \qquad \textbf{(6-2-1)}$$

Although, once again, the length of the decision period is fixed, in this paper Parkin constructs two models based on alternative assumptions about its

* This figure is correct as of Autumn 1988. Earlier in the 1980s the figure was twelve. (My thanks to Helena Skarbek of the Bank of England and Issy Cohen for the update.)

length. In model H(1) the decision period is assumed to be in excess of the duration of a typical call loan, while in model H(2) the decision period is exceeded by the duration of a typical call loan. Thus, in the first model the decision period is between one week and three months, and in the second it lies between one day and one week. The individual Discount House is assumed to maximise its expected utility which, as we have seen,[27] is tantamount to maximising

$$W = \mu - (b/2)\sigma^2. \tag{6-2-2}$$

Parkin defines the stochastic variate, actual profit, Π, to be:

$$\Pi = m'v \tag{6-2-3}$$

where m' is a (1 x k) vector of yields and borrowing rates, and v is a (k x 1) vector of assets (measured positively) and liabilities (measured negatively). Because of the existence of uncertainty, the Discount House can only follow policies based upon its expected yields/borrowing rates vector, m, which is related to m such that:

$$m = \widehat{m} + u_m$$

where u_m is a (k x 1) vector of forecast errors. Parkin rewrites (6-2-3) as:

$$\Pi = (\widehat{m} + u_m)'v$$

$$= \widehat{m}'v + u_m'v \qquad {}^{28}(6\text{-}2\text{-}4)$$

Now, $\mu \equiv E(\Pi) = \widehat{m}'v + E(u_m')v$. Parkin assumes $E(u_m) = 0$, so that (6-2-4) becomes:

$$\Pi = m'v \tag{6-2-5}$$

By definition the variance of profit is:

$$\sigma^2 = E\{[\Pi - E(\Pi)]^2\}$$

$$= E\{(u_m'v)^2\}$$

$$= v'E\{u_m u_m'\}v = v'Sv \tag{6-2-6}$$

where $S \equiv E\{u_m u_m'\}$; ie, S is the covariance matrix.

Parkin proceeds by writing out in full the vector of assets and liabilities:

$$v' = (T, C, B, -L, -A) \tag{6-2-7}$$

where T represents Treasury Bills, C is commercial bills, B is government bonds, -L is call loans, and -A represents discounts and advances, all in real terms. Similarly, he writes the vector of expected yields and borrowing rates as:

$$\widehat{m}' = (\mu_t, \mu_c, \mu_b, \mu_l, \mu_a)$$

where the subscript denotes the relevant asset or liability. The covariance matrix, S, may be written in full as:

$$S = \begin{bmatrix} \sigma_{tt} & \sigma_{tc} & \sigma_{tb} & \sigma_{tl} & \sigma_{ta} \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ \sigma_{at} & \sigma_{ac} & \sigma_{ab} & \sigma_{al} & \sigma_{aa} \end{bmatrix} \qquad \textbf{(6-2-8)}$$

Finally, Parkin also defines:

$$f = Q - E \qquad \textbf{(6-2-9)}$$

where Q represents "other assets",[29] and E is capital and reserves.[30] Further, he assumes that:

(i) the elements of v constitute the Discount House's choice set; and

(ii) the elements of m, S and f are regarded by the Discount House as being exogenous. This implies that the Discount House operates as if it were a price-taker in all markets.

With liabilities being treated as negative assets, the only constraint is a single (balance sheet) equality of the form:

$$i'v + f = 0 \qquad \textbf{(6-2-10)}$$

Parkin is now able to state and solve the Discount House portfolio and debt selection problem. This may be written as:

given m, S, and f, choose v to maximise $W = \mu - (b/2)\sigma^2$ subject to $i'v + f = 0$.

To solve this Parkin sets up the following Lagrange function:

$$W^* = \widehat{m}'v - (b/2)v'Sv + \lambda(i'v + f) \qquad \textbf{(6-2-11)}$$

where λ is the Lagrange multiplier. The conditions for W to be maximised are:

$$\frac{\partial W^*}{\partial v} = \widehat{m} - bSv + \lambda i = 0$$

$$\frac{\partial W^*}{\partial \lambda} = i'v + f = 0 \qquad \textbf{(6-2-12)}$$

and the principal minors of the bordered Hessian $\begin{bmatrix} -bS & i \\ i' & 0 \end{bmatrix}$ alternate in sign starting positive. **(6-2-13)**

Using (6-2-12) the solution vector is obtained as:

$$\begin{bmatrix} v \\ \lambda \end{bmatrix} = \begin{bmatrix} -bS & i \\ i' & 0 \end{bmatrix} \begin{bmatrix} \widehat{m} \\ f \end{bmatrix} \qquad \textbf{(6-2-14)}$$

from which Parkin derives the following solution for v:

$$v = (1/b)G\widehat{m} + Hf \qquad \textbf{(6-2-15)}$$

where $G = \left[S^{-1} - \frac{S^{-1}ii'S^{-1}}{i'S^{-1}i}\right]$ and $H = \left[\frac{S^{-1}i}{i'S^{-1}i}\right]$. The equations (6-2-15) constitute the asset demand and liability supply functions of an individual Discount House. Parkin makes the following observations about the properties of G:

(i) G is symmetrical. This follows directly from the fact that the covariance matrix, S, (and hence its inverse, S^{-1}) is symmetrical.

(ii) G has zero row and column sums. To see this for the rows, first post-multiply G by i; this gives $Gi = \left[S^{-1} - \frac{S^{-1}ii'S^{-1}}{i'S^{-1}i}\right] = S^{-1}i - S^{-1}i = 0.$

Due to symmetry, the column sums will also be zero.

(iii) It follows directly from (6-2-13) that the diagonal elements of $\begin{bmatrix} -bS & i \\ i' & 0 \end{bmatrix}$ will be non-positive. Multiplying by -1 to get (6-2-14) changes the diagonal elements to all become non-negative. The economic interpretation of this is that a *ceteris paribus* increase in the own rate of interest will never lead to a decrease in the volume of that asset held. As a result of property (ii) the sum of the off-diagonal elements of G will be less than zero. In economic terms this indicates that substitution dominates complementarity.

The only property of H that can be deduced in a similar fashion is that the sum of its elements (ie, its column sum) is -1.

In order to obtain empirically estimable asset demand/liability supply equations, Parkin first aggregates over all Discount Houses. This can only be done (as we have already noted) on the somewhat restrictive assumption that each and every Discount House have identical expectations and the same matrix of forecast errors. Aggregating, then, Parkin obtains:

$$V = \beta G\widehat{m} + HF \qquad \textbf{(6-2-16)}$$

as the analogue to (6-2-15). Unsurprisingly, $V = \Sigma v_i$, $b = \Sigma(1/b_i)$ and $F = \Sigma f_i$ for all i = 1, 2,..., 12. However, for empirical purposes, (6-2-16) is not entirely satisfactory. For example, the vector $\widehat{m}$ is specified in terms of (unobservable) expected rates of interest. Parkin also finds a need to account for seasonality, as well as including the assumption that Discount House behaviour will depart stochastically from that postulated by the deterministic equation. He therefore obtains:

$$V = \beta G\overline{m} + HF + JD + u \qquad \textbf{(6-2-17)}$$

where $\overline{m}$ is a vector of observable interest rates such that $\widehat{m} = \overline{m} + e$ (e being a random variable with zero mean), D is a vector of dummy variables with J its vector of coefficients, and u represents the stochastic departure of Discount House behaviour from that postulated by the deterministic equation.

The next step is for Parkin to rewrite (6-2-17) in full as:

$$\begin{bmatrix} T \\ C \\ B \\ -L \\ -A \end{bmatrix} = \beta \begin{bmatrix} g_{tt} & g_{tc} & g_{tb} & g_{tl} & g_{ta} \\ g_{tc} & g_{cc} & g_{cb} & g_{cl} & g_{ca} \\ g_{tb} & g_{cb} & g_{bb} & g_{bl} & g_{ba} \\ g_{tl} & g_{cl} & g_{bl} & g_{ll} & g_{la} \\ g_{ta} & g_{ca} & g_{ba} & g_{la} & g_{aa} \end{bmatrix} \begin{bmatrix} m_t \\ m_c \\ m_b \\ m_l \\ m_a \end{bmatrix} + \begin{bmatrix} h_t \\ h_c \\ h_b \\ h_l \\ h_a \end{bmatrix} F + \begin{bmatrix} j_t \\ 0 \\ 0 \\ j_l \\ 0 \end{bmatrix} + \begin{bmatrix} u_t \\ u_c \\ u_b \\ u_l \\ u_a \end{bmatrix} \qquad \textbf{(6-2-18)}$$

The data generated by this model may be represented as:

$$T = [M{:}\ F{:}\ D]\ \gamma_t + u_t$$

$$C = [M{:}\ F{:}\ D]\ \gamma_c + u_c$$

$$B = [M{:}\ F{:}\ D]\ \gamma_b + u_b$$

$$-L = [M{:}\ F{:}\ D]\ \gamma_l + u_l$$

$$-A = [M{:}\ F{:}\ D]\ \gamma_a + u_a$$

where T, C, B, -L, and -A are ($\tau \times 1$) vectors of observations on asset and liability levels ($\tau = 46$), M is a ($\tau \times 5$) matrix of observed interest rates, F is a ($\tau \times 1$) matrix of observations on f, D is a ($\tau \times 1$) vector of dummy variables, and u_t, u_c, u_b, u_l and u_a are ($\tau \times 1$) vectors of disturbances. Also, the vectors of coefficients are:

$$\gamma_t = \begin{bmatrix} bg_{tt} \\ bg_{tc} \\ bg_{tb} \\ bg_{tl} \\ bg_{ta} \\ h_t \\ j_t \end{bmatrix} \quad \gamma_c = \begin{bmatrix} bg_{tc} \\ bg_{cc} \\ bg_{cb} \\ bg_{cl} \\ bg_{ca} \\ h_c \end{bmatrix} \quad \gamma_b = \begin{bmatrix} bg_{tb} \\ bg_{cb} \\ bg_{bb} \\ bg_{bl} \\ bg_{ba} \\ h_b \end{bmatrix} \quad \gamma_l = \begin{bmatrix} bg_{tl} \\ bg_{cl} \\ bg_{bl} \\ bg_{ll} \\ bg_{al} \\ h_l \\ j_l \end{bmatrix} \quad \gamma_a = \begin{bmatrix} bg_{ta} \\ bg_{ca} \\ bg_{ba} \\ bg_{la} \\ bg_{aa} \\ h_a \end{bmatrix}$$

Using these definitions the equations may be stacked to produce the following single regression model:

$$\underset{(5\times1)}{\begin{bmatrix} T \\ C \\ B \\ -L \\ -A \end{bmatrix}} = \beta \underset{(5\times25)}{\begin{bmatrix} [M \vdots F \vdots D] \vdots 0 \vdots 0 \vdots 0 \vdots 0 \\ 0 \vdots [M \vdots F] \vdots 0 \vdots 0 \vdots 0 \\ 0 \vdots 0 \vdots [M \vdots F] \vdots 0 \vdots 0 \\ 0 \vdots 0 \vdots 0 \vdots [M \vdots F \vdots D] \vdots 0 \\ 0 \vdots 0 \vdots 0 \vdots 0 \vdots [M \vdots F] \end{bmatrix}} \underset{(25\times1)}{\begin{bmatrix} \gamma_t \\ \gamma_c \\ \gamma_b \\ \gamma_l \\ \gamma_a \end{bmatrix}} + \underset{(5\times1)}{\begin{bmatrix} u_t \\ u_c \\ u_b \\ u_l \\ u_a \end{bmatrix}} \qquad \textbf{(6-2-19)}$$

and the vector $\gamma = \begin{bmatrix} \gamma_t \\ \gamma_c \\ \gamma_b \\ \gamma_l \\ \gamma_a \end{bmatrix}$ is estimated subject to the restriction Rb = r, where R is a (17 x 32) vector and r is a (17 x 1) vector, the elements of which are known and arranged to impose the five sets of restrictions mentioned earlier (eg, symmetry of G). The restricted least squares estimates of the asset demand and liability supply functions thus obtained are reproduced here as Table 6-3.

Table 6-3: Discount Houses' asset demand and liability supply functions: Restricted Least Squares estimates using end-quarter average interest rates R(1)

	Treasury Bills	Commercial Bills	Short Bonds	Call Loans (negative)	Discounts and Advances (negative)
Treasury Bill rate	301.987 (6.59)	36.412 (2.05)	-45.394 (14.25)	-403.825 (14.25)	110.82 (3.96)
Commercial Bill rate	36.412 (2.05)	0.683 (0.05)	133.543 (12.50)	-145.512 (9.77)	-25.126 (1.45)
Short bond rate	-45.394 (14.25)	133.543 (12.50)	75.458 (5.07)	-172.99 (15.50)	9.383 (0.69)
Call loan rate	-403.825 (14.25)	-145.512 (9.77)	-172.99 (15.50)	778.707 (36.41)	-56.381 (3.09)
Bank rate	110.82 (3.96)	-25.126 (1.45)	9.383 (0.69)	-56.38 (3.09)	-38.697 (1.26)
Other assets less capital	-0.94 (3.44)	1.826 (6.94)	-0.066 (0.25)	-1.569 (5.81)	-0.251 (0.93)
Seasonal dummy	155.938 (13.12)	— —	— —	-155.938 (13.12)	— _

( ) = t-statistic

It is immediately noticeable that three of the five own-rate coefficients are positive and significant, as predicted by the theory, while the own-rate coefficients for commercial bills and discounts and advances are not significantly different from zero. Additionally, in this model Parkin discovers three significant cases of complementarity: between Treasury bills and commercial bills; between bonds and commercial bills; and between Treasury bills and discounts and advances. The remaining assets are all found to be substitutes. This would appear to offer *a priori* evidence that, rather than choosing a simultaneous allocation of funds among all assets, the Discount Houses operate a sequential procedure in their portfolio selection, with Treasury bills having a priority over their investable funds.

The Parkin model would appear to explain a goodly proportion of the portfolio and debt changes of the Discount Houses. Nonetheless, like its descendant—the PGB paper on commercial banks—there are a number of problems. In particular, the own-rate coefficients in the commercial bills and discounts and advances equations are found to be insignificant, yet Parkin offers no explanation as to why this might be. One possibility might be to ascribe it to 'market imperfections'. Consider by way of example a Discount House which is unable to purchase its desired quantity of Treasury bills; it is not unreasonable for the Discount House to regard (eg) commercial bills as an adequate replacement asset, and to therefore purchase a quantity of them to make up the shortfall in Treasury bills. In such a case it is a supply-side constraint—the inability of the Discount House to purchase its desired quantity of Treasury bills—which is the dominant factor in determining its demand for commercial bills, not the own-rate on commercial bills. A similar argument might be extended to account for the high degree of complementarity between Treasury and commercial bills.

The above example also provides further evidence for the possibility that the Discount Houses invest sequentially, but a complete study of this hypothesis would require the inclusion of parameters such as the current level of issues of (especially) Treasury bills as a means of testing the existence of any supply-side constraint.

A final comment once again concerns the specification of expected interest rates: Parkin makes various suggestions in this paper about alternative formulations of the model, but does not even hint at the possible use of alternative expectations-generating mechanisms in his equations (6-2-16). In both this paper and that by PGB a vector of quarterly interest rates is used as a simple proxy for expected rates. This would appear to be a rather naïve approach, especially in view of the sophistication exhibited by the rest of the model.

6.3 Building Societies

Building societies first began to appear in the British economy around the middle of the eighteenth century. At that time they were predominantly "terminating" societies, being wound up when, as a result of their efforts, all members had been accommodated. The more modern "permanent" building society began to appear in the nineteenth century and sought to attract funds from the general public to help finance members' housing construction. Nowadays, the societies are not directly involved with house construction, but they still aim to attract funds from the general public to help finance members' house purchases. Consequently, the building societies operate in two markets: that for personal savings, and the housing market. These reflect the major source and the major use of funds respectively. Because of the various government constraints neither market can be considered 'free'. In the personal savings market the building societies are in direct competition with other financial intermediaries to attract funds. In recent years this competition has come to be especially against the banks, although not exclusively. Indeed, in the last few years the dividing line between banks and building societies has become increasingly blurred. In similar vein, when it comes to selecting and purchasing their portfolio, the societies are also in competition with the other financial intermediaries, although this is not the case for mortgages.

The main government-imposed restrictions on building societies portfolio and debt behaviour are that

(i) liquid assets (ie, all assets with the exception of mortgages) must account for at least 7.5 per cent of all assets; and that

(ii) reserves should be at least two per cent of total assets.[30]

The major liability of any building society is its Shares and Deposits. These are the funds attracted from the general public, on which the societies pay a rate of interest. Although this rate is free to vary with market conditions, changes in its level are both infrequent and irregular. This is also true of the rate of interest that accrues to societies by way of mortgages. In fact, these rates of interest may differ from an individual society's desired levels because, for the most part, they are determined by (nearly) all building societies in collusion via the Building Societies Association (BSA). Of course, these cannot be properly determined without due regard to the prevailing market conditions, but it does mean that building societies are essentially not price-takers in the markets in which they operate. This is obviously an important aspect of their behavior that needs to be incorporated into any model explaining their portfolio behaviour. As the banks and Discount Houses are regarded as price-takers, this gives a new dimension to our look at the portfolio behaviour of financial intermediaries.

There is also a second major distinction between the building societies and most other financial intermediaries, and that concerns their objective. Unlike most other financial institutions, a building society is a "friendly society" and, therefore, is legally prohibited from making any profits in the traditional sense. This is a view taken by the Radcliffe Committee (1959), and its acceptance means that the building societies cannot be regarded as profit-maximisers, or as deriving utility from profits. This has been a matter of some controversy because the societies do accrue 'surpluses', which are usually used to increase their reserves, so that some authors regard the societies as essentially profit-maximisers regardless of legal niceties.

6.3.1 Ghosh and Parkin (1972)

Once again we find the name of Michael Parkin to the fore, this time in collaboration with Depabriya Ghosh. The basic approach of this paper is much the same as that of the two papers by Professor Parkin that we have already reviewed. This paper was soon followed up by a book, *The Economics of Building Societies*, in which Ghosh presented an expanded, more elaborate version of his collaboration with Parkin. We shall, therefore, only consider briefly some of the more salient points of the Ghosh-Parkin paper before taking a detailed look at Ghosh's book.

Despite the law of the United Kingdom, the views expressed in evidence to the Radcliffe Committee and one or two other quoted sources, Parkin and Ghosh believe there to be "...certain considerations which persuade us that the Societies are interested in profit." These are:

> First, the Societies are interested in growth. Whether they want to grow to satisfy philanthropic goals or to satisfy empire building managers, or to make bigger profits, need not concern us here. Coupled with this desire to grow is the desire for security. This is evidenced by the fact that the Societies regard there as being a minimum fraction of total assets which should be backed by unborrowed funds—what we termed General Reserves on the Balance Sheet. The desire for security is further evidenced by the fact that the Societies hold about 15% of their total assets in highly liquid form, compared with a $7\frac{1}{2}$% minimum liquid assets ratio.

They proceed by stating:

> We can capture this desire for growth, subject to some acceptable security level in a variety of ways. The way in which we choose to do this is to assume that the Societies aim to maximise the expected utility of reserves. The faster reserves

grow, the faster can total assets grow, hence, a desire to grow implies a desire to accummulate reserves. The desire for security is captured by assuming that it is the expected utility of reserves, rather than reserves, which is maximised.

(1972, page 234)

As with the previous Parkin (Essex school) papers, a Freund (exponential) utility function is adopted. In this case, it takes the form:

$$U = 1 - e^{\beta R} \tag{6-3-1}$$

where U represents utility, R is the level of reserves, and β is the coefficient of risk-aversion. From this Ghosh-Parkin assume a single-period decision model and write:

$$U = 1 - e^{\beta R_0} - e^{\beta \Pi} \tag{6-3-2}$$

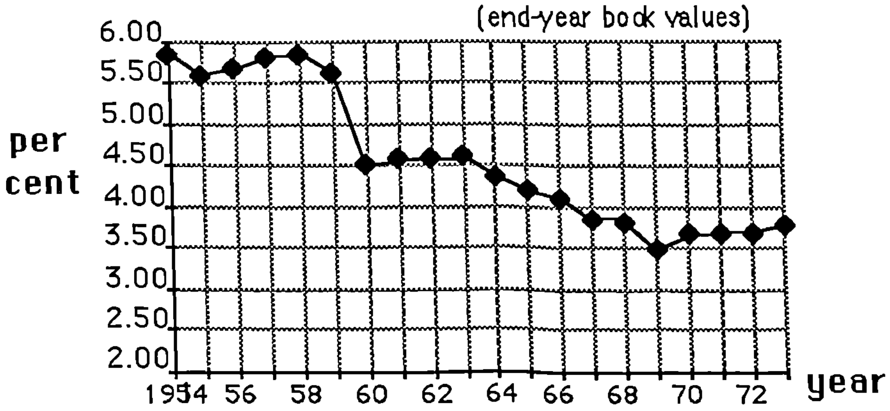
where R_0 represents initial reserves (ie, at the start of the period), and Π is profit during the decision period (ie, the increment in reserves, dR). Of course, Π is assumed to be a normally distributed stochastic variate with mean μ and variance σ^2. They then transform the origin of (6-3-2) to give:

$$U^* = 1 - e^{\beta \Pi} \tag{6-3-3}$$

Via the standard procedure (which we have already seen), a building society is assumed to maximise the expected value of its utility, which is equivalent to maximising $W = \mu - (\beta/2)\sigma^2$. This expression is referred to as the building society's "operational objective function". The only constraint is that imposed by balance sheet considerations. By construction of a Lagrange function, asset demand and liability supply functions are obtained from the first- and second-order conditions. Then, subject to the usual assumptions, these are aggregated over all building societies and the result estimated via a maximum likelihood estimator incorporating the various through-equation restrictions.

When the results of the estimation were tested, the restrictions were not found to be binding at any level of significance. Furthermore, this model did not perform as well as similarly specified models for the commercial banks and the Discount Houses. One possible reason that immediately springs to mind is that Ghosh and Parkin could be wrong in assuming the building societies to be profit, or reserves, maximisers. Indeed, this is an argument that is taken up with some vigour by the Sheffield school (Clayton (1962), especially pp.14-15 and 24-28). Certainly, the *prima facie* evidence would appear to lean in favour of the Sheffield criticism; for example, as illustrated in Figure 6-1, it is a fact that historically reserves as a fraction of total assets have been declining. We shall return to this issue later on in this section.

Figure 6-1: Reserves as a Percentage of Total Assets



Source: G. Clayton, J. C. Dodds, M. J. Driscoll and J. L. Ford (1975, page 21)

6.3.2 Ghosh (1974)

As mentioned earlier, this book is primarily an extended version of the Ghosh-Parkin paper. Once again the Freund utility function is adopted, and its expected value maximised subject to two constraints. The first is that put forward in the Ghosh-Parkin paper, namely that the balance sheet must balance. The second constraint is the preservation of a (legally required) minimum liquidity reserve ratio. Thus, the Ghosh objective function is more sophisticated than its predecessor (ie, that of Ghosh and Parkin), and is specified in such a manner that explicit account is taken of the Arrow risk-aversion hypothesis.[31] Thus, the individual building society is regarded as trying to maximise the expected value of:

$$U = 1 - \exp\left\{-b'\Pi/W_0^{\delta}\right\} \qquad \textbf{(6-3-4)}$$

where W_0 represents initial wealth at the start of the decision period, and $0 < \delta < 1$.[32] According to Ghosh, the usual definition of the planned addition to the general reserve is Π/W_0, but this is no longer true as one per cent of total assets in reserves must be fixed assets. Hence the planned addition to the general reserve ratio will be Π/W_0^{δ}, which is smaller than Π/W_0.[33] The coefficient of absolute risk-aversion is $b'W_0^{-\delta}$, while that of relative risk-aversion is $b'W_0^{1-\delta}$, thereby satisfying the Arrow hypotheses. Even with the inclusion of this extra degree of sophistication, the maximisation of expected utility is still found to be equivalent to the maximisation of the Ghosh-Parkin "operational objective function", $W = \mu - (b/2)\sigma^2$, only in this case $b = b'/W_0^\delta$.

The balance sheet constraint is written as:

$$i'v + f = 0 \qquad \textbf{(6-3-5)}$$

where i' is a unit vector, v' = (t, l, g, a, m, -s), f = C + Z - R - B, and t, l, g, a, m, and -s represent Treasury bills, local authority bills, government securities, local authority securities, mortgages, and Shares and Deposits (a liability, so entered negatively) respectively, with C, R, and B being cash and bank balances, reserves, and government loans respectively, with Z being a balancing item. The items in f are assumed to have zero yield, while the yields on the items in v' are represented by the vector r.[34] The items B and f are exogenously determined, all other items being endogenous. Ghosh writes profits as:

$$\Pi = r'v \qquad \textbf{(6-3-6)}$$

with r and v assumed to be independently distributed. Thus, expected profits are:

$$E(\Pi) \equiv \mu = \hat{r}'\hat{v} \qquad \textbf{(6-3-7)}$$

where $\hat{r}$ is the vector of expected yields, and $\hat{v}$ the vector of expected asset/liability levels. In a similar manner he obtains:

$$\sigma^2 = E\{[\hat{r}'\hat{v} - E(\hat{r}'\hat{v})]^2\}$$

ie,

$$\sigma^2 = \hat{v}'C_{rr}\hat{v} + \hat{r}'C_{vv}\hat{r} + \gamma \qquad \textbf{(6-3-8)}$$

where C_{rr} and C_{vv} are the covariance matrices of asset/liability levels and interest rates respectively, and γ is a constant. Using (6-3-7) and (6-3-8), the operational objective function becomes:

$$W = \hat{r}'\hat{v} - (b/2)\{\hat{v}'C_{rr}\hat{v} + \hat{r}'C_{vv}\hat{r} + \gamma\} \qquad \textbf{(6-3-9)}$$

Thus, the building society's portfolio selection problem is:

> given $\hat{r}$, C_{rr}, C_{vv} and f, choose that $\hat{v}$ which maximises the operational objective function (ie, 6-3-9) subject to the balance sheet constraint (ie, 6-3-5).

To solve this problem it is necessary to form the following Lagrange function:

$$L = \hat{r}'\hat{v} - (b/2)\{\hat{v}'C_{rr}\hat{v} + \hat{r}'C_{vv}\hat{r} + \gamma\} + \lambda(i'v + f) \qquad \textbf{(6-3-10)}$$

where λ is the Lagrange multiplier. According to Ghosh, W is maximised if:

$$\frac{\partial L}{\partial v} = \hat{r} - bC_{rr}\hat{v} + \lambda i = 0$$

$$\frac{\partial L}{\partial \lambda} = i'v + f = 0 \qquad \textbf{(6-3-11)}$$

and the principal minors of the bordered Hessian $\begin{bmatrix} -bC_{rr} & i \\ i' & 0 \end{bmatrix}$ alternate in sign, starting positive.

From (6-3-10) Ghosh obtains the following set of asset demand and liability (ie, Shares and Deposits) supply equations:

$$\hat{v} = (1/b)H\hat{r} + h\hat{f} \qquad \textbf{(6-3-12)}$$

where $H = C_{rr}^{-1} - \frac{C_{rr}^{-1}ii'C_{rr}^{-1}}{i'C_{rr}^{-1}}$ and $h = \frac{-C_{rr}^{-1}i}{i'C_{rr}^{-1}}$. Subject to the usual assumptions,[35] Ghosh aggregates over all n building societies to obtain the following set of aggregate asset demand and liability supply functions:

$$\hat{V} = b^*H\hat{r} + h\hat{F} \qquad \textbf{(6-3-13)}$$

where $V = \Sigma v_i$, $F = \Sigma f_i$, and $b^* = \Sigma b_i$ for all i = 1, 2,...n. Ghosh now makes the assumption that the vector of expected interest rates, $\hat{r}$, may be proxied by a vector of quarterly averages of actual interest rates, $\bar{r}$. To this, he adds the assumption that the actual values of $\hat{V}$ and $\hat{F}$ depart stochastically from their expected values, so that:

$$\hat{V} = V + u_V \qquad \text{and} \qquad \hat{F} = F + u_F$$

where the u terms represent the relevant stochastic components. Ghosh then rewrites (6-3-13) in terms of actual values, viz:

$$V = b^*H\bar{r} + hF + (hu_F - u_V) \qquad \textbf{(6-3-14)}$$

This describes the building societies' choice of assets and liabilities in a speculative demand model. Thus far, in constructing the model, Ghosh has implicitly assumed that the societies are "price-takers" in all markets, yet this is not obviously the case for, as Ghosh himself previously suggested, in both the market for Shares and Deposits and that for mortgages the rates of interest are set by the building societies via the BSA Council.

To alleviate this anomaly, one of the methods Ghosh considers is utilisation of a game-theoretic approach to model the setting of interest rates in the Shares and Deposits market (ie, r_s) and in the mortgage market (ie, r_m). However, he rejects this approach in favour of the assumption that the BSA possesses a utility function which consists of a weighted sum of the utilities of each and every member society. The BSA is posited as trying to maximise its utility as described by this function, taking both sides of the two markets into account. If α_i represents the "weight" of the $i^{\underline{th}}$ society, then the BSA tries to solve the following parametric programming model:

$$\text{maximise } U = \sum_{i=1}^{n} \alpha_i . \max[E(u_i)] \tag{6-3-15}$$

$$\text{subject to } \sum_{i=1}^{n} V_{im} \leq M(r_s, r_m, r_1, \cdot \cdot r_k, 0) \tag{6-3-16}$$

$$\sum_{i=1}^{n} V_{is} \leq S(r_s, r_m, r_1, \cdot \cdot r_k, 0) \tag{6-3-17}$$

$$i'V_i + f_i = 0 \text{ for all } i = 1, 2, \ldots n \tag{6-3-18}$$

$$M = M(r_s, r_m, r_1, \ldots r_k, 0) \tag{6-3-19}$$

$$S = S(r_s, r_m, r_1, \ldots r_k, 0) \tag{6-3-20}$$

where (6-3-19) and (6-3-20) represent the personal sector supply and demand equations, 0 represents "other factors", r_s and r_m are expected rates of interest, $r_1, \ldots r_k$ are the rates on other relevant assets and liabilities, ΣV_{im} is the sum of all mortgage loans offered by the building societies, and ΣV_{is} is the sum of all Shares and Deposits held in all the building societies. As the rates of interest 'recommended' by the BSA are almost invariably adopted by virtually every single building society, this completes our look at Ghosh's speculative model.

6.3.3 O'Herlihy and Spencer (1972)

This paper, which appears in the 1972 *National Institute Economic Review*, possesses several characteristics that endow it with a certain value as a *curiosum*. Firstly, it is perhaps the only work on modelling the behaviour of financial intermediaries published in the early 1970s that came under neither the "Essex" or "Sheffield school" approaches. For this reason alone, it would seem worthy of mention, but there is an additional reason, for, in attempting to model building society behaviour, O'Herlihy and Spencer (HS) do not make explicit use of portfolio theory. Nonetheless, their work deserves our serious considerations on two counts. In the first place, close examination of the HS paper gives as an alternative to the other approaches we are considering, and may therefore give us some insight into the pitfalls of financial model-building. Secondly, the high standard of performance that their model achieved indicates that there may be some features worthy of note for future use.

> In their model, HS make use of a set of structural equations to try and
>
> ...describe the determination of the major financial flows involved in the Building Societies' balance sheets and the two key interest rates over which they have control - the rate on shares and deposits, and the mortgage rate. (1972, p.)

According to HS, there are two major financial flows on each side of the balance sheet: on the liabilities' side these are the outflow of withdrawals (W) and the inflow of new shares and deposits (D); on the assets side they are the outflow of new mortgage advances (A) and the inflow of repayments of principal (R). Unfortunately, the method of obtaining the structural equations is unclear; the building societies are not explicitly hypothesised to be in pursuit of any specific objectives, and hence the model is seen to be rather *ad hoc* in its construction. This lack of objective must lead to a questioning of the *raison d'étre* of the building societies: for example, why should they demand assets or supply liabilities? And, given that such demand and supply is observed, what rationale is there for the various explanatory variables included in their model? What relationships do HS expect to emerge between the explanatory variables and the asset demands and liability supplies, and why?

In Table 6-4 we have reproduced the results obtained by HS. These were obtained by applying two-stage least squares estimation on seasonally adjusted quarterly data. The absence of any explicit objective ascribed to the behaviour of the building societies creates many problems, the most troublesome being in interpreting the extent to which there is a causal relationship between the dependent and independent variables from the estimated equations. A further criticism may be made of HS's practice of eliminating from the final equations those variables which are found to be insignificant in earlier regressions. This is a particularly dubious approach, especially in view of the fact that (presumably) the authors felt there was a good *a priori* case for including these eliminated variables. A good example of the problems created by these inadequacies is to be found in the Clayton, Dodds, Driscoll and Ford pamphlet (1975). They point out that because of the non-existence of an explicit objective, equations are mis-specified, leading to incorrect inferences from the empirical results. In particular, they cite equation three:

> With this equation H-S[36] seek to explain New Mortgages advances by the lag of New Mortgages Advances, Real Disposable Income, Seasonal Dummies and two further dummy variables—D(1) and D(2)—one of which is meant to proxy "hard rationing" and the other "soft rationing".[37] It is the inclusion of the last two dummies that we are concerned about. The signs on the coefficients on these two variables are both negative indicating that the existence of either type of rationing will yield a drop in new mortgage advances. It is quite in order to draw this conclusion if we are to take it that the estimated structural equations are more than simple correlations and are supposed to indicate how one variable depends upon the other. Indeed it is the apparent dependence of New Mortgage advances on rationing which we wish to examine. H-S claim that it is
>
> "An outstanding feature of Building Societies that they ration mortgage lending by 'non-price' means, and apparently make little use of changes in mortgage rate as a way of influencing demand".

Table 6-4: O'Herlihy and Spencer Estimates

	Dependent Variable	Constant Term	Regression Coefficients				R^2	SE	SE/ MEAN %	DW
(1)	Gross Receipts of shares and deposits	- 681.8 (4.43)	+ 618 $(D/P)_{-1}$ (7.37)	+ .058 Y/P (4.05)	+ 45.5 TAX (3.50)	- 11.53 IBR (3.38)	..	18.34	7.1	1.96
	D/P		+ 44.06 i (3.38)	+ 40.3 S(1) (5.36)	- 6.89 S(2) (.96)	+ 10.8 S(3) (1.58)				
(2)	Withdrawal of shares and deposits	235.3 (2.81)	+ .080 $(S/P)_{-1}$ (13.26)	- .048 Y/P (5.34)	-16.38 TAX (2.40)	+ 9.14 IBR (4.53)	..	11.08	6.6	1.36
	S/P		- 14.23 i (1.51)	+ 5.0 S(1) (1.06)	+ 5.5 S(2) (1.31)	+ 6.4 S(3) (1.53)				
(3)	New mortgage advances	-23.5 (.92)	+ 714$(A/PH)_{-1}$ (9.86)	+ .017 Y/P (2.58)	- 18.9 D(1) (3.69)	-33.1 D(2) (5.87)	.943	15.65	8.0	2.01
	A/PH			- 7.7 S(1) (1.30)	+22.9 S(2) (3.73)	+15.1 S(3) (2.62)				
(4)	Repayments of mortgages	6.4 (3.23)	+ .803 R_{-1} (12.91)	+ .195 A (8.24)	- 107 A_{-1} (3.39)		..	3.99	3.7	2.00
	R			-12.4S(1) (8.10)	+ 2.5 S(2) (1.48)	+ .5 S(3) (.33)				
(5)	The mortgage rate of interest m	.702 (3.43)	+ .757 i (5.94)	+ .451 m_{-1} (5.17)			..	.179	2.8	2.37
(6)	The share and deposit rate of interest I	.638 (-2.33)	+ .848 i (-11.84)	- .193 L* (-3.15)	- .088 K* (-2.55)		.950	.120	3.2	2.22

Key:

D/P value of new shares and deposits deflated by the consumer price index (P)

W/P value of withdrawals deflated by P

A/PH value of new mortgage advances deflated by the price index of new housing (PH)

Y/P real disposable income

S/P stock of shares and deposits

i recommended share rate

m average mortgage rate

R repayments

TAX standard rate of income tax

IBR Bank Rate

S(1), S(2), S(3) seasonal dummies

D(1), D(2) dummies for "mild" and "strict" rationing respectively

L*, K* transformations of the liquidity and reserve ratios (see HS, p.46, for details)

the subscript $_{-1}$ indicates variable lagged one quarter

Now if there is rationing it would suggest that there is excess demand.[38] If the Building Societies then decide not to let the mortgage rate rise to 'clear the market' [39] then they will obviously have to find some other way of allocating the funds that they have available for advances—perhaps rationing on a first come first served basis. Given this we could argue that it si not rationing that has caused a decline in new advances but rather that it is a relative (to demand at the given mortgage rate) dearth in the availability of funds that determines the decline in mortgage lending and that, moreover, if the Building Societies pursue this type of policy described by H-S declining mortgage lending and rationing will often occur simultaneously, [40] but they will both be causally independent. Both variables are in fact dependent upon the availability of funds. (1975, page)

With this critique in mind, let us now turn our attentions to the study that Clayton, Dodds, Driscoll and Ford themselves produced to model the portfolio behaviour of the building societies in the United Kingdom.

6.3.4 Clayton, Dodds, Driscoll and Ford (1975)

Published in 1975, the article by Clayton, Dodds, Driscoll and Ford (CDDF) is one in a series of pamphlets on finance published by the *Société Universitaire des Europeenes Recherches Financieres* (SUERF), and forms a continuation of the Sheffield school approach. The pamphlet opens with a look at the importance played by the building societies in the British financial system. This is followed by a consideration of previous works in the area, which at the time consisted of the Parkin-Ghosh and O'Herlihy-Spencer models. (Some of the CDDF comments are to be found in the section following). Unlike earlier attempts in this area, CDDF place a great deal of emphasis on the objective(s) of the building society movement. They attempted to resolve this controversial issue by means of a questionnaire to various building societies which, together with the answers they received from the Building Societies' Association (BSA), they reproduce in the pamphlet. From this and other observations on building society behaviour CDDF note the following about building societies:

1. they are not profit maximisers and therefore we would expect that standard speculative models of portfolio behaviour would be inappropriate as vehicles by which to explain their behaviour;
2. they appear to be trying to maximise the rate of growth of Mortgage assets subject to certain constraints;
3. the ratio of Mortgages to Total Assets maintained by them appears to be a relatively stable value of just over 80%;
4. the adjusted liquid assets ratio appears to be fairly stable implying that the holding of liquid assets is insensitive to the structure of rates on liquid assets and Mortgages;

5. the main source of net additions to outstanding Mortgages and hence, given a more or less fixed ration of these to Total Assets, of net additions to liquid assets is the net inflow of funds from the Personal Sector of the economy.

(1975, p.29)

As a result of these points CDDF suggest that a fixed-coefficient input-output model would provide a more appropriate characterisation of building society behaviour than the models we have already considered. They argue in favour of a two-stage decision-making procedure: firstly, at time t the building society decides upon its current level of mortgage advances, given its net inflow of funds in the previous period, t-1; and secondly, the remainder is apportioned out among other assets according to a speculative model. However, if there were no change in the structure of interest rates then the same asset proportion of this remainder would remain in force. To construct such a model requires the assumption of exogeneity of interest rates, yet the evidence here would seem to suggest otherwise; as we have seen, the rate on Shares and Deposits is usually fixed by the BSA Council.

CDDF argue their way round this as follows: To attract funds by way of Shares and Deposits the building societies are in competition predominantly with the commercial banks. The banks offer a fixed rate rate of interest on bank deposits at a fixed mark-up over and above the Bank Rate/Minimum Lending Rate (MLR). Thus, for a given deposit rate the BSA Council recommend a rate on Shares and Deposits that would be expected to bring about an 'acceptable' level of Shares and Deposits. Now, if MLR is exogenous, and the rate on Shares and Deposits is linked to MLR, then the rate on Shares and Deposits must also be exogenous. Hence, the model adopted is one in which the desired holding of any asset (except mortgage advances) is determined according to the level of the net inflow of funds and the structure of interest rates. Because it is quite likely that these items will vary from one decision period to the next, it follows that changes will occur in a building society's desired portfolio. However, adjustment to a new desired portfolio cannot be instantaneous and therefore involves a time-lag. Consequently CDDF construct a dynamic model in which it is hypothesised that

> ...a constant proportion of the difference between the desired and actual holdings of the various assets is reduced in the period following a change in the interest rate structure or any other explanatory variable... (1975, p.33)[41]

and the model captures this adjustment by use of a lagged dependent variable.

Using the ordinary least squares method, CDDF estimate both dynamic and static versions of "speculative" and "flow of funds" type models. Both "level" and "first difference" data were employed, although only the latter were published due to "...the extent of the multicollinearity and the ubiquitously high R^2's throughout..." the former. All in all, the performance of these models was less than outstanding, although the speculative model generally performed better than its flow-of-funds counterpart. In spite of this, CDDF still argue in favour of the flow-of-funds approach on the basis of the BSA Council's answers to their questionnaire. They try to prove their point by testing the predictive powers of the various models. This is done by making use of Theil's "inequality coefficient", U,[42] which is a standard measure of a model's ability to predict changes in variables. The value of the coefficient U may vary between zero and infinity, the former value implying perfect clairvoyance, a value of unity implying the model is no better than zero change extrapolation, and a value exceeding unity implying a performance inferior to zero change extrapolation. Unsurprisingly, this test tends to confirm the CDDF preference for the flow-of-funds model.

6.3.5 Hendry and Anderson (1977)

Unlike the other works we have been considering, this paper does not take the investigation of building society portfolio behaviour as its prime objective. Rather, it is an extremely technical work whose major concern is the methodology of econometric model-building, and so we shall only pay it scant attention here. Briefly, the aim of Hendry and Anderson is to set up a method for the analysis of the specification of an econometric model, so that it might then be more properly specified. In order to make their case the authors make use of the O'Herlihy-Spencer model, both in its original form and reformulated in light of criticisms of their own and of others.

Published in 1977, Hendry and Anderson set out

> ...to integrate a 'long run equilibrium' theory of the behaviour of Building Societies with a short run control-theoretic model of their dynamic disequilibrium adjustment deliberately designed such that the equilibrium solution of the latter reproduces the former. The theory also suggests which data transformations may be useful (eg, differencing, ratios, etc) (1977, pages)

The Hendry-Anderson reformulation of the O'Herlihy-Spencer model is constructed in a manner not dissimilar from the original but with a greater degree of sophistication. Unlike O'Herlihy and Spencer, the authors do postulate an objective for the building societies—that of minimising the discounted value of the 'costs' of not being in an equilibrium situation. They believe support for such an objective function is to be found in the answers to the questionnaire published in the Clayton, Dodds, Driscoll and Ford pamphlet

(1975). The authors are able to show that mathematical manipulation of the necessary and sufficient conditions for minimisation of the objective function does, in fact, lead to a short-run model of building society disequilibrium adjustment behaviour whose equilibrium solution matches that of the long-run theory. Indeed, this model turns out to be not unlike the original version of O'Herlihy and Spencer. The statistical tests performed on the O'Herlihy-Spencer model by Hendry and Anderson revealed a number of mis-specifications, and the estimates they obtained from their reformulated model "...suggest appropriate ways of revising the formulation of the model...". This evidence would appear to suggest that it is entirely possible for a model that has been constructed strictly according to the observed facts to not perform well empirically.

6.3.3 Comments

In this section we have been able to consider several papers that attempt to model the portfolio behaviour of building societies from various standpoints. The works of Ghosh and Ghosh-Parkin provide a fine example of the "Essex school" approach, the pamphlet by Clayton, Dodds, Driscoll and Ford is an example of of the "Sheffield school", while the work of O'Herlihy and Spencer and that of Hendry and Anderson belong to no particular stable. Once again we can see that the Essex approach has a more rigorous theoretical underpinning that the Sheffield approach. Nonetheless, the CDDF pamphlet represents the first serious attempt to examine and analyse the true objective of a financial intermediary (ie, a building society) rather than resort to more obscure and less measurable concepts, such as maximisation of utility functions. The papers also construct their models according to two basic views of building society behaviour; these are speculative demand models and flow-of-funds models.

Unfortunately, a model (such as Ghosh's) that looks only at the demand for financial assets from a speculative viewpoint has a number of drawbacks. In particular, its use implies that any cash held by the building societies will be at an exogenously determined level. In many respects, this is analogous to analysing the demand for money by ignoring the transactions and precautionary elements and only considering the speculative component. It also ignores any consideration of the liquidity ratio, whose value historically has tended to be double the minimum which is legally required of the societies. To compensate for these drawbacks, Ghosh constructs a model that incorporates both the transactions and speculative demands for financial assets by the building societies. He does this by the explicit inclusion of the liquidity constraint into an expanded form of his model (which we have just briefly reviewed). It is interesting to note that there is not a great deal of difference between the equations obtained by either method. As before, the model is estimated by stacking all equations for estimation as one. Estimation is by means of a specially devised variant of the maximum likelihood method. Although the results that emerge represent somewhat of an improvement over its predecessor (Ghosh-Parkin), the model still seems to underperform similar models of other financial intermediaries, possibly for the reasons already highlighted.

The O'Herlihy and Spencer model is most often criticised for its lack of any explicitly-stated objective underlying the behaviour of the building societies, but let us redress the balance somewhat by saying a few words in its favour. For instance, the (potential) financial model-builder should be grateful to the authors for, in their model, they have demonstrated that it may be more useful to explain inflows and outflows separately, rather than by way of 'net acquisitions'. Furthermore, the O'Herlihy-Spencer model performed rather well, far outstripping those more rigorously derived models such as we have already considered in this chapter. Indeed, it was able to forecast *ex post* all of the variables dealt with in a more satisfactory manner. Of course, this is not to deny that in any scientific investigation, including those within Economics, a rigorous theoretical foundation is a prerequisite by way of explaining any observable phenomenon. Rather, it should also be recognised that there is no reason whatsoever why the construction of such a theory should not (and indeed, could not) be preceded by statistical tests of an empirical nature on apparently observed (ie, derived in an *ad hoc* manner) causal relationships.[43]

Despite the rather poor empirical performance of the CDDF models it should be noted that they were more reliably constructed according to the observable facts of building society behaviour than those of Ghosh and Parkin-Ghosh, who (probably erroneously) adopted profit maximisation as the building societies' objective, and that of O'Herlihy-Spencer, who adopt no explicit objective. In fact, Hendry and Anderson were able to show that this might well be the case. Consequently, a large amount of CDDF models' underperformance may be justifiably put down (eg) to the quality of the data or aggregation problems. Nonetheless, there still remain several criticisms of the CDDF models. In particular, in common with their various counterparts there still looms large a question mark over the treatment of expectations in the models. Once again, in nearly all cases the current yield on an asset is used as a proxy for its expected value. This could be seen as a mis-specification of the model. In view of their very careful approach to modelling as exemplified by their use of a questionnaire to obtain a suitable objective for the building societies, the lack of an attempt to explain their generation of expectations stands in marked contrast.

As a final point it may be worth mentioning that, for all of the models of building society behaviour we have considered, a degree of their underperformance may well be due to some methodological problem such as mis-specification of the theory, or inappropriate use of an estimation technique. The rather lackadaisical approach to the modelling of expectations provides one highly possible explanation. As a footnote, it is also worth mentioning that the environment within which the building societies operate has changed quite considerably during much of the 1980s, such that nowadays they are much like the commercial (joint stock) banks in many respects. It therefore follows that the previously considered models are in need of much updating to take account of these changes.

6.4 Insurance Companies

It would not be an exaggeration to claim that insurance companies are probably the most widely misunderstood institution with which the general public deals. Yet insurance is the most important method by which the problems of risk have been handled by individuals and the business world. It is immediately apparent that the kinds of risk that are faced by (eg) a commercial enterprise are very different from those to which individual is exposed. Equally, the kinds of risk against which a given individual wishes to insure themself will vary from person to person, according to their respective circumstances and preferences. One consequence of this is that there are very many different forms of insurance contract in existence. For practical purposes, however, it is convenient to divide them into two broad groupings. The first, which we shall refer to as **general insurance**, consists of all insurance except for life contracts and is usually written on an annual (or other short-term) basis, often with the option of being renewable. These contracts tend to be such as insurance against fire, accident, theft, etc, and concerning possessions such as within the household or relating to the automobile. The second group is **life insurance**, which is often referred to in the United Kingdom as life assurance. The policy here is much more long term by nature (at least twenty years in most cases). Although there are different types of life insurance contract, they may all be seen as consisting to varying degrees of both a protection element and a savings element, the latter being subject to various guarantees on capital security and long-term yield. The distinction between life and general insurance is not, however, purely academic for, even if an insurance company has business in both areas, separate funds are usually maintained. Additionally, there is a great deal of difference in the asset/liability structures adopted by life and general funds. It is a well-established fact that the life funds dominate the insurance industry,[44] and consequently there is a substantial literature on life funds yet an absolute dearth on general funds. Thus, although this section nominally deals with insurance companies in its broadest sense, in practice we shall mainly be looking at life insurance companies.

Although a substantial literature on the economics of insurance companies does exist, much of it is purely descriptive and to devote a great deal of time to it here would not serve our purposes awfully well. Nonetheless, it would also be folly to ignore these studies completely, so our first offering in this section is devoted to an overview of what is arguably the best.

6.4.1 Clayton and Osborn (1965)

In their 1965 book, Clayton and Osborn set out to identify, formulate and discuss the principles underlying the investment behaviour of life (insurance) companies. Because this work sets out to be primarily descriptive it does not contain any econometric specification,[45] yet there are statistical analyses of (eg) the relationship between fund size (as proxied by total assets) and the percentage of the portfolio held by way of seven major asset classes. We reproduce here as Table 6-5 the results for their complete sample of eighty-six life offices of various sizes for the year 1955. Unfortunately, with the highest correlation figure turning out at only 0.13, and with many of the estimates not exhibiting any statistical significance, little emphasis can be placed upon these results.[46] However, it is of great interest to note that the most consistent results that emerged were the negative correlations between mortgages and British government securities, debentures, preference shares, and ordinary shares. Given that the data pertains to 1955 it is not surprising that the results lack quality, for at this time it can be argued that most portfolios had not fully 'recovered' from the imbalances which resulted from the Second World War, neither were attitudes completely adjusted to peacetime conditions such that equities would be regarded in a more favourable (ie, less risky) light than had been the case prior to 1945.

Table 6-5: Clayton and Osborn: correlation coefficients 1955

Total: 86 life companies

	1	2	3	4	5	6	7	8
1		-0.10	**-0.40**	**-0.44**	**-0.40**	**-0.35**	+0.05	-0.10
2			+0.08	+0.16	-0.11	-0.04	-0.11	-0.11
3				-0.06	+0.04	-0.12	**-0.29**	+0.06
4					**+0.24**	+0.20	**-0.24**	+0.13
5						**+0.46**	-0.07	-0.01
6							+0.06	+0.06
7								+0.11
8								

bold denotes statistical significance

Variables used:

1 Mortgages as per cent of assets
2 Loans, per cent
3 British government and guaranteed securities
4 Debentures, per cent
5 Preference shares, per cent
6 Ordinary shares, per cent
7 Property, per cent
8 Total Assets, in £ millions

6.4.2 Carter and Johnson (1976)

Although never published, the major purpose of this University of Nottingham discussion paper was to illustrate the stock and flow magnitudes of the life companies' portfolios. Thus, in common with Clayton and Osborn, it was also primarily descriptive. The major outcome of this study was to suggest that life companies are concerned with, and engage in, a highly active investment policy rather than the more conservative "buy and hold" strategies with which they are usually attributed. Carter and Johnson also emphasised the substantial rôle played by the life companies in the various primary markets (ie, those for new issues), a view that has found much support in the paper by J. C. Dodds (1978). For example, in the case of debentures Carter and Johnson find that

> ...when issues of debentures [X] are relatively small life offices will tend to purchase a large share of these (76% when X = £1m.), but as the amount issued in any one year increases their share will decrease (38% when X = £100m.).

6.4.3 Ryan (1973)

The first econometric-based study of the portfolio behaviour of life offices to be published appears to be that of T. M. Ryan. In this study he attempts to develop a general model of portfolio review, and offer background evidence on portfolio behaviour. Ryan assumes the maximisation of expected yield to be the life companies' objective, and this leads to each life office having a desired portfolio at each time-period. From this he constructs a speculative model with incomplete adjustment towards the desired position in any single time-period owing to imperfectly competitive financial markets. Because his model is "speculative" Ryan is implying that there is substitutability across the whole portfolio, although he does include a necessary wealth/income constraint which is imposed by the finite inflow of funds in any time period. However, when it comes to estimation Ryan ignores this substitutability factor by only including own-yields ("...to improve multicollinearity"), thereby eliminating the possibility of cross-substitution. This would appear to be a serious weakness in Ryan's model, although perhaps not as serious as his failure to take full account of the various constraints (both internal and external) to which life company investment behaviour is subject. For example, no account is taken of capital and income risk, neither is investment policy linked to the life company's liability structure, nor are there any liquidity considerations. Theseare serious omissions.

For estimation purposes Ryan uses three variant forms of his basic model, each with a different specification of expected yield.[47] The first variant makes use of a distributed lag proxy such that

$$\text{expected yield, } \bar{y}_t = \sum_{j=1}^{\infty} \lambda^j y_{t-j} \tag{6-4-1}$$

for any individual asset, where y_{t-j} is the actual yield j time-periods earlier. The second variant incorporates a three quarters moving average of past yields, whilst the third variant opts for "perfect foresight". Ryan estimates his models using ordinary least squares and, perhaps unsurprisingly, the third variant performs worst with the distributed lag proxy giving the best results. The results obtained on this variant tend to confirm higher degrees of imperfection in those markets with 'thin' or non-existent secondary markets.

Because Ryan intended that his models should be generally applicable to other financial institutions, we are able to account for his abstracting from some of the more peculiar behavioural foundations of life companies' investment, 'though this is not to condone it. Nonetheless, in spite of his inattention to institutional factors and that his work leaves a lot of questions unanswered, it is certainly a step in the right direction, not least because he shows that the inclusion of explicitly modelled expectations improves the resulting estimates.

6.4.4 Munro (1974)

A study in a similar vein to Ryan's is the unpublished University of Stirling discussion paper by Alex Munro, although a direct comparison is not possible due to the different asset groupings employed by the two authors. Like Ryan, Munro takes the maximisation of expected yield as the life company's objective. However, where Ryan was trying to construct a generally applicable model, Munro is more concerned with constructing a model that may easily be incorporated into a flow of funds model of the whole financial sector of the United Kingdom. Munro makes several attempts to improve upon the shortcomings of the Ryan model. For example, he directly links the investment behaviour of the individual life company to its liability structure. Additionally, to maintain substitutability over a wide range of assets (ie, to operate a speculative model) and yet overcome the problems of multicollinearity, Munro makes use of interest rate differentials between those on gilts and on local authority securities. Further, in contrast with the straightforward simultaneous allocation approach of Ryan, he adopts three sequential allocation models. The first model adopts the simultaneous allocation scenario; the second involves a two-stage sequence, where investment in the property sector is predetermined in the first stage; and the third involves a three-stage sequence, with property investment determined in the initial stage, private debt investment determined in the second, and all other assets competing simultaneously in the final stage. It should be recognised that this latter version denies the possibility of substitution between private and public debt, while both sequential versions deny the substitutability of property. In common with Ryan, Munro has a problem specifying the relevant expected yield date which he 'overcomes' using a mixture of proxies and extrapolative mechanisms.

When estimated, each of the three versions of the Munro model give remarkably similar results in terms of fit and significance, so the sequential approach appears to have little superiority over the simultaneous allocation version, at least in the case of life companies. Thus, although the Munro approach is more sophisticated, there does not appear to be a great deal to choose between it and that of Ryan. However, it is worth noting that the major difficulty faced by both authors lay in the specification of expected yields. It would be a most tempting and interesting experiment to reconsider these models using alternative expectations-generating mechanisms, and see if improved results could be obtained!

6.4.5 Dodds (1979)

Arguably the most prolific writer on the economics of life insurance companies is J. C. Dodds. Earlier in this section we have mentioned another study (1978) by Dodds in this general area, but in this section we shall concentrate on reviewing his 1979 book, *The Investment Behaviour of British Life Insurance Companies.* One might view this as a culmination of his other works in this area, or alternately his other works may be regarded as being largely an abstraction from his book. Either way we are provided with a rationale for considering the book alone, without being guilty of omitting to review his other works. It is also worth noting that Dodds had also co-authored a number of works on other financial intermediaries emanating from the Sheffield school, such as the Clayton, Dodds, Driscoll and Ford pamphlet (1975) on building societies, and so on.

The Dodds book is a substantial and thorough piece of research work on the economics of life insurance companies, with most of the original empirical estimation based firmly on observed phenomena. Indeed, the book begins by considering the actual business of life companies and the history of their 'industry'. It is from this solid institutional foundation that Dodds is able to establish later a set of objectives of life insurance company investment behaviour. Much of the history concerns the changing legal and financial environments to which the life offices have found themselves subject. From such accounts he is also able to glean information about the various (external) constraints on behaviour faced by the life offices, as well as how they perceive them and adapt to any changes therein. This is aided by analysing the flow of funds through the life insurance industry in recent years. Thus, by the time Chapter Three rolls around Dodds is able to state clearly the objectives and constraints on life insurance company investment policy as deduced from observation. Although he recognises that life offices may pursue more than one objective, Dodds argues that

> ...the maximisation of expected yields, subject to the life office being in a position to meet its contractual obligations, is perhaps a realistic unitary objective.
>
> (1979, p.98)

Thus, at this stage there is no dissent from other authors in the area. Nonetheless, because these form the foundations of the model that is to be tested, it is worthwhile to give these constraints and objectives a thorough consideration.

Dodds sub-divides the constraints on insurance company investment into two categories: those imposed externally, and those imposed internally. Of the five external constraints the first is **government regulation**. For the most part this is imposed for consumer (ie, those who pay premiums) protection, and relates to the solvency of life offices. Also within this Dodds includes the government's regulatory powers over the financial sector, eg, those designed as tools of monetary policy. According to historical evidence the author suggests that this constraint is unlikely to be effective. The second external constraint is that imposed by **the structure of taxation**. For example, the current and recent structure has been such that insurance has been widely encouraged as a savings medium and, in common with the pension funds, the insurance companies enjoy certain taxation advantages on their investment gains that are not widely available to other investors. A third external constraint concerns **exchange rate risks and regulations**. Many life offices receive premiums from overseas insurees, and the insurance contracts will usually be denominated in terms of the overseas currency. To invest all of these premiums on the domestic capital markets would involve risking the vagaries of exchange rate fluctuations.[48] Thus, life offices are required to maintain minimum deposit levels in those countries from which they receive premium payments. The fourth external constraint concerns **market imperfections**; it is quite possible for a life company to be unable to purchase those assets it deems desirable (in terms of risk, return, maturity, etc) because of supply side constraints in the financial markets. Equally, they may also be constrained on the demand side, being unable to dispose of assets as desired due to (eg) their dominance in a market or the lack of a suitable secondary market. The final external constraint relates to problems due to **inflation**. For example, the existence of inflation is said to have brought about a reverse yield gap such that a life company will have less to lose from holding (eg) ordinary shares (with nominally denominated prices) than from holding fixed-interest securities which involve the risk of falling real values.

As with the external constraints, Dodds also posits five major categories of internal constraints that affect the investment behaviour of the life insurance companies. However, unlike the external constraints, it should be emphasised that these constraints are largely self-imposed and, in a less responsible environment, would play no part in the behaviour of the life offices. The first internal constraint concerns **the nature of the liabilities** issued by the individual life company; different types of insurance policy will require different investment provision to ensure the fulfillment of contractual obligations. One major consequence of this is that the life offices face a number of risks, reduction (to an acceptable level) of which entails the imposition of the next two internal constraints. (Naturally, in common with other investors, the investment policy of a life company will be constrained by the amount of risk it is prepared to assume.) Dodds divides these risks as faced by the life companies into two categories, each of these corresponding to an internal constraint. The first category is that of **capital risk**, and this has two major components: **default risk**, which is present in most financial claims, with the possible exception of (eg) British government securities, and **market risk**, which occurs due to fluctuations in the market value of securities. Dodds shows that the post-1945 evidence on the portfolios of life offices indicates that the existence of capital risk does not appear to restrict the types of investment assets purchased by them. The second category is **income risk**, which may be due to either income default or the result of the investment of future premiums. One illustration of the default aspect is the risk associated with the income payments from investments in (eg) ordinary shares.[49] A second aspect of income risk arises because an insurance policy is a contract with a guarantee of future income for a given premium (in pensions parlance, it is **defined benefit**). This implicitly assumes a minimum rate of return will be earned when the life company invests the premium. However, this future investment is made at unknown future rates of interest, and so there is an element of risk that the minimum return will not be obtained. It was partly in response to this problem that immunisation (ie, hedging) policies have been adopted in the past.

The fourth internal constraint relates to the life company's liquidity position. Unlike many other financial intermediaries, life offices are not subject to statutory liquidity requirements, but they do maintain a self-imposed liquidity ratio as a 'cushion' against unforeseeable circumstances of an adverse nature. The need to provide such a cushion acts as a restriction on their investment policy. The fifth and final constraint that is internally imposed concerns the **administrative and organisational limits** of the life insurance company. For example, pursuance of an active trading policy requires the collection and analysis of a larger body of information than that required for a "buy and hold" policy. The former policy will involve, therefore, substantial costs; funds spent on the acquisition of information might alternatively have been used to purchase additional investment assets.

In his Chapter Three, Dodds backs up his assertion that the major objective of life companies is the maximisation of expected yield with substantial argument. As he suggests, on the basis of its yield expectations, the life office will assume at each point in time a desired portfolio of assets. Between these points in time the life office will buy and sell assets in an attempt to achieve their desired portfolio. Thus, any model of the investment behaviour of life insurance companies needs to be dynamic to capture this adjustment process. However, it is at this juncture that problems begin to arise for, as Meiselman points out,

> Independent evidence of interest rate expectation is virtually unobtainable and behavior based on those expectations is revealed only by the phenomena we seek to explain. (1962, p.)

As we have already noted in this chapter,it is precisely this problem which has led us to criticise many of the models we have already considered. However, Dodds continues unabated by considering some of the more orthodox methods of modelling interest rate expectations.[50] Combining this concern with his dynamic framework, Dodds posits a partial adjustment mechanism for financial asset demand:

$$A_t^a = A_{t-1}^a + \alpha(A_t^* - A_{t-1}^a) \qquad \textbf{(6-4-2)}$$

where, at time t, A^a is the actual demand for asset a and A^* is the desired holding level for asset a. Putting the term A_{t-1}^a on the left-hand side of (6-4-2) gives an expression for the net acquisition of asset A. Combining this with a proxy for expected yield gives Dodds the following formalisation of a life company's net acquisition of any asset i:

$$NA_i = a_{i0} + \sum_{j=1}^{n} a_{ij}R_j + \sum_{k=1}^{n} b_{ik}S_k \qquad \textbf{(6-4-3)}$$

where R_j (j = 1, 2,..., n) is a vector of yields and S_k (k = 1, 2,..., m) is a vector of other explanatory variables and constraints. It is probably worth emphasising here that Dodds is mainly concerned with the strategic investment decisions of the life offices rather than their operational (tactical) decisions. That is to say, his major concern is how the portfolio is divided between the various broad asset groupings, rather than what determines the quantity of any individual security that is held. The asset groupings he adopts are Corporate bonds (ie, debentures), ordinary shares (including unit trust units), government securities (sometimes *en masse,* occasionally split into maturity ranges about the fifteen-year mark), Loans and Mortgages (again, both as a unit and split), Land, Property and Ground Rents, and short-term assets. A residual asset class, including such items as overseas assets and preference shares, completes the list.

Dodds sees the strategic decision as being influenced by four major factors:

(1) the changing liability structure and adjustment towards the desired portfolio;

(2) issues of the stock;

(3) movements in yields and inflation trends; and

(4) the availability of funds, ie, the life office's income constraint.

He examines each of these factors in some detail before modelling them for use in the estimation of his individual asset demand equations in Chapter Five. Most of these take the basic structure posited in (6-4-3), and are estimated using ordinary least squares on data running from 1963.I to 1974.IV. Although most of the results obtained are "disappointing" due to either poor fit or variables turning out (unexpectedly) to be insignificant, they do represent something of an improvement over the results of previous works on insurance company investment, such as those by Munro and Ryan. However, these results are not entirely unexpected because, as Dodds himself is keen to point out, these equations are posited as if the demand for each asset was a single decision; only the use of yield gaps allows for the existence of interdependent demand and, therefore, substitutability.

Prior to bringing the equations of Chapter Five together, Dodds tests their predictive abilities. Using Theil's inequality coefficient, U,[51] the individual asset demand equations are tested against *ex post* data for the period 1975.I to 1976.IV. For the most part the equations appeared to predict well as shown by values of U less than unity throughout. In particular, the predictive power of the Property and House Purchase Loans equations is remarkably good, but this is offset by a poorer showing in the Government Securities and Debentures equations. This latter result was considered particularly surprising in view of the equation's good fit obtained in his Chapter Five estimates. The worst equation was that for Short-Term Assets, whose predictive power was little better than that of a zero-extrapolation model. Re-estimation of the individual asset demand equations over the complete data period (1963-1976) threw up no surprises, being very similar to the earlier, 1963 - 1974, results.

Following his examination of a series of individual demand equations, Dodds moves on to consider an "...overall portfolio model of strategic investment choice and allocation." Of course, it is not possible to combine the individual asset demand equations into a single behavioural model without introducing various modifications, which may well result in problems. For example, consistency of estimation usually requires the same set of independent variables to appear on the right-hand side of each equation, but this is likely to result in multicollinearity. However, avoidance of possible multicollinearity could result in the undoing of useful work performed at the individual specification level. Similarly, there are compelling reasons for not maintaining the asset groupings adopted in Chapter Five. Thus, a "cost-benefit" approach is adopted whereby the method least likely to create problems is utilised. In the context of his overall model Dodds opts for a sequential investment procedure, whereby Loans and Mortgages have first call on funds and Debentures second, with all other assets then competing simultaneously for those funds remaining after the initial allocations. No income constraint is included as the large positive net inflow of funds to life companies is assumed sufficient to meet any anticipated needs. Therefore, Dodds posits a portfolio dependent upon (expected) asset yields, the liability mix and asset characteristics. Supply constraints are also modelled by use of an "issues" proxy where they are considered relevant.

Dodds specifies two versions of his overall model. The first is static, suggesting that the (aggregate) portfolio of the life offices is in equilibrium. The second is dynamic, and incorporates the stock adjustment mechanism as illustrated in (6-4-2). This manifests itself in the reduced form equations as the inclusion of a lagged dependent variable. Both models are estimated using ordinary least squares. We only reproduce here as Table 6-6 Dodds' results for the dynamic version over the data period 1963-1974. Apart from an improved Loans and Mortgages equation there is little difference between these estimates and those obtained using the static version of the model.

Once again using Theil's U-coefficient, Dodds finds the predictive powers of his overall equations to be remarkably similar to that of his individual asset demand equations. Although the degree of fit is not particularly outstanding it is significantly better than had been obtained by alternative formulations. Perhaps the most worrying aspect of Dodds' overall portfolio model is the proliferation of insignificant coefficient estimates, an even greater number than were obtained in the individual demand specifications. A second criticism can be voiced concerning Dodds' use of the yield on ordinary shares (R^{01}) in some of the yield gap independent variables. This would appear to be a particularly strange usage in view of the fact that life insurance companies (in common with most investors) regard government securities as the most "risk free" asset, against whose yield all other yields are to be compared. Thus, it would seem more appropriate when using yield gaps as independent variables to make use

Table 6.6: Life Insurance Companies—1963-1974

Version 2 (Dynamic)

Equation Number	6.5(1)	6.5(2)	6.5(3)	6.5(4)	6.5(5)	6.5(6)	
Variables							
Dependent Variable		NA^{C}	NA^{LM}	NA^{O}	NA^{P}	NA^{G}	NA^{STA}
Constant	24.2* (8.0)	84.9* (27.5)	30.0* (15.0)	-16.4* (6.6)	46.9* (20.3)	-7.9* (2.8)	
I_t^C	0.25* (0.04)						
I_t^O			0.18* (0.08)	-0.04 (0.03)	0.05 (0.1)	-0.13 (0.14)	
I_t^G			-0.01 (0.005)	0.0033 (0.004)	0.07* (0.01)	-0.06* (0.02)	
HPI_{t-1}			-0.1 (0.1)	0.19* (0.06)	-0.06 (0.19)	0.06* (0.03)	
R_{t-1}^{STA}			-4.8 (3.3)	2.5* (1.3)	-6.1 (4.4)	10.3 (6.3)	
$(R^D - R^L)_{t-1}$	-3.0 (5.4)						
$(R^D - R^{01})_{t-1}$	17.2* (1.4)						
$(R^L - R^{01})_{t-1}$			6.6* (3.2)	1.91 (1.16)	7.4 (4.1)	-20.5 (5.6)	
TNA^{AA1}			0.21* (0.10)	-0.06 (0.04)	0.07 (0.1)	0.7* (0.2)	
$BSLiq_{t-1}$		-4.3* (1.5)					
D(2)	-24.8* (7.2)						
Lagged Dependent variable		0.02 (0.1)	0.6* (0.1)	0.23* (0.11)	0.28* (0.12)	-0.04 (0.1)	-0.22* (0.2)
$\bar{R}^2$		.76	.63	.67	.89	.50	.57
DW		1.9	2.1	2.2	2.2	2.0	1.6
Det. C		.02	.6	.005	.002	.009	.01

Key:

( ) = standard error

$\bar{R}^2$ coefficient of determination adjusted for degrees of freedom

DW Durbin-Watson statistic

Det. C correlation determinant

NA^{C} net acquisition of debentures

NA^{LM} net acquisition of loans and mortgages

NA^{O} net acquisition of ordinary shares

NA^{P} net acquisition of property

NA^{G} net acquisition of government securities

NA^{STA} net acquisition of short-term assets

I_t^C net new issues of debentures

I_t^O net new issues of ordinary shares

I_t^G net new issues of government securities

HPI house price index

R^{STA} interest rate on short-term assets

R^{D} interest rate on debentures

R^{L} interest rate on long-term government securities

D(2) shift dummy

R^{01} interest rate on ordinary shares

BSLiq building society liquidity ratio

TNA^{AA1} total net acquisitions minus prior net acquisitions of debentures and loans and mortgages of the yield on government securities rather than that on ordinary shares as the 'standard'. Probably the only exception is the use of a yield gap between the yields on two assets which are known to possess a high degree of substitutability, and this can only be determined following the results of estimating the equations.

Obviously there are a number of other, less serious criticisms that might be levied at the Dodds' models. In particular, these would include questioning his adoption of a sequential investment procedure and his use of current yields as a proxy for expected yields. Nonetheless, it should be recognised that his results have not yet been bettered, and although they are disappointing, the high degree of predictive power of the models indicate that greater success is not too far away. Indeed, the inclusion of an expectations-generating mechanism would seem to be the logical first step in this direction. But, as we have seen, this is a shortcoming that is not Dodds' alone.

6.4.6 El Habashi (1977)

Before leaving the realm of life insurance companies' investment behaviour there is one final work worthy of mention. In his unpublished University of Sheffield Ph.D. thesis, El Habashi (1977) sets out to develop both a static linear programming model of life insurance company investment portfolio selection and a static linear programming model of life insurance company asset-business portfolio selection. Indeed, this latter model takes explicit account of the life office's liability structure. The author cites the major theoretical foundations of his thesis as Markowitz (1959) and the later, more practical extensions such as Sharpe (1963, 1964). It follows that with these intellectual roots the model's inputs are various measures of risk and return. However, El Habashi feels that this is bound to create problems:

> ...most of the examples shown in the literature involved only equities. Because the return on these securities is primarily influenced by market price, it appears to be a reasonable measure of risk. This leaves unsolved, the dilemma of formulating similar inputs for publicly-traded bonds, mortgages, real estate, and other common investment outlets. The problem is that the return on these investments cannot be determined reliably from price movement because of the inactive trading in the majority of such investments. Price movements are of little concern in debt issues that a holder plans to hold to maturity. Historical or current market prices usually do not exist for mortgage loans. In addition government securities yield fixed returns. Therefore, the empirical study (testing static LP investment portfolio selection model) is limited to equities; in other words, the data is collected for an equity portfolio only. (1977, pp.8-9)

Thus, the El Habashi model is concerned more with tactical decisions, unlike the other works we have reviewed which considered the life offices' strategic investment decision. Nonetheless, it is a solid piece of research showing how the Markowitz method applies to the investment decisions by a British financial intermediary.

6.4.7 Comments

In this section we have looked at a number of works on the investment behaviour of the life insurance companies. Although the studies by Clayton and Osborn (1965) and Carter and Johnson (1976) are largely descriptive, they do enable us to see the impact that the institutional set-up has on the behaviour of financial institutions—in this case the life offices. This is obviously a very important point, which was largely ignored by Ryan (1973), while Dodds manages to incorporate such factors, regarding them as manifesting themselves as the internal and external behavioural constraints. Nonetheless, the Ryan and Munro (1974) works do shed more light on the pitfalls of financial model-building by revealing avenues likely to prove fruitful or otherwise. In fact, these two authors are to be commended for having the courage to model the generation of expectations. Nearly all economists acknowledge expectations as being of paramount importance in the investment decision yet they are largely ignored in models of portfolio investment behaviour by financial intermediaries, as we have been noticing.

Finally, the El Habashi (1977) paper differs from the others in this section by concerning itself with the tactical decision. It should be recognised that for a complete view of any investment portfolio selection procedure, both the tactical and strategic decisions should be reviewed, perhaps sequentially with the strategic decision naturally being taken first. The El Habashi thesis offers a great deal of insight into the tactical decision and, if the problems of determining the risk and return on the non-equity investments could be eliminated, the linear programming approach would offer arguably the best prospect for modelling investment portfolio selection. However, despite much greater investment activity on an increased number of financial markets since 1977 these problems still exist. Thus, if we are to model the strategic investment decision the linear programming approach must still be regarded as a non-starter.

6.5 General/Sectoral Models

In the previous sections of this chapter we have looked at some of the more highly regarded approaches to modelling the investment behaviour of specific financial institutions in the British context that have appeared in the literature. One of the features of this kind of approach is that the models often lack a sense of generality that would enable them to be applied to other institutions. Some of the papers we criticised for trying to be so general that they virtually ignored the peculiar institutional constraints pertaining to a given institution that were likely to affect its behaviour significantly. That there are differences between the various types of financial intermediary would seem to be indisputable but, as we saw in Chapter Two, they all play essentially the same rôle in the economy, that of channelling funds from surplus to deficit units. The question that needs to be asked concerns the degree to which financial intermediaries are similar or different. For, if they can be regarded as largely similar then it would be entirely possible to construct a truly general model of their behaviour that would apply equally to (say) banks as it would to insurance companies. It is with this thought in mind that we now consider some of the works of a sectoral approach that have been published. As we shall see, these studies often aggregate all financial institutions together as if they were a single unit, on the (implicit) assumption that their similarities far outweigh any differences. Because of the nature of modelling the whole financial sector there is not a great proliferation of work in this area, but we shall press on undeterred.

6.5.1 Clayton, Dodds, Ford and Ghosh (1974)

Probably the first British work in this area to appear was the Clayton, Dodds, Ford and Ghosh (1974) econometric model of the financial sector of the United Kingdom (hereafter CDFG). This ambitious undertaking consisted of a nine sector model with sixteen categories of assets/liabilities, essentially in a flow of funds framework as epitomised by the table reproduced here as Table 6.7 The model implicitly assumes a behavioural function for each sector whereby each institution tries to maximise "expected net revenue" or the "expected utility of net revenue", given an endowment of net worth and its expectations about future rates of return. Further, it is assumed that all sectors hold the same expectations concerning future rates of return, an assumption that deserves some very serious questioning, but we shall leave that for another occasion. Of more importance here is the obvious similarity between this attempt to model an individual institution's portfolio selection procedure with

Table 6.7: The CDFG Model of Financial Intermediation in the U. K.

Assets/ Liabilities	Sectors	Public Sector 1	Discount Houses 2	Deposit Banks 3	Other Banks 4	Building Societies 5	Other FIs 6	Industrial & Commercial 7	Personal Sector 8	Overseas Sector 9	Rates
Currency	1	$-\bar{a}_{11}$		a_{13}	a_{14}	a_{15}		a_{17}	a_{18}		r_1-($\dot{P}_e$)
Treasury Bills	2	$-\bar{a}_{21}$	a_{22}	a_{23}	a_{24}	a_{25}	a_{26}	a_{27}		a_{29}	r_2
British gov't securities	3	$-\bar{a}_{31}$	a_{32}	a_{33}	a_{34}	a_{35}	a_{36}		a_{38}	a_{39}	r_3
National Savings	4	$-\bar{a}_{41}$					a_{46}		a_{48}		r_4
Call Loans	5		$-a_{52}$	a_{53}	a_{54}			a_{57}	a_{58}	a_{59}	r_5
Local Authority Debt	6	$-\bar{a}_{61}$	a_{62}	a_{63}	a_{64}	a_{65}	a_{66}	a_{67}	a_{68}	a_{69}	r_6
Deposits with Deposit Banks	7	$\bar{a}_{71}$		$-a_{73}$		a_{75}	a_{76}	a_{77}	a_{78}	a_{79}	r_7
Deposits with other Banks	8	$\bar{a}_{81}$			$-a_{84}$		a_{86}	a_{87}	a_{88}	a_{89}	r_8
Shares & Deposits	9					$-a_{95}$			a_{98}		r_9
Deposits with OFIs	10						$-\bar{a}_{10,6}$	$a_{10,7}$	$a_{10,8}$	$a_{10,9}$	r_{10}
Advances by Deposit Banks	11	$-\bar{a}_{11,1}$		$a_{11,3}$			$-\bar{a}_{11,6}$	$-\bar{a}_{11,7}$	$-\bar{a}_{11,8}$	$-\bar{a}_{11,9}$	r_{11}
Advances by other Banks	12	$-\bar{a}_{12,1}$			$a_{12,4}$		$-a_{12,6}$	$-a_{12,7}$	$-a_{12,8}$	$-a_{12,9}$	$\bar{r}_{12}$
Advances	13	$a_{13,1}$	$-a_{13,2}$								r_{13}
Commercial Bills	14	$a_{14,1}$	$a_{14,2}$	$a_{14,3}$	$a_{14,4}$		$a_{14,6}$	$-a_{14,7}$		$a_{14,9}$	r_{14}
Mortgages	15					$a_{15,5}$			$-a_{15,8}$		r_{15}
Equity	16	$a_{16,1}$	$a_{16,2}$	$a_{16,3}$	$a_{16,4}$		$a_{16,6}$	$-\bar{a}_{16,7}$	$a_{16,8}$	$a_{16,9}$	r_{16}
Changes in Net Worth (residual)	17		$\bar{A}_2$	$\bar{A}_3$	$\bar{A}_4$	$\bar{A}_5$	$\bar{A}_6$	$\bar{A}_7$	$\bar{A}_8$	A_9	

Key:

$\bar{r}_1$-($\dot{P}_e$) negative rate of inflation

r_2 the rate on Treasury Bills

r_3 the rate on British Government Bonds

r_4 the rate on national savings

r_5 the rate on Call Loans

r_6 the rate on Local Authority Debt

$\bar{r}_7$ the rate on Deposits with Deposit Banks

r_8 the rate on Deposits with Other Banks

r_9 the rate on Building Society Shares

r_{10} the rate on Deposits with Other Financial Institutions (OFI's)

$\bar{r}_{11}$ the rate on Advances by Deposit Banks

$\bar{r}_{12}$ the rate on Advances by Other Banks

$\bar{r}_{13}$ Bank Rate

r_{14} the rate on Commercial Bills

r_{15} the Building Societies Mortgage rate

r_{16} the rate on Equity

many of those we have observed in other sections of this chapter. In almost all cases we note that the institution is seen as allocating its net worth among various financial assets according to its expectations of future yields (interest rates) in order to maximise its expected yield, or the expected utility thereof. Where the CDFG model distinguishes itself is that a given institution's demand for (supply of) any single asset is postulated as being dependent upon the yield on each and every asset demanded (supplied) by that institution. However, although this might well be in accord with the tenets of neoclassical demand theory, as we have already seen in this chapter, such an approach is very likely to create estimation problems due to multicollinearity.

Because the CDFG model is a closed multi-sector model, supply constraints on investment behaviour are explicitly included. The model is also static in form,implying that each sector's portfolio is in equilibrium. CDFG estimate their model using two-stage least squares, with each sector's demand (supply) function for assets (liabilities) being estimated simultaneously. Given the rather ambitious nature of the project, it is perhaps not surprising that the results obtained vary from rather good to abysmal, with the majority being towards the latter. (Thus, nothing would be gained by reproducing their results here.)

6.5.2 Dodds and Ford (1974)

In one of the few studies to test well-known theories of the term structure of interest rates using British data, Dodds and Ford use Chapter Six of their *Expectations, Uncertainty and the Term Structure of Interest Rates* to present a later, revised version of the CDFG model, of which they had been co-authors. It should be noted that the focus they take is rather different from that of CDFG, with the revised model being used to examine the validity of the "Hedging Pressure" theory of the term structure of interest rates. Before we look at the Dodds-Ford version let us briefly review the Hedging Pressure theory of the term structure of interest rates.

Many theories explaining the term structure of interest rates are concerned with attributing the shape of the yield curve to the expectations of investors.[53] The Hedging Pressure theory stands in direct contrast to this view, its main contention being that investors are not influenced by expectations. That is not to say that investors do not form expectations, but rather that they do not act upon them.[54] Thus, according to this theory, the position of an investor is determined solely by the structure of his liabilities; that is to say, that investors act to try and match up the maturity of their investment assets with those of their liabilities, ie, they hedge. A weaker view of the Hedging Pressure theory suggests that investors may not be fully matched because the structure of interest rates counterbalances the investor's innate matching preference. It therefore follows that if all investors took up a fully hedged position then segmentation of the financial markets into distinct maturity ranges would result. Thus, the validity of the Hedging Pressure theory can be tested by considering the degree of segmentation that occurs in the market for financial assets, and it is to this end that Dodds and Ford use the CDFG model.

Although not primarily concerned with the same objectives as CDFG, the revised model used by Dodds-Ford is virtually the same as its progenitor with the exception of the following revisions: firstly, government bonds are disaggregated into four separate maturity ranges; secondly, the model is given a dynamic re-specification using the same adjustment mechanism as in (6-4-2) to account for the possibility that observed portfolios may not be equilibrium portfolios. Although these changes are made, there is no attempt to improve upon the use of a "static" expectations-generating mechanism, although this may not necessarily be inappropriate in view of the highly diminished effect that expectations play under the Hedging Pressure theory. It is not altogether surprising that these minor amendments do bring about an overall improvement in the results obtained, yet this is probably entirely due to the inclusion of the adjustment mechanism as the behavioural functions assumed for each sector are otherwise identical to those of the original CDFG model.

6.6 Closing Comments

Throughout this chapter we have concerned ourselves with a review of the literature on the modelling of the investment behaviour of a wide range of British financial intermediaries. What is perhaps most surprising is the high degree of consensus exhibited on many of the issues. For example, in almost all cases the institution was posited as having the maximisation of its expected net revenue, or the expected utility thereof, as its primary objective. This applies equally to studies under both the Essex and Sheffield school banners, although the former take a purely theoretical approach to consideration of the objective while the latter takes the objective from empirical observation and enquiry. Pursuit of such an objective leads the institution to construct a desired portfolio of assets based upon their expectations of future yields, with an eye to their current and future liabilities. It is from this point that the studies tend to diverge. We have found both the static approach—where it is assumed that the observed portfolio is an equilibrium portfolio—and the dynamic approach—where the intermediary adjusts towards its desired portfolio—modelled by a standard adjustment mechanism. Almost all of the Essex school models seem to be of a comparative static nature, while the Sheffield school studies tend to also include a dynamic version of the model, albeit by the inclusion of a lagged dependent variable. It is intriguing to note that in almost all of the cases we considered the reduced form equations to be estimated were of a high degree of similarity regardless of the underlying approach. Furthermore, these reduced form equations were predominantly of a type that we would expect according to standard neoclassical microeconomic theory. Thus, it would appear that the debate between the two major methodologies is largely a question of semantics rather than one of major importance in terms of the progress of the discipline of Economics.

Although there is much good to be found in the fact there is a high degree of consensus among the various studies, there is one area in which they tend not to differ which is a cause for concern. As we have seen, a financial intermediary will "...construct a desired portfolio of assets based upon their expectations of future yields, with an eye to their current and future liabilities." Despite the high degree of importance attached to expectations and the existence of a large body of expectations-generating mechanisms in nearly all cases no attempt was made to model expectations. In fact, the most popular method seemed to be that whereby current yields are viewed as a good proxy for their expected values; the so-called "static" expectations. And yet, in the few cases where expected values were explicitly modelled the outcome was a better set of results.

Perhaps the most worrying feature that was common to almost all the studies reviewed is the disappointing quality of the empirical results obtained. In many cases coefficients were wrongly signed, contradicting strongly held *a priori* assumptions, or were just plain insignificant. Such results are both disappointing and discouraging in terms of future work in the area. It is apparent from the poor results that there is indeed something significant missing from these models, and I would venture to suggest two major omissions. Firstly, there seems little rationale for the use of a static expectations-generating mechanism as commonly employed; this would appear to have no basis whatsoever, either theoretically or empirically. It is the argument of this writer that, in order to accurately construct a model of any

Chapter Six Endnotes:

1 For a complete description of these different circumstances with particular reference to the commercial banks see Brechling and Clayton's 1965 *Economic Journal* article.

2 See, for example, Table 1-10 in Chapter One. Also section 6.4.5 (this chapter) and Chapters Seven and Eight for detailed analysis.

3 In fact, much of this large body of literature is concerned with the financial institutions of the United States.

4 For example, in France pensions are almost universally operated under a Pay-As-You Go system, while in West Germany the State social security system provides pensions by a Pay-As-You-Go operation with private sector pensions predominantly financed via the book reserve method. For further details see *Pension Funds in the UK* (1977).

In the United States, social security pensions are essentially Pay-As-You-Go financed, with private pensions tending to be advanced-funded much like the system in the United Kingdom. In addition there are a substantial number of U. S. citizens who purchase their own pension on an individual basis known as Individual Retirement Accounts (IRAs). These are typically offered by banks, insurance companies, etc. In common with the United Kingdom, the relationship in the United States between publicly- and privately-provided pension schemes and the capital market is largely determined by the tax structure (hence the popularity of IRAs) and such institutions as the Pension Benefit Guarantee Corporation. For further details see (eg) Alicia H. Munnell (1982) or Zvi Bodie and John B. Shoven (1983).

5 Indeed, prior to 1970 the only work published in this area that had a direct connection to what we shall come to refer to as the "Sheffield School", in that they were (at least partly) penned by George Clayton, in many respects the 'guru' of that school. Perhaps the only non-contemporary works on British financial institutions are the classics by Edgeworth (1888) and Lavington (1921).

6 At the time of its publication this had much less of an impact in the United Kingdom than subsequently.

7 In addition, it could also be pointed out that these works were broadly in line, both philosophically and in terms of their conclusions, with the increasingly-popular new orthodoxy of the post-War era—the "Keynesian revolution".

8 The user of correct English will note that the proper word here should be "interest"; however, because of the other connotations that attach to this word in this area of Economics, in common with the practice of many economists, I have taken the liberty of 'inventing' a different form of the word to avoid ambiguity and convey its meaning and distinction. Apologies to purists!

9 This article is surveyed in detail in section 6.1.1 of this chapter.

10 This may well be due to its use as a proxy for the expected future rate of interest. However, the statistical insignificance should not be interpreted as expectations having no part in determining asset demand. A more plausible reasoning would suggest that Δi is a poor proxy for expected future rates of interest. This is not really such a surprising result in view of the simple specification of the expected future rate of interest adopted by the authors.

11 As will become apparent from this survey chapter, this approach is common to all the work on financial intermediaries emanating from the Essex school.

12 See section 5-2(d) in Chapter Five.

13 Note that in applying the Freund model, its form appears somewhat different from the original in Freund (1956).

14 Although the length of the decision-period is not specified in the formal model, PGB make use of quarterly data for their estimation, implying a 90 day (ie, three-month) decision-period.

15 The bank's utility function is of the form:

$$U = a - ce^{-b\Pi} \qquad (1)$$

The bank is assumed to maximise E(U) by implicit use of the expected utility theorem. Thus from (1):

$$E(U) = \int \left[a - ce^{-b\pi}\right] \frac{1}{\sigma\sqrt{2pi}} e^{-\frac{1}{2}\left[\{(\pi-\mu)/\sigma\}^2\right]} d\pi \qquad (2)$$

where pi $\cong$ 22/7 (usually π).

Alternatively:

$$E(U) = E(a) - E(ce^{-b\pi}) \qquad (3)$$

$$= a - E(ce^{-b\pi}) \qquad (4)$$

Now, since a and c are constants known with certainty:

$$E(U) = a - c\int e^{-b\pi} \frac{1}{\sigma\sqrt{2pi}} e^{-\frac{1}{2}\left[\{(\pi-\mu)/\sigma\}^2\right]} d\pi \qquad (5)$$

$$\Longrightarrow \quad E(U) = a - c\int \frac{1}{\sigma\sqrt{2pi}} e^{-b\pi-\frac{1}{2}\left[\{(\pi-\mu)/\sigma\}^2\right]} d\pi \qquad (6)$$

$$\Longrightarrow \quad E(U) = a - c\int \frac{1}{\sigma\sqrt{2pi}} e^{-\frac{1}{2}\sigma^2\left[b\pi 2\sigma^2 + (\pi-\mu)^2\right]} d\pi \qquad (7)$$

Rewriting $[b\pi 2\sigma^2 + (\pi-\mu)^2]$ by completing the square gives:

$$[b\pi 2\sigma^2 + (\pi-\mu)^2] = [\pi - \{(\pi-b\mu)^2\}]^2 + 2\mu b\sigma^2 - b^2\sigma^4 \qquad (8)$$

Substituting (8) into (7) gives:

$$E(U) = a - c\int \frac{1}{\sigma\sqrt{2pi}} e^{-\frac{1}{2}\sigma^2\left[\{\pi - (\mu-b\sigma)^2\}^2 + 2\mu b\sigma^2 - -b^2\sigma^4\right]} d\pi \qquad (9)$$

$$E(U) = a - c\int \frac{1}{\sigma\sqrt{2pi}} e^{-\mu b + (b/2)^2\sigma^2 - \left(\frac{1}{2}\sigma^2\right)\left[\{\pi - (\mu-b\sigma)^2\}^2\right]} d\pi \qquad (10)$$

Now, $e^{-\mu b + (b/2)^2\sigma^2}$ is a constant, ie, independent of π so (10) becomes:

$$E(U) = a - ce^{-\mu b + (b/2)^2\sigma^2}\int \frac{1}{\sigma\sqrt{2pi}} e^{-\frac{1}{2}\left[\frac{(\mu-b\sigma)^2}{\sigma^2}\right]} d\pi \qquad (11)$$

Note that $\int\ldots$ is the area under a normal density curve with mean $(\mu - b\sigma)^2$ and variance σ^2, so it is equal to unity. We may therefore write:

$$E(U) = a - ce^{-\mu b + (b/2)^2\sigma^2} \qquad (12)$$

or

$$E(U) = a - ce^{-b\left[\mu + (b/2)^2\sigma^2\right]} \qquad (13)$$

Given that $b > 0$ implies that the bank should try to maximise $W = \mu - (b/2)\sigma^2$, then it can be seen that this will be the same as if the bank were maximising its expected utility, E(U).

16 PGB believe that these assumptions may be relaxed without significantly affecting the outcome.

17 A case could be made for including A as a choice variable; however, during the PGB data period it was subject to Bank of England control, hence its status as an exogenous variable.

18 We have taken the liberty of introducing a change of notation here! For example, whereas in the original PGB use $(\hat{v}_1' : \hat{v}_2')$ we have $(\hat{v}_N' : \hat{v}_X')$, with X and N being used to indicate the eXogenous and eNdogenous sets respectively.

19 In this 'balance sheet' constraint the vector i represents a unit vector, eg, (1, 1, 1, ...), a point which is not made clear by PGB in their original work.

20 The criteria are:

(i) the submatrix in the upper left-hand corner, $bC_{m_N m_N}$ must be non-singular; and

(ii) $-\left[\frac{1}{b}\right] i_N' C^{-1}_{m_N m_N} i_N$ must be non-zero.

If these are fulfilled then block inversion may occur by application of the familiar formula (see A. S. Goldberger (1966) page 27).

With regard to the matrix $\begin{bmatrix} -bC_{m_N m_N} & i_N' \\ i_N & 0 \end{bmatrix}$, the first criterion is satisfied since $C_{m_N m_N}$ is a covariance matrix. Also, because $-\left[\frac{1}{b}\right] i_N' C^{-1}_{m_N m_N} i_N$ is a quadratic form in $C^{-1}_{m_N m_N}$ and $C_{m_N m_N}$ is positive definite (being a covariance matrix), the second criteria is also fulfilled.

21 It is interesting to note that, although derived in a far more rigorous manner, this set of reduced form equations does not differ greatly from that used by Brechling and Clayton. In both cases there is a set of desired asset holdings (or ratios) which are dependent upon the expected values of their rates of interest and the expected values of those asset holdings/ratios which are determined exogenously. However, as we shall see, the Brechling-Clayton estimates are based upon a much more highly aggregated version of these equations than that used by PGB.

22 This is a standard step taken in each work under the "Essex school" banner. Most empirical estimation on financial intermediaries is performed using aggregate data; in the case of the U. K. pension funds, for example, there is little alternative as the individual funds are not required to publish any form of detailed accounts.

23 There are arguments both in favor and against the degree of realism exhibited by this assumption. It could be argued that because the advisors to the various banks will have received broadly similar training in their field and are likely to be in possession of similar information, their calculations on behalf of their employers will lead to broadly similar expectations and therefore to broadly similar covariance matrices of forecast errors. Conversely, even if banks possess the same expectations it does not necessarily follow that they will act in the same or similar manner, as their interpretations of the perceived information is bound to vary due to risk-aversion, prejudice, sub-cultural variations, and so on.

24 For a detailed consideration of this point and its ramifications, see Section 7.3 (Chapter Seven).

25 For a fuller, more detailed description see J.R.S. Revell (1973).

26 For an explanation of these symbols see Section 6.1.2 (Chapter Six).

27 See footnote 15 above.

28 Note that in the PGB paper the vector v consists of both an expected component, v, and an error term, u_v.

29 Q is assumed to be exogenous for empirical reasons.

30 Reserves may be defined as the accumulated value of the excess of assets over liabilities from all previous accounting periods.

31 See the section on risk aversion in Chapter Five.

32 The value of δ is calculated as $W_0^{\delta} = 0.99W_0$. So, $\delta = (\log W_0 + \log 0.99)/\log W_0$.

33 This accounts for the second constraint, ie, the preservation of a minimum liquidity reserve ratio.

34 These yields include capital gains/losses, and are assumed to be stochastic.

35 That is, $\hat{r}$ is the same for all building societies, as is C_{rr}

36 This is the standard abbreviation for the authors' surnames employed by Clayton, Dodds, Driscoll and Ford. Please note that I have taken the liberty of changing the numbers referring to the original footnotes, although their contents remain quoted *verbatim*, replete with with spelling and typographical errors (of which there are many).

37 The rationale for the inclusion of these dummy variables runs something as follows: The building societies are renowned for their rationing of credit, which tends to be chronic rather than transient. Because of this, there can be no observable demand-for-mortgages schedule. To combat this, HS use 'prior' subjecting information (eg, newspaper reports) to formulate dummy variables to proxy "mild" rationing, D(1), and "strict" rationing, D(2). Apart from the Clayton-Dodds-Driscoll-Ford criticisms, this approach can be criticised because of its subjective nature, as well as because of its implication of constant absolute magnitude effects due to rationing.

38 (footnote 8): "To some extent this is confirmed by the insignificance of the coefficient on the mortgage rate (not included in equation 3, but reported on in the discussion)."

39 (footnote 9): "This is a common phenomenon and usually arises because the Building Societies do not wish to increase the burden on existing borrowers or the government use 'moral suasion' to keep the rate for that reason or for political expediency."

40 (footnote 10): "It is possible that new mortgage advances will rise and that rationing may also exist but they will never fall without rationing taking place unless excess supply already exists in the market for mortgages or demand falls by at least as much as the fall in advances."

41 This would appear to be questionable. It is my contention that a building society (eg) will adjust its desired portfolio from period to period depending upon both current and expected values of the parameters (ie, the level of the inflow of funds and the structure of interest rates). Indeed, I would also venture to suggest that this is backed up by the BSA Council's answers to the CDDF questionnaire. Yet the CDDF model seems to suggest that changes in asset holdings are brought about solely by historical changes in the parameters. But this can only be assumed to be the case if the expected values are hypothesised as depending upon their previous historical values alone. In their estimation procedure CDDF adopt "static" expectations, whereby current values proxy expected values.

42 H. Theil (1966), *Applied Economic Forecasting*. The computational formula for U is:

$$U = \sqrt{\frac{\sum_{i=1}^{n} (P_i - A_i)^2}{\sum_{i=1}^{n} A_i^2}}$$

where P_i is the predicted value of the dependent variable at time i, and A_i is its actual value at that time.

43 The more fanciful reader (and student of the history of Economic thought!) may well find an analogy with the famous case of the Phillips' curve, whereby an *ad hoc* relationship between the rate of (wage) inflation and the level of unemployment was found to be statistically significant by Professor A. W. Phillips (1958). Yet Phillips provided no satisfactory explanation of this apparent phenomenon; theorctical justification was provided later by Professor R. G. Lipsey.

44 See (eg) J. C. Dodds' "The Role of British Life Insurance Companies in Britain's Financial Markets", (1979a), especially section 2.

45 This should not be interpreted as meaning that it lacks depth.

46 In fact, Clayton and Osborn 'hide' these results in an appendix, so they would appear to be fully aware of this.

47 Note that this is the first work we have considered in which expectations are explicitly modelled.

48 Since the time of Dodds' writing, we have seen the removal of exchange controls and the development of many markets in forward exchange markets which would allow (eg) the insurance companies to 'insure' themselves against exchange rate risk by hedging.

49 That is to say, the income payments (ie, dividends) from ordinary shares (eg) are subject to wide variations, hence they are very risky. Thus, investment in such a security means the assumption of a greater degree of income risk as compared to an asset with a certain income, such as a fixed interest bond.

50 Many of these and others are considered in detail in Appendix 6-1.

51 See Section 6.3.4 (this chapter) on the use of this in the Clayton, Dodds, Driscoll and Ford pamphlet (1975) on building societies.

52 Once again, despite the importance attached to expected returns in the decision-making procedure, at estimation time they are proxied by actual current returns, ie, "static" expectations are assumed.

53 For a rather good readable review of various theories of the term structure of interest rates see Dodds and Ford (1976).

54 If this assertion were to turn out to be true, it would have quite serious ramifications for virtually all of the studies we have reviewed in this chapter!

55 Much of this Appendix is due to the author's unpublished (undergraduate) project, "A Quantitative Evaluation of Inflation and Expectations in the U. K. Since 1963", (1976) University of Essex.

56 See (eg) my "Reading Difficulties—The Economists' Paradigm" (1986).

57 Many of these mechanisms have also been used in the study of inflationary phenomena.

58 For this example I have taken the liberty of reconstructing Thomas Sargent's example (1984) which pertained to American football ("gridiron") to a more European version pertaining to Association Football ("soccer").

That expectations are important in the panoply of economic decision-making is indisputable. However, in many areas within Economics it is argued that the formation of expectations is a peripheral issue and therefore not central to the matter in hand. Yet experience, both common and of the literature, indicates that many controversies abound precisely as a result of disagreements about the assumptions (implicit or otherwise) pertaining to the formation of expectations. It is only at its most naïve level that Economics does not deal with expectations, using the fiction of single period decision-making. Typically, however, economic decisions are made with respect to a longer time horizon. That this is the case has already been seen in (eg) Chapter Two, where we reviewed the consumption-saving decision as the impetus for the growth and development of financial intermediation. Such a decision is obviously intertemporal and made on the basis of expectations. In a world in which there were a complete set of forward markets then individuals would currently be able to make contracts for all future transactions at prices determined currently. In this case there would be no need to form views about the future, ie, expectations, as all prices would be determined in the current period. However, in the 'real world' information tends to be both imperfect and costly giving rise to transactions costs and uncertainty. These factors act to restrict the number of forward markets that can operate in practice. Therefore, it is necessary for economic agents to form expectations to enable them to make reasonably sensible intertemporal decisions. This applies equally to the firm or financial intermediary as to the individual.

The importance of expectations for the decision-making process can be seen to extend far beyond the realm of the economic decision. (Alternatively, all decisions can be regarded as essentially economic in the sense that they are made by the comparison of benefits with costs and may therefore be considered with the help of economic analysis [56]). It is all the more remarkable, therefore, that Economists have not yet been able to draw on the work of other social scientists, such as psychologists, etc, who delve more deeply into the phenomena of individual human activity, to derive a scientifically-derived yet empirically-based model of the generation of expectations.

In Chapter Six we have reviewed some of the more renowned models of the investment behaviour of British financial intermediaries. One major point of note was that almost all of the models considered relied on the concept of an intermediary possessing a 'desired portfolio', ie, the portfolio of assets that a given intermediary has decided at time t that it feels would be desirable to hold at some point in the future, say t+1. As we have seen, the desired portfolio may not actually be achieved due to (eg) market imperfections and therefore is unobservable. However, the composition of an intermediary's desired portfolio is chosen, *ceteris paribus*, according to the intermediary's expectations of future rates of return (yields) of the assets in its feasible set. Thus, to be able to specify successfully an intermediary's optimal (in its own view) investment behaviour requires us first to specify the manner in which it forms its expectations. Many of the models we reviewed in Chapter Six opted for the method of "static" expectations, and this was found to be a possible reason for poor quality estimates and a major source of criticism. In this Appendix we shall be considering some of the more widely regarded mechanisms for generating expectations series.[57] In particular, we shall be concentrating on the formation of expected rates of return (yields).

6A.1 Classical (or Static) Expectations

The classical, or static, method of forming expectations posits that values currently prevailing are expected to continue unchanged into the next time period. In other words, under classical expectations the rate of return that is currently expected to prevail in the future, (eg) at time t, is simply equal to the actual rate of return in the previous time period, t-1. Thus, letting R_t^e represent the rate of return that is expected to occur in period t and R_t the actual rate of return in period t, classical expectations says that

$$R_t^e = R_{t-1}$$

Under this regime, even if the rate of return had been increasing over the last fifty years (eg) the rate of return this period would still be expected to prevail next period. This is obviously a rather unsophisticated mechanism (perhaps naïve) that can be considered equivalent to the formation of no expectations whatsoever. It would seem that such a process would only be valid in an economy with a zero-growth steady state.

6A.2 Extrapolative Expectations

Under classical expectations no account is taken of the fact that economies are usually dynamic and therefore the rate of return on an asset is likely to vary from period to period. Under extrapolative expectations the classical mechanism is extended to account for this variation. Here we find that the rate of return expected in period t is equal to the rate of return in the previous period, t-1, less a correction factor which is dependent upon the trend exhibited by the rate of return. Using the same notation as before

$$R_t^e = R_{t-1} - \theta(R_{t-1} - R_{t-2})$$

where $0 < \theta < 1$ is the correction factor.

This equation can be manipulated to give an alternative yet identical expression of this form of expectations-generating mechanism. This involves rewriting the expected rate of return in period t as a weighted average of the rates of return in the previous two time-periods, viz

$$R_t^e = (1 - \theta)R_{t-1} + \theta R_{t-2}$$

In his book, Dodds (1979d) suggests that the following form of extrapolative expectations is worthy of note:

$$R_t^e = R_{t-1} + \left[\frac{R_{t-2} - R_{t-3}}{2}\right]$$

6A.3 Adaptive Expectations

The hypothesis of adaptive expectations was first introduced into Economics by M. Nerlove (1958) and P. Cagan (1956). They postulated that individuals use information on their past forecasting errors in order to revise their current expectations. In essence their approach may be viewed as a simple extension of the extrapolative expectations-generating mechanism, with the expected rate of return being a weighted average of all past rates of return. The weights are such that greater importance is attached to more recent rates of return. The adaptive expectations approach can be formulated with varying degrees of sophistication:

6A.3.1 first order

Until the mid-to-late 1970s this had become one of the most popular methods of modelling the formulation of expectations in the literature. Under this *schema* expectations adjust in proportion to the last recorded forecast error alone. In notation:

$$R_t^e - R_{t-1}^e = \theta(R_{t-1} - R_{t-1}^c)$$

where $0 < \theta < 1$. By manipulation the above may also be written as

$$R_t^e = \theta R_{t-1} + (1 - \theta)\, R_{t-1}^e \qquad (1)$$

It is interesting to note that this is essentially the same as the adjustment mechanism employed in many of the studies we reviewed in Chapter Six. For example, compare with equation (6-4-1).

6A.3.2 second order

In this slightly more sophisticated version expectations adjust in proportion to the forecast errors of the previous two periods. In notation:

$$R_t^e - R_{t-1}^e = (1-\theta_1)(R_{t-1} - R_{t-1}^e) + (1-\theta_2)(R_{t-2} - R_{t-2}^e)$$

Or alternatively:

$$R_t^e = \theta_1 R_{t-1}^e = (1-\theta_1)R_{t-1} + (1-\theta_2)R_{t-2} - (1-\theta_2)R_{t-2}^e$$

For the most part, authors seem to be content to use the first order variant in their studies, and with good reason. Consider the second formulation of the first order variant (1); since this must also be true one period earlier we obtain

$$R_{t-1}^e = \theta R_{t-2} + (1-\theta)R_{t-2}^e \qquad \textbf{(2)}$$

This must also be true for each and every time period. Thus, by recursive substitution of (2) into (1) the unobservable expectation term can be eliminated, giving

$$R_t^e = \theta R_{t-1} + \theta(1-\theta)R_{t-2} + \theta(1-\theta)^2 R_{t-3} + \ldots + \theta(1-\theta)^{t-n-1} R_{t-n}^e \qquad \textbf{(3)}$$

Because θ is a positive fraction it follows that as n increases $(1 - \theta)^n$ gets steadily smaller, and as n reaches a sufficiently large number the final term in (3) can be considered negligible. This means that the adaptive expectations regime allows us to model unobservable expectations purely in terms of past observations.

A closer look at equation (3) also serves to emphasise that, in essence, adaptive expectations is little more than a series of weighted values of past observations. In this lies both its tremendous appeal and the source of the criticisms levied by its detractors.

Finally, it should be mentioned that although the adaptive expectations mechanism can be used at higher orders, the costs (in terms of calculation time, etc) will usually be found to exceed the possible benefits.

6A.4 Weighted Expectations

This is often regarded as a more generalised form of adaptive expectations, whereby the expected rate of return is a simple weighted average of all previous rates of return. In notation:

$$R_t^e = \theta_1 R_{t-1} + \theta_2 R_{t-2} + \theta_3 R_{t-3} + \dots$$

where $0 < \theta_i < 1$ for all i. This model is often specified such that $\Sigma\theta_i = 1$. One of the more popular forms of this mechanism was first suggested by Almon (1965) and is usually referred to as the Almon or polynomial lag model. It has been found, both empirically and through practical experience, that a polynomial of the fifth degree is usually sufficient for most purposes.

6A.5 Regressive Expectations

This form of generating expectations has its roots in the Keynesian notion of a "normal" rate of interest, which is often represented by some fairly riskless long-term rate. According to the theory, if the prevailing rate of interest is above (what is regarded as being) the normal rate, then capital gains are likely because interest rates are expected to fall towards the normal rate, and vice-versa. Because the normal rate is determined subjectively it cannot be measured with any accuracy. Indeed, there is no real consensus among economists on the definition of the normal rate of interest. Nonetheless, various attempts have been made to proxy the normal rate, for example:

6A.5.1 the Koyck transformation

Here the normal rate is constructed as a geometrically declining weighted average of past actual long-term rates of interest. In notation:

$$R_t^N = \sum_{i=0}^{n} \theta^{i+1} R_t - (i+1)$$

where $0 < \theta < 1$. The Koyck transformation gives a proxy series for the normal rate of interest from which investors' expectations of gains or losses due to interest rate changes can be assessed. One method of achieving this is to take a linearised form of the difference between the actual long rate (R) and the normal rate (R^N):

$$NA_t = a + b(R - R^N)_t$$

where NA_t is the net acquisition of a given asset at time t.

6A.6 Inverted-V Expectations

It could be argued that to take expectations as being either extrapolative or regressive is to dichotomise the process artificially. According to the seminal work by de Leeuw (1965) the two views are not necessarily divergent. By using a particular form of the distributed lag function the weights may be varied such that they produce Keynesian (long-lag) and Duesenberry (short-lag) variables. This can be modelled as follows:

$$R_e(\lambda) = R_t - \left[\frac{1-\lambda}{1-\lambda^{11}} \sum_{i=1}^{11} \lambda R_{t-i} \right]$$

where $R_e(\lambda)$ is the expected capital gain/loss, and R_t is the yield on the relevant asset in period t. Note that in the study λ was varied from 0.15 to 0.95; set at the former value the model is tantamount to first differences, while with the latter value it "...is the current value in relation to a much longer average." It is interesting to note that, according to de Leeuw, the term in parentheses gives the normal rate of interest. He also suggests that its coefficient should be the opposite sign to that of the coefficient of R_t.

6A.7 Rational Expectations

According to Begg (1982) the problem with the expectations-generating mechanisms we have already considered in this Appendix is that they

> ...have the disturbing implication that they allow individuals to make systematic forecasting errors period after period, without requiring any amendment to the basis of the forecasting rule itself. (1982, p. 29)

Consider the following by way of example.[58] Fans of soccer in the English Football League's First Division may well have observed the following behaviour by Tottenham Hotspur F. C. during the current season: when confronted with a corner kick the ball was crossed towards the two forwards who were positioned on the far corner of the six-yard box. At home against local rivals, Arsenal, this occurred on all corner kicks, while the following week against Manchester United such corners occurred 93 per cent of the time, and later against Liverpool the same tactic was employed 100 per cent of the time, as it was for the rest of the season. In short, on the basis of the time-series data, Tottenham Hotspur has a tendency to play corners to their two strikers positioned on the far corner of the six-yard box, no matter who the opposition or the venue.

Having observed this historical record, we now wish to predict how Tottenham Hotspur will behave on future corner kicks. Suppose that next week they will play a League Cup game away at Doncaster, a team they have never played before. It would seem safe to predict that they will play corners to their two strikers positioned on the far corner of the six-yard box. This sensible prediction is based not on any understanding of the game of Association Football ("soccer"), but rather on simply extrapolating a past behaviour pattern into the future.

In many cases we would expect this method of prediction to work well. However, for precisely those cases in which predictions are most interesting, the extrapolative method can be expected to break down. For example, suppose that F. I. F. A., soccer's ultimate ruling body, announced a rule change, effective immediately, whereby players could now be in an offside position from a corner kick. Would we still expect Tottenham Hotspur to play corners to their two strikers positioned on the far corner of the six-yard box? Clearly not; at least no one familiar with the game of association football! (The defenders would no longer be likely to take up a position on their goal-line, thereby putting the attacking players on the six-yard box in an offside position).

What this example demonstrates is that historical patterns of human behaviour often depend on the rules of the game in which people are participating. Since much human behaviour is purposeful, it makes sense to expect that it will change to take advantage of changes in the rules.

The main postulate of the rational expectations hypothesis is that individuals do not make systematic errors in their forecasts. This is assumed to follow directly from the usual assumption adopted by economists of rationality on the part of economic agents. Traditionally, the assumption of rationality has implied that economic agents always act in their best self interests, ie, to maximise their own utility. Under rational expectations this is taken a step further, the implication being not that individuals forecast accurately; rather that they learn from experience and that on average and in the long run their expectations will be fulfilled. According to Chrystal (1979)

> ...agents will form expectations on the basis of the best available information in the context of the best available model. Mistakes will be made in expectations but these errors will be random. If they were not random, some systematic information would be being ignored, which is inconsistent with the theory.(1979, p.162)

This is not to imply that all economic agents are top-class economists, but rather they act as if they were. This is sometimes referred to as the weak form of the rational expectations hypothesis. Rational expectations can be defined, then, according to the following equation:

$$_{t+1}X_t^* = \underset{\cdot}{E}\,[X_{t+1}]$$

Formally, this says that all relevant information that is available on X at time t is employed in the formation of expectations on X at time t+1. The rational expectations hypothesis is often attributed to J. Muth (1961), whose position is perhaps best expressed by J. Pesando:

> To be rational in the sense of ... Muth, ... expectations must be generated by a reduced-form equation in the exogenous variables which actually generate the variable to be predicted. (1975, p.850)

Thus, in the models we have been considering, a geometric lag system of past yield values may be rational if no other variables seem to matter. However, many researchers would argue that other current endogenous variables matter, as well as other predetermined variables, in predicting yields.

Arguably the best complete description of the incorporation of rational expectations into an empirically testable model is in Chapter Four of Begg (1982). In this chapter Begg shows how a macroeconomic consumption function with income and wealth as arguments can be expanded to incorporate the expected values of those arguments on a rational expectations basis. Essentially there are two sets of simultaneous equations: the first is the consumption function, which depends on the expected values of income and wealth; the second is the equations whereby expected income and wealth are anticipated rationally, using a model of the macroeconomy. This models agents acting as if they knew how to estimate future values of income and wealth in a macroeconomic model, and should be seen in much the same way as we view the firm pursuing its objectives without explicitly measuring its marginal cost and marginal revenue curves.

Chapter Seven: The Flow of Funds Through the United Kingdom Pension Funds

7.0 Introduction

In this chapter it is our intention to focus on the activities of the pension funds as financial intermediaries. In Chapter Two we considered the role of such financial institutions in the economy; to transfer loanable funds from savers ("ultimate lenders") to investors ("ultimate borrowers") by purchasing primary securities from investors and issuing secondary securities to savers. In the case of a pension fund there is only one form of secondary security issued, and that is the contract to provide pension benefits to those savers who are members of the scheme organised by the fund. However, as we shall find out shortly, the securities that are purchased by a pension fund come from virtually every group of financial claim issued. Indeed, the pension funds have also been known to acquire real assets (other than property) for their portfolios from their occasional forays into the more esoteric non-financial investment markets. Obviously the holding of such a wide diversity of assets requires some explanation of the motives of a pension fund, and the aim of this chapter is to move in that direction by considering in detail the rôle played by the pension funds as financial intermediaries. We undertake such a task via a series of related surveys: we consider the various asset groups from which a pension fund may construct its portfolio—its "feasible set"—and then move on to consider the actual asset distribution of the pension funds' portfolio—what it looks like, and how it has changed over time. We also consider the various viewpoints expressed by government-sponsored investigations into the financial markets and institutions of the United Kingdom. Examination of these details should provide us with some of the insight necessary to construct an accurate model of British pension fund investment behaviour, in particular their objectives and the constraints to which their actions are subject. In Chapter Eight we move on to consider the rôle of the pension funds in the capital markets of the United Kingdom, as this too must surely be an important factor in determining their investment behaviour.

7.1 Sources and Uses of Funds

We begin this chapter with a brief look at the sources and uses of funds by the pension funds. Unlike (say) the insurance companies the pension funds' major liability is homogeneous, ie, the payment of pensionable benefits, while the assets they hold come from as wide a variety that one might conceivably imagine. Although we refer to a pension fund as a fund *per se* many of them, as we have seen, are effectively operating on a pay-as-you-go basis;[1] ie, using this year's contributions to finance this year's benefits, any surplus contributions being invested in various types of both financial and other assets. However, this could be construed as an over-simplification in many cases; a mere tautology, for the fund technically invests 'immediately' its current contributions and pays current benefits from the income it receives from maturing financial assets and the sale of financial and other assets. But whichever way you choose to look at it, it matters not! Either way there is a fund which is invested. This is illustrated, for example, in Table 7-1 (below) where we present data on the pension funds' income and expenditure for 1982 (data for some other years is presented in Table 1-8).

Turning to Table 7-1 it is interesting to note that, in terms of the pension funds' sources of funds, the amount from employers contributions and that due to income from investments are almost equal and comprise the lion's share. Equally, the major expenditure is on the payment of pensionable benefits, as we might have expected. As we suggested above, the data which are available show that there is a surplus of income over expenditure to the tune of approximately fifty per cent. It is this remaining amount that the funds may be considered as using for the purchase of additional financial assets.

With regard to the pension funds' income and expenditure statistics two other points are worthy of mention. Firstly, it should be recognised that 1982 was a recessionary year in the United Kingdom, and to a large extent this accounts for the item "additional contributions of employers". These contributions were exceptional payments made on a "one-off" basis to ensure that pension schemes were properly funded at a time when normal contributions alone would have meant that they were underfunded. During the growth years of 1985 - 1986 this situation appears to have been reversed, with many funds enjoying huge actuarial surpluses. The second point relates to the administrative costs of the pension funds. For 1982 the figures for the private, public and local authority sector funds are £30 million, £40 million and £40 million respectively. In absolute terms the private sector funds have the lowest administrative costs. However, when we consider that these lower costs are incurred in administering larger sums of both income and expenditure, the administration of the public and local authority funds comes into question. In

Table 7-1: Pension Funds' Income and Expenditure

	Private Sector		Local Authorities		Other Public Sector		Combined private & public sector funds	
	1982	**1983**	**1982**	**1983**	**1982**	**1983**	**1982**	**1983**
Income								
Contributions of employers:								
Normal	2,734	2,909	979	1,031	1,519	1,587	5,693	5,980
Additional	238	240			223	213		
Contributions of employees:	701	728	420	450	631	636	1,752	1,814
Rents, dividends and interest receivable	2,715	3,276	718	756	1,523	1,574	4,956	5,606
Transfers from other pension schemes	296	255	91	119	55	52	442	426
Other Income	9	9	..	17	4	17	13	43
Total Income	**6,693**	**7,417**	**2,208**	**2,373**	**3,955**	**4,079**	**12,856**	**13,869**
Expenditure								
Payments to members and their dependents:								
Pensions	1,672	1,927	691	792	1,240	1,301	3,603	4,020
Lump sums on retirement	636	698	164	165	392	347	1,327	1,210
Death benefits	112	113	23	23		63		199
Refunds of contributions	57	69	23	26	19	20	99	115
Transfers to other pension schemes	187	253	94	123	23	44	304	420
Other expenditure:								
Interest and rent payable	20	18			18	16		
Administrative costs met by the fund	35	47	..	11	25	25	110	127
Miscellaneous expenditure	4	9			8	1		
Total Expenditure	**2,723**	**3,134**	**995**	**1,140**	**1,725**	**1,817**	**5,443**	**6,091**
Surplus of income over expenditure	**3,970**	**4,283**	**1,213**	**1,233**	**2,230**	**2,262**	**7,413**	**7,778**

Source: *Business Monitor MQ5*

Table 7-2 we present the data on administrative costs as a percentage of the funds' income and expenditure:

Table 7-2:

Administrative costs as a percentage of:	Private	Public	Local Authority
Expenditure	1.12%	2.29%	4.00%
Income	0.4695%	1.0076%	1.8519%
Net Investment*	0.8108%	1.8018%	3.4483%

* Net Investment = Income - Expenditure

Source: Table 7-1

The data in Table 7-2 shows conclusively that the most expensive funds to administer are those within the local authority sector, with private funds being the least expensive by all three methods of measuring costs as a percentage of the funds' activities. Several possible explanations can be put forward to account for this phenomenon. The first is that the pension funds in the two public sectors are subject to much closer immediate control and accountability and consequently this raises their administrative costs. A second suggestion would be that of economies of scale; that is to say, that larger funds can reduce their costs by investing in labour-saving technology such as computers, customised financial software, etc. However, if we recall Table 1-10, many of the largest pension funds were found to be in the public sector. If the large public sector funds do enjoy economies of scale then for this explanation to hold the smaller public sector funds must be incurring huge administrative costs. While we do not have any evidence to deny this possibility, it does seem to be highly unlikely. A third possibility is the rather cynical view that public sector bodies seem to be less efficient almost by nature. Without investigating a substantial number of individual pension funds we are unlikely to be able to decide why the larger funds seem to enjoy lower costs, so we now turn our attention to consider in detail how these funds are invested, and in which assets.

7.2 The Assets

7.2.1 Asset Characteristics

According to William L. Silber (1970):

> ...Securities that are candidates for an investor's portfolio can be characterized by two attributes that help determine the ultimate asset composition of the portfolio. The two characteristics are yield and risk. (1970, p.7)

As we have already seen in Chapters Five and Six, the securities that are chosen to make up a portfolio are selected on the basis of their yield and risk characteristics. Let us now proceed to examine these attributes in some depth:

(a) **Yield:** Following Professor Revell (1973), we may formally define a financial asset as

> ...a claim to the payment of a future sum of money and/or a periodic payment of money. The 'and/or' in this definition implies that either one of the payments will be a sufficient condition, but that both may be promised. In many cases there is no periodic payment: treasury bills and commercial bills, which are issued at a discount and repaid at par, and national savings certificates, on which accrued interest is paid in full when they are cashed are cases in point. Similarly there may be no promise to repay a definite sum in the future: perpetual bonds are promises to pay an annual rate of interest without providing for future redemption, and ordinary shares (equities) carry no promise of redemption. (1973, p.30)

Allowing for one of the forms of payment (ie, redemption or interest) to take the value of zero we may think of a financial claim as typically carrying an obligation on the issuer to pay interest periodically and to redeem the claim at a stated value in any one of three ways:

(i) on demand;
(ii) after a stated period of notice has been given; or
(iii) on a given date or within a given range of dates.

The future payments of periodic interest and that on redemption may or may not be fixed in value. For example, a bond typically has a fixed rate of interest over its life and a redemption value ("par") stated in advance. With an ordinary share neither payment is fixed; periodic payments fluctuate according to the proportion of available profits which the directors decide to distribute to shareholders; redemption value depends upon the market price of the share at the time of sale, or by a share of the realised assets should the company be wound up. A deposit with a bank or building society possesses a face value sum on redemption but a varying level of interest payments. And so on.

For a contractual right to receive either or both of these forms of future payment to rank as a financial claim the promise to pay must be unconditional. For this reason such items as (eg) a life insurance policy may rank the title of "financial claim" because it promises a given payment upon death[2] or the prior attainment of a certain date. This is not the case with (say) fire insurance as payment only occurs in the event of fire breaking out, which may not happen. Some contractual obligations to make future payments are not regarded as financial assets because they are not transferable from one owner to another. The payment of a wage or salary under a contract comes into this category.

We regard the yield of a financial asset as being composed of the sum of both periodic payments (ie, the total of all expected future periodic payments) and also the redemption payment. This will give us a measure of the absolute return on any financial asset; however, an investor will usually be more concerned with the value of their return relative to the purchase price of the asset, ie, its rate of return. Expressed simply, the rate of return (or yield) of an asset is:

$$\text{rate of return} = \frac{\text{receipt - expenditure}}{\text{expenditure}}$$

where **receipt** is the sum of all future payments, both periodic and redemption, and **expenditure** refers to the purchase price of the asset. It is usually the case that these values are unknown except in the present and the past, thus in formulating investment plans the expected rate of return is calculated and utilised.[3] Obviously if the expected rate of return is positive then it would appear to be beneficial to purchase the particular financial asset (assuming for the moment that there are no transactions costs), but this is not the whole story. If an investor can calculate the expected rates of return on all financial assets they can be ranked according to their expected rates of return. At first glance it would seem reasonable to invest solely in that asset offering the highest expected rate of return, but, as we already learned in Chapter Five, this would indeed be most unwise. Without going into detail here, this is primarily because there is a second characteristic of any financial asset which must be taken into account in formulating any investment selection rules, and it is to this that we now turn.

(b) **Risk and Uncertainty:** While the yield on any asset is a fairly unambiguous concept, it is a more daunting task to determine exactly what we mean when we talk of risk. In much of the literature the term "risk" is used interchangeably with the term "uncertainty", although they are by no means synonymous. Thus, for clarity, it is important for us to distinguish between these two terms. Probably the first attempt to define the concepts of risk and uncertainty was that by Frank Knight in his classic *Risk, Uncertainty and Profit*

(1921). These definitions were also employed by Keynes in his *A Treatise on Probability* (1921). According to Friedman

> ...Frank Knight drew a sharp distinction between risk, as referring to events subject to a known or knowable probability distribution and uncertainty, as referring to events for which it was not possible to specify numerical probabilities. (1976, p.282)

Thus, drawing on the work of Knight and Keynes we may define the outcome of a decision as involving **RISK** if the probability of (considerable) loss is not small. On the other hand, the outcome of a decision is said to be **UNCERTAIN** if:

(i) the various pairs of possible outcomes are difficult to compare; or

(ii) it is difficult to decide on a list of possible outcomes.

So in situations of risk there exists a well-defined probability density function, while uncertainty implies that such a function is ill-defined, if it exists at all. However, for such as Friedman this is a false distinction:

> ...I have not referred to this distinction because I do not believe it is valid. I follow L. J. Savage in his view of personal probability, which denies any valid distinction along these lines. We may treat people as if they assigned numerical probabilities to every conceivable event. (1976, p.282)

Thus, following Friedman, it is always possible to turn a situation of "uncertainty" into one of "risk" by assuming that the probability density function is at least known subjectively. The interchangeability of the terms "risk" and "uncertainty" in much of the literature is usually based upon this assumption. This is a view with which Keynes in his later writings was very much at odds; when referring to "uncertainty" he argues

> ...The sense in which I am using the term is that in which the prospect of a European war is uncertain, or the price of copper and the rate of interest twenty years hence, or the obsolescence of a new invention, or the position of private wealth-owners in the social system in 1970. About these matters there is no scientific basis on which to form any capable probability whatever. We simply do not know. (1937, p.217)

It is largely on the basis of this position that much of the Post-Keynesian research agenda is based, while the neo-classical paradigm (including the Rational Expectations school) adopts the Friedman position. Because of the large amount of time series data available on securities, and because of the increasing use of computer-generated investment strategies (which are implicitly based on the Friedman view) it can be argued that capital markets can be regarded as situations of "risk" in the Friedman sense rather than situations of Keynes "uncertainty", at least in the short to medium run. In all that follows, therefore, we shall implicitly be adopting this convention, unless stated to the contrary.

It was intimated earlier that there are many different types of risk to be encountered in the domain of finance and investment. These are all reasonably well-defined and therefore easy to classify. Following Clayton and Osborn (1965) we define the following five risk categories:

(i) **purchasing power risk:** this relates to uncertainty about the purchasing power of the unit of currency (in our case, the Pound Sterling), and occurs as a result of the existence of inflation (or deflation). Consider by way of example the case of an investor who purchases a security promising a fixed rate of interest. Because the interest is usually expressed in nominal terms (ie, in terms of the monetary unit, such as pounds in the U. K.) the security's real rate of interest will depend upon movements in the general price level. This relationship can be demonstrated by use of the well-known equation first posited by Irving Fisher:

$$R_{real} = R_{nominal} - \Pi$$

where **R** represents the rate of interest (with the appropriate subscript) and Π represents the (expected) rate of inflation. Naturally, the greater the volatility of the rate of inflation the more purchasing power risk is assumed.

(ii) **default risk:** this concerns the likelihood that the issuer of a security will fail to honour their obligation, due to (eg) bankruptcy. Securities whose issuers have a long history of punctually meeting their obligations are likely to be considered less risky than those issued by less well-known characters. In addition, the amount of default risk may also be influenced (positively) by the period to maturity of a security.

(iii) **marketability risk:** this depends upon the likelihood that a security can be realised without much danger of loss, and relates directly to the existence and efficiency of any secondary markets. Similarly, following Silber, this category should explicitly include

> ...factors such as imperfect knowledge on behalf of participants in the secondary market or the existence of only a small number of traders in the market account for the fact that an attempt to sell a large block of the security requires a significant decrease in price... (1970, p.8)

Marketability risk is sometimes referred to as reversibility risk, because it relates to the ability of the investor to reverse her decision.

(iv) capital value risk: this arises because there may be uncertainty attached to the security of the principal (the amount of money used to purchase the security). In other words, the greater the likelihood of the market value of any security fluctuating over time the greater the degree of capital value risk involved. According to Ryan (1978, p.53) this kind of risk is likely to be encountered if an investor's assets have longer to go to maturity than his liabilities.

(v) income risk: according to Clayton and Osborn (1965), this occurs because "...interest income cannot be predicted with certainty beyond the maturity and call dates of a security." Ryan (1978) suggests this type of risk to be most likely when an investor's assets have a shorter maturity horizon than her liabilities.

Obviously, each and every financial claim (as well as most real assets!) will possess each of these risk attributes to some degree or another. Nonetheless, purchasing power risk in particular has received quite considerable attention over the past decade or so when a fairly high and often volatile rate of inflation has been the norm. In particular, those securities possessing a fixed face value in money terms, such as bonds, may be cited as being prone to this type of risk. Similarly we may observe that ordinary shares are much less likely to incur any marketability risk than (say) mortgages, for which there does not exist a well-organised secondary market, and certainly nothing to match the London Stock Exchange! It is readily apparent that short-term securities will possess greater certainty with regard to capital value than their longer-term counterparts, and will therefore assume less capital value risk. By way of corollary, this situation is reversed when considering income risk. It should also be understood that the different categories of risk attached to any given financial claim are not an immutable set of characteristics. As we noted in Chapter Two, the financial system is a particularly dynamic sector of the economy, with intermediaries constantly seeking (eg) to innovate either to evade legislative constraints or to improve upon the competition. Thus, (eg) with the appearance of new financial markets and the increased competition due to more trading on older markets most financial assets experience diminishing marketability risk over time. It would seem to follow that the increasing internationalisation of the world's capital markets coupled with sensible deregulation should lead to higher potential returns for investors (especially in terms of a wider range of options) as well as a diminution of risk within almost all of the various categories, and also through the option of an increased geographic diversification.

7.3 Asset Relationships

Given the different types of risk that exist (as outlined above), as well as the security groups to which they particularly relate, we are now in a position to establish certain *a priori* hypotheses about the relationships between particular asset classes. Following Markowitz (1959) and assuming that for any given level of expected yield an investor will wish to minimise their risk via diversification, we would expect securities showing the same risk characteristics to be substitutes within a portfolio. Thus, the ordinary shares of (eg) Tottenham Hotspur plc would seem to be a good substitute for the ordinary shares of London Weekend Television plc, both being within the leisure industry. Indeed, it has often been standard practice to assume all securities to be substitutes to some degree or another,[4] and to a large extent this can be seen as the basis for applying linear programming techniques to the portfolio selection problem. However, it would seem more reasonable to suggest that if the risk components of different securities compensated each other to a large extent (ie, their risk components were independent) we would expect these securities to be used to diversify the portfolio, and hence they may be considered as being complementary. In either case, however, we must first formulate a rigorous definition that lends itself easily to empirical testing. We begin this task by a consideration of the definitions adopted in 'traditional' consumer theory, and then see how these might lend themselves to portfolio theory.

Two commodities, x and y, are said to be substitutes if an increase in the price of good y (P_y) brings about an increase in the demand for good x (Q_x) *ceteris paribus*; in mathematical notation, x and y are substitutes if $\partial Q_x/\partial P_y > 0$. Similarly, x and y are complements if $\partial Q_x/\partial P_y < 0$. In fact, traditional demand theory also makes a distinction between the concepts of **gross** and **net** substitutes, the former being inclusive of the income (or wealth) effect, the latter being net of any income effect. Whether such a distinction is applicable to the securities market remains to be seen, and so discussion of this point is postponed as we must first translate the above definitions into a securities market context. The obvious *a priori* approach would be to define two securities as substitutes if $\partial Q_x/\partial P_y > 0$ and as complements if $\partial Q_x/\partial P_y < 0$, where Q_x represents the demand for security x, and P_y represents the price of security y, etc. However, because it is more convenient (ie, more accurately reflects observed behaviour) we usually express relationships between securities in terms of their yields (or interest rates). Consequently, because there is an inverse relationship between the price of a security and its yield we may define two securities, x and y, as substitutes if $\partial Q_x/\partial r_y < 0$ and as complements if $\partial Q_x/\partial r_y > 0$, where Q_x represents the demand for security x, and r_y represents the interest (or yield) on security y.

So far, so good; but if we are truly to extend these definitions of substitution and complementarity from the traditional goods market to the securities market there are certain qualifications that need to be made. In particular we must concern ourselves with the effects of expectations upon demand. Consumer theory typically abstracts from this, but surely we cannot ignore the role of expected yields when discussing the demand for securities? After all, a security is purchased because the buyer expects a positive future yield on it, unlike a consumer good which typically yields immediate satisfaction (utility) to its purchaser. Further, it is evident that any change in the current rate of interest will influence expected future rates,[5] which in turn are likely to affect the demands for securities in the current period. Therefore we must take account of this effect in the substitution term. In other words, $\partial Q_x/\partial r_y$ should include the effect of r_y on Q_x via its effect upon expected interest rates. This should also apply to $\partial Q_x/\partial r_x$. Because interest rates on securities (especially those of similar maturity) are expected to move together *ceteris paribus*, it is possible that the effects of expected interest rate changes may cancel each other in the relative demands for two securities.

Given these definitions of substitutes and complements as applied to securities we may now formulate their empirical counterparts. It is known that the regression coefficients of an estimated equation are interpreted as partial derivatives[6]—the coefficient a_1 of an explanatory variable X_1 implies that a unit change in X_1 will induce a change of a_1 times that unit in the dependent variable, *ceteris paribus*. If the demand equation for a particular security is specified to include as arguments the own-rate of interest, the rates of interest on other securities plus a portfolio constraint (consumers are constrained by income, whereas a financial institution is more likely to be constrained by its total liabilities), the estimated coefficients of the non-own rates may be interpreted as $\partial Q_x/\partial r_y$. Indeed, this is the precise term that tells us whether x and y are substitutes or complements in this particular investment portfolio. Nonetheless it is still not obvious whether this term corresponds to the gross or net concept of substitution, so we must now consider whether or not the income effect is relevant for the demand for a security by a financial institution.[7]

Unlike consumer theory there is no income effect present in the traditional theory of the firm because there does not exist any budget constraint.[8] However, the situation is quite different for a 'firm' such as a pension fund (or, indeed, any financial institution) for many reasons. Firstly, it is usually assumed that financial intermediaries take their flow of deposits as given[9]—this is obviously the case with the pension funds as we have seen in earlier chapters—and this imposes a constraint upon their behaviour not unlike the consumer's budget constraint. Secondly, even in the case of a firm, its demand for financial assets is usually quite different from its demand for inputs into the productive process. For, although the firm's scale of production may not be limited by any kind of budget constraint, its holdings of financial assets are likely to be limited by some form of wealth constraint (unless, of course, it can issue its own debt indefinitely to finance its voracious demand for financial assets!). Thus it seems likely that a financial intermediary's demand for financial claims will be subject to an income effect.

Given the likely existence of an income effect we must consider whether or not it is included in the estimated regression coefficients attached to the yields (rates of interest); that is to say, are we estimating gross or net substitutability? In the light of the foregoing it would seem correct to suggest that we are determining gross substitutability. If we hold some measure of income (or wealth) constant in an equation—via (say) the inclusion of the stock of liabilities as an explanatory variable—then the effect of the rate of interest on the demand for a security, through its impact on the value of the institution's flow of income (or its wealth), is clearly not excluded from the coefficient on the rate of interest.

Against this it should be noted that, in discussing the estimation of commodity-demand equations, Wold and Jureen (1953, pp.23, 98-111, 116, 242) point out that for market-demand equations there is no direct counterpart of the Slutsky equation and, hence, no direct counterpart to the income effect on an individual consumer. Similarly, when estimating his demand equations for financial assets, Feige (1964, p.35) assumes that the income effect is negligible and thus the coefficients on the non-own rates of interest represent the net substitution concept. Feige models this by imposing the condition that the substitution term between the demand equations for any two assets is symmetrical. This assumption (of the negligibility of the income effect) is also implicit in those models which come under the "Essex School" banner, as we saw in Chapter Six. Indeed, of all the models that we considered in that chapter the only examples of net substitutability were to be found in those models in which the symmetry of the substitution term was imposed as an *a priori* restriction. Thus the empirical evidence would appear to support the view that there does exist an income or wealth effect in the investment behaviour of the various financial institutions.

On the theoretical side support for this premise is to be found in the 1967 article by Royama and Hamada. The authors set out to

> ...develop a theory of the choice of risky assets analogous to consumer demand theory. The effect of the change in expected returns on the demand for assets can be decomposed into two terms: the substitution effect and the income (or wealth) effect. (1967, p.27)

By using a quadratic von Neumann-Morgenstern utility function, the authors develop what they refer to as a "Slutsky equation of asset-choice theory."[10] They are particularly keen to promote the analogy between their equation and that of Hicks in the Mathematical Appendix in *Value and Capital* (1946), and therefore suggest that "We may call the second term the (expected) wealth effect or the future wealth effect" (1967, page 33). Royama and Hamada are able to show quite categorically that "the substitution effect is reciprocal" (page 34), but this depends entirely on the assumption "that the wealth effect is neglected." (page 33). In fact, early on they state that "...the sign of the substitution effect determines whether assets are substitutes or complements" (page 27), but this is simply another way of saying that the authors are primarily concerned with the concept of net substitutability, not that they are suggesting that the income effect can be considered to be negligible. Rather the assumption of neglect of the income effect is "...For simplicity..." (page 39). That they recognise this and that there may be an income effect in practice is borne out when the authors state that the properties they obtain "...hardly gives us any operational relationship with regard to the nature of demand in actual capital markets." (page 37)

Further support, both theoretical and empirical, for the non-negligibility of the income effect may be found in the more recent paper by V. Vance Roley (1983). He explains that:

> The symmetry restriction in a system of financial asset demands has frequently been employed to reduce the number of independent parameters to be estimated.

> Despite the usefulness of constraint in empirical applications, the symmetry restriction imposes a behavioral assumption on the model which may not conform to actual portfolio behavior. In particular, a system of financial asset demands with a symmetric coefficient matrix implies that investors exhibit constant mean-variance risk aversion with respect to the mean of the argument of the utility function. (1983, p.129)

Roley substantiates his argument with empirical evidence which he derives by testing the symmetry restriction in a disaggregated model of the United States' market for Treasury securities. His results "...indicated that the symmetry restriction could be rejected at low significance levels in virtually every test." In addition, we may also cite once again the study by Wold and Jureen (1953). Although they refer to there being no income effect, this is with particular reference to the market-demand equations, ie, the demand for an asset on aggregate, rather than by a particular investor or group of investors. To suggest that for the market as a whole there is no income effect is a very different proposition from suggesting that an individual investor is not subject to an income effect. Most of the models we considered in Chapter Six were attempting to explain the behaviour of certain single elements within the market, ie, the investor, either as an individual or institution. It would be no exaggeration to say that in all of the papers in which net substitutability between assets was imposed no adequate behavioural explanation was offered for the adoption of such an assumption. Consequently, in the model we construct later on in this paper we shall adopt the assumption that the coefficients on the non-own rates of interest (yields) represent gross substitutability. Obviously if we are to adopt such an approach we are automatically ruling out the use of a model along the lines laid down by the "Essex School", despite its apparent advantages in terms of theoretical rigour.

7.4 The Asset Categories

We have previously made mention of our concern in this paper with the underlying motivations behind the strategic investment portfolio decision; that is to say, how the pension funds allocate their funds across various broad categories of asset. We shall not concern ourselves in any depth regarding the tactical portfolio decision, ie, how the funds are allocated among the various individual securities within any one of these asset categories, although we concede that this is indeed an important area of study that might possibly have a bearing on our own investigation. Nonetheless, to consider all the available securities together, regardless of the category into which they fall, would be a monstrous denial of our observations on the 'real world' for, as we have seen, this is not the *modus operandi* of the pension funds. To reiterate briefly: the pension funds operate initially via a trustees' decision to allocate various amounts of their current income (in either absolute terms or percentages) to various categories of asset; the decision as to which individual securities are to be purchased (or even sold off) is usually considered as one of detail and left to either one of the pension fund's employees—such as the equities investment manager, gilts manager, etc—for those with "in-house" investment management, or to the fund's outside advisors—such as banks, stockbrokers, etc—or to a combination of the two.

In common with many other studies of an empirical nature the degree of aggregation we adopt may have some bearing on the results we obtain, and this should be borne in mind when considering the possible interpretations of the estimates. However, in this paper the asset categories are exogenously determined to a very large extent by circumstances beyond the author's control. For example, there is the problem of the existence (or, more appropriately in our case, the non-existence!) of published data. In the United Kingdom the pension funds are not legally required to publish annual accounts, and many therefore do not. Similarly, many do not even respond to the questionnaires sent out by the Central Statistical Office (CSO),[11] from which the data for such publications as Financial Statistics are culled. Consequently even those data which are available are (highly) suspect with regard to measurement error. We must also remember that we are trying to construct a model to explain the investment behaviour of the pension funds as observed, and so the asset categories we adopt should be the same as those used by the pension funds in their decision-making process. These asset categories must also be chosen in such a manner that the assets within a category are highly similar in terms of both risk and return characteristics. Consequently the asset categories we adopt in the construction of our model correspond with those found in the major journals of relevant statistics[12] and are as follows:[13]

(i) **government securities:** these are bonds issued by the central government in the United Kingdom and are often referred to as "gilt-edged" securities (or just "gilts"), an indication of the low levels of risk that investors attach to their holding. Indeed, these securities would appear to be subject to purchasing power and capital value risks only. Because of the existence of a well-organised secondary market and the apparent non-existence of default risk, gilts are frequently viewed as a totally risk-free asset which, therefore, may be used as a yardstick against which the characteristics of other financial assets can be measured. Although government securities are issued possessing a wide variety of maturities, following the practise of data-publishers we adopt three maturity categories: **short gilts** are those government securities with a maturity of less than five years; **medium gilts** are those with a maturity between five years and fifteen years ; and **long gilts** have a maturity in excess of fifteen years. This latter category also includes **undated gilts** (including perpetuities, such as Consols) due to published data inconsistencies. In general it is the case that short-dated securities have low capital value risk but are subject to a high degree of income risk (because the proceeds from redemption must be reinvested at the prevailing rate of interest), while the reverse is true of long-dated securities, although as we have already discussed this is not of particular concern to the United Kingdom pension funds. Beginning in 1981 we find the introduction of a new form of long-term gilt, that of **Index-Linked Treasury Stock**. The major difference between this and the traditional long-term gilt being that the interest payment on Index-Linked Treasury Stock is tied to the rate of inflation in the U. K. at the time of issue.

(ii) **U. K. local authority securities**: in most respects these are similar to gilts, the major difference being that they are issued by local rather than central government. They are normally regarded as possessing more default risk than gilts in spite of the fact that no local authority in the United Kingdom has ever defaulted on its debt. However, they are more prone to the other types of risk than are gilts. Because there is a smaller issue of local authority securities than comparable gilts, and because they are traded less frequently, their market is regarded as being somewhat 'narrow', implying a marketability risk not found with gilts. This is compounded by the fact that a substantial proportion of United Kingdom local authority securities are unquoted (unlisted) and therefore not readily tradeable on a secondary market. Although U. K. local authority securities are of various maturities they are aggregated into a single asset category mainly because they account for such a small fraction of the pension funds' portfolio.

(iii) **overseas securities**: although in theory this category comprises both equity and debt instruments further analysis reveals it to be predominantly composed of securities issued by overseas governments at both central and local levels, at least in the period prior to the mid-1970s. After 1975 we find published data on both domestic and overseas ordinary shares, and a similar disaggregation for loans and mortgages. Obviously the demand for overseas assets, regardless of issuer, will be dependent upon the (risk-adjusted) yield differential of any foreign asset and its domestic counterpart.[14] Nonetheless, throughout most of the period of study there has been a series of exchange controls in the United Kingdom (and elsewhere) which, in all probability, has limited the overseas investments of the pension funds to a small fraction of their total holdings. Certainly, the amount of overseas investment undertaken by the pension funds has increased, in both absolute and relative terms, since the virtual abolition of exchange controls in October 1979.[15] Before this, overseas portfolio investment had to be financed by foreign currency loans or by the purchase of foreign exchange from other investors who were selling overseas assets or by swaps (the exchange of British financial asset ownership for ownership of overseas assets). It is readily apparent that these are much more costly (in terms of time, effort, etc) than direct investment in overseas assets.

(iv) **debentures**: these are bonds of various maturities which are issued by the private corporate sector of the economy and, issuer apart, are similar to both gilts and local authority securities. However, unlike these latter financial claims, it has been known for a company to default on its debt from time to time, and so debentures are usually regarded as more risky than government-issued securities. Demand for debentures, therefore, depends upon the trustees' considerations of the extent to which their yields should exceed those on gilts of similar maturity in order to offset the disadvantage of their comparative lack of marketability and security.

(v) **preference shares**: these are regarded as equity assets, although the holder of preference shares is entitled to a fixed rate of interest on their holdings. This interest payment is a prior charge on the profits of the company and must, therefore, be met before any dividends are distributed to ordinary shareholders, etc. One result of this is that preference shares are often grouped together with debentures, especially where preference shares constitute a small fraction of the total portfolio. The issue of preference shares has diminished dramatically since the introduction of Corporation Tax in 1965, a point which is considered in detail on page 277.

(vi) **ordinary shares**: bring up the subject of equities in conversation and most people will automatically think of ordinary shares. Unlike the holder of bonds, the ordinary shareholder is a part-owner of the issuing company and, accordingly, possesses voting rights which (at least, theoretically) gives them a say in the decisions of that company. The 'cost' of this right is that the income to be received from holding ordinary shares is not fixed or guaranteed in any way. Rather, the holder is entitled to whatever share of the profits after tax and prior charges (i.e. interest payments to debenture and preference share holders) the directors deem appropriate. Over the shorter period the price of an ordinary share can be quite volatile as the result of speculative investment behaviour, yet over the longer term the price of an ordinary share is more likely to reflect the underlying value of the firm. Consequently, for the longer-term investor ordinary shares would appear to provide a good hedge against inflation as the value of most firms (listed on the Stock Exchange) tend to move in tandem with movements in the general price level. They are, therefore, an attractive holding for the pension funds.

Ordinary shares are also advocated on the grounds that dividend levels will be affected by general economic conditions in broadly the same way as earnings levels—although their attraction still depends upon their profitability vis-à-vis other investments. Another attractive feature of ordinary shares is the existence of a well-established secondary market—the London Stock Exchange—which virtually eliminates marketability risk.

The extent to which an individual fund may invest in those companies whose employees are its members—the 'parent' company—is not explicitly limited by law, even where there may be a clear conflict of interests. Clearly there can be no objection to investment in such a company to the extent dictated by the normal requirements of a balanced portfolio, but it is undesirable for both economic and political reasons. Firstly, such an investment lays itself open to charges of manipulation.[16] Secondly, if a large part of the pension fund were invested in the parent company, then the accruing pension benefits would not be backed up by assets whose worth was independent of the prosperity of the employer. Thus if the employer became bankrupt, not only would the employees lose their jobs, but also their prospective pension benefits would be in jeopardy. This criticism only applies with such severity to investment in the ordinary shares of the parent company.

(vii) **unit trust units**: the holder of unit trust units is the holder of a part-share in a diversified portfolio of ordinary shares. Thus the main advantages and disadvantages of ordinary share investment apply. However, unit trust units have a special appeal to the smaller investor (such as the smaller pension fund) who are thereby able to achieve a greater degree of diversification than would otherwise be possible; this is not to say that they have no appeal for the larger pension funds. The taxation position for the pension fund remains the same as if the ordinary shares had been purchased directly. The risks involved in the purchase of unit trust units are the same as those pertaining to the purchase of ordinary shares generally, although the diversification achieved via this medium may reduce the degree somewhat. Because unit trust units are essentially portfolios of ordinary shares, they are often aggregated in with ordinary shares, especially where unit trust units form a small fraction of the total portfolio held (or acquired) by a financial intermediary.

(viii) **property unit trusts**: this asset category is much the same as unit trust units with the exception that here the unit trust's portfolio consists entirely of companies which specialise in land and property. To the extent that such a portfolio is less diversified than a more general unit trust it may be regarded as involving more risk. Nonetheless, it is an indirect method of investment in property (itself regarded as a good hedge against inflation) and, therefore, holds special appeal for the smaller pension funds and those wishing to expand the property holdings of their portfolio without incurring the necessary expenditure on expert advice.

(ix) **land, property and ground rent**: the main attraction of investing in property is that it offers an immediate yield which is often higher than that obtainable on other assets, as well as the prospect of rent increases in the event of future inflation. Direct investment in a property company is usually not undertaken as the dividends paid out will be from income after the deduction of corporation tax. Thus it is advantageous, with regard to taxation, for the U. K. pension fund to invest directly in property or, as we have already suggested, through the medium of a property unit trust. Because of the need for a specialised knowledge in the acquisition and management of real estate direct investment can only be undertaken by the larger pension funds. Furthermore, only a large fund could purchase sufficient high-class properties to obtain a reasonable spread. The major risk involved in the purchase of land, property, etc. is that of marketability; there does not exist a highly efficient, organised secondary market for property and, therefore, it is not easy to dispose of. In addition, because property is not usually purchased by a single payment rather than by a series of payments over a number of years, the fund that invests in property must be fully aware of the long-term nature of its commitment.

(x) **loans and mortgages**: although pension funds do not formally issue claims against themselves (the pension contract notwithstanding) they do, on occasion, lend money by way of loans and mortgages. The main types of risk that ensue from such activity are those pertaining to marketability and default. The relative lack of any secondary markets for these assets in the U. K. means that they are subject to a high degree of marketability risk. Although there is little that can be done to reduce this, careful consideration of prospective borrowers can virtually eliminate default risk.

(xi) **short-term assets (net)**: consisting mainly of money (in its broader sense) and near-monies, as well as various bills (Treasury, commercial, etc.), this category of assets is demanded for various reasons, such as the regular and frequent disbursement of benefits to entitled members. Additionally, we have discussed elsewhere the usefulness of short-term assets in a portfolio when longer-term assets appear to offer unfavourable opportunities. Thus there is a degree of income risk attached to the holding of short-term assets by pension funds. The inclusion of the "net" term indicates that the pension funds have an occasional penchant for borrowing, predominantly for the short run, when they do not possess enough liquid assets to pay out current benefits.

(xii) **other**: this is the ubiquitous "catch all" category used to cover any assets not included in any of the previously described categories. Indeed, the topical fine art collections of some pension funds as well as other esoteric investments find inclusion here. Because of the potential breadth of this category we must necessarily endow it with a high degree of all types of risk, although some of these may well be diversified away within the category itself. This category is best considered as being one of residual demand for assets claiming only a small fraction of the portfolio on an individual basis, but significant when aggregated. Anecdotal evidence would seem to suggest that this is not an unreasonable approach. After all, it was not developments within the art market that prompted the pension funds to buy *objéts d'art* for their portfolios; it was the relatively poor performance and prospects offered by the 'traditional' capital markets.

7.5 Trends in Pension Fund Investment

In Chapter Two we discussed in some detail the rôle of financial intermediaries in the economy. As we saw, in common with other financial institutions the pension funds' rôle is the efficient transfer of funds from savers to investors. In spite of this common economic rôle, we may, however, distinguish the pension funds from other financial institutions by a balance sheet comparison. This is because the particular specialism that a financial intermediary adopts is largely in response to the demands of surplus units for a haven for their surpluses. It therefore follows that the distinguishing features of a financial intermediary are manifested through the liabilities they issue which, in turn, is a major influence on the assets which they hold. In this way, we can see that a balance sheet comparison provides useful insight into the operations of financial intermediaries.

On the liabilities side the pension fund's only liability is in the form of a contract to deliver from some specified date specific amounts of money in a prescribed manner for which it currently receives income by way of contributions (see Table 7-1 above). Such contracts are very definitely non-marketable and, therefore, highly illiquid. However, as these contracts involve a long term commitment on the part of the pension fund, the investment assets they purchase have at least to honour this. In other words, the liabilities of a financial institution should be one of the major determinants of its investment portfolio distribution. An institution with short-term liabilities would be expected to invest primarily in short-term assets, and so on.[17] Although the liabilities of a pension fund are inevitably long term they do also invest in assets with a wide range of maturities. Why they should choose to invest in any particular asset (and short-term assets in particular, given the long-term nature of their liabilities) is the subject of this paper's investigation. However, no scientific explanations will be put forward at this juncture. What is more appropriate at this point is a detailed consideration of the portfolio of the pension funds over recent decades. For convenience we consider the pension funds as an aggregated group in the first instance and then look at the individual positions of the private, Local Authority and (other) public sectors that make up the pension fund industry.

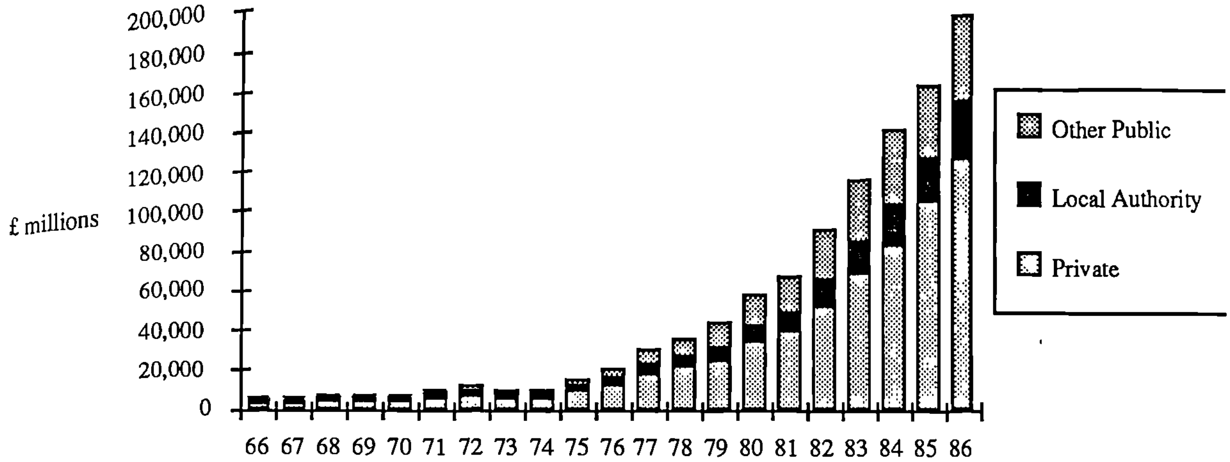
7.5.1 The Pension Funds' Portfolio—An Overview

As we have already seen in earlier chapters, the pension funds control a large proportion of the personal (or household) sector's savings which they invest on their behalf in order to provide a guaranteed retirement income (i.e. pension) in the future. In Table 7-1 we illustrated this link between the pension funds' sources and uses of funds. In this section we wish to analyse in some detail the actual balance sheet data for the pension fund industry and its net acquisitions of assets; this latter item, as we have noted, is made up of both the disbursement of new monies and the sale of (some) existing assets. This will require an examination of the financial markets within which the pension funds participate in terms of their relative holdings and share of turnover. Such an examination is crucial because the pension funds operate within a given financial system and if we are to understand and explain the asset holdings of the pension funds and their investment policy it is essential that we know something about the environment within which these decisions are made. We have already embarked on such a task in our earlier overview chapters, and the task is completed in detail in Chapter Eight. For the time being, however, we concentrate on a consideration of the pension funds' balance sheet and net acquisitions positions over recent years.

7.5.2 The Aggregate Position

In Table A-1 we show the data for annual aggregate pension fund holdings in (almost) all of the major asset categories described earlier, for the years since 1971. This data has also been calculated as percentages of net total investments and this appears in Table A-2. In considering these data we also need to bear in mind that in some cases they are not always directly comparable, because although almost all figures are being quoted at market value, some others (albeit only very few, and only in the local authority sector) are quoted at book value. Because this information pertains to the pension funds as a large single group the inferences we can make are somewhat limited, as is the case with any aggregation. However, bearing this in mind the data do exhibit a series of interesting patterns that offer a revealing glimpse into the investment behaviour of the U. K. pension funds. Before we do this it is probably worth considering the relative proportions by which the pension fund industry is made up of its three component parts: the private sector, public sector, and local authority funds. This can be easily seen from Figure 7-1. In all years the private sector funds account for the largest percentage and the local authority funds the smallest in terms of pension fund holdings. Although not illustrated here, this is also mirrored in the net acquisitions data. From the figure we can see that the private sector funds account for at least fifty per cent of all pension fund holdings, often much more. While the local authority funds account for the smallest percentage of pension fund holdings, their share since 1972 is at least a significant eleven per cent, and is even as high as some fifteen per cent on occasion. The other public sector funds account for anywhere between twenty per cent and one-third of all pension fund holdings.

Figure 7-1: **All Pension Funds—Balance Sheet at market values**



A first look at the two tables immediately reveals two striking features. The first is that the portfolio is widely diversified, with a spread of assets unmatched by the other financial institutions with the possible exception of the life insurance companies.[18] It is this tremendous diversification that we shall be trying to account for in later chapters. The second feature is the apparent stability in the portfolio proportions over the 1970-1985 period, a period of time during which financial innovation occurred at an ever-increasing rate. Figure 7-2 illustrates this quite clearly. Although there are very definite trends in the holdings of many assets by the pension funds, perhaps representing changes in the pension funds' investment policy, these are also remarkably smooth with the possible exception of the 1973-1975 period which may be considered as somewhat atypical, a point which we discuss in detail below. (To a lesser extent the 1981-1982 period may also be regarded in a similar vein). What is perhaps even more surprising is the relative speed with which the pattern of holdings settles down to its previous path following this apocalyptic period! Taking a bird's eye view of the trends in the asset distribution for now we notice that over the fifteen-year period, 1970-1985, the holdings of virtually every asset category in absolute terms (ie, in millions of nominal Pounds) has risen (see Figure 7-3 by way of illustration). This is as one might naturally expect during a period of time when double-digit inflation was the rule rather than the exception, and there were an ever-increasing number of contributors.

Perhaps the most noticeable exceptions are the categories of United Kingdom Local Authority securities, LAMIT (the Local Authorities Mutual Investment Trust), and loans and mortgages. Similarly there would appear to have been only marginal changes in short-term gilts (those with a maturity of less than five years), as well as in debentures and preference shares. Certainly for the period for which data for (eg) preference shares alone is available (1970-1975) there is a noted decline in their holdings, in both nominal and percentage terms. To a large extent this is likely to be due to the decreasing numbers of preference shares being issued over that time period, a phenomenon Dodds (1976) refers to as "Say's Law of financial markets".

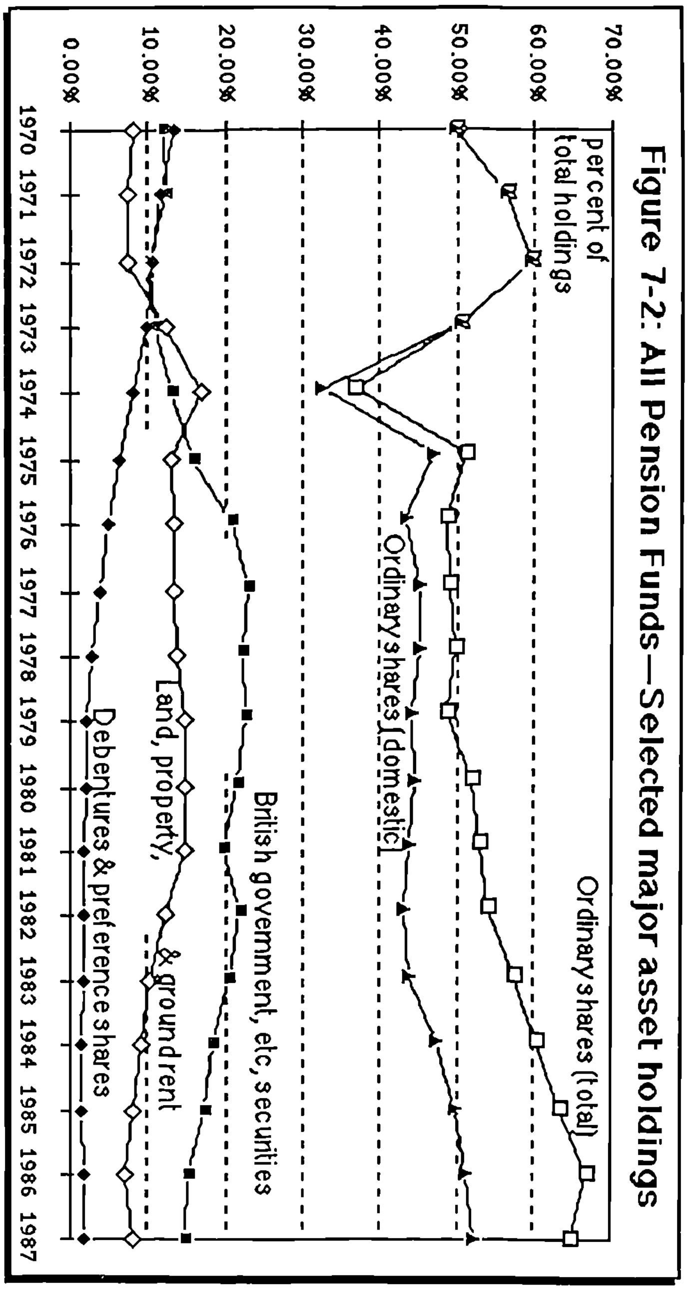
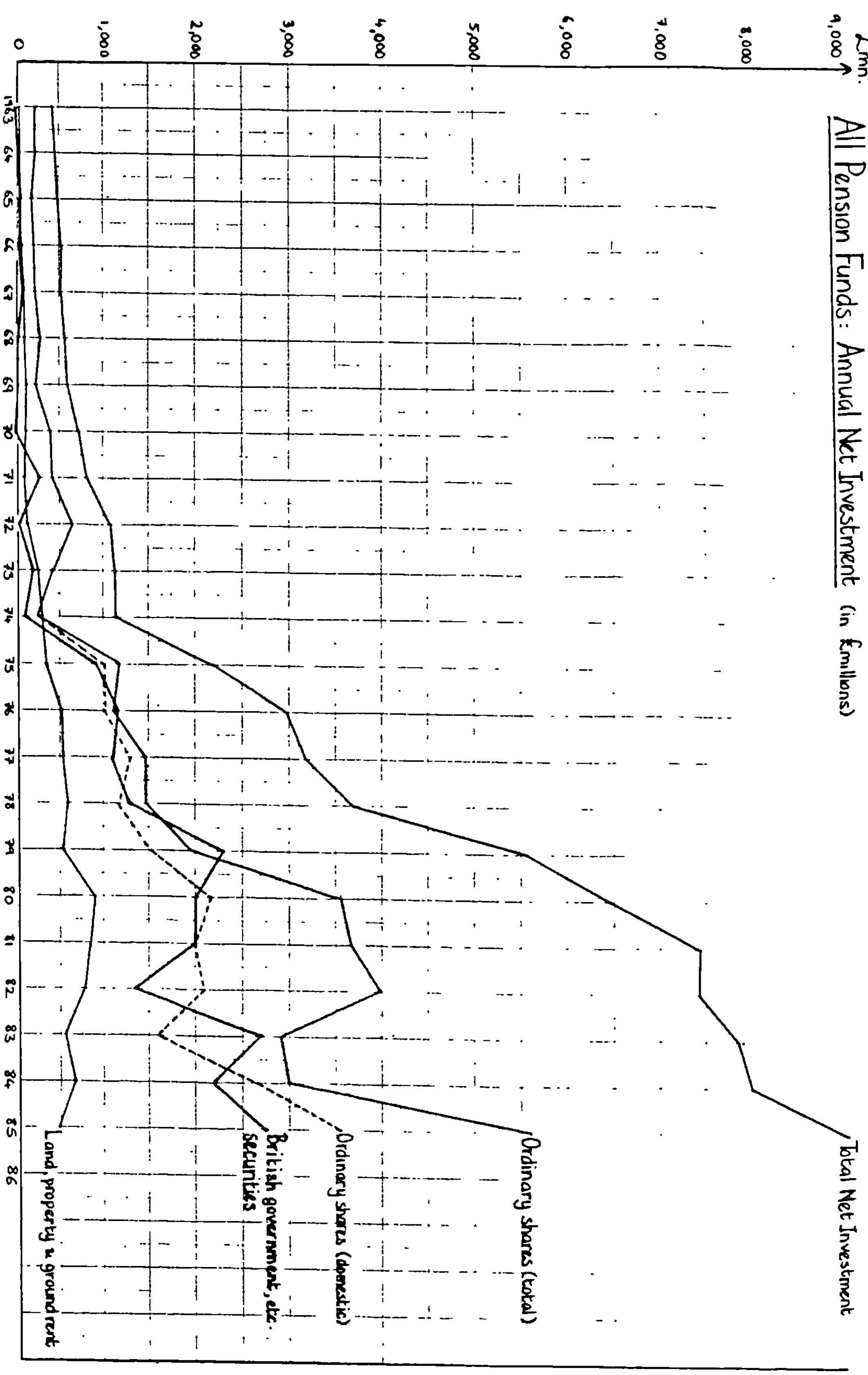


Figure 7-2: All Pension Funds—Selected major asset holdings

Figure 7-3: Annual Net Investment by All Pension Funds



The picture for holdings of short-term assets (in percentage terms), however, shows no definite monotonic trend over the data period, but rather exhibits an almost cyclical pattern that follows the business cycle. This should not really come as much of a surprise given that the pension funds are more likely to hold a greater proportion of liquid assets during a period of uncertainty such as a recession. For example, we notice that in 1974 the holdings of short-term assets doubles from the previous year which might be accounted for as follows: Following the (initial) OPEC-induced oil crisis there was also an almost catastrophic secondary banking crisis[19] (which followed the speculative bubble in property with which Slater-Walker is associated). These two factors in particular brought about an almost unprecedented lack of confidence in Britain's financial system as indicated by the decline of the Financial Times industrial ordinary share index from 261.9 in December of 1972 to a low of 68.4 in December of 1974. Unsurprisingly, interest rates also rose by at least two percentage points over 1974. Consequently with this uncertainty surrounding the stability of the financial system in the U. K. and the simultaneous breakdown of the Bretton Woods regime of international financial arrangements it is no wonder that the pension funds took up with assets of fairly short-term maturity rather than their more 'traditional' long-term claims in the 1972-1974 period. It is also comforting to note that as stability became restored in the ensuing years the funds reverted to their more usual approach, and as they switched out of short-term assets they replaced them with claims of a longer maturity. This pattern is revealed once again in the 1979-1982 period, during which the U. K. economy again moved into recession.

In looking at the longer-term securities we find that holdings of unit trust units have exhibited the most growth, being almost one hundred and fifty times greater in 1985 than in 1974, up from a negligible amount in 1970. Similarly the pension funds were holding nearly thirty times as many overseas government securities in 1985 than in 1970, and even this was a doubling of the 1983 figure. The decline in holdings of overseas government securities between 1971 and 1974 presumably had much to do with the instability following the breakdown of the Bretton Woods system of international monetary arrangements and the associated international problems. Another significantly large increase—fifty-four times—is exhibited by the pension funds' holdings of overseas ordinary shares. This general trend of increased holdings of overseas assets may be regarded as the result of two trends over the data period: first, there has been an increasing erosion of exchange and other controls in both the United Kingdom and elsewhere. Second, the increasing efficiency of technology in the transmission of information has led to an ever-increasing internationalisation of the World's capital markets, to the point that many commentators now regard them as a single World capital market. The combination of these two factors have surely enabled the pension funds (as well as other investors) to reduce portfolio risk by the pursuit of a wider geographical diversification of assets and increase the potential return from a greater range of markets, such as being able to invest in economies with (eg) higher growth rates and capital gains than the United Kingdom due to changes in exchange rates, etc.

Holdings of British government securities have varied but only within a fairly narrow range. While there has been a relative decline in their holdings of short-term gilts the pension funds have largely offset this by substantially increasing their holdings of medium- and long-term gilts over the same 1974-1985 period by forty and twenty-three times respectively. Notice that each of these growth rates exceeds the rate of growth of increase in prices, indicating the pension funds' belief that the yields on these assets would exceed the inflation rate. In absolute terms all maturities of gilts show little volatility, with the short-term declining in favour of increasing holdings of longer-term gilts over the 1974-1982 period and again after 1984. It is worth noting at this point that from 1981 onwards the percentage of the portfolio allocated to long-term central government securities has declined, although the amount going to long-term gilts has declined to a greater extent. This would appear to be partly because some of these longer-term funds have been shifted to the acquisition of Index-Linked Treasury Stock, which did not exist prior to 1981. One might speculate that it would presumably have been the case that these funds would have been in long-term gilts had the Index-Linked stock not been issued. This decline in the holdings of gilts would appear to have been counterbalanced by increasing holdings of overseas ordinary shares, which is in all likelihood a reflection of the pension funds' perception of the relatively poor growth prospects of the United Kingdom economy.

Many of these inferences would tend to be substantiated by the information in Table A-2, and Figure 7-2. We can readily see that short-term gilts, U. K. Local Authority securities, debentures and preference shares, LAMIT, loans and mortgages, and short-term assets (net) all declined in terms of their share of the aggregated pension funds' portfolio. Equally, those assets such as medium- and long-term gilts, ordinary shares, etc. increased the percentage of the portfolio they accounted for over the data period (notwithstanding the decline in holdings of gilts since 1982). In the previous paragraph we have put forward some *a priori* hypotheses to explain some of these trends, but these need to be tested more rigorously, such as by way of an econometric model, a procedure that is postponed until later. The decline in holdings of preference shares, both in absolute terms and in terms of portfolio proportions is readily attributable to their decline in popularity as a means of raising corporate finance following the introduction of Corporation Tax in 1965. Under this 'tax innovation' loan interest payable on debentures was allowed as tax-deductible, a privilege not extended to interest on preference shares. One further point of note concerns the fairly stable proportions of the portfolio accounted for by government securities (gilts) and domestic ordinary shares, about twenty-one and forty-three per cent respectively. The only major discrepancy occurs during 1974, an atypical recessionary period, as we have already pointed out.

It is readily apparent that the pension funds' portfolio is dominated by three major types of asset: ordinary shares, government securities and land, property and ground rent respectively. What is not so apparent yet a fascinating feature of the holdings data is that substantial changes in the holdings of ordinary shares seem to be offset by opposite changes in the holdings of land, which may also be regarded as an equity asset. This would tend to be confirmed by examining the trends in Figure 7-2. Although these offsetting movements are not equal it does indicate that the pension funds regard these two asset categories as being substitutes to a large degree.

A final comment on the annual holdings data is to note the increasing proportion of the portfolio accounted for by the residual category ("other assets"). Were we to disaggregate this sector even further we would notice that over the data period the various assets that make up this category have increased in number, a reflection of the ever-present phenomenon of financial innovation. As any asset and its secondary market becomes more established it is likely to account for an increasing proportion of the pension funds' portfolio simply as a result of diversification. Indeed, over the years the pension funds have increased their holdings of some assets in this residual category to such an extent that they now warrant inclusion on their own merit. Examples of this include overseas ordinary shares, unit trust units, overseas loans and mortgages, etc.

Although the annual holdings data do indeed give us a good start in examining the investment behaviour of the pension funds it is really just an exercise in comparative statics. We can get further information by considering the dynamics of pension fund investment behaviour. This we do by considering their net acquisitions data. What these data reveal are the variations in the allocations of funds to the various asset categories. That is to say that year by year the pension funds can change the nature of their portfolio by utilising the net inflow of new monies as well as by the purchase and sale of securities to arrive at the net acquisition of a particular asset and, *in toto*, the net acquisition of all assets. In other words, it is as a result of the flow of net acquisitions that the stock of annual holdings comes about. The net acquisitions data presented in Tables A-15 and A-16 give a rather different picture of the pension funds' portfolio. It is interesting, although perhaps not surprising, to note that total net acquisitions in nominal terms exhibit a monotonic upward growth trend on an annual basis, although the quarterly figures are much more variable.

At first glance, save for the fact that the net acquisitions of longer-term gilts and ordinary shares are substantially greater than for virtually all other asset categories—being of the order of thousands of millions of pounds in recent years—few obvious patterns emerge. Very few of the asset categories appear to have been "buy only" or "sell only", as indicated by the sign. Perhaps the only major note of consistency lies in the fact that the asset categories tend to exhibit either double-digit or single-digit percentages of total net acquisitions. For example, the three asset groups which dominate the pension funds' portfolio, land (including property and ground rent), longer-term gilts, and ordinary shares (both domestic and overseas) unsurprisingly account for double-digit percentages of total net acquisitions, while all other categories are of single-digit percentages. Nonetheless, a glance at Figure 7-3 does reveal certain investment patterns over the 1963-1985 period which tend to corroborate many of the inferences made from the annual holdings data. Firstly, we note that, while there is a definite upward trend, the rate of growth of annual net investment does vary from year to year. In fact, while the period between 1963 and 1969 shows a fairly constant rate of growth, this is followed by a somewhat higher growth rate until 1972. The rate of growth seems highest in the period between 1977 and 1981, after which it tends to slow down once again. Of course, some of the explanation of the rate of growth lies in the underlying rate of inflation. We should also note that there are two periods in which the annual net investment of the pension funds actually declines in nominal terms: 1974 and 1982. Once again, these periods are those of the two major post-War recessions in the British economy, despite which the total net investment of the pension funds exhibits a remarkably stable upward trend.

The net acquisitions of each of the individual asset categories exhibit rather less stability, however. Figure 7-3 reveals that the major assets of ordinary shares, gilts, and land do not show the same monotonic increase as total net investment. In the periods of the two major recessions the net acquisitions of these assets is much more volatile, especially in the case of gilts and ordinary shares. Taking the private sector securities which largely dominate the portfolio, company securities do not appear to take a set proportion of the flow of funds. In some years they accounted for around fifty per cent while in other years the proportion has fallen, with the lowest figures occurring in the atypical 1973-4 period. It is apparent that the trend is cyclical. As with the holdings data the trend for ordinary shares is reversed for land, property and ground rent, so that this latter category also exhibits cyclical properties albeit of the reverse nature. Figure 7-3 also seems to imply that there is a substitute relationship between gilts and ordinary shares, as indicated by the increasing net acquisition of one corresponding to a decreasing net acquisition of the other. The only time this relationship does seem to breakdown somewhat is between 1974 and 1975 and also between 1978 and 1979, ie, immediately following the two oil-price shocks. This substitute relationship would appear to be further confirmed by the percentage data and also illustrated by Figure 7-2. In fact, this figure would appear to indicate that, in addition to gilts, land and debentures and preference shares are also substitutes for ordinary shares.

While the net acquisitions of the major assets of gilts, ordinary shares and land are more volatile than total net investment, they are relatively stable by comparison with the net acquisitions of other assets in the pension funds' portfolio. For example, while the net acquisitions of major assets both increases and decreases over the 1963-1985 period, there are only two occasions on which the pension funds actually divest themselves of them; these are the years 1963 and 1970, when we find the pension funds net acquisitions of gilts to be negative. (This could mean that either the pension funds are actively selling off some of their holdings of government securities or that the price of government securities has declined to such an extent that it has offset any increase in the number of gilts purchased, thereby leading to a decline in the nominal value of net acquisitions of gilts.) Those assets which comprise smaller percentages of the pension funds' portfolio do not exhibit this same tendency; while on many occasions they are the subject of acquisition there are also many occasions on which we find them the subject of divestment. By way of example, consider U. K. local authority securities. Between 1963 and 1968 the pension funds seem to be quite happy to continue to acquire these for their portfolios, albeit in increasingly smaller amounts. However, between 1969 and 1972 there seems to be a major sell-off of these assets, which is especially marked in 1971 with net acquisitions of some minus sixty-two millions of pounds worth of local authority securities. From 1973 on there is no particularly discernible pattern of net acquisitions, with periods of positive acquisition being followed by periods of divestment but not in any regular or cyclical manner. Similar comments would seem to apply equally to the net acquisitions of the other 'minority' assets with the following additional noteworthy points. Net acquisitions of both forms of unit trust units (ie, authorised and property) appear to have an upward trend over most of the 1963-1985 period, perhaps reflecting the growth of smaller pension funds seeking already diversified investment media. However, property unit trusts decline in popularity in the very late 1970s, a decline matched soon after by land acquisitions, while unit trusts maintain a modest growth rate apart from a sudden dramatic burst of interest in 1982 and 1983. Despite showing a high degree of volatility loans and mortgages would appear to exhibit a waning popularity over the data period, with declining but positive net acquisitions until the mid-1970s followed by a major sell-off for the remainder of that decade and steadily declining net acquisitions throughout the 1980s. All of these comments would appear to be borne out by the percentage data.

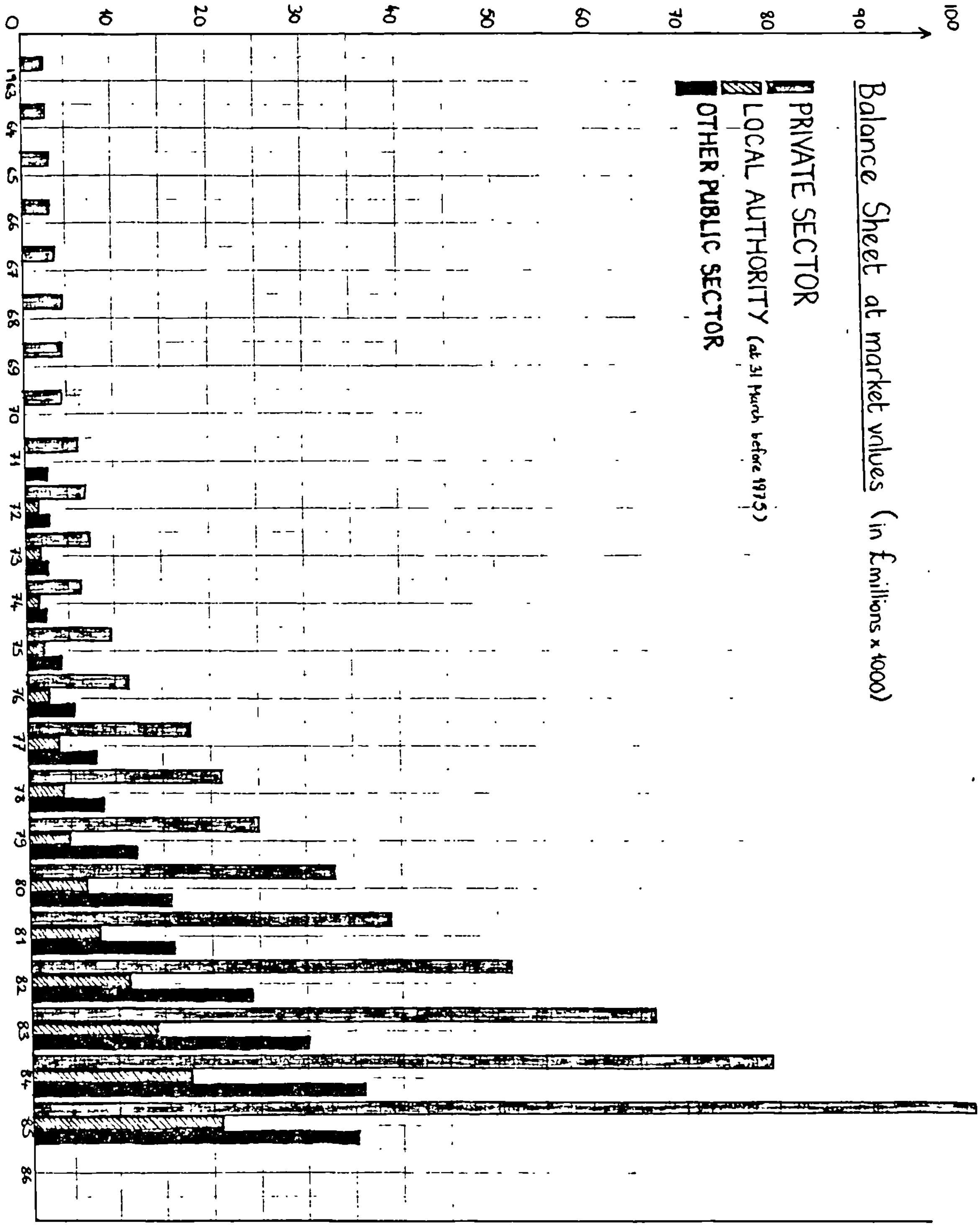
Throughout the foregoing we should bear in mind that, of course, these are annual net acquisitions data and therefore likely to indicate only longer term investment trends. However, the quarterly net acquisitions data (not reproduced in this Thesis) sheds no further light on the pension funds' investment behaviour; indeed, as we have previously mentioned, the quarterly data appears to be even less patterned than that on an annual basis. That the net acquisitions should appear so inconsistent might seem somewhat surprising at first glance, especially in view of the consistent nature of the data on annual holdings. However, further examination reveals two possible reasons that might explain this discrepancy. Firstly it should be noted that this data is for **all** pension funds within the United Kingdom and, while they might exhibit consistency with their holdings, this may not be the case with their net acquisitions if one sector of the pension fund industry dominates the overall picture by virtue of being more active in the capital markets. A second hypothesis is that the pension funds, at any point in time, have in mind a desirable portfolio of assets that they are trying to achieve, and the annual holdings data is a representation of the actual outcome—that is, a portfolio that is either a complete or partial attainment of the desired portfolio. The net acquisitions data, on the other hand, represents their attempts to get to their desired portfolio in any year/quarter[20] and is therefore likely to be much less consistent on two grounds. Firstly, the desired portfolio itself is likely to change over time as expectations adjust to changing circumstances in the financial (and other) markets. Secondly, some deviations are likely to occur as portfolio managers make investments that were not originally planned but are deemed currently opportune. As we have already alluded, a more consistent picture might emerge when we disaggregate the pension fund industry into its three component sectors and then examine that data, which we now do.

7.5.3 The Private Sector Position

In Tables A-3 and A-4 we present the annual holdings of the private sector pension funds in millions of Pounds and percentages respectively. Because the private sector funds account for the lion's share of all industry holdings (58 per cent in 1982, 59 per cent in 1978, 61 per cent in 1975, for example. See Figure 7-4 and Table 7-2 by way of illustration.) we would expect the pattern that emerges here to be not so very different from that for the pension fund industry as a whole. In fact, that turns out to be very much the case. There are significant increases in all categories except United Kingdom Local Authority securities, which actually decline substantially, and marginal increases in short-term gilts and loans and mortgages (which declined for the industry). Once again, we note the fairly large increase in holdings of overseas assets in the current decade. Following 1980 we note a significant increase in holdings of overseas ordinary shares with a similar trend in holdings of government securities after 1981. The explanation put forward earlier applies equally here. As with the industry data, we note smaller increases in the holdings of short-term gilts and also debentures and preference shares. In this latter category we note that by 1973 holdings of preference shares had dwindled to virtually zero. Finally, once again, we note an increasing percentage of long-term gilts holdings being accounted for by Index-Linked Treasury Stock, following their introduction in 1981.

Perhaps the major inconsistency between the private sector and the industry data lies in the short-term assets (net) category which showed only a marginal increase for the industry yet exhibits rather more substantial growth

Figure 7-4: All Pension Funds—Balance Sheet at market values



for the private sector funds. Because the private funds form such a large proportion of the pension fund industry such a discrepancy must give some cause for concern. The simplest *a priori* explanation lies in the different investment strategies adopted by funds in different sectors. For example, the funds in the private sector are often larger and also less conservative typically in their investment strategies; they are therefore more likely to hold a larger stock of liquid funds for taking advantage of short-term opportunities that might arise. The funds in both of the public sectors tend to regard themselves as more immediately accountable (eg, to the government in the final analysis) and are therefore more likely to pursue a fairly conservative buy-and-hold strategy. Nonetheless, as we might have expected, there is a great deal of similarity between the holdings of the private sector pension funds and those of all pension funds combined.

As with the industry, the private sector shows most growth in its holdings of British government securities, especially medium- and long-term gilts, land, property and ground rent, and, in particular, ordinary shares, both domestic and overseas. These latter two categories (ie, land and ordinary shares) are perhaps the most spectacular in terms of their growth, with land holdings growing some one hundred-fold over the entire data period,and ordinary shares exhibiting a similar rate of growth over the 1974-1985 period. This growth in the private sector holdings of ordinary shares has been mirrored (if not exactly paralleled) by their holdings of both authorised unit trust units and property unit trust units.

Although these conclusions apply to the figures in millions of pounds they also seem to be borne out for the most part by the data in percentage terms, as illustrated in Figure 7-5. Here overseas ordinary shares and medium-term gilts seem to be the main upward movers, with most other categories remaining fairly constant, except for the monotonic declines in debentures and preference shares and United Kingdom local authority securities. Total gilt holdings have a steady long-term trend around the lower twenty per cent mark apart from a deviation in the early years of the 'seventies when the figure declined to around twelve per cent. This seems to be almost wholly offset by changes in the holdings of ordinary shares, indicating a high degree of substitutability between these two asset types. Land, property and ground rent is interesting in that it exhibits a fairly steady monotonic growth in both nominal and percentage terms until 1981-1982 when the latter drops by some three percentage points with no apparent offsetting rise in another category. It is

Figure 7-5: Major Asset Holdings—Private Sector Pension Funds

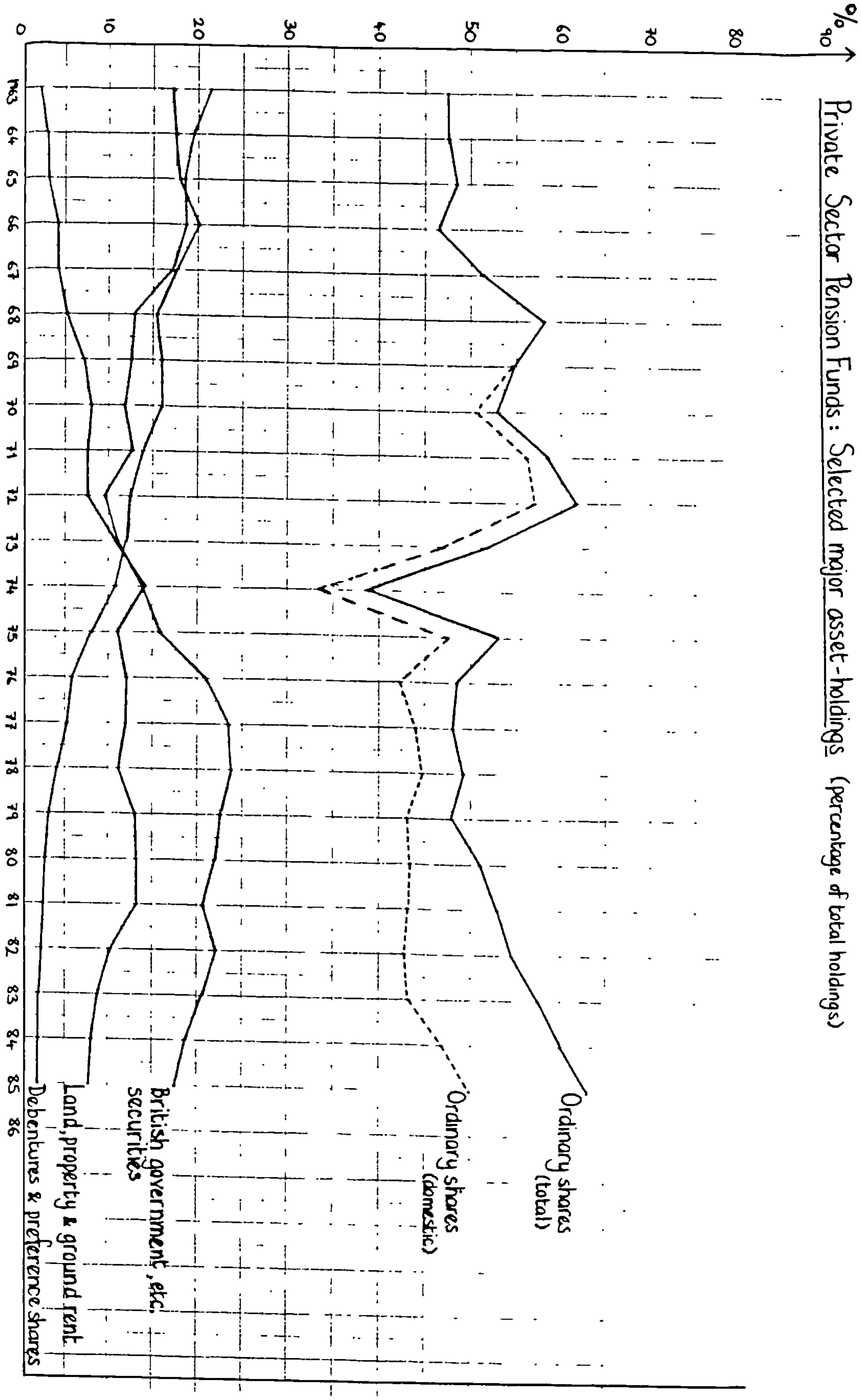
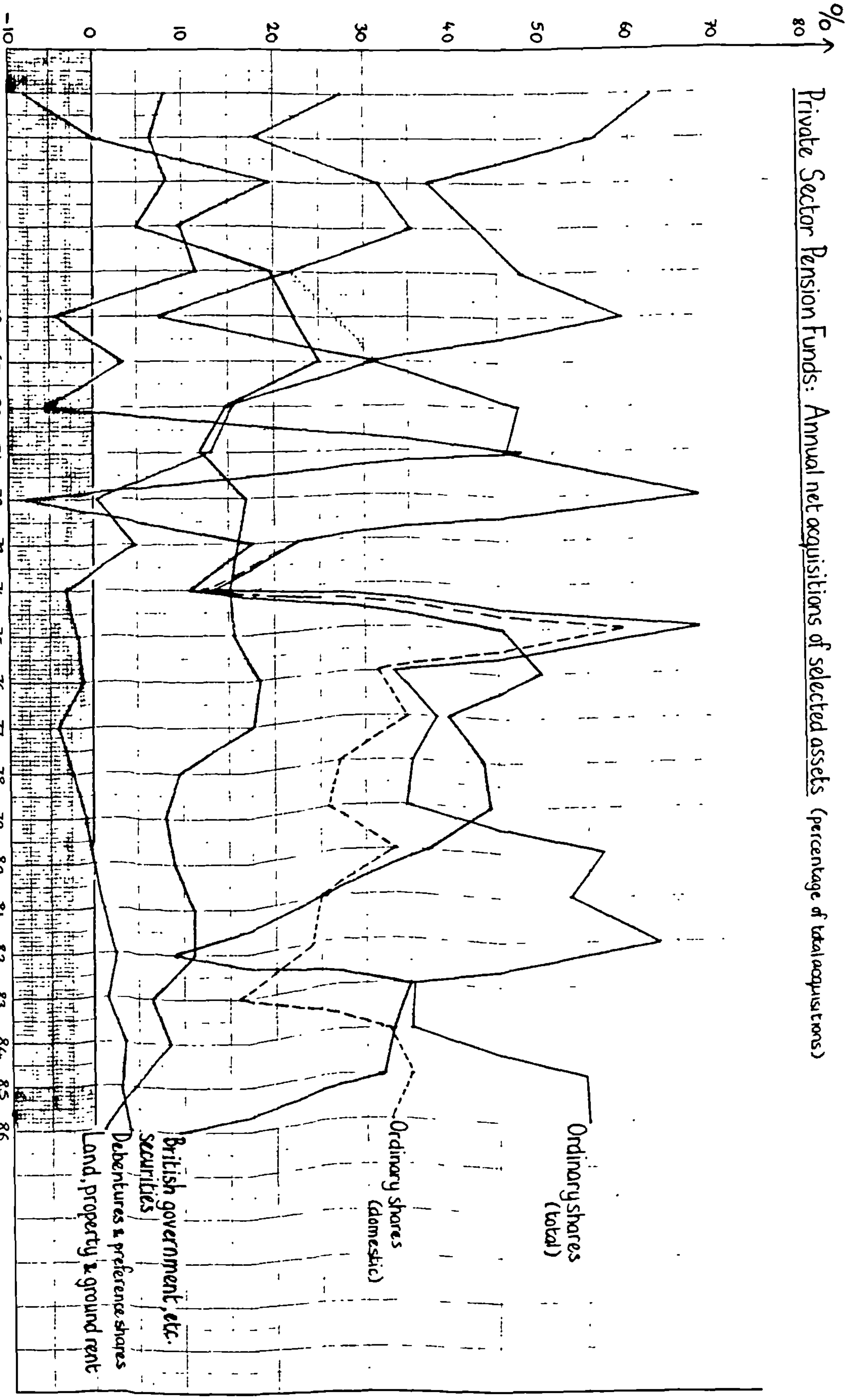


Figure 7-6: Selected Annual Net Acquisitions—Private Sector Pension Funds



possible that the post-1979 declines in the percentage of both land and gilts holdings can be accounted for by the increased holdings of ordinary shares.

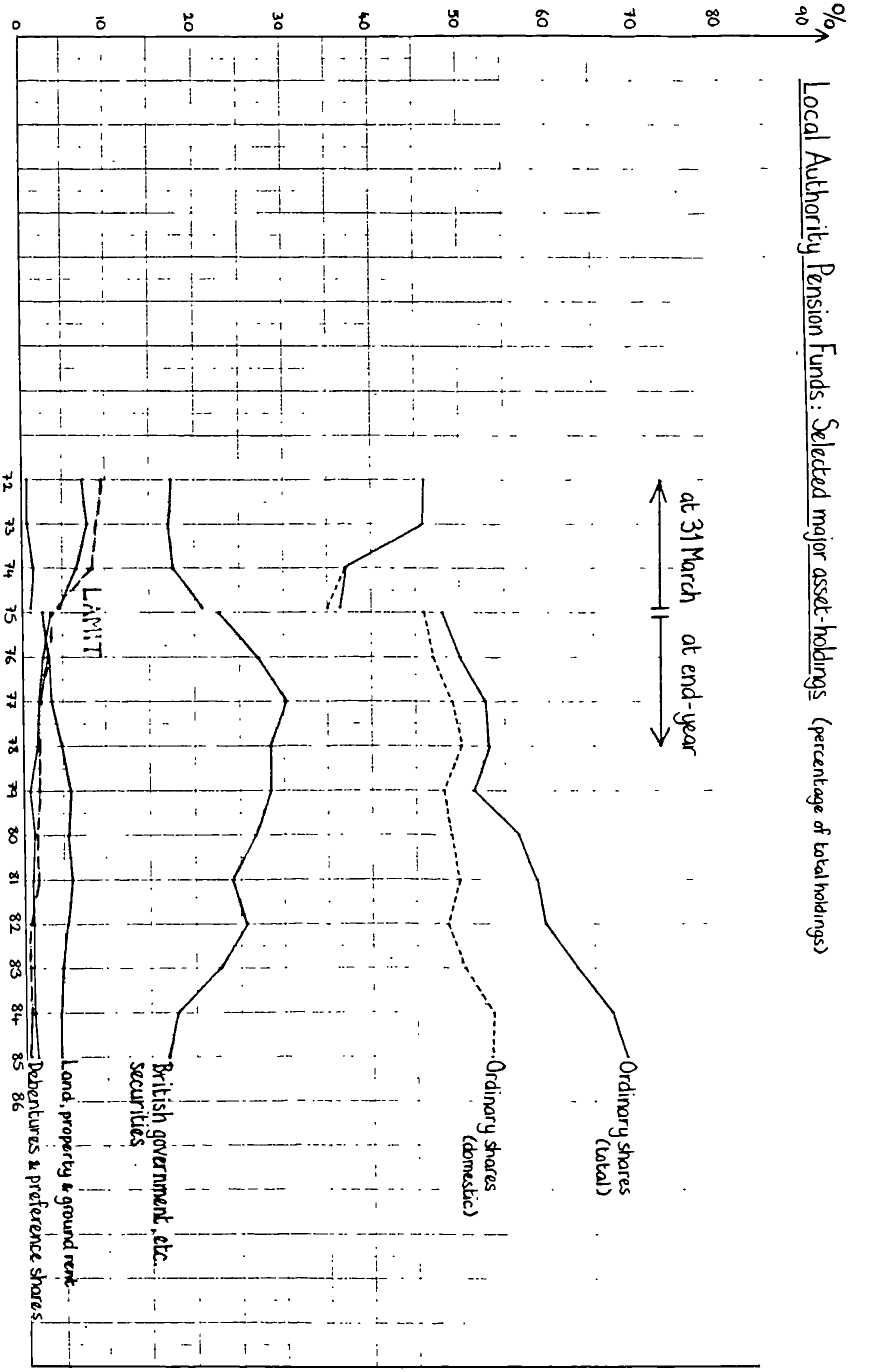
Perhaps the most fascinating difference between the data for the private sector pension funds and those for the whole industry is that the former appears to be largely uninfluenced by the trade cycle. That the investment pattern of the whole industry should be influenced by the cyclical movements of the economy while its major component, the private sector funds, remains unaffected would appear to require an explanation. One possible explanation would be that while the private sector funds' investment behaviour remains largely sheltered from cyclical influences, the behaviour of the pension funds in both public sectors is not so sheltered. This would seem a particularly likely explanation given the generally more conservative investment approach adopted by the public sector and local authority funds which we have already observed. Given their more immediate accountability to various elected bodies, investment managers in the public sector and local authority funds may be less likely to respond rapidly to changes in the financial markets or general economic conditions. Equally, they may also be less willing to follow the lead of their expectations of changes in the economic situation. While this is a plausible theory we need to observe if, in fact, the investment behaviour of the pension funds in the local authority and public sectors does indeed follow a cyclical pattern, which we now do.

7.5.4 The Local Authority Sector

Perhaps the most noticeable characteristic of the statistics on the Local Authority sector pension funds' holdings is that there is no published data prior to 1972. Equally, the data up to 1975 is based on the pension funds' portfolios at 31st March of each year while for 1975 *et seq* the data is measured at 31st December (ie, at end-year) in common with that for the other two sectors. These two facts are amply illustrated by Figure 7-7. Fortunately, no such problem arises with the net acquisitions data. However, armed with this knowledge we can press on and attempt to make some inferences about the investment behaviour of the Local Authority sector pension funds.

In Tables A-7 and A-8 we present data on the asset-holdings of the Local Authority sector pension funds in millions of Pounds and percentages respectively. Although the lack of data limits our inferences, especially around the early 1970s, certain patterns would still seem to be identifiable. For example, in both the aggregate and private sector situations we noticed a

Figure 7-7: Major Asset Holdings—Local Authority Pension Funds



severe dip in the holdings of ordinary shares (in particular) following the 1973 oil shock, although this was to a large degree offset by increased holdings of land, property and ground rent. This pattern is also exhibited by the Local Authority pension funds, with a dramatic decline in holdings of ordinary shares from £888 millions at 31st March 1973 to £596 millions at 31st March 1975. In common with the private sector and the industry, this position was also quickly reversed with ordinary shareholdings rebounding to some £1,026 millions by the end of 1975. Unlike the private sector and aggregate positions, this decline was not offset by increased land holdings. Although in 1974 land holdings did increase, it was only up by £7 millions from the 1973 figure of £17 millions, not really much of an offset to the almost £300 million decline in ordinary shareholdings! This applies equally to these holdings both in nominal and percentage of portfolio terms, the latter illustrated in Figure 7-7.

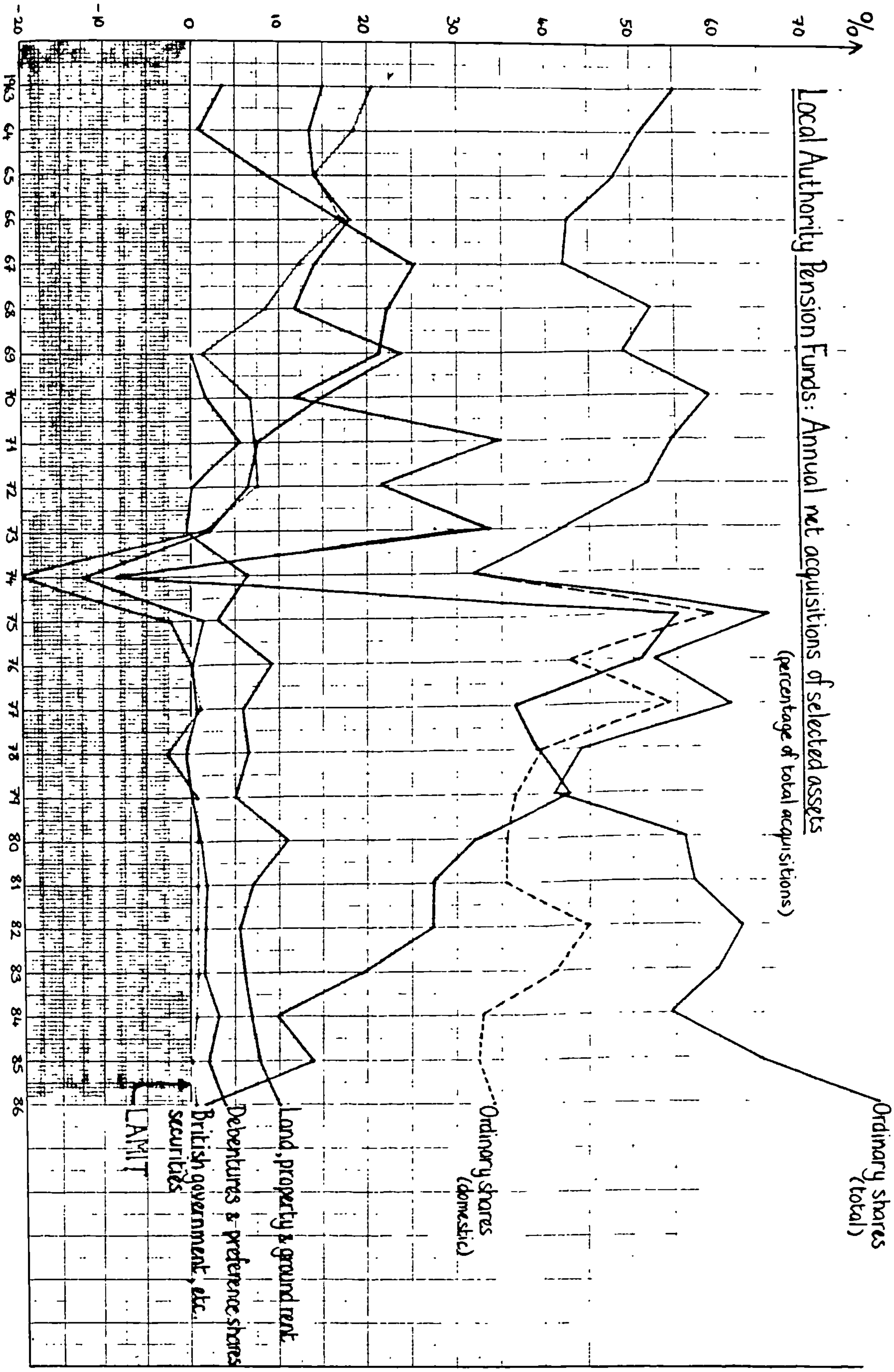
Looking at the holdings picture from 1975 until 1985, we find that the Local Authority funds increased the market value of their assets some ten times; from £2,134 millions in 1975 to £20,973 millions in 1985. While this would appear to be a fairly substantial rate of growth, it is rather less than that exhibited by the private sector funds. Nonetheless, in common with their private sector counterparts, the Local Authority funds have increased their holdings of virtually every asset category over the ten-year period to 1985. The major exceptions to this growth being declines in holdings of local authority securities, loans and mortgages, and short-term gilts, and a marginal increase in holdings of LAMIT (Local Authorities Mutual Investment Trust). It will be recalled that similar declines were noted for the private sector funds.

From the foregoing we might be tempted to conclude that the investment behaviour of the Local Authority funds as evidenced by the annual holdings data bears more than a passing resemblance to that of the private sector funds. However, when we consider their holdings of short-term assets a rather different picture emerges. For, whereas the private sector funds' short-term holdings exhibited a cyclical pattern over the course of the business cycle, short-term holdings by the Local Authority funds shows an almost monotonically increasing upward trend. While their short-term holdings do indeed double between 31st March 1973 and 31st March 1974 (in response to the oil crisis), from 1975 on they continue upward. In fact, over the data period there are only two periods when holdings of short-term assets decline. First during 1975, when current assets decline from holdings of £290 million at 31st March to £181 million at end-year. And secondly, there is a marginal decline between 1979 and 1980. No major increases are noted during recessionary periods, with the possible exception of substantially increased holdings of short-term gilts between 1982 and 1983. However, this period actually follows the recession of the early 1980s, so unless this is a somewhat belated response to the decline in economic activity it is rather more difficult to posit an explanation.

In looking at the holdings of longer term securities by the Local Authority sector pension funds we note that the most growth in the decade up to 1985 was exhibited by the various categories of overseas assets. For example, overseas ordinary shareholdings grew over seventy-two times while holdings of overseas government, etc, securities grew a staggering one hundred and forty-five times. What is equally interesting, although perhaps not surprising, is that most of this growth occurred after the removal of exchange controls during the course of 1979 (see Appendix 7-B). It should also be noted that although the Local Authority pension funds increased the growth rate of their overseas asset-holdings following 1979, it does not appear to have been a dramatic once-for-all increase in response to the abolition of exchange controls. Rather, there is a continued higher growth rate of overseas holdings throughout the 1980s. Whether this is the result of a responsible investment strategy or simply due to the increasing valuation of overseas assets in foreign bull markets can be verified by a consideration of the net acquisitions data, which we perform shortly.

In the case of British government securities we note an increase over the data period in absolute holdings of all maturity ranges with the exception of short-term gilts, as noted above. Again, we note the almost-perfect substitution of some Index-Linked Treasury Stock for long-term gilts in the portfolio, following the introduction of Index-Linked Treasury Stock in 1982. The percentage of portfolio data gives a rather different picture, however. While the decline in short-term gilts remains even more marked, we see that the Local Authority pension funds have displayed a declining preference for the proportion of their portfolio held as long-term gilts. To a large extent this has been offset by the increasing percentage of the portfolio held as medium-term gilts. Nonetheless, over the data period 1975-1985, the Local Authority funds have decreased the percentage of their portfolio held as government securities from twenty-seven per cent to some seventeen per cent. We note a similar decline for the private sector funds over the same data period, although they never held more than almost twenty four per cent of their portfolio as gilts.

Figure 7-8: Selected Annual Net Acquisitions—Local Authority Pension Funds



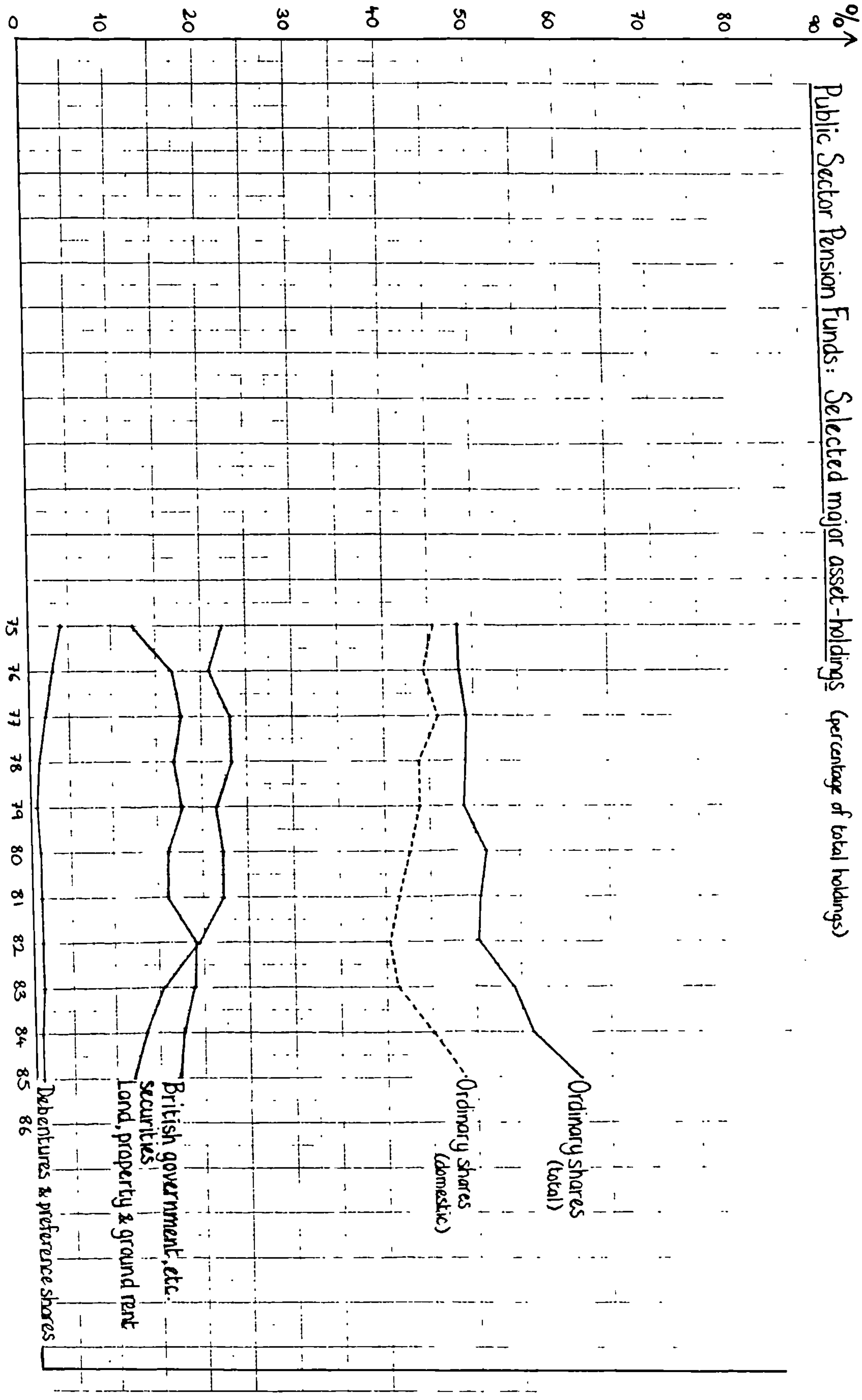
This slight difference could either be due to a scale effect (the private sector funds have more funds to invest, as we have seen) or to a difference in investment strategy due to (eg) differing degrees of risk aversion, or to a combination of these two factors.

7.5.5 The Public Sector Position

In Tables A-11 and A-12 we present the annual holdings of the public sector pension funds in millions of Pounds and percentages respectively. Once again, the pattern that emerges is not so very different from that for the pension fund industry as a whole, and for the reasons already suggested. Again we note increases in all categories except United Kingdom Local Authority securities and loans and mortgages, which both decline quite substantially. Like the private sector, the public sector data for the short-term assets (net) category—which showed only a marginal increase for the industry—exhibits some 300 per cent growth, although this is not exactly unexpected with net total investment increasing more than ten times over the 1970-1982 period. Similar rates of growth are to be observed in most categories, the only notable exception being debentures and preference shares. As with the overall picture and that for the private sector pension funds, there is a decline in the holdings of most overseas assets during the period of the breakdown of the Bretton Woods regime (1971-1974), but this is more than compensated by the tremendous increase in the period since 1974. Holdings of overseas government securities increase from £10 million in 1975 to £157 in 1982, while holdings of overseas ordinary shares rose from £116 million to £3,760 million over the same period. Even overseas loans and mortgages show a dramatic rise from £11 million in 1974 to £139 million in 1982, and this against a backdrop of a (marginal) downward trend in overall holdings of loans and mortgages. Like the private sector funds, the public funds have exhibited dramatic growth in their holdings of government securities, ordinary shares and land, property and ground rent. However, unlike the private funds they appear to have most of their growth in holdings of gilts rather than ordinary shares, an indication of the more conservative investment strategy pursued by funds in the public sector.

Once again, the data on percentages tends to substantiate the above conclusions (see Figure 7-9). However, certain peculiarities that require some explanation are brought to the surface. For example, public sector holdings of ordinary shares constitute a substantially greater percentage of the portfolio than that given by the aggregate data during the immediate pre-oil shock

Figure 7-9: Major Asset Holdings—Public Sector Pension Funds



period, while these same holdings are substantially below that of the aggregate immediately following the oil-shock, and do not approximate the norm until 1979. We may read several things into this behaviour: firstly, that the public sector pension funds are rather slower in adjusting their behaviour to changing market conditions. Secondly, the public sector funds would appear to be more likely to follow market trends than to set them. (One might stick one's neck out and suggest that their analysts are "fundamental" rather than "technical"!) All-in-all, this evidence suggests that the public funds are rather more cautious than average in their investment policy, although like any investor they can be caught with their trousers down when the bubble bursts!

7.6 Summary and Conclusions

From the foregoing we have been able to ascertain a great deal about the investment behaviour of the United Kingdom pension funds. Perhaps the most interesting fact which came to light is the high degree of similarity of investment behaviour between the three sectors which make up the pension funds movement in Britain. Indeed, it would make sense to suggest that on the basis of the evidence offered we could reasonably model the investment behaviour of the pension funds using data for the pension funds on aggregate, rather than having to perform the rather more tedious individual estimation of the three sectors. Indeed, what we have seen in this chapter would suggest that such disaggregated estimation would raise the costs of this research without increasing the insights gained as a result in all likelihood. Indeed, the only discrepancies that came to light were that the private sector holdings of short-term assets were less volatile (and therefore less prone to follow the business cycle), while the Local Authority portfolio exhibited a smaller degree of substitutability between land and ordinary shares, as well as being less prone to cyclical volatility.

Let us summarise some of the more salient features of the investment behaviour of the pension funds, both as individual sectors and *in toto*, over the period since the late 1960s. In terms of their annual holdings, we have observed that there is no discernible pattern as regards short-term assets (net) with the exception that they account for a much larger percentage of the portfolio during the major recessions of 1973-1974 and 1979-82. Given that short-term assets are usually regarded as a residual, this increase during periods of heightened economic uncertainty can be considered as a predictable increase in liquidity preference on the part of the pension funds in response to a pessimistic investment outlook brought on by the unfavourable economic climate. The assets whose holdings exhibited the most growth over the data period were unit trust units and overseas government securities. Although no 'raw' data on issues of these assets is available, based on anecdotal evidence we can suggest that this is likely due to an increased supply (eg, increased availability) over the date period.

Looking at the contribution of government-issued securities ("gilts") to the portfolio, we saw that there was little change overall. Holdings of gilts over the data period showed modest growth, but there was a change in the maturity composition, with long- and medium-term gilts becoming increasingly favoured over short-term gilts over time. As a percentage of the pension funds' portfolio, we saw a marked decline in the attractiveness of short-term gilts, a characteristic shared with U. K. local authority securities, Local Authorities Mutual Investment Trust (LAMIT), loans and mortgages, and short-term assets (net). The portfolio of the U. K. pension funds was increasingly accounted for by medium- and long-term gilts and ordinary shares in particular. These figures were substantiated by those for net acquisitions, where we observed a tremendous sell-off of U. K. local authority securities between 1969 and 1972, in particular, the waning popularity of loans and mortgages over the entire data period culminating in a major sell-off after the mid-1970s, and a high level of net acquisition of unit trust units that plateaued in the late 1970s.

It was also fascinating to observe the high degree of importance attached to ordinary shares by the investment managers of the U. K. pension funds. The data points very heavily to a sequential investment process, with ordinary shares coming first in the sequence. Indeed, during periods when ordinary shares seem unfavourable we note that certain substitutes come to light. Of these, the asset that exhibits the highest degree of substitutability with ordinary shares is land (ie, land, property and ground rent). This substitutability seems to be particularly enhanced during the two major recessions of the 1970s. To a lesser degree we also observed fixed-interest securities (gilts, debentures, preference shares) as substitutes for ordinary shares. Perhaps unsurprisingly, the only asset category that exhibited any degree of complementarity with ordinary shares was unit trust units.

Given the likely influence of the long-term nature of the pension funds' liabilities on their investment portfolio, it is no surprise to find the major asset categories being the long-term investments of gilts, ordinary shares and land.

It is also interesting to note that these are the assets whose net acquisitions seem to be the most stable. Indeed, it is almost as if the actions of government or short-term changes in the financial markets have virtually no effect upon investment in these three major categories, their acquisition and holding being more influenced by the pension funds' long-term view of the economy. Such findings would be endorsed by the theory of financial intermediation, as seen in Chapter Two, as well as by the portfolio theory we observed in Chapter Five, given that these three asset groupings tend to exhibit less risk over time than the other categories we have encountered.

From what we have seen then, we may conclude that while the pension funds appear to be active traders in many markets, their overall investment strategy is typically of the "buy and hold" variety. To what degree this strategy is a conscious attempt to stay with the market (and hence the economy) and to what degree it is forced upon them because of their dominance of the U. K. financial markets we shall determine in the next chapter.

Chapter Seven Endnotes

1 This is particularly true of many pension funds in the public sector. See Chapter Two for full details.

2 It would seem to be reasonable to argue that death is inevitable. This was certainly a view held by Benjamin Franklin!

3 As we saw in Appendix 6, there are a multitude of methods available for calculating expected values.

4 is not true, of course, under Culbertson's Hedging Pressure theory, the strict form of the Preferred Habitat theory of the term structure of interest rates.

5 A full discussion of the relationship between expected and actual rates of interest appears in Appendix 6.

6 This point is covered in almost every basic text on econometrics, but for a recommended exposition see (eg) J. Johnston (1972), pages 52-61, or L. Klein (1962), pages 18-19.

7 It should be noted that when dealing with changes in the rate of interest this refers to the effect of such a change on the purchasing power of the monetary unit (eg, £1) plus, perhaps, its effect upon the capital value of the investment portfolio, and how these affect the demand for the security.

8 See, however, H. Makower and W. Baumol, "The Analogy Between Producer and Consumer Equilibrium Analysis", *Economica*, February 1950.

9 It could be argued that the commercial banks are, perhaps, the only exception on the grounds of the existence of the bank credit (money supply) multiplier. That is to say, because their liabilities are often regarded as part of the means of payment (ie, as money), when a bank extends credit this will usually end up redeposited in the banking system enabling further loans to be made. Thus, although the amount of loans that can be made by the banks may be constrained by the level of deposits, the loans made by the banks will also be a major determinant of the level of deposits. This feature is unique to those financial intermediaries whose liabilities are regarded as being almost moneylike; traditionally this was solely the commercial banks but more recently this is true of most depository intermediaries (licensed deposit-takers in the U. K.).

10 See, in particular, their equation 16 (1967, page 33). In a footnote (page 39) they also suggest that the quadratic nature of the utility function is not a prerequisite for the results they obtain.

11 Copies of these questionnaires are reproduced as Appendix 7-A.

12 The most obvious examples are *Financial Statistics, Annual Abstract of Statistics, Business Monitor MQ5*, etc.

13 Further details of these asset categories and their components may be found in Chapter Four of Professor Revell's excellent *The British Financial System* (1973).

14 This yield differential may consist of both the difference between the quoted rates of interest and a possible capital gain/loss due to fluctuations in the exchange rate. Of course, nowadays a large part of exchange rate uncertainty can be removed by using the forward exchange markets. A full discussion of these points is offered in virtually all undergraduate textbooks on international economics.

15 A chronology of the major changes in exchange controls since 1962 is presented in Appendix 7-B.

16 In the "Finance" section of the November 4, 1978 edition of *The Economist* a number of stories are related revealing the problems caused by investment in the parent company. A selection of quotes is illustrative:

> In 1976 the financial position of J. Lyons, the food-manufacturing, hotels, property and catering group, was precarious. But not quite as precarious as it would have been without a timely injection of cash from its pension fund. This cash injection was one of at least three transactions between J. Lyons and the trust company that administered its pension funds which give rise to clear conflicts of interest;... (page 109)
>
> Few people outside Brooke Bond Liebig know that the big food group's pension fund has for the past four years been helping prop up a subsidiary of London and Manchester Assurance ... Welfare Insurance. ... As it happens, the fund had little choice but to take part since an uncomfortably high proportion of its own assets consisted of paid-up insurance policies with Welfare. ... (pp.110-111)

Other examples of investment in the parent company revealed by *The Economist* include borrowing from the pension fund by British Rail, London Transport and Westminster City Council; Between 3 and 4 per cent of the ICI pension fund's assets was held as ICI shares; 26 per cent of Lucas Industries' pension fund was in Lucas' own shares, accounting for over 13 per cent of the Lucas equity; Sheffield toolmaker James Neill's pension fund had 16 per cent of its fund invested in the parent company; Ricardo and Company, Engineers (1927) was 5.6 per cent owned by its pension fund; and so on! Since 1978 coverage of such cases by *The Economist* has dwindled to virtually zero, so it would seem that perhaps investment in parent company's by pension funds has become rather more prudent.

17 According to Culbertson (1957, pp.498-499)

> ...Non-speculative behavior ... is probably the predominant type of debt market behavior ... It involves making choices on some basis that is independent of any particular expectation ... This can be done in a number of possible ways. A common one is to select a portfolio maturity structure suited to the liquidity needs of the investor ... and then hold to this portfolio structure through whatever short-run shifts may occur in expectations of interest rates. The behavior of most financial institutions is of this general character, with investment concentrated in long-term debt except in so far as liquidity needs require the holding of short-term debt.

18 This point can easily be confirmed by reference to the CSO publication, *Business Monitor, MQ5.* We shall be looking in much greater detail at the investment behaviour of many other financial intermediaries in Chapter Eight.

19 A superb account of the secondary banking crisis and the ensuing "lifeboat" attempt to prevent the total collapse of the system by the Bank of England is to be found in Margaret Reid's excellent *The Secondary Banking Crisis, 1973-75.*

20 This approach was put forward by William L. Silber in Chapter Two of his *Portfolio Behavior of Financial Institutions* (see pages 15-17 in particular), and is also used by Dodds (1979). According to Silber

> ...empirical studies of behavior in the financial markets have used the stock adjustment principle as the basic format for the specification of demand equations for particular financial assets.

Silber uses the following formulation of the stock adjustment process:

$$\Delta X_t = a(X_t^* - X_{t-1})$$

where $0 < a < 1$, $\Delta Xt = (X_t - X_{t-1})$ refers to the net acquisition of security X during time period *t*, and X_t^* represents the desired holdings of security X. Obviously, the desired portfolio consists of the sum of X_t^* for all possible X.

The Dodds book is reviewed in Chapter Six of this Thesis; see page 6-54 *et seq* for details of his use of this approach to modelling the investment behaviour of financial institutions.

20 This slow adjustment to changing circumstances may be considered 'responsible' due to the large volume of funds that the pension funds have available for portfolio investment. For example, if a large number of pension funds were to have responded (almost) instantaneously to the abolition of exchange controls in the United Kingdom by the wholesale shift of their portfolio from British to foreign securities there is every possibility that this would have brought about a dramatic decline in the various Financial Times indexes and created bull markets in several foreign securities markets due to the pension funds' market dominance. In addition, the interdependence of the world's financial markets means that there would also be likely exchange rate effects; the declining prices on the London Stock Exchange would bring about a decline in confidence in the U. K. economy (Economists would refer to this as a reduced level of expectations) which would reduce demand for Sterling on the international currency markets, etc.

The issue of market dominance by the pension funds is examined in depth in Chapter Eight.

Appendix 7-A:

Central Statistical Office (CSO) Questionnaires

For official use					

An Inquiry conducted by the Government Statistical Service

IN CONFIDENCE

SUPERANNUATION AND PRIVATE PENSION FUNDS
BALANCE SHEET AS AT 31 DECEMBER 1979

Please correct any errors shown in the name and address

Department of Trade
Economics and Statistics Division 6A
Room 330, Sanctuary Buildings
16 - 20 Great Smith Street,
London SW1P 3DB

Telephone 01-215 5843

31 March 1980

Dear Sir

This is the form relating to assets and liabilities at 31 December 1979. I should be grateful if you would complete and return it to the above address not later than 30 June 1980. A franked addressed label is enclosed to cover your reply.

The return should cover assets and liabilities held by funds whose investment policy is managed from within the United Kingdom including, if possible, funds of subsidiary companies in your group. Should it be more convenient to make a separate return in respect of funds of subsidiary companies, additional forms will be sent on application.

Your return should relate to your balance sheet at 31 December; if this is not possible, please give figures for the nearest date and indicate on page 3 what the date is.

Yours faithfully

P G Walker

P G WALKER (MRS)
Statistician

GENERAL NOTES *(Please refer also to the detailed notes on page 4)*

Assets and liabilities should be reported at their market value on the date to which this return relates (normally 31 December). The market value of listed securities should be based on the closing middle market price. Where the market price indistinguishably includes interest (as with longer dated British Government securities), such interest should form part of the valuation. In the case of unlisted securities, the market value as estimated by the fund managers should be given, however approximate this may be. Where it is impossible to provide a market valuation for some items the written down book value may be substituted. Similarly investments in land, buildings etc should be shown at current market values as far as these can be estimated by the fund managers.

The value of foreign currency assets should be converted to sterling at the closing middle market spot rate on the date to which this return relates.

The Republic of Ireland is regarded as an overseas country.

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BALANCE SHEET AS AT 31 DECEMBER 1979

ETS Please refer to the notes and definitions on page 4	CODE	Balances at market values, £ thousand
Current Assets		
1.1 Cash and short-term assets (items 1 to 3 on quarterly form) (A)	09	
1.2 Amounts receivable from stockbrokers	10	
1.3 Income accrued on investments and rents (B)	11	
1.4 Amounts receivable from Inland Revenue	12	
1.5 Other debtors, UK and overseas (please specify)		
	13	
Public Sector Securities (C)		
2.1 British government and government guaranteed securities by maturity: (D) (E)		
2.1.1 Up to 5 years	14	
2.1.2 Over 5 years and up to 15 years	15	
2.1.3 Over 15 years and undated	16	
2.2 United Kingdom local authority listed securities and negotiable bonds (F)	17	
2.3 United Kingdom local authority unlisted securities, loans and mortgages (F)	18	
2.4 Overseas government, provincial and municipal securities (G)	19	
Company Securities (C) (H)		
3.1 Debentures (including unsecured loan stocks and Eurodollar bonds):		
3.1.1 Companies registered in the United Kingdom:		
3.1.1.1 listed	20	
3.1.1.2 unlisted	21	
3.1.2 Companies registered overseas (I)	22	
3.1.3 Convertible United Kingdom debentures (J)	23	
3.2 Preference stocks:		
3.2.1 Companies registered in the United Kingdom:		
3.2.1.1 listed	24	
3.2.1.2 unlisted	25	
3.2.2 Companies registered overseas (I)	26	
3.3 Ordinary stocks: (K)		
3.3.1 Companies registered in the United Kingdom:		
3.3.1.1 listed	27	
3.3.1.2 unlisted	28	
3.3.2 Companies registered overseas (I)	29	
3.4 Authorised unit trust units (L)	30	
Loans and Mortgages		
4.1 United Kingdom (including sterling assets for back-to-back loans):		
4.1.1 to parent organisation	31	
4.1.2 for house purchase	32	
4.1.3 to financial institutions (M)	33	
4.1.4 to companies other than financial institutions (N)	34	
4.1.5 other (please specify)		
	35	
4.2 Overseas	36	

BALANCE SHEET AS AT 31 DECEMBER 1979

ASSETS (continued) Please refer to the notes and definitions on page 4	CODE	Balances at market values, £ thousand
5 Property unit trust units (O)	37	....
6 Fixed Assets		
6.1 Land and buildings, property and ground rents (P)	40	....
6.2 Other (ie vehicles, office machinery, furniture and fittings, computer equipment, etc)	42	....
7 Other investments (Q) (please specify)		
....	43	....
TOTAL ASSETS		

LIABILITIES Please refer to the notes and definitions on page 4	CODE	Balances at market values, £ thousand
8 Current Liabilities		
8.1 United Kingdom bank overdrafts and other short-term UK bank borrowing (R)	45	....
8.2 Loans from parent organisation (S)	46	....
8.3 Other short-term borrowing: (S) (please specify)		
8.3.1 United Kingdom	47	....
8.3.2 Overseas	48	....
8.4 Amounts payable to stockbrokers	49	....
8.5 Pensions due but not paid	50	....
8.6 Other creditors, UK and overseas (please specify)		
....	51	....
9 Long-term debt (including foreign currency liabilities on back-to-back loans):	57	....
10 Reserves and provisions	59	....
11 Market value of the pension fund (= net assets of fund)	60	....
TOTAL LIABILITIES (= TOTAL ASSETS)		

Date to which return relates if other than 31.12.79 ....

Signature .... *Date* ....

Name .... *Telephone number* ....

NOTES AND DEFINITIONS

A Short-term assets are those maturing within one year of their originating date including loans repayable at lender's option within one year of the date of issue. Include, however, any term deposits at UK banks even if for 12 months or over. Include money at call and short notice and other short-term loans, including longer term mortgages other than local authority mortgages, which are repayable by invoking a break clause within the first year. The short-term assets entered under item 1.1 should be of the same type as those entered under items 1 to 3 on the quarterly form.

B Accrued income from investments will normally be included with the value of those investments. If, however, such income is accrued separately it should be shown under item 1.3. Income due but not yet received on investments and rents should be shown under item 1.1 (see note F of quarterly form).

C All investment items should be dealt with by reference to the date of contract rather than the date of payment or receipt of funds. In cases where payment has not been made or received, a contra item must be entered under items 1.2 or 8.4, representing balances due from or to stockbrokers. For listed securities, the market value should be the closing middle market price. For unlisted investments, the fund managers' valuation should be given. However, if you have acquired securities on which further instalments are payable, (or "rights" to subscribe to a forthcoming issue), please enter the total payments made so far (or the cost of the "rights"). Exclude any amounts due in respect of future instalments, (or of future subscription to the new issue) as these will appear in future returns.

D Excluding Treasury bills which should be entered under item 1.1.

E Securities should be classified according to their residual maturity. Securities with optional redemption dates should be classified by their final date.

F Exclude local authority bills, which should be included under item 1.1. Shares of water companies should be included under item 3. Local authorities do not include passenger transport executives, statutory port authorities, regional water authorities in England and Wales or new town development corporations, investment in which should be shown under item 7.

G Include those listed in the Stock Exchange Official List (or Yearbook) under Commonwealth Government and Provincial securities; Commonwealth Corporation Stocks; Foreign stock, bonds etc; Corporation stocks – Foreign; International Bank for Reconstruction and Development.

H Including securities of investment trusts.

I Securities issued by companies registered outside the United Kingdom (including securities of overseas registered companies which are listed on a United Kingdom Stock Exchange).

J Including convertible debentures and loan stocks where rights of conversion into equity are still outstanding.

K Including shareholdings in unit trust management companies.

L A list of authorised unit trusts is enclosed. Shareholdings in unit trust management companies should be shown under item 3.3. Units of unauthorised unit trusts (eg Equity Capital for Industry Ltd) should be included under item 7. Unit trust units should be valued at the bid price.

M Financial institutions (other than United Kingdom banks and discount houses) are savings banks, finance houses, insurance companies, building societies, listed investment trusts, authorised unit trusts, superannuation and pension funds, property unit trusts, the Crown Agents, and certain special finance agencies engaged in medium and long term financing of industry in the United Kingdom and Commonwealth, eg Finance for Industry Ltd, Equity Capital for Industry Ltd.

N Non-financial companies: UK registered public and private companies (including UK registered subsidiaries of overseas registered companies) and UK branches of overseas registered companies, but excluding banks, discount houses and financial institutions (as defined in note M). Include UK co-operative societies.

O Exclude investments in overseas property unit trusts, which should be included under item 7.

P Exclude investment in property overseas, which should be shown under item 7. The market value of land should be as valued during the last three years.

Q Include commodities, gold coins, works of art, insurance policies, annuities etc, and units of unauthorised unit trusts (eg Equity Capital for Industry Ltd). Include investments in overseas property unit trusts and in property overseas.

R Overdrafts and borrowing of less than 12 months, from the banks and discount market institutions shown on the enclosed list.

S Loans with an original maturity of 12 months or more should be included under item 9.

An Inquiry conducted by the Government Statistical Service
IN CONFIDENCE

For official use				

SUPERANNUATION AND PRIVATE PENSION FUNDS
TRANSACTIONS IN ASSETS DURING THE QUARTER
ENDED 30 JUNE 1980

Please correct any errors shown in the name and address

Department of Trade
Economics and Statistics Division 6A
Room 330, Sanctuary Buildings
16 - 20 Great Smith Street
London SW1P 3DB

Telephone: 01 - 215 5843

30 June 1980

Dear Sir

I should be grateful if you would complete this voluntary inquiry form for the second quarter of 1980 and return it to the above address not later than 31 July 1980. Would you please note the inclusion of a new Note V on page 4. A franked addressed label is enclosed to cover your reply.

Yours faithfully

P G WALKER (MRS)
Statistician

NOTES AND DEFINITIONS

This return should cover financial assets held by funds whose investment policy is managed from within the United Kingdom including, if possible, funds of subsidiary companies in your group. Should it be more convenient to make a separate return in respect of funds of subsidiary companies, additional forms will be sent on application.

A Cash book balances including United Kingdom coin, note issues of the Bank of England and Scottish and Northern Ireland banks; balances on current and deposit accounts including any term deposit, even if for 12 months or more, held at the Bank of England or with offices located in the United Kingdom of deposit banks, whether registered in the United Kingdom or not (including accepting houses and discount houses, but not savings banks, or municipal banks, deposits with which should be included under item 2.4). All foreign currency balances held in the UK should be included. Bank overdrafts should be shown under item 5.1.

B Short-term assets are those maturing within one year of their originating date, including loans repayable at lender's option within one year of the date of issue, and longer term mortgages which are repayable by invoking a break clause within the first year. Include money at call and short notice except with UK banks, and discount houses (entered under item 1).

C The value of foreign currency balances should be converted to sterling at the closing middle market investment currency rate ruling at the end of each quarter (including 100 per cent of the premium); while for transactions the rate ruling at the time of the transaction should be used.

D Local authority bills, and unsecured money lent to local authorities, with an original maturity of less than 12 months. Local authority securities, bonds and mortgages should be entered under items 7.2 and 7.3 even if they mature in 12 months or less. Local authorities do not include passenger transport executives, statutory port authorities, regional water authorities in England and Wales or new town development corporations, investment in which should be shown under item 12.

E Financial institutions (other than United Kingdom banks and discount houses) are savings banks, finance houses, insurance companies, building societies, listed investment trusts, authorised unit trusts, superannuation and pension funds, property unit trusts and certain special finance agencies engaged in medium and long term financing of industry in the United Kingdom and Commonwealth, eg Finance for Industry Ltd, Equity Capital for Industry Ltd.

(Continued on page 4)

TRANSACTIONS IN ASSETS DURING THE QUARTER ENDED 30 JUNE 1980

Please refer to the notes and definitions on pages 1 and 4	CODE	£ thousand	
		Balances at end of previous quarter	Balances at end of current quarter
Cash in hand and balances with United Kingdom banks (A)	01		
Short-term assets in the United Kingdom (B)			
2.1 Certificates of deposit issued by United Kingdom banks:			
2.1.1 Sterling	02		
2.1.2 Other currencies (C)	03		
2.2 United Kingdom Treasury bills	04		
2.3 United Kingdom local authority bills and temporary money (D)	05		
2.4 Short-term assets with United Kingdom financial institutions other than banks (E)	06		
2.5 Other short-term assets (F) (please specify)	07		
Short-term assets overseas (C) (G) (H) (please specify)	08		
Total of items 1 to 3			
Net balances with stockbrokers (I)	44		
Short-term borrowing (J)			
5.1 United Kingdom bank overdrafts and other short-term UK bank borrowing (K)	45		
5.2 Other short-term borrowing:			
5.2.1 United Kingdom (please specify)	52		
5.2.2 Overseas (C) (H) (please specify)	53		

		Gross borrowing in current quarter	Repayments in current quarter
Long-term borrowing			
6.1 United Kingdom bank borrowing (including foreign currency through UK banks)	54		
6.2 Other long-term borrowing (including foreign currency liabilities on back-to-back loans):			
6.2.1 United Kingdom (please specify)	55		
6.2.2 Overseas (C) (H) (please specify)	56		

		£ thousand	
		Assets realised during current quarter - proceeds	Assets acquired during current quarter - at cost
Public Sector Investments (L) (M)			
7.1 British Government and Government guaranteed securities by maturity:			
7.1.1 Up to 5 years	14		
7.1.2 Over 5 years and up to 15 years	15		
7.1.3 Over 15 years and undated	16		
7.2 United Kingdom local authority listed securities and negotiable bonds (N)	17		
7.3 United Kingdom local authority unlisted securities, loans and mortgages (N)	18		
7.4 Overseas government, provincial and municipal securities (C) (H) (O)	19		

TRANSACTIONS IN ASSETS DURING THE QUARTER ENDED 30 JUNE 1980

Please refer to the notes and definitions on pages 1 and 4

	CODE	Assets realised during current quarter - proceeds *(continued)*	Assets acquired during current quarter - at cost *(continued)*
8 Company Securities (L) (P)		£ thousand	
8.1 Debentures (including unsecured loan stocks and Eurodollar bonds):			
8.1.1 Companies registered in the United Kingdom:			
8.1.1.1 listed	20		
8.1.1.2 unlisted	21		
8.1.2 Companies registered overseas (C) (H) (R)	22		
8.1.3 Convertible United Kingdom debentures (Q)	23		
8.2 Preference stocks:			
8.2.1 Companies registered in the United Kingdom:			
8.2.1.1 listed	24		
8.2.1.2 unlisted	25		
8.2.2 Companies registered overseas (C) (H) (R)	26		
8.3 Ordinary stocks (S)			
8.3.1 Companies registered in the United Kingdom:			
8.3.1.1 listed	27		
8.3.1.2 unlisted	28		
8.3.2 Companies registered overseas (C) (H) (R)	29		
8.4 Authorised unit trust units (T)	30		
9 Loans and mortgages			
9.1 United Kingdom (including sterling assets for back-to-back loans):			
9.1.1 to parent organisation	31		
9.1.2 for house purchase	32		
9.1.3 to financial institutions (E)	33		
9.1.4 to companies other than financial institutions (U)	34		
9.1.5 other (please specify)	35		
9.2 Overseas (C) (H) (V)	36		
10 Property unit trust units (W)	37		
11 Investment in fixed assets (X)			
11.1 Land, existing buildings, property and ground rents	38		
11.2 New buildings (Y)	39		
11.3 Other (ie vehicles, office machinery, furniture and fittings, computer equipment, etc)	42		
12 Other investments (Z) (please specify)	43		
Total of items 7 to 12	99		

Signature .... *Date* ....

Name .... *Telephone number* ....

SPF 2/80

NOTES AND DEFINITIONS *(continued)*

F Include assets held in the form of bank bills and any short-term assets held with the Crown Agents. Include income due but not yet received on investments, rents and pension contributions. Sums due from Inland Revenue should be excluded from this return but should be included in the annual return. If income from investments and rents is accrued separately this should also be excluded from this return but included in the annual return.

G Include certificates of deposit issued by overseas banks.

H The Republic of Ireland is regarded as an overseas country.

I Net balances due from stockbrokers including amounts due on securities sold for future settlement. Net balances owed to stockbrokers should be included as a negative item.

J Loans with an original maturity of 12 months or more should be included under item 6. Include loans from parent company. Sums due to Inland Revenue and pensions due but not paid should be excluded.

K Overdrafts and borrowing of less than 12 months (including any in foreign currency), from banks and discount market institutions.

L All investment items should be dealt with by reference to the date of contract rather than the date of payment or receipt of funds. In cases where payment has not been made or received, a contra item must be entered under item 4, representing balances due to or from stockbrokers. However, if you have acquired securities on which further instalments are payable, (or "rights" to subscribe to a forthcoming issue), please enter the actual payment made during the quarter (or the cost of the "rights"). Exclude any amounts due in respect of future instalments (or of future subscription to the new issue) as these will appear in future returns.

M Securities and bonds should be classified by their expectation of life on the last day of the quarter to which the return relates. Securities with optional redemption dates should be classified by their final redemption date. Exclude Treasury bills, which should be entered under item 2.2.

N Exclude local authority bills, which should be included under item 2.3 and shares of water companies which should be shown under item 8.

O Include those listed in Stock Exchange Official List (or Yearbook) under Commonwealth Government and Provincial securities; Commonwealth Corporation Stocks; Foreign stock, bonds etc; Corporation stocks — Foreign; International Bank for Reconstruction and Development.

P Include securities of investment trusts.

Q Including convertible debentures and loan stocks where rights of conversion into equity are still outstanding.

R Securities issued by companies registered outside the United Kingdom (including securities of overseas registered companies which are listed on a United Kingdom Stock Exchange).

S Include shareholdings in unit trust management companies.

T Shareholdings in unit trust management companies should be shown under item 8. Units of unauthorised unit trusts (eg Equity Capital for Industry Ltd) should be included under item 12.

U Non-financial companies: UK registered public and private companies (including UK registered subsidiaries of overseas registered companies) and UK branches of overseas registered companies, but excluding banks, discount houses and other financial institutions (as defined in note E). Include UK co-operative societies.

V Exclude loans covered by ECGD specific bank guarantees or ECGD buyer credit guarantees, which should be included under item 12.

W Exclude investments in overseas property unit trusts, which should be included under item 12.

X Include any items which appear in your capital account, or rank as capital items for taxation purposes. Exclude overseas investments, which should be shown under item 12.

Y Include any buildings purchased or sold before completion, and expenditure on the improvement of old buildings.

Z Include commodities, gold coins, works of art, insurance policies, annuities etc, and units of unauthorised unit trusts (eg Equity Capital for Industry Ltd). Include investments in overseas property unit trusts and in property overseas. Include loans covered by ECGD specific bank guarantees or ECGD buyer credit guarantees.

Appendix 7-B: A Chronology of the Major Changes in Exchange Controls Since 1962

The system of exchange controls that existed in post-1945 Britain should be seen as an element of the Bretton Woods regime of fixed exchange rates. Obviously, if a government is able to effect restrictions that prevent the international flow of funds by the private sector, its own task of maintaining a given exchange rate by use of official reserves is made easier. Drawing on Chapter Two, it would seem that exchange controls prevent the efficient flow of funds from savers to investors on a global basis, and this has been cited as one reason for (i) the disparate growth of different regions of the planet, and (ii) the slowdown of real economic growth that occurred worldwide during the late 1960s and into the early 1970s. There are those who would argue that the first oil crisis (1973-1974) was simply a reaction that brought these events rather swiftly and dramatically to a head.

The slow yet (some would argue) inevitable removal of exchange controls in the United Kingdom (and elsewhere) can be viewed as parallel to the slow yet (some would argue) inevitable breakdown of the Bretton Woods regime and the adoption of (in theory) a floating exchange rate for the Pound sterling. There is no doubt that these events run along parallel courses, albeit with a small time lag.

1962	Merging of the investment currency markets for north American securities ("hard" dollars) with that for securities denominated in currencies of other countries covered by exchange controls.
May 1962	Companies making direct investments outside the Sterling Area that did not promise "clear and commensurate benefits" to U. K. export earnings or the balance of payments within the immediate future (2-3 years) were allowed to purchase investment currency. This relaxation of controls provided the first availability of the investment currency market for non-portfolio investments.
April 1965	Introduction of the 25% surrender rule.
May 1966	Portfolio investments by British institutions in Australia, New Zealand, South Africa and the Republic of Ireland became subject to voluntary restrictions.
August 1970	Merging of the property market (which had been shrinking in size) with the investment currency market. Before this the property currency market

had performed a similar rôle to that of the investment currency market, albeit more specialised, being concerned with the trading of eligible real estate abroad.

June 1972 Securities denominated in the currencies of former overseas Sterling Area countries subject to exchange control, but not subject to the 25% surrender rule.

March 1974 25% surrender rule extended to the sale of securities denominated in the currencies of overseas Sterling Area countries. U. K. direct investment in both the former overseas Sterling Area countries and the E. E. C. subject to the same financing requirements as investment in other countries outside the Schedule Territories (ie, the U. K., the Channel Islands, the Isle of Man, the Republic of Ireland, and Gibraltar). Permission was required for direct investment in the former overseas Sterling Area countries and the E. E. C. if these were financed with borrowed foreign currency or investment currency. Official exchange no longer available except where the investment promised exceptionally large and rapid benefits to the U. K. balance of payments and met the so-called "super-criterion". The sale of U. K. direct investments in countries outside the Scheduled Territories which were not members of the overseas Sterling Area countries or the E. E. C. now had to be conducted through the official foreign exchange market, being no longer eligible for sale in the investment currency market with the benefit of the premium. This brought consistency in the treatment of disinvestment from all countries.

January 1978 Abolition of the 25% surrender rule.

June 1979 Abolition of the requirement to use investment currency to purchase private property abroad.
Allowed interest and other charges on foreign currency borrowings for portfolio investment abroad to be paid with official exchange. Abolition of the requirement to hold 115% cover for such borrowings in the form of foreign currency securities and/or investment currency.

July 1979 Exchange controls relaxed to allow:
(i) the repayment with official exchange of foreign currency borrowing for portfolio investment which, at 19 July 1979, had been outstanding for at least one year; and
(ii) the purchase, using official exchange, of most quoted foreign currency securities denominated and payable in the currencies of E. E. C. member states and of foreign currency securities issued by E. E. C. institutions and other international groups of which the U. K. is a member.

October 1979 Abolition of all exchange control restrictions from October 24, except those required for maintaining economic sanctions against Rhodesia, which were lifted from December 13.

Chapter Eight: The Position of the Pension Funds in the United Kingdom Capital Markets

8.1 Introduction

In the previous chapter we considered the portfolio position of the pension funds in the United Kingdom and changes in this since 1963. In Chapter Two we considered the economic rôle played in the economy by the financial institutions as a whole. To a very large degree the rôle played by an individual financial intermediary within a given financial market may be seen as being the same (albeit on a smaller scale)—to channel the funds of surplus units to the needs of deficit units, ie, the conversion of savings into productive investments. In Chapter Seven we looked at the portfolio and investment behaviour of the pension funds in isolation from the perspective of their operating environment. However, it is entirely possible for the structure and circumstances of this environment to influence the investment behaviour of its participants to a very large degree. In this chapter, therefore, we now consider the investment behaviour of the pension funds within the context of the United Kingdom financial markets. By looking at the position of the funds in the various capital markets and comparing and contrasting their behaviour with that of the other financial institutions we hope to learn something of their motivations and the restraints (both internal and external) on their investment behaviour which we can put to use in our modelling procedure in Chapter Nine.

The efficiency of a capital market in channelling savings into productive investments depends largely upon its structure in terms of competitiveness, and to a somewhat lesser extent its degree of contestability.[1] As we saw in earlier chapters, many of the financial markets in the United Kingdom are dominated by the financial institutions in the sense that they either hold the majority of issued securities or they are active traders of the majority of traded securities in a given market. Even abstracting from the political issues that such a high degree of market power through concentration throws up, a number of economic issues need to be addressed.[2] For example,—and most importantly—most of portfolio investment behaviour theory is predicated upon the assumption that markets are competitive, as a result of which market participants are unable to influence price by their individual actions.[3] We refer to such market participants as **price-takers**. Now, while this may certainly be true for the average Briton, it would not seem to be the case for (eg) a Sir James Goldsmith or the British Rail Pension Fund, whose asset holdings are large enough to permit them to purchase the total outstanding equity of several "blue chip" corporations at a fell swoop. Indeed, it is partly on the basis of such market power that we often observe a significant rise in the price of the ordinary shares of a company subject to a takeover bid by such individual investors. It therefore would seem reasonable to suggest that the degree of market power possessed by an investor is likely to significantly influence not only their own investment behaviour but also that of other investors. An investor who dominates a market must, in their own interests, be careful that their attempts to purchase given securities do not unduly push up the price prior to the purchase.

In his 1978 paper, Dodds shows the implications of supply-side constraints that are imposed upon the investor with a high degree of market power. He refers to this phenomenon as "Say's Law of Financial Markets". Thus, given the *a priori* market dominance that we have seen exhibited by the United Kingdom pension funds, we would not be remiss in suggesting at the outset of this chapter that their investment behaviour in many of the United Kingdom's capital markets is likely to be constrained by such supply-side limitations. However, if we are to include supply-side constraints in our modelling of their investment behaviour we need to substantiate the claim of dominance with empirical evidence.

8.2 The Rôle of the Pension Funds

As we have indicated *ad nauseam*, the pension funds are financial intermediaries, that is to say they are transporters of capital from surplus units to deficit units. Nonetheless, they are not the only form of financial intermediary in existence. As we indicated in Chapter Two, while many types of financial institution carry out the rôle of intermediary their specialism varies in terms of the liabilities they issue. As we saw there, the particular form taken by a financial intermediary is usually determined by the needs of society at that time. Thus, we saw in Chapter Three that the pension funds grew up in response to an increased need by society to save for retirement income. From this, it therefore follows that the major aspect which distinguishes one type of financial intermediary from another is the kind of liabilities that are issued. Once again, we have already pointed out that, unlike most other financial intermediaries, the pension funds do not issue a wide range of liabilities; rather, they only issue the claim to a future retirement income:- a pension.[4] Thus the pension contract promises future delivery of specific amounts of money over a period of time in a prescribed manner in return for current payments (ie, contributions).

We discovered in Chapter Two that the types of liabilities issued by a financial intermediary will play a significant rôle in determining the types of assets they hold in their investment portfolios. The pension contracts issued by the pension funds are non-marketable in the extreme and are therefore highly illiquid. Indeed, unlike real assets, the owner of a pension fund contract (ie, the member of a pension scheme) cannot sell the contract at will. While the contract can be rescinded by the member this usually involves substantial costs, including a great deal of bureaucratic wrangling, as well as a likely foregone investment income on the principal.[5] Given these characteristics of the liabilities issued by pension funds it makes sense that the assets purchased by the pension funds should at least attempt to honour this commitment. Given the long term nature of the pension fund's liability we would expect a substantial proportion of their asset holdings to also be long term. This is exactly what we discovered in Chapter Seven.

While the pension funds do hold the majority of their assets in long-term vehicles, we saw in Chapter Seven that they do also hold a small, yet significant amount of short-term assets. Indeed, during periods of secular economic uncertainty the proportion of short-term assets held seems to increase substantially. From this we may deduce that we would expect the pension funds to be dominant participants in the markets for longer-term financial assets, such as ordinary shares and long-term gilts, but relatively small players in markets at the short end of the financial system (except perhaps during those periods of marked uncertainty, of course). One natural consequence of all this is that the relative importance of the pension funds in a given financial market can be summarised in terms of their dominance of that market. Dominance is usually taken as referring to the phenomenon that the actions of investors (here, the pension funds) are transmitted to the market in such a way that the price and yield determined in the market are not independent of the investor's actions, *ceteris paribus*. Put more simply, dominance implies that the investor is no longer a price-taker. Let us proceed to examine the concept of dominance in some detail.

8.3 Dominance in the Financial Markets

We have defined dominance above, but not yet given it any meaning that will be empirically testable. Examples of anecdotal evidence of the concern occasioned by perception of pension fund dominance in the financial markets were presented in Chapter One, Section 1.4. The low degree of accountability enjoyed by the pension funds enhances the public's perception, making the pension funds appear to dominate all capital markets, almost to the point of anti-social conspiracy. However, if we are to consider dominance as a measure of the importance and rôle of an investor in the financial markets we need a more scientific and accurate measurement of dominance, which we now consider.

The activities of an investor in a given financial market can be seen from any of three vantage points: their holdings, their net acquisitions, or their trading (ie, their purchases and sales). Dodds (1979) poses the question as to which of these gives the best measure and answers as follows

> Holdings *per se* are unlikely to give this effect period by period so that it is more likely to be trading and the overall net acquisitions which can move the market. Thus one can conceive of a market where one class of investor is dominant in terms of holdings but another investor, say with only 10 per cent of total holdings, can, via its trading, be effectively dominant in terms of price and even the terms on which securities are offered for sale as new issues (with respect to say coupon, maturity, etc.). (1979, pp. 66-67)

While it is certainly the case that investors are more likely to be able to influence the price of a financial asset by their trading or net acquisitions behaviour, it is also observable that larger investors may be able to influence price simply as a result of their large holdings. While holdings represent the results of previous actions taken in the various asset markets, and therefore do not adequately reflect any period-by-period dominance, it would seem to be the case that it is usually those investors with larger holdings of any particular financial claim that are the 'market makers'. Thus, for example, if an investor, despite being relatively inactive in trading in a particular market, held a large proportion of that market's financial claims, then the investment behaviour of other participants in that market would be highly influenced by their **expectations** about the behaviour of that larger investor. In consequence, it is entirely possible to conceive of a market where one investor is dominant in terms of holdings, while another investor with only a small fraction of that market's total holdings is, as a result of its trading or net acquisitions, effectively dominant in terms of (spot) price, and perhaps even regarding the terms (eg, coupon, maturity, etc) on which (eg) new issues of the security are offered. Given that an investor's dominance can manifest itself in terms of either its holdings, its net acquisitions or its turnover, (or any combination of these) we now proceed to examine the relative holdings, net acquisitions and turnover of the pension funds in the United Kingdom capital markets to see if they do exhibit dominance.

8.3.1 The Financial System

(a) **Holdings:** In his 1982 SUERF pamphlet, David Fanning points out that

> the three principal areas of pension funds investment are British government and government guaranteed securities, predominantly long-dated and undated stocks, company ordinary shares, and land and property (1982, page 3)

This view is entirely consistent with our findings in Chapter Seven. Indeed, we expressed a similar view there, also noting that the pension funds appeared to regard ordinary shares and land as good substitute assets within their portfolio. If the portfolios of the pension funds are dominated by these three asset categories, then it would not be unreasonable to expect any dominance by the pension funds to be more likely in the markets for those particular assets. Thus, as we seek dominance in the financial markets our primary focus will be on the markets for gilts, ordinary shares, and land.

We commence our analysis of the holdings-dominance exhibited by the pension funds by looking at their overall position within the domestic capital markets. In Table 8-1 we present data on the year-end holdings of all assets of the major non- bank financial intermediaries from 1963 to 1984. This data has been converted into percentages, which is presented in Table 8-2. The astute reader will suggest that the percentages ignore the fact that some financial claims are held by groups other than the non-bank financial intermediaries, such as the personal sector or indeed the banks. While we would not wish to suggest that these holdings are irrelevant, a case can be made that they can be considered unimportant in the light of our analysis. Firstly, the proportion of financial assets held directly by the personal sector in the United Kingdom is substantial—individuals accounted for some 25 per cent of share ownership in 1983—the number of investors within this group is very large and highly diverse, with no real possibilities for effective collusion, so that in terms of market influence the personal sector can effectively be disregarded. In fact, the degree of market share accounted for by the personal sector has been diminishing substantially in the post-War era; individual share ownership was 58 per cent in 1958![6]

Table 8-1: Year-end Holdings of Financial Institutions

market values (£ millions)

	Buildng Socities	Unit Trusts	Investment Trusts	INSURANCE COS. General Funds	INSURANCE COS. Long-term Funds	PENSION FUNDS Private Sector	PENSION FUNDS Local Authority	PENSION FUNDS Public Sector	ALL
1963	4,359	350	2,817	972	7,425	2,882	727	1,027	4,636
1964	4,888	406	2,887	989	8,143	2,985	791	1,071	4,847
1965	5,577	500	319	1,041	8,826	3,293	..	1,145	4,438
1966	6,350	553	3,033	1,082	9,514	3,245	838	1,182	5,265
1967	7,523	788	4,013	1,212	10,173	3,879	907	1,434	6,220
1968	8,357	1,349	5,583	1,335	11,830	4,648	1,086	1,746	7,480
1969	9,336	1,334	4,902	1,460	12,741	4,468	1,220	1,699	7,387
1970	10,940	1,316	469	1,671	13,781	4,687	1,246	1,844	7,777
1971	13,067	1,953	5,780	2,089	15,011	6,175	1,316	2,535	10,026
1972	15,386	2,553	7,570	2,528	16,574	7,028	1,845	3,068	11,941
1973	17,709	2,097	5,815	3,186	19,732	7,489	1,934	2,813	12,236
1974	20,094	1,010	3,132	3,639	20,718	6,307	1,372	2,521	10,200
1975	24,204	2,299	5,381	4,548	23,342	9,642	2,134	4,104	15,880
1976	28,202	2,271	5,745	5,463	24,487	11,847	2,652	5,516	20,015
1977	34,288	3,109	6,341	7,375	34,256	16,983	3,849	8,005	28,837
1978	39,538	3,474	6,460	8,458	38,371	20,253	4,304	9,701	34,258
1979	45,789	3,600	6,996	9,585	42,677	23,622	4,942	12,261	40,825
1980	53,793	4,629	8,352	11,516	53,746	31,543	6,891	15,501	53,935
1981	61,815	5,369	8,904	13,132	61,084	36,921	8,167	18,348	63,436
1982	73,032	7,309	10,051	16,293	79,759	48,869	11,365	23,964	84,198
1983	85,869	10,843	13,371	18,782	95,768	63,131	14,274	29,754	107,159
1984	102,689	14,007	15,251	20,019	112,851	77,162	17,649	35,480	130,291

Source: *Annual Abstract of Statistics, Financial Statistics,* various editions

Given their high degree of visibility as major financial intermediaries it would seem at first glance that the banks cannot be disposed of quite so readily. For example, while the asset holdings of the pension funds amounted to £130,291 millions in 1984, the asset holdings of British retail banks amounted to £143,504 in the same year. If we were also to include the asset holdings of overseas banks, consortium banks, the discount market institutions, and the banking department of the Bank of England, this figure rises to a staggering £679,092 for 1984 (*Bank of England Quarterly Bulletin,* June 1984). However, while the banks are, in fact, an immensely dominant feature of the British financial landscape, their influence does not truly extend much beyond the money markets. For example, as we saw in Chapter One,[7] bank ownership of ordinary shares is at best minimal (1.7 per cent in 1969), and has declined to such an extent that nowadays the banks are typically aggregated together with investors such as the personal sector and others not included in the category of non-bank financial intermediaries. Indeed, the evidence presented to the Wilson Committee (1980, page 498) shows that the **only** financial markets where the banks' holdings may be regarded as significant are those for U. K. local authority securities, where they held an 18 per cent share in 1978, and British government securities, where they held a 9.1 per cent share in 1978.

Table 8-2: Year-end Holdings of Financial Institutions

(per cent)

				INSURANCE COS.			PENSION FUNDS		
	Building Societies	Unit Trusts	Investment Trusts	General Funds	Long-term Funds	Private Sector	Local Authority	Public Sector	ALL
1963	21.20	1.70	13.70	4.73	36.11	14.02	3.54	5.00	22.55
1964	22.06	1.83	13.03	4.46	36.75	13.47	3.57	4.83	21.87
1965	26.94	2.42	1.54	5.03	42.63	15.91	0	5.53	21.44
1966	24.62	2.14	11.76	4.19	36.88	12.58	3.25	4.58	20.41
1967	25.14	2.63	13.41	4.05	33.99	12.96	3.03	4.79	20.78
1968	23.26	3.75	15.54	3.72	32.92	12.93	3.02	4.86	20.82
1969	25.12	3.62	13.19	3.93	34.28	12.02	3.28	4.57	19.87
1970	30.43	3.66	1.30	4.65	48.33	13.04	3.47	5.13	21.63
1971	27.27	4.08	12.06	4.36	31.32	12.88	2.75	5.29	20.92
1972	27.21	4.51	13.39	4.47	29.31	12.43	3.26	5.43	21.12
1973	29.14	3.45	9.57	5.24	32.47	12.32	3.18	4.63	20.13
1974	34.18	1.72	5.33	6.19	35.24	10.73	2.33	4.23	17.35
1975	31.99	3.04	7.11	6.01	30.85	12.74	2.82	5.42	20.99
1976	32.72	2.64	6.67	6.34	28.41	13.75	3.08	6.40	23.22
1977	30.02	2.72	5.55	6.46	29.99	14.87	3.37	7.01	25.25
1978	30.28	2.66	4.95	6.48	29.39	15.51	3.30	7.43	26.24
1979	30.63	2.41	4.68	6.41	28.55	15.80	3.31	8.20	27.31
1980	28.93	2.49	4.49	6.19	28.90	16.96	3.71	8.34	29.00
1981	28.92	2.51	4.17	6.14	28.58	17.27	3.82	8.58	29.68
1982	26.98	2.70	3.71	6.02	29.47	18.06	4.20	8.85	31.11
1983	25.88	3.27	4.03	5.66	28.86	19.03	4.30	8.97	32.30
1984	25.99	3.55	3.86	5.07	28.56	19.53	4.47	8.98	32.98

Source: Table 8-1

Much of what is revealed by Table 8-1 is simply an extension to the entire non-bank financial sector of what we discovered for the three pension fund groups in Chapter Seven. To summarise, over the period 1963 to 1984 the asset holdings of all groups within the non-bank financial sector showed a long-run upward trend, with occasional short-term reductions. For example, the pension funds, unit trusts, and investment trusts all experienced reductions in their asset holdings in 1974, following the OPEC crisis. It is interesting to note that both categories of insurance companies—general funds and long-term funds—as well as the building societies were barely affected by the OPEC-induced recession of the early 1970s. In fact, both insurance companies' categories do exhibit a noticeable reduction in the rate of growth of their asset holdings during the 1973-1976 recession. Presumably the long-term and actuarially certain nature of their liabilities shielded them from any short-term reduction in the value of their investment portfolios.[8] Even more interesting is the almost constantly monotonically upward growth exhibited by the holdings of the building societies, who appear to be totally unaffected by general economic conditions. It is true that the building societies began to become more prominent on Britain's High Streets in the early 1970s as they undertook heavy advertising campaigns and became a seriously threatening competitor to the U. K.'s traditional depository intermediaries, the commercial or joint-stock banks. Additionally, as a result of the rampant uncertainty of the stagflation of the early 1970s, many investors, both individual and institutional, sought those investment media which were more liquid and more certain; from the individual's viewpoint, the building societies' liabilities certainly qualified and in a more attractive fashion than those of the more staid joint-stock banks. Nonetheless, during the relentless bull markets of the decade of the 1980s the longer-term intermediaries—the pension funds and long-term insurance funds—saw dramatic growth in their holdings to the extent that they actually overtook the building societies.

The percentage data presents a similar picture, albeit in terms of a representation of market share. The building societies do not seem to exhibit the smooth path of their absolute holdings. Their market share has oscillated between 21 and 34 per cent, showing a long-run upward trend until the mid-1970s and downward since. During the mid-1970s, especially following the OPEC crisis, the building societies held the largest market share of all non-bank financial intermediaries. The insurance companies' long-term funds held the largest market share until being superseded by the building societies in the mid-1970s. Over the entire data period the insurance companies' long-term funds have maintained a dominant market share, but like the building societies this share has oscillated dramatically. These oscillations have become reduced substantially since the late 1970s. The most surprising feature of the market share of the insurance companies' long-term funds is that over the entire data period it has shown a general downward trend, albeit one which has slowed during the 1980s. This is almost in direct contrast with the market share of the insurance companies' general funds. Despite a dip in the late 1960s and another in 1983, their market share has shown a slow but steady increase over the entire data period,stabilising at around 5 per cent since the mid-1970s.

Both unit trusts and investment trusts have shown wide swings in their relatively small market shares, especially prior to 1975. Following 1975 these shares seem to stabilise with unit trusts showing a slow but steady increase and investment trusts showing a slightly more rapid decline. During this latter period the unit trusts average a market share of some 2.5 per cent, while the figure for the investment trusts is about 4 per cent.

Like the other groups on non-bank financial intermediaries the pension funds' market share over the entire data period seems to hit a watershed during the OPEC crisis. Prior to this period the pension funds seemed to be losing its market share by a small degree, with some oscillation around this downward trend. However, since those heady days of stagflation their market share has shown a quite steady and marked upward trend to the point that they have held the major market share during the 1980s, having overtaken both the insurance companies'' long-term funds and the building societies in 1980.

From the above we may summarise that there are three major groups of non-bank financial intermediary which possess any significant degree of dominance over the financial system taken as a whole in terms of their holdings: the long-term funds of the insurance companies, the building societies, and the pension funds. Let us see if such a conclusion can be evidenced by the net acquisitions data as well.

(b) **Net Acquisitions:** In Table 8-3 we present the data for the annual net acquisitions of assets by the major non-bank financial intermediaries. Yet again, both the banks and the personal sector are conspicuous by their absence, for the reasons we have already cited. Again, the data have been converted into percentages, which are presented in Table 8-4.

Table 8-3: Annual Net Acquisitions of Financial Institutions

market values (£ millions)

	Buildng Societies	Unit Trusts	Investment Trusts	INSURANCE COS General Funds	Long-term Funds	Private Sector	PENSION FUNDS Local Authority	Public Sector	ALL
1963	518	54	69	31	586	214	62	75	428
1964	527	72	96	56	631	239	67	81	452
1965	687	66	19	25	633	274	75	84	489
1966	779	105	69	40	610	292	79	91	531
1967	1,159	80	64	79	682	256	91	99	516
1968	830	234	130	104	791	283	100	116	591
1969	958	173	34	65	751	277	108	124	598
1970	1,600	84	(8)	157	837	349	120	204	734
1971	2,118	81	105	271	971	368	152	204	876
1972	2,309	289	551	372	1,270	409	163	331	966
1973	2,323	196	(35)	341	1,322	557	199	462	1,237
1974	2,580	(21)	(202)	436	1,466	737	134	559	1,445
1975	4,075	344	(37)	725	1,784	1,072	355	861	2,203
1976	3,767	47	(8)	928	2,101	1,232	484	1,256	2,974
1977	6,549	144	100	954	2,952	1,454	541	1,208	3,178
1978	4,985	170	(73)	854	4,002	1,687	592	1,455	4,425
1979	6,394	53	(2)	1,352	4,487	2,920	754	1,906	5,583
1980	8,155	87	82	1,020	5,026	3,593	993	1,868	6,872
1981	7,924	429	(33)	1,551	6,047	3,994	1,128	2,317	7,439
1982	11,097	514	208	843	6,285	3,920	1,202	2,251	7,373
1983	12,797	1,114	261	1,228	6,673	4,239	1,230	2,357	7,826
1984	16,283	908	(509)	..	..	4,459	1,410	2,176	8,045
1985	17,648	2,346	406	..	..	5,320	1,388	2,088	8,808

Source: *Annual Abstract of Statistics, Financial Statistics*, various editions

Perhaps the most noticeable difference between the annual net acquisitions and the holdings data (in £ millions) is that, while most of the institutions exhibit a long run growth in their net acquisitions, there is a lesser degree of stability exhibited in them by virtually all of the non-bank financial intermediaries. Of course, this is exactly what we discovered for the pension funds in Chapter Seven. In fact, it is the net acquisitions of the longer-term intermediaries, the pension funds and long-term funds of insurance companies, that exhibit the smoothest pattern of growth. While for virtually the entire data period the annual net acquisitions of the building societies appear to well outstrip those of the other non-bank financial institutions, their pattern of growth exhibits a very high degree of oscillation. The building societies' net acquisitions grow from some £518 millions during 1963 to £17,648 millions during 1985, with major declines in the level during 1968, 1976, 1978, and 1981, and a significant plateau during 1973. This contrasts with the net acquisitions of the long-term funds of the insurance companies, which show no declines. As with holdings, the net acquisitions of the unit trusts, investment trusts, and the general funds of the insurance companies show very small growth with substantial oscillations. Indeed, both the unit trusts and investment trusts exhibit **negative** net acquisitions during some years in the data period. Also in common with the holdings data, the pension funds grow at a faster pace than their long-term insurance companies cousins in the period after the OPEC crisis in the early 1970s. This is a reversal of the situation before the crisis.

Table 8-4: Annual Net Acquisitions of Financial Institutions

(per cent)

	Buildng Societies	Unit Trusts	Investment Trusts	INSURANCE COS General Funds	Long-term Funds	Private Sector	PENSION FUNDS Local Authority	Public Sector	ALL
1963	32.18	3.36	4.28	1.93	36.39	13.32	3.86	4.67	21.86
1964	29.79	4.06	5.46	3.17	35.65	13.52	3.76	4.58	21.87
1965	36.88	3.54	1.04	1.32	34.01	14.70	4.02	4.49	23.21
1966	37.73	5.07	3.32	1.93	29.57	14.14	3.84	4.40	22.38
1967	46.17	3.19	2.55	3.15	27.17	10.21	3.61	3.95	17.77
1968	32.09	9.04	5.02	4.02	30.58	10.93	3.86	4.47	19.25
1969	38.49	6.94	1.37	2.61	30.17	11.13	4.32	4.97	20.42
1970	47.87	2.53	-0.25	4.69	25.04	10.43	3.59	6.10	20.13
1971	49.60	1.90	2.47	6.34	22.74	8.62	3.56	4.78	16.95
1972	40.55	5.08	9.67	6.53	22.30	7.19	2.86	5.82	15.86
1973	43.31	3.65	-0.65	6.35	24.65	10.38	3.70	8.61	22.69
1974	45.35	-0.37	-3.55	7.67	25.77	12.96	2.36	9.82	25.13
1975	44.40	3.74	-0.40	7.90	19.44	11.68	3.87	9.38	24.92
1976	38.41	0.48	-0.08	9.46	21.42	12.56	4.94	12.81	30.31
1977	47.11	1.03	0.72	6.86	21.23	10.46	3.89	8.69	23.04
1978	36.46	1.24	-0.53	6.24	29.27	12.34	4.33	10.64	27.31
1979	35.79	0.30	-0.01	7.57	25.12	16.35	4.22	10.67	31.24
1980	39.16	0.42	0.39	4.90	24.14	17.25	4.77	8.97	30.99
1981	33.93	1.84	-0.14	6.64	25.89	17.10	4.83	9.92	31.85
1982	42.16	1.95	0.79	3.20	23.88	14.89	4.57	8.85	28.01
1983	42.80	3.73	0.87	4.11	22.32	14.18	4.11	7.88	26.17
1984	65.85	3.67	-2.06	..	..	18.03	5.70	8.80	32.54
1985	60.45	8.04	1.39	..	..	18.22	4.75	7.15	30.13

Source: Table 8-3

One of the most interesting features of the net acquisitions data in percentages is that the various groups of institutions, despite substantial oscillations in their market share, seem to maintain their relative position over much of the data period. Thus, for example, while the building societies' market share varies from less than 30 per cent in 1964 to more than 65 per cent in 1984, they maintain the highest market share of non-bank financial institutions' net acquisitions over virtually the entire data period. This stability of relative position is less the case for the other institutions over the entire data period, but not over lengthy periods of time. The pension funds are behind the long-term insurance companies until the period of the 1973 crisis when their relative positions are reversed. Equally, while the unit trusts, investment trusts and insurance companies' general funds battle it out for relative positions during the early part of the data period, they settle down with the insurance companies ahead of the unit trusts, ahead of the investment trusts following the 1973 crisis.

The net acquisitions data expressed in percentages also reveals some interesting relationships between the various non-bank financial intermediaries that are not readily apparent when the data is expressed in billions of Pounds. Firstly, and perhaps not entirely surprisingly, we note that over most of the data period the relative positions of the pension funds and the insurance companies' long-term funds move in tandem. Thus, when the market share of the pension funds declines so does that of the insurance companies' long-term funds. The only exception to this seems to be briefly in the late 1970s. A similar pattern also seems to be the case for the unit trusts and investment trusts. The opposite relationship appears to be the case between the building societies and the pension funds (and hence the long-term insurance companies as well). Here, when the market share of the building societies rises that of the pension funds (and the long-term insurance companies) declines. Again, the only exception here is during the years of the early 1970s. A similarly competitive relationship would seem to exist between the pension funds and the investment trusts, albeit to a somewhat lesser degree. This probably tells us more about the British public's penchant for investment media during different parts of the business cycle than it does about institutional dominance of financial markets.

In looking at the percentage data on net acquisitions for the major groups of British non-bank financial intermediaries the same basic conclusion as deduced from the monetary data seems to be justified. That is to say, that dominance of the financial markets over most of the data period is exhibited by the building societies, the pension funds and the insurance companies' long-term funds, all of whom account for more than 20 per cent of the market share of net acquisitions. Certainly, while the pension funds do hold a dominant market share, in the period before the OPEC crisis, they are themselves dominated by both the building societies and the insurance companies' long-term funds. In the period since 1974, while the pension funds dominate the insurance companies' long-term funds, they are still well exceeded by the building societies.

(c) **Turnover:** Unfortunately there are no data available on the overall turnover of financial assets of the groups of non-bank financial intermediaries with which we have been concerned. Thus, our conclusions about institutional dominance of the financial markets **in general** must be based solely on the holdings and net acquisitions data that we have already considered.

From the foregoing we can summarise that the pension funds certainly appear to be a dominant investor in terms of their holdings in the U. K. financial markets taken as a whole. In fact, for much of the 1980s it would not be an exaggeration to suggest that they are **the** major dominant financial institution. The net acquisitions data also reveals the pension funds to be a dominant investor, but with a lesser degree of dominance than the building societies. This is certainly in line with what we might expect on the basis of the theory of investment by financial intermediaries; that is to say, we would normally tend to expect financial intermediaries which issue predominantly short-term liabilities to be more active traders in the financial markets than their counterparts which issue longer-term liabilities. What is, perhaps, rather more interesting is that despite having the smaller net acquisitions, the pension funds overtake the building societies in terms of holdings (both in Pounds and percentage terms) during the 1980s. This must surely indicate that the pension funds are earning a much higher return on their investments than the building societies. Comparison of the predominantly long-term nature of pension fund investment, especially during the lengthy bull market of the 1980s, with the building societies' major investment—mortgage loans, during a period of relatively stable and low inflation—would lend much credence to this view-point. We can therefore conclude that not only are the pension funds a dominant investor on the British financial scene but also a rather successful one.

Let us now go in further detail into the issue of dominance and consider individually the various markets that make up the financial system in the United Kingdom.

8.3.2 British Government Securities

The importance of the market for British government securities for the smooth operation of both fiscal and monetary policy in the United Kingdom is both paramount and obvious. The importance of this market within the financial system of the United Kingdom is not so readily apparent. According to the Wilson Committee

> The gilt-edged market provides the largest proportion of Stock Exchange trading measured in terms of value (75 per cent in 1978). It predominantly comprises British government and government guaranteed stocks... (1980, page 494)

Thus, in many respects the market for British government and government guaranteed stocks may be regarded as the most important market within the financial system of the United Kingdom.

(a) Holdings: In Table 8-5 we present the data on holdings of British government securities by the various financial institutions in nominal terms. The maturity split is for short-dated gilts (ie, with maturities up to five years) and medium- and long-dated gilts combined. This latter combination is due to the lack of published data in a more disaggregated form. For completeness we also include a set of data for **all** maturities. This latter data is also presented in percentage form in Table 8-6.

Unlike the overall data presented in the previous section, the picture of dominance in the gilts market is somewhat blurred. In nominal terms virtually all of the market participants increase their holdings over the data period, the only exception being the Discount Market. This holds for gilts of all maturities, although the Discount Market does seem to be switching out of the longer- and medium-term into the short-term gilts as the 1980s commence. This, as we also saw in Chapter Seven, is the reverse of the picture that emerges for the pension funds; as we enter the 1980s they seem to be moving out of the short and into the longer gilts.

Table 8-5: Holdings of British Government Securities by Financial Institutions

(£ millions, at end-March)

short dated	1964	1970	1974	1976	1977	1978	1979	1980
Official Holders				2.864	2.536	4.091	4.033	5.796
Banks	1.045	1.060	1.553	2.053	2.044	2.914	2.388	1.670
Discount Market	442	289	58	65	321	417	668	765
Insurance Companies	80	96	173	808	1.152	953	1.853	1.918
Pension Funds	40	96	115	386	400	375	383	390
Building Societies	121	530	805	1.930	1.898	2.632	3.303	3.726
Savings Banks	40	193	173	249	488	1.032	1.703	1.792
Investment & Unit Trusts	-	-	58	57	90	148	119	72
Other	2.290	2.602	2.818	5.341	6.735	6.647	7.124	8.104
Total	**4,018**	**4,818**	**5,751**	**13,753**	**15,664**	**19,209**	**21,574**	**24,233**

long- & medium-dated	1964	1970	1974	1976	1977	1978	1979	1980
Official Holders				3.568	3.154	4.525	3.782	4.892
Banks	937	686	461	249	183	195	270	504
Discount Market	-	-	-	4	8	10	30	7
Insurance Companies	1.978	3.088	4.300	6.054	8.046	10.263	13.458	16.391
Pension Funds	1.145	1.258	1.689	2.637	5.000	5.775	8.169	9.751
Building Societies	208	229	461	447	392	528	208	475
Savings Banks	104	343	921	855	997	1.056	1.043	1.327
Investment & Unit Trusts	-	114	-	195	203	217	197	142
Other	5.993	5.605	7.524	7.818	8.856	10.334	10.609	13.263
Total	**10,408**	**11,438**	**15,356**	**21,827**	**26,839**	**32,903**	**37,766**	**46,752**

al maturites	1964	1970	1974	1976	1977	1978	1979	1980	1981	1982	1983	1984
Official Holders				6432	5690	8616	7815	8861	10555	10715	11657	12775
Banks	1981	1746	2013	2302	2227	3109	2658	2220	4374	3835	3868	4312
Discount Market	442	289	58	69	329	427	698	779	1309	456	287	551
Insurance Companies	2058	3185	4472	6862	9198	11216	15311	17857	21250	23363	25014	27394
Pension Funds	1185	1355	1804	3023	5400	6150	8552	10886	12966	14653	16014	18702
Building Societies	329	759	1266	2377	2290	3160	3511	4358	5639	6828	7722	9773
Savings Banks	144	536	1094	1104	1485	2088	2746	3119)				
Investment & Unit Trusts	0	114	58	252	293	365	316	214	3712	4159	4283	4283
Other	8223	8206	10342	13159	15591	16981	17733	19454	21619	23374	23678	23678
Total	**14362**	**16190**	**21107**	**35580**	**42503**	**52112**	**59340**	**68317**	**81424**	**87383**	**92523**	**101468**

Source: Bank of England
David Fanning (1982)

Table 8-6: Holdings of British Government Securities by Financial Institutions

(per cent)

all maturities	1964	1970	1974	1976	1977	1978	1979	1980	1981	1982	1983	1984
Official Holders				18.08	13.39	16.53	13.17	12.97	12.96	12.26	12.60	13.25
Banks	13.80	10.79	9.54	6.47	5.24	5.97	4.48	3.25	5.37	4.39	4.18	4.47
Discount Market	3.08	1.79	.27	.19	.77	.82	1.18	1.14	1.61	.52	.31	.57
Insurance Companies	14.33	19.67	21.19	19.29	21.64	21.52	25.80	26.14	26.10	26.74	27.04	25.95
Pension Funds	8.25	8.37	8.55	8.50	12.71	11.80	14.41	15.94	15.92	16.77	17.31	16.61
Building Societies	2.29	4.69	6.00	6.68	5.39	6.06	5.92	6.38	6.93	7.81	8.35	10.14
Savings Banks	1.00	3.31	5.18	3.10	3.49	4.01	4.63	4.39				
Investment & Unit Trusts	0	.71	.27	.71	.69	.70	.53	5.71	4.56	4.76	4.63	4.44
Other	57.25	50.69	49.00	36.98	36.68	32.59	29.88	28.48	26.55	26.75	25.59	24.56

In terms of nominal values there is no doubt that the largest participant in the government securities market is the "other holders" category. This group is defined in the official statistics as being a **residual** category, consisting largely of individuals in the personal sector. As we argued before, despite the *largesse* of this group's holdings, it is unlikely that this group is likely to exert any degree of dominance in the gilts market. The next largest group of participants over the entire data period is the insurance companies. In his 1979 SUERF pamphlet, Dodds recognises the insurance companies as the major group of investors in the gilts market in terms of holdings, somewhat ahead of the pension funds. This dominance, he suggests, is particularly marked at the long end of the market. Certainly, a glance at a copy of the government publication *Business Monitor MQ5* will reveal that, while both the insurance companies and pension funds as long-term investors with a penchant for long-term assets that match their liabilities, the insurance companies tend to hold a greater percentage of their portfolio as gilts while the pension funds appear to have a greater preference for equity.

The view of dominance in the market for government securities is probably best seen from the percentage data. One of the most interesting features that emerges from this data is the secular decline of the market share accounted for by "other holders"; from over 57 per cent in 1964 to less than 25 per cent in 1984. This is entirely consistent with the decline in individual investment, and the secular increase in financial intermediation that we observed in Chapter One. The declining market share of the Discount Market is also revealed by the percentage data, a characteristic that also seems to apply to the banks. In the period since 1976 three groups appear to have increased their market share substantially; in ascending order these are the building societies, the pension funds and the insurance companies. The building societies are up to some 10 per cent in 1984, the pension funds to 17 per cent, and the insurance companies are leading the pack with 26 per cent. While these are significant shares of the gilts market, it would seem that dominance via holdings can only be attributed to the insurance companies and the pension funds. The disaggregated data by maturity shows this to be much more the case for the long end of the market. It may indeed be the case that the building societies, while exerting very little dominance in the gilts market as a whole, are indeed dominant at the short end of the market. Given that none of these groups seems to be in a truly monopsonistic position, let us look further afield to see if any institutions are dominant in the gilts market.

(b) **Net Acquisitions:** The data on institutional investment in the market for British government securities is presented in both nominal and percentage terms in Table 8-7 for the period 1972 - 1985. Given that the holdings data occur as a result of the net acquisitions data, it is no real surprise to find that the latter confirm the findings of the former. For example, we noticed a secular decline in the holdings of gilts by the banks and "other holders"; in terms of net acquisitions, both of these groups have largely been net sellers over the data period. The net acquisitions data also reveals the cyclical nature of the investment behaviour of the various financial intermediaries, something which is not readily apparent from the holdings data. Other interesting features exhibited by the net acquisitions data include the virtual disappearance of the savings banks from the gilts market after 1982, the low percentage of net acquisitions of government securities accounted for by the unit and investment trusts combined, the dramatic secular growth of the market share of net acquisitions of the pension funds, especially during the 1980s, and the marginal secular decline in the market share of the insurance companies.

Given that the pension funds account for some 30 per cent of all net acquisitions of government securities during the 1970s, a figure which rises to over 55 per cent by 1985, it would not seem unreasonable to suggest that they are a dominant investor in that market. Certainly, the issuers of these securities would be inclined to take into account the behaviour of such major purchasers in their pricing and issuing behaviour.[9] In order to fully establish the hypothesis of pension fund dominance in this market we must now turn our attention to other aspects of their trading activity by considering turnover.

Table 8-7: Institutional Investment in British Government Securities

(£ millions)

	TOTAL	Pension Funds	Insurance Companies		Trusts		Building Societies	Savings Banks	Other
1972	228	15	288	-30	-38	192	-9		
1973	699	190	318	23	62	113	-7		
1974	290	86	114	42	61	-4	-9		
1975	3310	930	1572	79	641	31	57		
1976	3332	1175	1799	11	172	270	-95		
1977	4710	1116	2229	130	680	578	-24		
			long-term	general	investment	unit			
1978	4785	1305	2426	213	-30	3	382	517	-31
1979	6660	2294	2542	393	73	4	822	532	1
1980	5546	2083	2176	433	-47	8	873	80	-52
1981	6302	1873	2207	703	-57	103	1251	265	-43
1982	4771	1362	1841	65	-7	90	1471	-	-51
1983	6448	2688	2092	288	127	122	1188	-	-57
1984	5416	2201	2455	-23	-	54	797	-	-68
1985	4860	2708	1744	149	67	21	247	-	-76

(per cent)

	Pension Funds	Insurance Companies		Trusts		Building Societies	Savings Banks	Other
1972	6.58	126.32	-13.16	-16.67	84.21	-3.95		
1973	27.18	45.50	3.29	8.87	16.17	-1.00		
1974	29.66	39.31	14.48	21.03	-1.38	-3.10		
1975	28.10	47.49	2.39	19.37	0.94	1.72		
1976	35.26	54.00	0.33	5.16	8.10	-2.85		
1977	23.69	47.32	2.76	14.44	12.27	-0.51		
		longterm	general	investment	unit			
1978	27.27	50.70	4.45	-0.63	0.01	7.98	10.80	-0.65
1979	34.44	38.17	5.90	1.10	0.01	12.34	7.99	..
1980	37.56	39.24	7.81	-0.85	0.14	15.74	1.44	-0.94
1981	29.72	35.02	11.16	-0.90	1.63	19.85	4.21	-0.68
1982	28.55	38.59	1.36	-0.15	1.89	30.83	-	-1.07
1983	41.69	32.44	4.47	1.97	1.89	18.42	-	-0.88
1984	40.64	45.33	-0.42	-	1.00	14.72	-	-1.26
1985	55.72	35.88	3.07	1.38	0.43	5.08	-	-1.56

Source: *Financial Statistics*

(c) **Turnover:** Data on the pension funds' turnover activity in the market for government securities is presented in Table 8-8 in both nominal and percentage terms. The data reveal that the pension funds' turnover varies from a low of 23.41 per cent in 1978 to a high of 40.66 per cent in 1975. However, in each year the turnover of the pension funds is exceeded by that of the insurance companies. Thus, we may conclude that while the pension funds account for a significant amount of the turnover in this market, the overall dominance is held by the insurance companies. Given what we have already seen of the relative importance of government securities in the portfolios of these two groups of financial intermediaries, this is hardly a surprising find, and is certainly consistent with the findings of other studies, such as that by Dodds (1978).[10] Nonetheless, during this data period the pension funds account for over twenty per cent of the turnover of government securities, so that while we may acknowledge the overall dominance of the insurance companies, we may consider the pension funds as being dominant to a significant but lesser degree. However, the net acquisitions data examined earlier did reveal that the relative positions of the insurance companies and pension funds in the market for gilts switched during the 1980s, so let us consider their turnover data for the 1980s, which is presented in Table 8-9.

Table 8-8: Pension Funds' Turnover—Government Securities Market

		£ million		per cent	
	TOTAL	Pension Funds	Insurance Companies	Pension Funds	Insurance Companies
1973	8,694	2,297	4,870	26.42	56.02
1974	12,782	3,416	7,901	26.73	61.81
1975	22,242	9,124	10,674	40.66	47.56
1976	28,330	10,583	13,527	37.36	47.75
1977	44,114	14,072	20,865	31.90	47.30
1978	36,642	8,577	21,306	23.41	58.15
1979	45,657	12,745	25,058	27.91	54.88

Source: *Financial Statistics*

Table 8-9: Turnover in Government Securities

£ million

	short*		medium*		long*		ILTS*		ALL	
	PF's	InsCos	PF's	InsCos	PF's	InsCos	PF's	InsCos	PF's	InsCos
1980	1,294	5,630	2,913	7,372	6,451	12,340	0	0	10,658	25,342
1981	745	5,681	3,598	11,595	8,170	15,110	0	0	12,513	32,385
1982	1,392	4,129	6,839	10,641	10,370	13,889	0	5,524	18,600	34,183
1983	2,110	8,889	8,095	16,495	11,417	18,021	852	820	22,474	44,225
1984	2,190	10,261	9,589	27,989	8,486	15,195	2,263	1,976	22,528	55,421
1985	1,115	7,618	13,360	24,724	11,427	19,487	3,867	0	29,769	51,829
1986	1,428	7,468	14,691	27,177	15,137	23,830	3,892	34	35,148	58,514

Source: *Business Monitor MQ5*

Table 8-9 reveals that much the same pattern of turnover that prevailed in the market for British government securities in the 1970s, persisted into the 1980s as well. Thus, while the 1980s also saw the pension funds account for a large percentage of the turnover of government securities, a larger turnover was exhibited by the insurance companies. This would appear to be true for virtually all maturity ranges of gilts. Given that "insurance companies" encompasses both general funds (fire, auto, theft, etc), whose liabilities are often short-term, as well as long-term funds (such as the life offices), we would be inclined to expect them to participate more in the market for gilts of shorter maturity than the pension funds, whose liabilities are entirely long term. The only category of government security where the pension funds turnover dominates that of the insurance companies is that of the Index-Linked Treasury Stock. Indeed, while the insurance companies seemed to have plunged into investment in ILTS with gay abandon upon their premier issue in 1982, their position has become somewhat reversed in the years following, years in which the rate of inflation was declining and becoming much less volatile than the stagflationary 1970s. However, given the legal requirement that pensionable benefits be linked to the general price level,[11] we should not be surprised by the dominance of the pension funds in the ILTS market. Thus, once again, the turnover data would seem to support the holdings and net acquisitions evidence of insurance company dominance of the market for government securities. However, we should still consider this conclusion as open to debate until we look at a couple of other ways of measuring dominance via trading activity.

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* short = maturity of less than 5 years; medium = 5 to 15 years; long = more than 15 years; ILTS = Index-Linked Treasury Stock.

In looking at the turnover data above we are considering the purchases and sales of government securities as a single sum. In Table 8-10 we show data on the pension funds' purchases and sales of government securities separately. It is interesting to note that purchases and sales tend to move together; that is to say, in a year when the pension funds are purchasing more gilts they are also selling more gilts. While some of this strong relationship between purchases and sales must be due to the impact of inflation on the nominal values of gilts being traded, the fact that a similar picture emerges from the percentage data (also in Table 8-10) implies that there are also other factors that might account for this phenomenon. The major factor that would seem to be relevant concerns the 'thickness' of the market.[12] Because trading in the market for government securities is very active and relatively low in transactions costs, we would readily expect the pension funds (or, indeed, any other investor) to sell assets when there is an opportunity to purchase the same assets at a lower price or with improved yield. The significantly high percentage data for the pension funds suggests that this is the type of investment strategy they do, indeed, pursue in the gilts market, rather than the more legendary "buy-and-hold" strategy with which they are typically endowed in undergraduate textbooks.

Table 8-10: Pension Funds' Transactions in British Government Securities *(£ millions)*

	Pension Funds		All NBFI's	
	Purchases	Sales	Purchases	Sales
1973	1,189	999	5,060	4,361
1974	1,751	1,665	6,536	6,246
1975	5,027	4,097	12,876	9,566
1976	5,879	4,704	15,830	12,499
1977	7,594	6,478	24,412	19,703
1978	4,941	3,636	20,711	15,931
1979	7,321	5,424	26,003	19,654

(per cent)

	Pension Funds		Insurance Companies	
	Purchases	Sales	Purchases	Sales
1973	23.50	22.91	63.00	65.81
1974	26.79	26.66	61.43	62.46
1975	39.04	42.83	47.55	47.57
1976	37.14	37.64	48.41	46.92
1977	31.11	32.88	47.30	47.29
1978	23.86	22.82	57.81	58.59
1979	28.15	27.60	53.84	56.26

Source: *Financial Statistics*

While the data shows that the pension funds are a significant force in the market for British government securities, accounting for some twenty to thirty-five per cent of all sales as well as purchases, they are not the dominant investor in the market. Once again, the dominant position seems to be occupied by the insurance companies, which account for between forty-five and sixty-five per cent of all purchases and sales. This, unsurprisingly, supports the conclusion we derived from both the turnover and net acquisitions data; that is to say, that while the pension funds are a significantly active and dominant trader in the market for government securities, they are not **the** dominant trader.

One final means of examining the market activity of participants is to make use of turnover ratios. Such an approach has been considered by (eg) R. L. Carter and J. E. V. Johnson (1976) and Dodds (1978, 1979). Following precedent, we only consider two such ratios, both of which make use of the data we have already seen. These ratios are used to estimate the extent to which the pension funds turn over their portfolio of assets. The first ratio, which I shall refer to as the **activity ratio** is defined as:

$$\frac{\sum S}{\sum P}$$

where $\sum S$ = total sales over a given period at market prices, and $\sum P$ = total purchases over a given period at market prices. If the activity ratio is above unity then we would expect net acquisitions over that time period to be negative, ie, a net selling tendency on the part of the investor. The lower the value of the activity ratio below unity, the greater the indication that the investor is pursuing a conservative "buy-and-hold" strategy. I shall refer to the second ratio as the **trading ratio,** and it may be defined as:

$$\frac{\sum S}{TH}$$

with $\sum S$ defined as before, and TH being some measure of the investor's total holdings. Given that $\sum S$ is a flow measure while TH is a stock, many analysts prefer to measure TH by taking the average of end-year holdings. Thus, instead of TH they use:

$$\overline{TH} = \frac{TH_t + TH_{t-1}}{2}$$

where TH_t = total holdings at end of year t, and TH_{t-1} = total holdings at end of year t-1 (ie, beginning of year t). With this ratio, a value above unity reveals the investor's preference to reduce their participation in the market for a particular asset. If the ratio is close to zero the implication is of an investor pursuing a conservative "buy-and-hold" strategy and whose actions in the market are, therefore, unlikely to influence the asset price significantly.

In Table 8-11(a) we present the annual activity ratios for the pension funds for the data period 1980-1987. As we have come to expect, the turnover of long-term government securities is rather less than that for medium- and short-term maturities. Also, for the most part, purchases exceed sales, giving activity ratios less than unity. It is particularly interesting to note the relatively high values the pension funds' activity ratios exhibit in virtually every year and over all maturity ranges. This would seem to indicate that the pension funds have a rapid turnover of their gilts portfolio, rather than the stereotypical "buy-and-hold" portfolio with which they are usually characterised. To establish whether this substantial turnover activity gives the pension funds the status of dominant investor in the market for British government securities we need to compare the ratios above with those for the major (non-bank) investor, the insurance companies. Activity ratios for the insurance companies' turnover of government securities are presented in Table 8-11(b).

Table 8-11: Turnover in British Government Securities—Activity Ratio

(a) Pension Funds:

maturity	1980	1981	1982	1983	1984	1985	1986	1987
short	1.2861	1.0623	0.7876	0.7030	0.8403	2.3476	1.1935	1.001
medium	0.8045	0.9808	0.9490	0.9311	0.8787	0.9180	1.1434	1.065
long	0.5919	0.6284	0.8303	0.7527	0.8404	0.7575	0.8426	0.876
ILTS				0.9233	0.5982	0.5815	0.6981	0.766
TOTAL	**0.71**	**0.7392**	**0.8688**	**0.8142**	**0.8284**	**0.8286**	**0.9514**	**0.96**

(b) Insurance Companies:

maturity	1980	1981	1982	1983	1984	1985	1986	1987
short	1.104	0.993	1.007	0.919	0.961	1.151	0.919	1.6173
medium	0.827	0.903	0.913	0.911	0.887	1.033	0.954	1.0459
long	0.704	0.741	0.777	0.844	0.909	0.746	0.922	1.0618
ILTS			0.882	1.092	0.918		0.789	1.1564
TOTAL	**0.82**	**0.84**	**0.86**	**0.89**	**0.91**	**0.93**	**0.94**	**1.077**

Source: *Business Monitor MQ5*

Taking government securities as a single group, regardless of maturity, we find that the insurance companies exhibit greater turnover than the pension funds, when proxied by the activity ratio. There are a couple of years in which this situation is reversed so that the pension funds' turnover exceeds that of the insurance companies. In both 1982 and 1986 the pension funds' turnover is marginally above that of the insurance companies. Indeed, the pension funds turnover as measured by the activity ratio increases monotonically, approaching unity throughout the 1980s. This would appear to back up the findings of both the holdings and net acquisitions data, ie, that the pension funds have become a more dominant investor in the market for government securities in recent years.

In looking at those gilts of short maturity, ie, with less than five years to maturity, no clear pattern of dominance emerges in terms of the activity ratio. In some years the pension funds exhibit greater turnover, in other years it is the insurance companies. The period since 1985 shows the pension funds emerging as the dominant investor with higher activity ratios, although with values consistently above unity they are showing a net selling tendency. A very similar picture is shown by the activity ratios for medium term gilts, ie, those with maturities between five and fifteen years, although it is frequently the case that when the pension funds dominate the short gilts market, the insurance companies are dominating the market for medium gilts.

In the market for long-term gilts, ie, those with more than fifteen years to maturity, the insurance companies are the unequivocal leader. In fact, in only two years do the pension funds reverse this situation, 1982 and 1985, and then only by a marginal amount. In fact, even if we were to group the ILTS with the long-term gilts, the insurance would still emerge as the dominant investor in the market for **all** long-term gilts. This is apparent as the insurance companies' ILTS activity ratios exceed those for the pension funds in virtually all years. These conclusions are consistent with those found by both Dodds (1979) and Fanning (1982). While our data period has some overlap with that examined by Fanning, both authors are dealing with somewhat earlier time periods than ourselves.

In Table 8-12 we show the calculated trading ratios for both the pension funds and the insurance companies.[13] With very few exceptions the insurance companies' ratios are higher than those for the pension funds, indicating yet again the overall dominance exhibited by the insurance companies in the markets for government securities. It is interesting to note that the trading ratios for both groups of financial intermediaries are generally highest for short-term gilts, and diminish as the maturity increases. It is only with the short-term gilts that we find ratios above unity. This is much as we would expect from institutions that primarily issue long-term liabilities. Once again, as we discovered with the activity ratios, with the exception of 1980, 1982 and 1986-1987, the insurance companies dominate the market for short-term gilts, by selling annually a greater proportion of their average holdings than the pension funds. While the ratios for short-term gilts do not differ tremendously, there is a much more marked degree of dominance in the market for both medium- and long-term gilts. In both markets the insurance companies are consistently exhibiting higher trading ratios than the pension funds of at least two points. It is only in the market for Index-Linked Treasury Stock that the picture is less clear, with the pension funds dominated by the insurance companies in all years except 1985-1986. This is in line with the findings of the activity ratios.

Table 8-12: Turnover in British Government Securities—Trading Ratio

(a) Pension Funds:

maturity	1980	1981	1982	1983	1984	1985	1986	1987
short	1.915	1.4268	2.0406	1.4197	1.0532	0.9862	1.1116	0.6809
medium	0.4334	0.462	0.5966	0.4764	0.4475	0.5432	0.6164	0.596
long	0.3258	0.4107	0.5701	0.527	0.4229	0.5255	0.7119	0.7348
ILTS				0.1536	0.2478	0.3797	0.3142	0.4462
TOTAL	**0.4119**	**0.4256**	**0.5411**	**0.4856**	**0.4334**	**0.524**	**0.607**	**0.6154**

(b) Insurance Companies:

maturity	1980	1981	1982	1983	1984	1985	1986	1987
short	1.861	1.667	0.96	1.471	1.456	1.148	0.967	1.06
medium	0.848	1.036	0.608	0.647	0.876	0.733	0.729	0.92
long	0.513	0.6	0.528	0.66	0.64	0.759	0.945	1.062
ILTS			3.487	0.323	0.546	0	0.006	0.82
TOTAL	**0.737**	**0.823**	**0.695**	**0.72**	**0.837**	**0.738**	**0.779**	**0.97**

Source: *Business Monitor MQ5*

(d) **Summary:** From the foregoing we may suggest that while the pension funds hold substantial quantities of British government securities of all maturities, including the innovative Index-Linked Treasury Stock, and while their net acquisitions are a very significant proportion of the total issue in any year, and while they are also much more active traders in the markets for British government securities than they are stereotypically depicted, they are exceeded in all of these areas by the activities of the insurance companies. Nonetheless, while the pension funds do not appear to be **the** dominant investor on the basis of the evidence presented above, according to Fanning, since the mid-1970s

> pension funds in the United Kingdom had increased their proportionate participation in the gilts (and equities) markets to the point where the funds were large and influential investors and probably price leaders. (1982, page 10)

It, therefore, follows that, while we should not characterise the pension funds as the dominant investor, they are a highly significant participant in the market for British government securities. Given the very high degree of their participation, it would not seem unreasonable to suggest that the actions of the pension funds may indeed influence the price of British government securities. Consequently, the demand for gilts by the pension funds is likely to find itself constrained by the level of gilts currently being issued. Thus, any attempt to model the investment behaviour of the pension funds needs to take this into account via the inclusion of a supply-side constraint. This we shall do in the following chapter.

8.3.3 U.K. Ordinary Shares

Far and away, the best study of the pension funds' activities in the market for British ordinary shares is Richard Minns' *Pension Funds and British Capitalism* (1980). Minns book appears largely stimulated by the view of legendary management guru Peter Drucker that pension fund holdings of equity constitute a form of "corporate" or "pension fund socialism" because via their pension funds the workers own much of the means of production. This is a view which finds little favour with Minns. He examines the hypothesis of "pension fund socialism" by means of an in-depth analysis of the rôle and position of the British pension funds in the equity markets of the United Kingdom. By contrast, Drucker's views are based largely on impressions gained over several decades as a widely-sought consultant to a large number of wide-ranging enterprises in the United States.[15] The essence of Minns' argument lies in the distinction between **ownership** and **control** for defining socialism, a distinction he suggests is lost by analysts such as Drucker. According to Drucker

> The emergence of the pension fund makes final the divorce of traditional 'ownership' from 'control' which has been a favorite topic of writers in the industrial and post-industrial economy since Berle and Means's pioneering book, written forty-five years ago. The pension funds are not 'owners', they are investors. They do not want control, indeed they are disqualified from exercising it. The pension funds are 'trustees'. (1976, pp.82-83)

This view is opposed by Minns. On the basis of an extensive survey of the pension funds' activities, including questionnaire surveys of many of the top policy-makers in the major British financial institutions, he argues that the pension funds do indeed represent the face of capitalism, not one of socialism. While many of his conclusions are open to debate on the grounds of (eg) being based on what many would regard as outdated emotive assumptions, politics notwithstanding, the study by Minns forms one of the most complete ever published on the position of the pension funds in the capital markets of the United Kingdom.

(a) **Holdings:** As we saw in Chapter Seven, the largest asset category within the pension funds' portfolio is that of ordinary shares. This is true both in terms of their holdings and their net acquisitions. Given that the pension funds are a very significant participant in the gilts market, and that their portfolio finds gilts dominated by ordinary shares, it would not seem unreasonable to suggest *a priori* that the pension funds will be the dominant investor in the market for domestic ordinary shares.

In Table 8-13 we present the data on holdings of domestic ordinary by the various financial institutions in nominal terms. In Table 8-14 we present the same data in percentage form and also include the Briston and Dobbins data for some of the intermediate years not presented in Table 8-13. In nominal terms there is no ambiguity about concluding that the pension funds are the dominant investor, given that their holdings are second only to the extremely heterogeneous group of "persons, executors and trustees". Once again, as we saw in Chapter One, the growth of the rôle of the financial intermediaries in the U. K. capital markets is immediately apparent. Indeed, this growth, corresponding to a decline in the relative share held by individuals was one of the major concerns of the Wilson Committee. One view put forward to the Committee was that of the Stock Exchange, who argued that

> The decline in the activity of the individual shareholder and the emergence of an identity of view by the institutions has meant that the two-way nature of the market, and thus its liquidity, has diminished. The loss of liquidity inevitably leads to greater day-to-day market movements since, in a narrow one-way market, buyer and seller cannot otherwise be matched.

Table 8-13: Holdings of Domestic Ordinary Shares by Financial Institutions

(£ millions)

	1957	1963	1969	1975	1978	1981	1984
Insurance Companies	1,020.8	2,749.8	4,390.6	7,091.4	12,456.2	18,860.0	44,000.0
Pension Funds	394.4	1,759.9	3,406.5	7,492.8	14,773.7	24,564.0	58,000.0
Investment Trusts	603.2	2,034.9	2,498.1	2,720.6	3,910.7	6,532.0	12,000.0
Unit Trusts	58.0	357.5	1,022.0	1,828.6	2,969.2	3,312.0	8,000.0
Banks	104.4	357.5	643.5	312.2	0.0	0.0	0.0
Finance, Stock Exchange and non-profit sector	510.4	1,677.4	4,012.1	2,988.2	4,779.7	2,024.0	4,000.0
Non-financial companies	313.2	1,402.4	2,043.9	1,338.0	2,969.2	4,692.0	10,000.0
Public sector	452.4	412.5	984.1	1,605.6	2,896.8	2,760.0	10,000.0
Persons, executors and trustees	7,632.8	14,848.9	17,940.9	16,725.0	24,043.4	25,944.0	46,000.0
Overseas	510.4	1,924.9	2,498.1	2,497.6	3,621.0	3,312.0	8,000.0
TOTAL	**11,600.0**	**27,525.5**	**39,439.7**	**44,600.0**	**72,420.0**	**92,000.0**	**200,000.0**

Sources: Table 1-10, The Wilson Committee, The Stock Exchange, Phillips and Drew, Gabrielli and Fano (editors), *The Challenge of Private Pension Funds*, (1986).

> A further factor in the increasing influence of the institutions is that the professional investment managers, with a fiduciary responsibility for the savings of the underlying investor, are less likely to select investments with a high risk element than people investing their own money. (1980, page 190)

This second concern of the Stock Exchange is really no surprise, as we explained in the theory of financial intermediation in Chapter Two. Indeed, it is the view of many financial and monetary economists that this may be beneficial in the sense that it allows funds to flow to investments with greater prospective returns at no greater, and possibly less, risk to the individual investors involved. In fact, this was precisely the view taken by the Wilson Committee (paragraph 665, pp.191-192). Nonetheless, the possibility of greater market volatility to this day remains a valid concern. In paragraph 663 the Wilson Committee expressed the view that

> It has not yet been established to our satisfaction that the institutions do cause greater price volatility, and the argument has not yet been resolved conclusively in the USA either, despite more research having been carried out there. As the proportion of shares held by the institutions continues to edge upwards, however, then increasingly they will find themselves trading with each other. In such circumstances one-way markets in which institutions sharing similar views are unable to trade until large price adjustments occur, which has already become a characteristic of the gilts market at certain times, may become increasingly common for equities. This does not necessarily imply that security pricing will thereby become less efficient in terms of incorporating information. ... But it can

make continuous dealing difficult. Moreover at times in both the gilt-edged and the equity markets it does appear to some of us that investment managers are more concerned with watching each other and seeing which way some of the big participants are going to jump rather than with longer-term prospects, and this seems bound to have a destabilising effect on the markets. (1980, page 191)

As well as echoing the sentiments of the late Lord Keynes in likening financial investment behaviour to the vicarious thrills enjoyed by viewers of beauty pageants,[17] the Wilson Committee views are indeed portentous of the immense market volatility that has characterised much of the second half of the 1980s, culminating, of course, in the dramatic decline in stock prices world-wide on October 19th, 1987. Our interest here, however, does not lie with the implications of the increasing rôle of the institutions *per se*, but rather in determining the degree to which the pension funds may be the dominant investor in the domestic equities' market.

Table 8-14: Holdings of Domestic Ordinary Shares by Financial Institutions

(per cent)

	1957	1963	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1981	1984
Insurance Companies	8.8	10.0	10.0	10.1	11.0	11.6	12.1	12.9	13.9	14.8	15.4	15.9	15.9	16.3	17.2	20.5	22.0
Pension Funds	3.4	6.4	8.0	8.4	8.8	9.0	9.7	10.7	11.9	12.9	14.8	16.8	17.9	19.5	20.4	26.7	29.0
Investment Trusts	5.2	7.4	6.2	6.5	6.5	6.6	6.5	6.7	6.8	6.5	6.6	6.1	6.3	5.9	5.4	7.1	6.0
Unit Trusts	0.5	1.3	1.8	2.0	2.4	2.7	2.7	3.1	3.1	3.4	4.1	4.1	4.2	4.2	4.1	3.6	4.0
Banks	0.9	1.3				1.7						0.7					
Finance, Stock Exchange and non-profit setor	4.4	6.1				10.6						6.7			6.6	2.2	2.0
Non-financial companies	2.7	5.1 }	74.0	73.0	71.3	{ 5.4 }	69.0	66.6	64.3	62.4	59.1	{ 3.0 }	55.7	54.0	{ 4.1	5.1	5.0
Public sector	3.9	1.5				2.6						3.6			4.0	3.0	5.0
Persons, executors and trustees	65.8	54.0				47.4						37.5			33.2	28.2	23.0
Overseas	4.4	7.0				6.6						5.6			5.0	3.6	4.0
TOTAL	**100**	**100.1**	**100**	**100**	**100**	**104.2**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**99.9**	**100**	**100**	**100**
Capitalised market values (£mn)	11,600	27,498			37,850						44,600				72,420	92,000	200,000

Sources: Table 8-12
Briston and Dobbins (1978)

It is quite apparent from Table 8-13 that there has been tremendous growth in the U. K. market for ordinary shares over the past thirty years or so. Indeed, some writers have been moved to talk of "the cult of the equity".[18] Nearly every category of investor has increased the nominal value of their holdings of U. K. quoted equities since 1957. The only exception appears to be the banks. Again, while some of this is due to the continuous inflation that has characterised the post-War period, other factors must also have been at work. Among the institutions, in 1957 we find that the insurance companies were the dominant investor, a position they relinquished to the pension funds during the 1960s. The data in Table 8-13 shows that since at least 1969 the pension funds have been the dominant investor in the equities' market, on the previously stated assumption about the category of "persons, executors and trustees". In fact, even without that assumption, by 1981 the pension funds' holdings of ordinary shares was almost equal to those of "persons, executors and trustees", and exceeded them by 1984. In 1984 the pension funds were the undisputed dominant investor by virtue of their holdings of ordinary shares. This conclusion is both confirmed and emphasised by the data on percentages in Table 8-14. In 1957 pension fund holdings accounted for 3.4 per cent of total equity ownership; by 1984 this had increased to a staggering 29 per cent. Over the same period the holdings of non-financial intermediaries fell from 81.2 per cent to 39 per cent! One feels compelled to point out yet again that the growth of equity holdings by the pension funds should be seen as part of the secular growth of financial intermediation in the post-War period. While the other non-bank financial intermediaries have not exhibited the same degree of growth as the pension funds in their equity holdings, they have shown the same upward growth (for the most part) in both nominal and percentage terms.

(b) **Net Acquisitions:** We present the nominal data on net acquisitions of ordinary shares by the financial intermediaries in Table 8-15. In Table 8-16 we present the same data in percentage form. As with the holdings data in nominal terms, there is no ambiguity about concluding that the pension funds are the dominant investor, given that their net acquisitions of domestic ordinary shares exceed those of all other financial intermediaries as well as the ubiquitous catch-all category of "other" which includes **all** other traders of ordinary shares. This evidence is emphasised beyond any shadow of a doubt by the data in percentage terms. To highlight this further we illustrate this percentage data in Figure 8-1.

Table 8-15: Net Acquisitions of Domestic Ordinary Shares

(£ millions)

	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Pension Funds	354	254	358	696	925	1189	1393	1328	1307	1116	944	972	1140	1482	1650
Insurance Cos.	188	11	-33	87	194	339	466	393	310	227	166	245	340	575	699
Investment Trusts	-406	-425	-308	-118	35	181	178	161	117	45	-16	-114	-86	-13	-60
Unit Trusts	-9	-40	123	229	270	328	231	113	78	28	49	78	111	137	97
Other	20	-13	-19	-43	-28	2	21	49	31	43	16	-43	-117	-109	-171
TOTAL	**147**	**-213**	**121**	**851**	**1396**	**2039**	**2289**	**2044**	**1843**	**1459**	**1159**	**1138**	**1388**	**2072**	**2215**

Source: *Financial Statistics, Business Monitor MQ5*

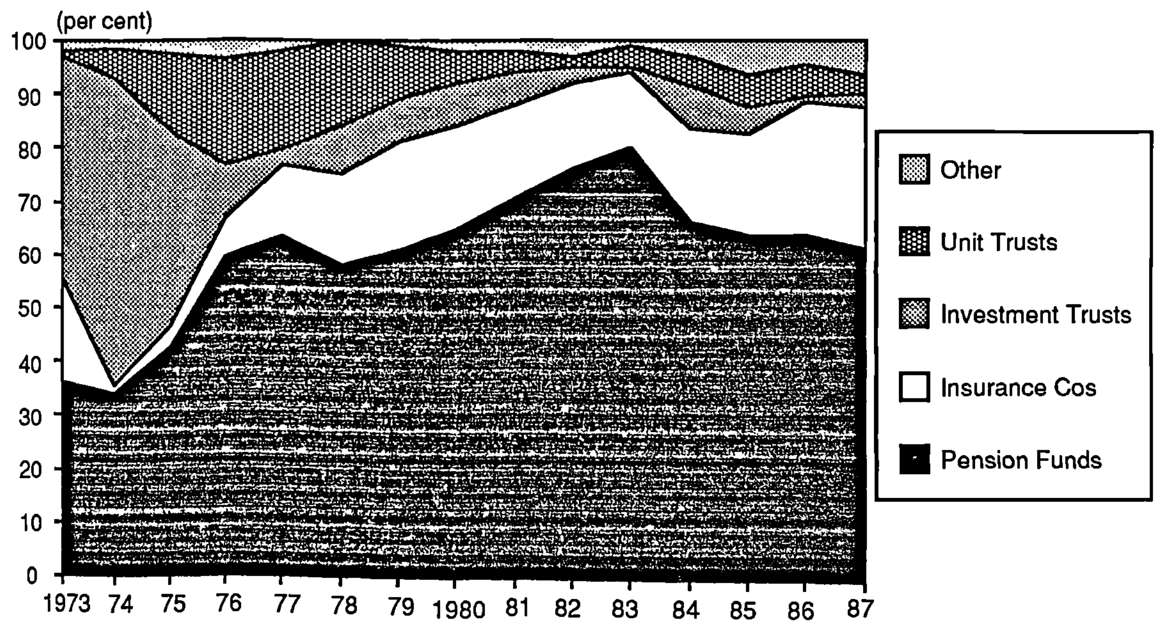
Table 8-16: Net Acquisitions of Domestic Ordinary Shares

(per cent)

	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Pension Funds	241	-119	296	82	66	58	61	65	71	76	81	85	82	72	74
Insurance Cos	128	-5	-27	10	14	17	20	19	17	16	14	22	24	28	32
Investment Trusts	-276	200	-255	-14	3	9	8	8	6	3	-1	-10	-6	-1	-3
Unit Trusts	-6	19	102	27	19	16	10	6	4	2	4	7	8	7	4
Other	14	6	-16	-5	-2	0	1	2	2	3	1	-4	-8	-5	-8

Source: Table 8-15

Figure 8-1: Net Acquisitions of Domestic Ordinary Shares



Source: Table 8-16

Yet again, both Tables present a picture of the increasing rôle of the financial intermediaries in the U. K. market for ordinary shares that is self-evident. And, yet again, it is the increasing rôle of the pension funds and insurance companies that is starkly revealed. Indeed, for much of the data period both the investment trusts and "other" are net sellers of ordinary shares. Examining the nominal data, we see that this is particularly the case in the years immediately following the recessions of the early 1970s and early 1980s. While the pension funds' net acquisitions do decline somewhat following the 1980-1982 recession, they recover and continue their upward trend throughout the remainder of the 1980s. The net acquisitions activities of the insurance companies lies somewhere between these two scenarios. Like the pension funds, their net acquisitions shows a steady upward trend over the data period with a small decline in the early 1980s; like the investment trusts, they become net sellers following the early 1970s recession. In all years we notice that the pension funds occupy the position of dominant investor by virtue of having the largest value of net acquisitions of ordinary shares. This dominance would seem to be even more marked when consideration is given to the percentage data.

In percentage terms, the lowest market share of net acquisitions enjoyed by the pension funds is some 58.31 per cent in 1978. In some of the years of the early 1970s, the pension funds appear to be buying not only new issues but the net sales of other groups of investors, as evidenced by net acquisitions above one hundred per cent. While this is also true to a lesser extent of the insurance companies, by way of contrast when the insurance companies account for 127.89 per cent of net acquisitions (ie, in 1973), the pension funds account for a staggering 240.82 per cent! In what might be regarded as more normal times for the U. K. capital markets (ie, in 1987), when the insurance companies account for 31.56 per cent, the pension funds' figure is 74.49 per cent. Putting together these findings with those established from the holdings data, we can see that while most groups of investors have increased their holdings of equities since the 1950s, the major purchasers of new issues of ordinary shares have been the insurance companies and (more particularly) the pension funds. At this stage, therefore, on the basis of both their holdings and net acquisitions, we may cautiously declare the pension funds to be the dominant participant in the market for U. K. ordinary shares.

Once again, these findings are given further credence because of their consistency with the findings of other studies, particularly those of Fanning

(1982) and Dodds (1979). While the increasing rôle of both the insurance companies and the pension funds does indeed give further fuel to the worries of the Wilson Committee about price volatility due to market dominance, the net acquisitions data in and of itself does not offer solid evidence either for or against that particular view. For such evidence we also need to consider the trading behaviour of the various participants in the market for ordinary shares, to which we now turn our attentions.

(c) **Turnover:** Data on the pension funds' turnover activity in the market for domestic ordinary shares is presented in Table 8-17 in both nominal and percentage terms. Once again, it is immediately apparent that the insurance companies and pension funds are the major participants in the market for U. K. ordinary shares, accounting for at least fifty per cent of the turnover during the data period. The pension funds' share of turnover exceeds that of the insurance companies in all years except 1974, a year in which we have already established that the insurance companies were heavy net sellers of equities. This picture is again illustrated by the data for the 1980s, which is presented in Table 8-18. It seems that the gap between the turnover of the pension funds and that of the insurance companies has increased quite steadily during the current decade; pension fund turnover has gone from some twenty-five per cent above that of the insurance companies in 1980 to being almost double by 1987! Thus, we may conclude that while the insurance companies account for a significant amount of the turnover in this market, the overall dominance is held by the pension funds, a dominance that seems to have increased over the post-War period. Having already seen the relative importance of ordinary shares in the portfolio of the pension funds, this is hardly a surprising find, although the degree of dominance is perhaps even more than we might have anticipated.

Table 8-17: Pension Funds' Turnover—Ordinary Shares

		£ million		per cent	
	TOTAL	Pension Funds	Insurance Companies	Pension Funds	Insurance Companies
1973	8,219	2,215	1,915	26.95%	23.30%
1974	6,419	1,660	1,777	25.86%	27.68%
1975	9,589	2,877	2,269	30.00%	23.66%
1976	10,453	3,946	2,321	37.75%	22.20%
1977	11,330	3,795	2,785	33.50%	24.58%
1978	12,138	3,416	2,930	28.14%	24.14%
1979	14,712	4,354	3,744	29.59%	25.45%

Source: *Financial Statistics*

Table 8-18: Pension Funds' Turnover—Ordinary Shares

(£ million)

	1980	1981	1982	1983	1984	1985	1986	1987
Pension Funds	4,943	7,422	10,197	13,987	18,733	27,276	36,980	49,659
Insurance Companies	3,784	5,248	6,593	9,088	11,753	15,336	22,594	25,675

Source: *Business Monitor MQ5*

In Table 8-19 we show the data on purchases and sales of ordinary shares as separate items, rather than aggregated together as "turnover", in both nominal and percentage terms. A comparison with Table 8-10 shows that the market for ordinary shares is somewhat smaller than that for government securities; consequently, it is not surprising to find that purchases and sales of ordinary shares are rather less than those of government securities. Nonetheless, this disaggregated data does tend to confirm the findings of the turnover data that the pension funds are the dominant investor in the market for ordinary shares. In all years their purchases exceed those of the insurance companies, and it is only in the post-OPEC years of 1974 and 1975 that their sales are exceeded by those of the insurance companies. As with the gilts market, we can account for this fairly high level of sales by these supposedly conservative investors (who are more usually associated with a "buy and hold" strategy) by acknowledging the low transactions costs and the relative 'thickness' of the market for ordinary shares.[19]

Table 8-19: Transactions in Ordinary Shares *(£ million)*

	Pension Funds		All NBFI's	
	Purchases	Sales	Purchases	Sales
1973	1,319	896	4,378	3,841
1974	957	703	3,103	3,316
1975	1,956	921	5,814	3,775
1976	2,474	1,472	5,910	4,543
1977	2,555	1,240	6,701	4,629
1978	2,290	1,126	7,094	5,044
1979	2,792	1,562	8,543	6,169

(per cent)

	Pension Funds		Insurance Companies	
	Purchases	Sales	Purchases	Sales
1973	30.13%	23.33%	25.95%	20.28%
1974	30.84%	21.20%	28.81%	26.63%
1975	33.64%	24.40%	0.07%	25.56%
1976	41.86%	32.40%	21.56%	23.05%
1977	38.13%	26.79%	25.07%	23.87%
1978	32.28%	22.32%	25.19%	22.66%
1979	32.68%	25.32%	27.34%	22.82%

Source: *Financial Statistics*

Thus far, examination of the holdings, net acquisitions, and turnover data have led us to the view that the pension funds are the dominant investor in the U.K. market for ordinary shares. For the sake of completeness, we need also to consider their trading activities via the two ratios we outlined on pages 8-23 to 8-24—the **activity ratio** and the **trading ratio**. In Table 8-20 we present the annual activity ratios for both the pension funds and the insurance companies for the data period 1980-1987.

Table 8-20: Turnover in U.K. Ordinary Shares—Activity Ratio

	1980	1981	1982	1983	1984	1985	1986	1987
Pension Funds	0.497	0.637	0.726	0.809	0.746	0.764	0.846	0.743
Insurance Companies	0.602	0.596	0.669	0.757	0.783	0.720	0.878	0.826

Source: *Business Monitor MQ5*

For the most part there is almost no discernible pattern that emerges from these ratios, with pension funds having the greater ratio some years but not others. In all years, however, we do find that purchases exceed sales, giving activity ratios less than unity. For both the pension funds and the insurance companies we find activity ratios consistently above 0.5, indicating a fairly active trading policy being pursued. However, this inconclusiveness is for the 1980s; in Table 8-21 we present findings for some earlier periods for comparison purposes.

Table 8-21: Turnover in U.K. Ordinary Shares—Activity Ratio

	1964	1970	1974	1976	1977	1978	1979
Pension Funds	0.20	0.45	0.73	0.60	0.49	0.49	0.56
Insurance Companies	0.41	0.57	0.99	0.82			

Sources: *Business Monitor MQ5*, Fanning (1982), Dodds (1978)

Here the picture is a little less blurred, and similar to the view presented by the holdings and net acquisitions data. What emerges is a picture of the increasing activity of the pension funds in the market for U. K. ordinary shares since 1964, a market in which the insurance companies have historically been more active traders (as measured by the activity ratio), at least prior to the advent of the 1980s. As with the market for gilts, we find the pension funds increasing their rôle to become dominant in the present decade.

In Table 8-22 we present the trading ratios for both the pension funds and the insurance companies during the 1980s.[13] What emerges here is a picture of increasing trading activity by both groups of financial intermediary, with the insurance companies' ratios being typically somewhat lower than those for the pension funds, indicating again the dominance exhibited by the pension funds in the equities market. These ratios are substantially lower than those we found for the market for British government securities, indicating these two investment giants have been rather less active in equities than in gilts during the 1980s. Once again, we need to examine the earlier period to see if a similar picture emerges. In Table 8-23 we present trading ratios for the non-bank financial intermediaries for the period since 1963.

Table 8-22: Turnover in Ordinary Shares—Trading Ratio

	1980	1981	1982	1983	1984	1985	1986	1987
Pension Funds	0.076	0.109	0.130	0.146	0.143	0.168	0.195	0.219
Insurance Companies	0.097	0.108	0.118	0.138	0.144	0.146	0.192	0.210

Source: *Business Monitor MQ5*

Table 8-23: Turnover in Ordinary Shares—Trading Ratio

	1963-67 average	1968-72 average	1973-77 average	1973	1974	1975	1976	1977	1978
Pension Funds	0.188	0.290	0.456	0.341	0.401	0.666	0.460	0.414	0.315
Insurance Companies	0.119	0.182	0.288	0.219	0.297	0.366	0.281	0.277	0.234
Investment Trusts	0.225	0.308	0.408	0.427	0.455	0.476	0.336	0.344	0.429
Unit Trusts	0.368	0.717	0.970	0.795	0.923	1.340	0.887	0.906	0.850
All investing institutions	**0.183**	**0.288**	**0.439**	**0.355**	**0.419**	**0.575**	**0.451**	**0.397**	**0.351**

Source: *Wilson Committee,* (1980) Table 7.1, page 552.

The data for the 1960s and 1970s does little to change the conclusions arrived at already. What Table 8-22 does reveal is the tendency for there to be an inverse relationship between a financial intermediary's level of holdings ordinary shares and their sales activity. This should come as no surprise given the high level of holdings that these financial intermediaries possess. As we have already observed, the greater the level of an investor's holdings the more likely is that investor (and others) to perceive that their actions in the market will influence price, ie, that they will dominate the market. Thus, we note that the investment and unit trusts typically exhibit higher trading ratios than either the pension funds or insurance companies. Of course, this is exactly what the theory of financial intermediation would predict. Nonetheless, we do note that the pension funds consistently have higher trading ratios than the insurance companies during the 1960s and 1970s. The occasional reversal of this situation that we observed during the 1980s can be attributed to the increasingly large holdings of ordinary shares enjoyed by the pension funds throughout that time.

(d) **Summary:** From the foregoing it is quite apparent that we may unequivocally declare the pension funds to be the dominant investor in the market for U. K. ordinary shares. In terms of all of the measures of dominance we have employed they have proven themselves to be such. While their holdings have not always been second-to-none, the other major group has been the immensely heterogeneous group of "other" investors, who, on aggregate, are highly likely to influence the price if they acted in concert, an extremely improbable event. In terms of net acquisitions the pension funds have consistently been the dominant participant during the 1970s and 1980s in particular. And their trading activity is typically higher over the entire data period than the other major participant in the equities' market, the insurance companies.

8.3.4 Other Company Securities (debentures and preference shares)

While the post-War capital markets have shown a remarkable preference on the part of industrial and commercial concerns to raise capital primarily through the issue of ordinary shares, this is not always the case. Indeed, firms reluctant to relinquish control typically prefer to issue loan stock—or debentures—and preference shares, which turned out to be fairly popular during the period from the end of World War II until the introduction of Corporation Tax in the mid-1960s. From the investor's viewpoint each of these types of asset has their own particular attributes, as we have seen in Chapter Seven. Obviously, assets that promise a fixed return, such as debentures, would tend to be in greater demand during periods of relative uncertainty; assets whose return moves in line with the general level of well-being of the economy, such as ordinary shares, would find great favour during extended periods of economic growth. In the post-War period we have seen a substantial increase in the issue of ordinary shares, a dramatic decline (almost to oblivion) in the issue of preference shares, and a relative decline in the issue of debentures. Let us now consider the rôle of the pension funds in the market for these other company securities.

(a) **Holdings:** In Chapter Seven we saw that the position of both debentures and preference shares in the portfolio of the pension funds had diminished quite markedly since the early 1960s, to the point where they have been listed *in toto* for well over a decade by the Central Statistical Office. The Wilson Committee revealed that this was not a phenomenon unique to the pension funds; in their Table 3.68 (1980, page 499) they show how the ownership of debentures ("loan capital") by all financial institutions diminished from 75 per cent of total market value in 1957 to 47 per cent in 1978. The corresponding figures for preference shares are from 36 per cent in 1957 to 76 per cent in 1978, revealing that despite reducing their holdings the financial institutions still accounted for an increasing percentage of an ever-decreasing market. This situation can be seen in a little more detail by reference to Table 8-24.

Table 8-24: Holdings of U.K. Quoted Fixed Interest Securities

(per cent)

	Debentures					Preference Shares				
	1964	1970	1974	1976	1978	1964	1970	1974	1976	1978
Pension Funds	24	20	24	30	12	8	6	7	7	3
Insurance Companies	44	35	66	65	29	26	40	61	73	49
Investment Trusts	1	2	3	2	1	6	14	11	9	9
Unit Trusts	-	1	1	-	-	1	3	6	8	12
All institutions	**69**	**57**	**94**	**97**	**42**	**41**	**64**	**85**	**97**	**72**
Other	31	43	6	3	58	59	36	15	3	28
Total (£ millions)	**1996**	**4291**	**4122**	**4147**	**5900**	**1259**	**649**	**509**	**544**	**700**

Total Fixed Interest Securities	**1964**	**1970**	**1974**	**1976**	**1978**
Pension Funds	18	18	22	27	11
Insurance Companies	37	35	65	66	31
Investment Trusts	3	3	4	3	2
Unit Trusts	-	1	2	1	1
All institutions	**58**	**58**	**93**	**97**	**45**
Other	42	42	7	3	55
Total (£ millions)	**3255**	**4940**	**4631**	**4691**	**6600**

Sources: Wilson Committee (1980), page 498
Bank of England Quarterly Bulletin
Financial Statistics

While we observe an increase in the proportion of the fixed interest market held by the institutions in the years immediately following the OPEC-induced recession of the early 1970s, by 1978 there has been a marked decline in that market share. Perhaps the most noticeable picture that emerges is that, as with the market for government-issued fixed interest securities, the insurance companies seem to be the major participant, holding a majority interest in most years.

In examining the market for debentures, we observe that pension fund holdings rise from 24 per cent of the market in 1964 to a post-recessionary high of 30 per cent, before dropping to a low of 12 per cent in the relatively more economically certain year of 1978. Each of these percentages is well below those of the insurance companies, indicating that, while the pension funds are a significant in the market for debentures, they are not the dominant investor. The position of the pension funds in the market for preference shares is less ambiguous. Here, the maximum percentage of the market held by the pension funds is 8 per cent in 1964. This figure has steadily declined to some 3 per cent in 1978, showing the small and ever-diminishing rôle played by the pension funds in the market for preference shares. We may, therefore, categorically state that, on the basis of their holdings, the pension funds may not be viewed as the dominant investor in the market for fixed interest securities.

(b) **Net Acquisitions:** While the holdings data do not reveal any dominance of the market for fixed interest securities by the pension funds, it may well be that their net acquisitions do show that their actions influence price. However, very little attention has been paid to the markets for both debentures and preference shares in the literature, mostly due to the rather small proportion of the U. K. capital markets accounted for by them as well as the fact that these assets typically account for only a small fraction of the portfolios of most institutional investors. Certainly, dominance of the markets for debentures or preference shares by the institutions did not appear to be a major concern of (eg) the Wilson Committee.

The data on institutional investment in the markets for both debentures and preference shares are presented in Table 8-24. Data for the two assets combined, which we refer to as "bonds", are also presented in that Table. Two things are immediately apparent: firstly, there is a great degree of similarity between this data and that we examined for the gilts mărket; and secondly, given that the holdings data to a large degree are the results of the net acquisitions data, it is no real surprise to find that the latter tend to confirm the findings of the former.

Table 8-24: Institutional Investment in Fixed Interest Company Securities *(per cent)*

Debentures

	1973	1974	1975	1976	1977	1978	1979
Pension Funds	38	150	137	24	137	-836	-556
Insurance Companies	72	-100	-105	96	-71	930	335
Investment Trusts and Unit Trusts	-24	72	35	-10	-3	86	401
Other	14	-22	33	-9	37	-80	-80
Total (£ millions)	**87**	**-18**	**-9**	**-40**	**27**	**50**	**53**

Preference Shares

	1973	1974	1975	1976	1977	1978	1979
Pension Funds	29	-38	33	19	11	-2	6
Insurance Companies	42	125	42	85	78	77	83
Investment Trusts	17	-38	4	-19	-5	-	-6
Unit Trusts	13	38	27	21	19	23	20
Other	-	13	-6	-6	-3	2	-3
Total (£ millions)	**24**	**8**	**48**	**48**	**37**	**82**	**35**

Debentures and Preference Shares

	1973	1974	1975	1976	1977	1978	1979
Pension Funds	36	300	9	-3	64	-318	-338
Insurance Companies	66	-280	76	33	15	400	238
Investment Trusts	-15	160	17	27	14	-65	163
Unit Trusts	3	-30	13	33	-7	112	88
Other	11	-50	-15	10	14	-29	-50
Total (£ millions)	**111**	**-10**	**39**	**8**	**64**	**132**	**88**

Source: *Financial Statistics*

In looking at net acquisitions in the debentures market we note that both the pension funds and the insurance companies are vying for the position of dominant investor. In particular, the pension funds appear to be the dominant investor in what might be regarded as the post-recessionary years of 1974-1975 and 1979. In other years the insurance companies dominate with large net acquisitions, both positive (net buying) and negative (net selling). Indeed, the position in debentures taken by the insurance companies seems to be very much cyclically determined. Nonetheless, we would have to conclude that, while the pension funds play a highly significant rôle in the market for debentures, given the more substantial holdings of the insurance companies the pension funds are **not** the dominant investor.

In the much smaller market for preference shares the conclusion is rather more easily deduced. In each year the percentage of net acquisitions accounted for by the insurance companies exceeds that of the pension funds. Indeed, in this market the pension funds' activities are often overshadowed by those of the investment and unit trusts. Consequently, we may unambiguously state that in this market the pension funds are definitely **not** the dominant investor.

Given the much larger size of the debentures market, when we examine the "market for bonds", the picture is much like that we found for the debentures market alone. While for the most part dominance is exhibited by the insurance companies, the pension funds are dominant in a couple of years, especially towards the end of the 1970s. Nonetheless, given that the pension funds account for some quite substantial fraction of all net acquisitions of bonds, it would not seem unreasonable to suggest that they are indeed a dominant investor in that market. We would certainly expect the issuers of these securities to take the activities of the pension funds into account in their pricing and issuing behaviour. However, to properly confirm or deny the hypothesis of pension fund dominance in this market we must now turn our attention to other aspects of their trading activity by considering their turnover.

(c) **Turnover:** Data on the pension funds' turnover activity in the market for fixed interest company securities ("bonds") is presented in Table 8-25 in both nominal and percentage terms. As before we show data for the individual markets for debentures and for preference shares, and also aggregated into a single market for "bonds". This data shows a consistent picture of the dominance of both the debentures market and that for preference shares by the insurance companies. This can be verified by both the data in nominal terms as well as by the percentage data. In each year the turnover of the pension funds is exceeded by that of the insurance companies. While the insurance companies typically account for at least fifty per cent of the turnover in both markets, the figure for the pension funds averages around thirty per cent for the debentures market and less than twenty per cent for the market for preference shares. Thus, we may conclude that while the pension funds account for a significant amount of the turnover in this market, the overall dominance is held by the insurance companies. Nonetheless, during this data period the pension funds do account for over twenty per cent of the turnover of "bonds", so that while we may acknowledge the overall dominance of the insurance companies, we may consider the pension funds as being dominant to a significant but lesser degree. However, the net acquisitions data examined earlier did reveal that the relative positions of the insurance companies and pension funds in the market for gilts switched during the 1980s, so let us consider their turnover data for the 1980s, which is presented in Table 8-26.

Table 8-25: Turnover - Company Securities (Fixed Interest) Market

£ million

	TOTAL Bonds	Pension Funds	Insurance Companies	TOTAL Debentures	Pension Funds	Insurance Companies	TOTAL Pref.Shares	Pension Funds	Insurance Companies
1973	1,215	406	559	1,043	365	503	172	41	56
1974	1,008	316	536	876	293	480	132	23	56
1975	1,341	517	634	1,165	463	572	176	54	62
1976	1,336	407	738	1,150	380	633	186	27	105
1977	1,421	414	816	1,248	392	713	173	22	103
1978	1,329	344	806	1,092	320	663	237	24	143
1979	1,344	351	781	1,113	333	654	231	18	127

(per cent)

	Bonds		*Debentures:*		*Preference Shares*	
	Pension Funds	Insurance Companies	Pension Funds	Insurance Companies.	Pension Funds	Insurance Companies
1973	33.42	46.01	35.00	48.23	23.84	32.56
1974	31.35	53.17	33.45	54.79	17.42	42.42
1975	38.55	47.28	39.74	49.10	30.68	35.23
1976	30.46	55.24	33.04	55.04	14.52	56.45
1977	29.13	57.42	31.41	57.13	12.72	59.54
1978	25.88	60.65	29.30	60.71	10.13	60.34
1979	26.12	58.11	29.92	58.76	7.79	54.98

Source: *Financial Statistics*

Table 8-26: Turnover—Company Securities (Fixed Interest) Market

(£ million)

	1980	1981	1982	1983	1984	1985	1986	1987
Pension Funds	425	557	984	1,452	1,788	2,142	2,606	3,870
Insurance Companies	1,122	1,717	7,389	2,904	3,244	4,366	7,711	8,437

Source: *Business Monitor MQ5*

Table 8-26 reveals that the pattern of turnover that prevailed in the market for fixed interest company securities in the 1970s persisted into the 1980s. While this offers rather conclusive further evidence of the dominance of the bonds market by the insurance companies, we should still regard this conclusion as debatable until we have completed our analysis of the other means of measuring dominance via trading activity. For example, in Table 8-27 we show data on the pension funds' purchases and sales of fixed interest company securities as separate items.

Table 8-27: Pension Funds' Transactions in Company (Fixed Interest) Securities

	<-------- (£ million) ------->				<-------- (per cent) -------->			
	TOTAL		Pension Funds				nsurance Companies	
	Purchases	Sales	Purchases	Sales	Purchases	Sales	Purchases	Sales
1973	223	183	223	183	33.63	33.15	47.66	44.02
1974	143	173	143	173	28.66	33.99	56.51	49.90
1975	263	254	263	254	36.58	40.84	49.24	45.02
1976	203	204	203	204	29.81	31.15	54.92	55.57
1977	173	241	173	241	26.33	31.54	60.88	54.45
1978	145	199	145	199	21.48	30.43	64.74	56.42
1979	162	189	162	189	23.89	28.38	59.00	57.21

Source: *Financial Statistics*

This data reveals the same pattern that we have seen already; that is to say, while the pension funds typically account for substantial proportions of both purchases and sales of bonds, the largest proportion is accounted for by the insurance companies. We can see from Table 8-27 that the insurance companies account for at least fifty per cent of both sales and purchases. It is an interesting afterthought to recognise that the purchases and sales of the pension funds tend to move together; that is to say, in a year when the pension funds are purchasing more bonds they are also typically selling more.

While the data shows that the pension funds are a significant force in the market for fixed interest company securities, accounting an average of twenty-five per cent of sales and thirty-three per cent of purchases, they are not the dominant investor in the market. Once again, that position is occupied by the insurance companies. This supports the conclusion we derived from both the turnover and net acquisitions data.

Our final means of examining the market activity of participants has been to make use of turnover ratios. In Table 8-28 we present the annual activity ratios for the pension funds and the insurance companies for the data period 1980-1987. Note that none of the ratios exceed unity, indicating a net buying tendency on the part of the two groups of investors. For most years the ratios exhibited by the insurance companies are above those of the pension funds. However, in 1983 and 1984 we find the positions reversed.[20] Thus, apart from these exceptional years, the insurance companies are the more active trader on the bonds market. This is confirmed by the trading ratios presented in Table 8-29. While the pension funds do exhibit increasing values in this ratio over time, for most years the insurance companies have higher trading ratios. The exceptions are those we have already observed via the activity ratios. These findings, once again, are consistent with those in Dodds (1979), although Fanning (1982) does not deem debentures and preference shares of enough importance in the pension funds' portfolio to be worthy of analysis.

Table 8-28: Turnover in Company (Fixed Interest) Securities—Activity Ratio

	1980	1981	1982	1983	1984	1985	1986	1987
Pension Funds	0.82	0.74	0.70	0.85	0.73	0.76	0.72	0 91
Insurance Companies	0.86	0.81	0.90	0.74	0.68	0.72	0.75	0 72

Source: *Business Monitor MQ5*

Table 8-29: Turnover in Company (Fixed Interest) Securities—Trading Ratio

	1980	1981	1982	1983	1984	1985	1986	1987
Pension Funds	0.18	0.19	0.29	0.39	0.39	0.40	0.39	0.41
Insurance Companies	0.20	0.27	1.00	0.28	0.23	0.28	0.43	0.29

Source: *Business Monitor MQ5*

(d) **Summary:** From the foregoing we may unambiguously conclude that the pension funds are a significant investor in the markets for both debentures and preference shares, revealing a clear preference for the former over the latter. Despite the large proportion of these markets accounted for by pension fund activity, they are exceeded in virtually all areas by the activities of the insurance companies, whom we must conclude to be the dominant investor.

8.3.5 Overseas Assets

In Chapter Seven we saw how overseas assets were becoming an increasingly important component of the pension funds 'portfolio, especially since the late 1970s. To a very large degree this increasing importance has not been occasioned so much by their increased attractiveness *per se* as by the changing nature of the institutional environment of the world financial system. Firstly, since the early 1950s the countries that make up the planet have gradually been tearing down the financial and exchange controls that were established as a result of the enmities of two World Wars and the "beggar-thy-neighbour" protectionist policies of the period between. This reduction in regulations has been especially marked since the late 1970s, and has enabled many investors, particularly the larger financial intermediaries, to seek the best return on their funds on a global basis, something they had previously been denied. Secondly, the advent of new technology, particularly the personal computer revolution, brought changes in the worlds of computing and telecommunications that made global financial transactions both less costly and more accessible than ever before. Thus, as a result of these two institutional changes the world's financial system may truly be regarded as a single system, if not a completely harmonious one. Given the diverse nature of the Earth's financial system at this early stage in its development, it is an extremely daunting prospect to attempt to determine the rôle of any individual investor within it at this point in time. Nonetheless, given that the financial system in the United Kingdom is substantially smaller in volume than its cousins in Japan and the United States of America, we may conclude quite safely that, despite the high degree of significance of the pension funds' investment activities in the financial markets of the United Kingdom, they are not much more than a drop in the water when viewed from the perspective of the much larger global financial ocean.[21] Nonetheless, for the sake of completeness, let us at least take a cursory glance at the position of the pension funds in the market for overseas assets.

(a) **Holdings:** In Table 8-30 we present a simple view of the relative importance of overseas assets in the portfolios of the major British non-bank financial intermediaries. Because of the manner of presentation of the data, we need to remind ourselves that while overseas assets bear more importance in the portfolios of the unit and investment trusts, the total assets of these intermediaries is typically much less than that of the insurance companies or pension funds. We should also bear in mind that this holdings data is for the period before the removal of exchange controls in the United Kingdom. In Chapter Seven we saw how the pension funds dramatically increased the share of their portfolio going to overseas assets in the years following removal of exchange controls. There we saw how holdings of overseas government securities increased from £10 million in 1975 to £157 million in 1982, while holdings of overseas ordinary shares rose from £116 million to £3,760 million over the same period. Even overseas loans and mortgages showed a dramatic rise from £11 million in 1974 to £139 million in 1982.[22] However, this does not give us much of an indication of the rôle played by the British financial institutions in the world's capital markets; simply an overview of their relative positions.

Table 8-30: Overseas Assets as a Percentage of Total Assets

	1970	1975	1976	1977	1978	1979
Pension Funds	1.5	4.5	5.3	4.0	4.9	5.3
Insurance Companies	5.2					
General Funds		5.7	8.9	7.8	8.9	9.5
Long-term Funds		3.3	4.8	3.0	4.4	4.2
Unit Trusts	10.3	15.6	20.2	12.3	17.4	19.9
Investment Trusts	33.1	41.7	47.3	30.1	34.3	32.3
TOTAL		**8.0**	**9.7**	**5.5**	**7.7**	**7.3**

Source: D. Corner and D. G. Mayes, *Modern Portfolio Theory and Financial Institutions*, (1983), page 206

J. R. S. Revell, *The British Financial System*, (1973)

(b) **Net Acquisitions:** In Table 8-31 we show some recent figures on the net acquisitions of overseas assets by the British financial institutions, divided into the two major groups of assets concerned. It is quite clear that, of the British institutions, the pension funds are the largest investor in overseas ordinary shares,while the insurance companies are the largest purchaser of overseas government securities, at least until 1984. This is consistent with the picture of investment preferences we have already observed; the insurance companies seem to prefer fixed interest securities, while the pension funds have a penchant for equity securities. Were we to combine the two sets of figures in Table 8-31, we would unambiguously find that the pension funds are the largest British investor in overseas assets. Nonetheless, without any figures for (eg) total world net acquisitions it is very difficult to come to any conclusion as to the degree of dominance (if any) exhibited by these giant British financial intermediaries.

Table 8-31: Net Acquisitions of Overseas Assets *(£ million)*

Ordinary Shares	1979	1980	1981	1982	1983	1984	1985
Pension Funds	442	1,385	1,516	1,888	1,299	317	2,041
Insurance Companies							
General Funds	30	46	53	-39	10	-15	-
Long-term Funds	113	490	627	947	826	272	1,097
Unit Trusts	23	102	276	217	736	185	999
Investment Trusts	49	361	162	369	210	-317	126
Other	-32	-140	-163	-159	-319	-261	-797
TOTAL	625	2,244	2,471	3,223	2,762	181	3,466
Government Securities	1979	1980	1981	1982	1983	1984	1985
Pension Funds	4	35	42	206	-28	147	253
Insurance Companies							
General Funds	41	38	39	161	98	79	-3
Long-term Funds	-14	59	92	231	461	248	89
Unit & Investment Trusts	-7	14	-3	207	-30	39	-100
Other	-1	-	-	4	-1	-1	-3
TOTAL	23	146	170	809	500	512	236

Source: *Financial Statistics*

(c) **Turnover:** In Table 8-32 we present some of the data pertaining to the turnover of overseas assets by the pension funds and the insurance companies. In part (a) the figures relate to their turnover in the markets for overseas ordinary shares, and in part (b) the figures concern turnover in the markets for all other overseas securities, which are primarily overseas government securities.

In looking at the market for overseas ordinary shares it is immediately apparent that the pension funds have a far greater turnover than the insurance companies as measured by sales plus purchases. This situation is reversed in the market for other overseas securities. However, these findings are not exactly mirrored by the two turnover ratios. In both the market for overseas ordinary shares and that for other overseas securities it is typically the pension funds that have the lower ratios. This indicates that the insurance companies are more active traders in the overseas markets than are the pension funds. Of course, this is not to suggest that the insurance companies are the dominant investor in the world's capital markets; rather that they turn over this component of their portfolio more actively than the pension funds. However, where overseas securities are concerned, given the much larger holdings and net acquisitions and the much larger turnover (ie, sales plus purchases) of the pension funds, the marginally higher ratios exhibited by the insurance companies may be of little significance.

Table 8-32: Turnover in Overseas Securities

(a) Ordinary Shares	1980	1981	1982	1983	1984	1985	1986	1987
Turnover (£ millions)								
Pension Funds	2,068	3,539	5,085	8,770	12,599	16,954	26,386	30,581
Insurance Companies	1,674	2,296	6,519	5,211	6,859	9,625	13,351	16,716
Activity Ratio (S/P)								
Pension Funds	0.31	0.44	0.53	0.74	0.97	0.78	0.86	1.15
Insurance Companies	0.54	0.54	0.79	0.72	0.94	0.80	0.90	1.03
Trading Ratio (S/TH)								
Pension Funds	0.16	0.21	0.22	0.30	0.39	0.38	0.47	0.54
Insurance Companies	0.31	0.27	0.65	0.32	0.35	0.36	0.41	0.46

(b) Other Overseas	1980	1981	1982	1983	1984	1985	1986	1987
Turnover (£ millions)								
Pension Funds	72	102	755	860	1,059	1,353	2,618	2,746
Insurance Companies	572	683	1,914	3,116	4,102	4,034	5,968	5,815
Activity Ratio (S/P)								
Pension Funds	0.33	0.46	0.58	1.05	0.79	0.67	0.95	0.93
Insurance Companies	0.73	0.70	0.65	0.72	0.85	0.96	1.01	1.00
Trading Ratio (S/TH)								
Pension Funds	0.24	0.29	1.00	0.93	0.77	0.63	1.15	1.14
Insurance Companies	0.56	0.51	0.68	0.70	0.66	0.57	0.76	0.64

Source: *Business Monitor MQ5*

(d) **Summary:** From the foregoing it is quite clear that while the pension funds are very active traders in various overseas markets, especially those involving ordinary shares, their primary concern seems to be with acquiring a portfolio of quality assets that will provide excellent returns over the longer run. Their lower ratios show less of a concern with short- and medium-run trends than that exhibited by the insurance companies. However, while the pension funds may be considered a giant among their domestic counterparts, given the immense scale of the world's capital markets as compared to the size of the pension funds' activities, it would be ludicrous to suggest that they are a significant or influential investor, let alone one which is dominant.

8.3.6 Loans and Mortgages

Even the most casual observer of the British financial scene is fully aware of the lack of a well-established secondary market for loans and mortgages. In consequence, it would seem to be of little point to examine the rôle of the pension funds in this lacuna in the financial system! Additionally, it is usually regarded as common knowledge that the main issuer of mortgage loans in the United Kingdom is the building societies. This point has been made by (eg) the Wilson Committee and also Clayton, Dodds, Driscoll and Ford (1975), who show how in 1974 the building societies supplied 71.5 per cent of all loans for house purchase in the United Kingdom (page 5). We offer the following (selective) evidence of the dominance of the 'market' for loans and mortgages by the building societies, thereby establishing the relative insignificance of the pension funds in that 'market'.

In Table 8-33 we show the complete dominance of the loans and mortgage 'market' by the building societies. The rather tiny fraction of the market accounted for by the pension funds would seem, in and of itself, to put to rest any notions of the ability of the pension funds to influence price by their own activities.

Table 8-33: Institutional Investment—Loans and Mortgages

(£ millions)

	1979	1980	1981	1982	1983	1984	1985
Pension Funds	-31	11	36	3	8	11	-21
Insurance Companies							
General Funds	16	41	29	50	85	45	-7
Long-term Funds	291	278	217	14	288	338	297
Unit & Investment Trusts	-	-	-	-	-	..	..
Building Societies	5,271	5,722	6,331	8,147	10,928	14,572	14,321
TOTAL	**5,547**	**6,052**	**6,613**	**8,214**	**11,309**	**14,966**	**14,590**

Source: *Financial Statistics*

Given the dominance of the building societies in this 'market', it can come as no surprise to learn that the price of mortgages is largely determined by a cartel of those building societies, the Building Societies Association (BSA). Known as the "recommended rate system", this price-setting mechanism is well described by the Wilson Committee:

> The Council of the Building Societies Association (BSA) has been making recommendations to its members about the interest rates they should charge on mortgages, and pay for on shares and deposits, since 1939. BSA members, who account for 99 per cent of all building society assets, are not compelled to accept these recommendations, but most of the larger ones do. (1980, page 107)

That the Wilson Committee regarded this price-fixing behaviour as (unacceptable) dominance of the market for loans and mortgages can be easily seen:

> The only sure way of providing a competitive spur to building societies is in our view to end the recommended rate system, that is to allow societies to set their own rates according to their own circumstances. . . (1980, page 113)

It is with complete confidence, therefore, that we are able to declare that the pension funds in no way whatsoever exhibit dominance of the 'market' for loans and mortgages.

8.3.7 Land, Property and Ground Rent

As with loans and mortgages, there is also not a very well-established secondary market for land, property and ground rent. While markets for both land and property certainly exist, there is nothing which could even be considered as close to the efficiency of the markets for most financial assets. Equally, the diversity of assets within each category make analysis very difficult. Nonetheless, as we saw in Chapter Seven, land, property and ground rent makes up a significant proportion of the pension funds' portfolio, and we need to make use of whatever data is available to see if they do exert any dominating influence in this market.

In Table 8-34 we show institutional investment in land, property and ground rent for the period since 1979, and in Table 8-35 we present various measures of turnover in that market by both the pension funds and the insurance companies. The net acquisitions data in Table 8-34 quite clearly reveals the significance of the pension funds in this market. In most years the pension funds account for at least one-third of the institutional investment in land, property and ground rent. However, once again we find the insurance companies accounting for an even larger share; here averaging over fifty per cent! Given the substantial share of the pension funds we need to also take into account turnover to conclusively establish or refute any hypothesis of dominance.

In looking at the various measures of turnover presented in Table 8-35 we clearly see a substantiation of the evidence afforded by the net acquisitions data. In every year the turnover of the insurance companies as measured by sales plus purchases exceeds that of the pension funds. In every year with the exception of 1983 the insurance companies have a higher activity ratio (sales/purchases) than the pension funds. And in every year with the exception of 1986 the insurance companies have a higher trading ratio (sales/average total holdings) than the pension funds. We may therefore conclude that, once again, the pension funds are a dominant investor in the market for land, property and ground rent, but they are not **the** dominant investor. That position is held by the insurance companies.

Table 8-34: Institutional Investment—Land, Property and Ground Rent

(£ millions)

	1979	1980	1981	1982	1983	1984	1985
Pension Funds	536	908	774	797	567	674	486
Insurance Companies							
General Funds	57	66	99	127	103	104	83
Long-term Funds	576	789	975	1,003	843	769	913
Unit Trusts	90	77	108	57	-10	47	-4
Investment Trusts	-	12	12	4	-3	2	1
Building Societies	100	144	196	144	127	131	87
Other	2	9	8	4	-9	-1	16
TOTAL	1,365	2,013	2,189	2,136	1,618	1,726	1,582

Source: *Financial Statistics*

Table 8-35: Turnover in Land, Property and Ground Rent

	1980	1981	1982	1983	1984	1985	1986	1987
Turnover (£ millions)								
Pension Funds	971	1,164	968	1,163	1,231	1,554	1,857	2,297
Insurance Companies	1,276	1,860	1,986	2,062	2,362	2,765	3,443	4,458
Activity Ratio (S/P)								
Pension Funds	0.10	0.33	0.20	0.41	0.27	0.49	0.75	0.81
Insurance Companies	0.16	0.38	0.26	0.39	0.48	0.49	0.51	0.72
Trading Ratio (S/TH)								
Pension Funds	0.01	0.03	0.02	0.03	0.02	0.04	0.06	0.07
Insurance Companies	0.01	0.04	0.03	0.03	0.04	0.04	0.05	0.08

Source: *Business Monitor MQ5*

As a footnote it is interesting to note the very low values of the trading ratios for both the pension funds and insurance companies, indicating the very low liquidity of the asset being traded. This is largely due to transactions costs, and can be seen as attributable to the information pertaining to any given piece of land or property. For example, while the nature and characteristics of a given stock or bond is readily discernible at low cost from (eg) a reputable newspaper and a consequent decision to buy or sell swiftly made, this is not the case with a plot of land or piece of property. While the financial pages of newspapers do carry details of land or property that is for trading, this information is not necessarily reliable or accurate. For, unlike financial assets, land and property cannot be put into standardised packages. The buyer of land or property requires surveys and appraisals by experts, as well as legal counsel to aid with the vast quantities of regulation and red tape that seems to be a universal constant, a costly and time consuming process that becomes more worthwhile as economies of scale are realised. It therefore makes sense that traders in this market, as well as being fewer in number, are also likely to be much less active traders than in the markets for financial assets.

8.3.8 U.K. Local Authority Securities

The final market to which we shall turn our attentions is that for securities issued by the local authorities of the British Isles. Like British government securities, these are regarded as being of little or no risk and offer some tax relief in many cases. However, the market for local authority securities is quite small, and this may account for the marginal rôle they play in the pension funds' portfolio. In Table 8-36 we present the data on institutional investment in this market, and in Table 8-37 we present the various measures of turnover.

Table 8-36 Institutional Investment—Local Authority Securities

(£ millions)

	1979	1980	1981	1982	1983	1984	1985
Pension Funds	4	-13	-4	17	5	-6	3
Insurance Companies							
General Funds	10	-35	-53	-6	-22	-12	-16
Long-term Funds	93	158	78	10	-19	-7	-13
Unit & Investment Trusts	-	-2	-1	-	-1	-	-1
Building Societies	-171	-126	-211	338	-98	-106	-80
TOTAL	**-64**	**-18**	**-191**	359	**-135**	**-131**	**-107**

Source: *Financial Statistics*

In looking at the institutional investment data it is immediately apparent that the market for United Kingdom local authority securities has been shrinking over the last decade. This is most likely the result of central government pressures on the local authorities to reduce their spending. However, it is also quite clear that the pension funds have been only a small participant in this particular market. Perhaps surprisingly, it is the building societies that appear as the dominant investor in this market, with the insurance companies in second place.

Table 8-37: Turnover in Local Authority Securities

	1980	1981	1982	1983	1984	1985	1986	1987
Turnover (£ millions)								
Pension Funds	223	306	112	210	126	66	51	125
Insurance Companies	502	470	707	682	501	348	385	126
Activity Ratio (S/P)								
Pension Funds	1.23	1.02	0.76	0.72	0.97	1.00	1.32	1.16
Insurance Companies	0.83	1.18	0.99	1.03	0.97	1.19	0.90	0.91
Trading Ratio (S/TH)								
Pension Funds	0.41	0.42	0.54	0.48	0.43	0.53	0.61	0.62
Insurance Companies	0.73	0.82	0.70	0.72	0.84	0.74	0.77	0.97

Source: *Business Monitor MQ5*

Yet again, the turnover data seems to confirm the previous findings. Measuring turnover as sales plus purchases shows the insurance companies to be a more active trader than the pension funds. This is also unambiguously confirmed by the trading ratio, where each year the insurance companies sell a greater proportion of their holdings than the pension funds, thereby indicating a more active trading policy on the part of the insurance companies. The activity ratio, however, sends mixed signals. While the ratios for the insurance companies are above those for the pension funds in most years, there are several exceptions: 1980, and 1986-1987. There are no clear reasons as to why these reversals should have occurred in those particular years, and so, given the weight of the other measures we have examined, we must conclude that the pension funds are not the dominant investor in the market for United Kingdom local authority securities. Indeed, they can not be truly regarded as a significant investor in that market.

8.4 Conclusion

From the foregoing series of analyses we have seen the important rôle played by the pension funds in many of the United Kingdom's financial markets. We have seen, both in this chapter as well as in Chapters One and Seven, that the pension funds have shown dramatic growth over the post-War period, a growth that seems to have even accelerated during the second half of the 1980s. However, given that the value of both the pension funds' income sources—contributions and investment income—are tied almost directly to the well-being of the economy in general, it is no real surprise that they have exhibited this growth over the long run. The close connection between the well-being of the pension funds and that of the economy can be seen by looking at newspaper stories during the good times and the bad times. When the economy is in a slump, such as during the early years of the 1980s it is often the case that employers are complaining of the need to 'top up' their pension funds to make up for apparent actuarial deficits in their funding. When the economy is doing well, the cry is usually one of outrage concerning the huge actuarial surpluses that the pension funds are enjoying. Human nature being what it is, and especially the short-term outlook favoured by many managers on the British corporate scene, this is likely to be a series of scenarios we are likely to see for many, many years to come.

We have discovered that the trend over the past twenty-five years has been one of increasing participation by the pension funds in the financial markets. There is really only one market in which we may conclude that the pension funds are dominant, that for ordinary shares. In the markets for fixed interest securities—government issued, debentures, preference shares—while the pension funds were a highly significant investor, with their actions possibly having some influence on price, they were not the dominant investor. That epithet was placed on the shoulders of the insurance companies. In the market for land, property and ground rent the same result obtained; the pension funds were significant, but the insurance companies dominated. In the markets for both local authority securities and loans and mortgages we found the pension funds to be a diminutive participant, with honours for dominance going to the building societies. Finally, while we were not able to establish dominance, we did discover that, of the British financial institutions, the pension funds were the most significant investor in overseas assets, particularly ordinary shares.

Chapter Eight Endnotes

1

> "A perfectly contestable market is defined as one in which entry and exit are easy and costless, which may or may not be characterized by economies of scale or scope, but which has no entry barriers, ... Potential entrants are assumed to face the same set of productive techniques and market demands as those available to incumbent firms." (Baumol, Panzar and Willig, *Contestable Markets and The Theory of Industry Structure*, 1982, page xx).

The main tenet of the contestable markets literature is that where there is the possibility of costlessly reversible entry into an industry or market there may be an efficient outcome even if there are not the large numbers of actively producing firms required by traditional (perfect competition) market theory. Most of the contestable markets literature has concerned itself with the implications of contestability for industrial organisation and market structure, and hence policy prescription. To the best of my knowledge the theory of contestable markets has not yet been used to examine the workings of the financial markets.

2 Although not dealt with explicitly here, there are also the problems of "insider trading" allegations that market dominance can occasion.

3 J. R. Hicks (1967) page 103.

4 This also includes payment to widows, payment upon death, etc. See Chapters Three and Four for full details.

5 See Chapter Four on the portability of pensions.

6 For some interesting views (based on a non-technical analysis) on the changing nature of the U. K. capital markets see the survey on "The City of London" in *The Economist*, 14 July, 1984.

7 See Table 1-10.

8 The insurance companies and the pension funds, while often subject to similar experiences, do appear to be affected differently during the 1973-76 recession. During this time many pension fund members took "early retirement", thereby increasing the outflow of funds from the pension funds beyond actuarial predictions. Of more importance was the reduction in contributions to the funds due to declining National Income and increasing unemployment, as well as the fact that real rates of return were often negative during this period of British economic history.

9 Empirical evidence for this viewpoint was presented in Chapter One when we considered the views of Hamish McRae and Frances Cairncross (1985), and *The Economist* articles (especially 28 October, 1978, page 118) on the alleged boycott of the government securities market by the financial intermediaries in the Autumn of 1976 and the Spring of 1978.

10 Unsurprising because turnover is the sum of purchases and sales, and net acquisitions is the difference between purchases and sales.

11 See Chapter Four for details.

12 A 'thin' market is one in which there is very little trading activity, perhaps because there are very few participants, or because the market is relatively new. As the number of participants, and hence the level of activity of a market, increases we may say that the market becomes 'thicker'. So, for example, we may regard the London Stock Exchange as a particularly 'thick' secondary market, while the secondary market for mortgages in the United Kingdom would still appear to be very 'thin'. As evidenced in Chapter Two, the 'thicker' a

market is, the more marketable (and, therefore, the less risky) will be the assets traded there, *ceteris paribus.*

13 The reader is asked to note that the 1987 ratios are provisional estimates., based on the 1987 holdings data only. This is because at the time of writing holdings data for 1988 is not yet available!

14 While the pension funds both hold and acquire a significant quantity of overseas ordinary shares, it would seem extremely unlikely that they will be the dominant investor in them, especially when one considers the capitalisation values of all non-domestic markets in ordinary shares. In this section, therefore, we concentrate wholly on the domestic ordinary shares' market.

15 See Peter F. Drucker's *The Unseen Revolution; How Pension Funds Socialism Came to America,* (1976).

16 Minns, for example, states that "The financial sector does not produce anything", (1980, page 147). This is a view that is similar to that held by the Physiocrats in the sixteenth century about the industrial sector. The Physiocrats held the belief that industry was largely parasitic, living off the surplus created by the only truly productive sector, agriculture. Minns view is based on the Marxian view of the financial system, which holds that it is essentially a parasite living off the surplus produced by the industrial and agricultural sector.

Minns also plays with semantics to argue his case, by trying to draw a distinction between legal ownership and economic ownership. He suggests that Drucker is concerned with the former, while the important concept is the latter, which he defines as involving "the ability to put the means of production to work." (1980, page 147). Thus, for Minns, true ownership necessitates control!

17 J. M. Keynes, *The General Theory of Employment, Money and Interest.*

18 See, for example, A. J. Frost and I. J. S. Henderson's "Implications of Modern Portfolio Theory for Life Assurance Companies" in *Modern Portfolio Theory and Financial Institutions,* Corner and Mayes (editors), (1983, page 165).

19 The following Table, showing the implied average period of holding ordinary shares, is reproduced from the Wilson Committee, and reveals that while the pension funds had reduced their average period for holding ordinary shares since the 1950s, they still tended to hold them longer than other non-bank financial intermediaries with the exception being, perhaps surprisingly, the insurance companies.

Number of years; reciprocal of sales rate (x 100)

	1963-67 average	1968-72 average	1973-77 average	1978
Insurance Companies	23.8	14.9	7.9	11.4
Pension Funds	23.3	9.8	6.1	9.7
Investment Trust Companies	9.6	6.9	4.6	4.5
Unit Trusts	9.8	3.3	2.2	2.5
All Investing Institutions	15.4	8.5	5.2	6.9
Insurance Companies:				
long-term	25.6	16.1	9	14.1
general	15.6	9.3	4.8	4.9
Pension Funds:				
private sector	20.4	8.1	4.9	8.3
local authority	..	9.3	8.1	11.6
other public sector	..	..	..	11.6

Source: Wilson Committee,(1980) Table 7.3, page 554.

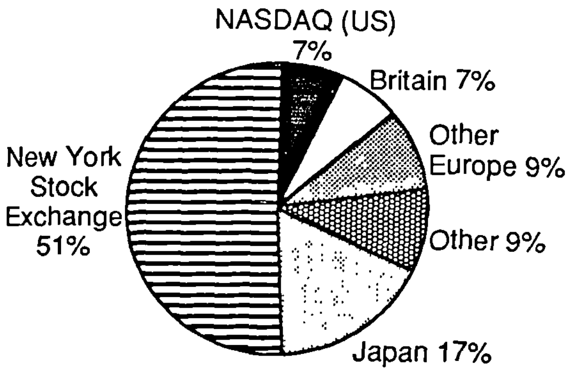
20 The data for 1987 is provisional, so we refrain from commenting.

21 According to the "Survey on the City of London" in the 14th July, 1984 edition of *The Economist*, at the end of 1983 the British stock market accounted for seven per cent of the world's $3.1 trillion major stock market capitalisations (see diagram below).

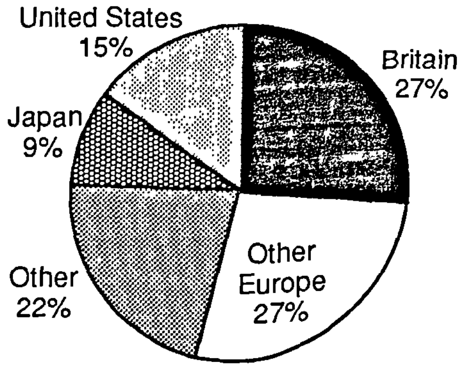
22 This is discussed in full on page 7-39, and a full chronology of exchange controls in the United Kingdom is presented in Appendix 7-B.

Capital Competitors

Major stock market capitalisations end 1983, total: $3.1 trillion



International banking by centre 1983, total: $2.5 trillion



Chapter Nine: Modelling Pension Fund Investment Behaviour

9.1 Introduction

In the previous two chapters we have considered the portfolio position of the pension funds, their rôle in the financial markets of the United Kingdom, and how this has changed over the twenty-year period, 1963-1983. In an earlier chapter we both summarised and critiqued various attempts to model the investment behaviour of other British financial intermediaries. In this chapter we commence on the estimation of our own model by drawing together these two areas to take into account those points we have previously stressed as being of importance in modelling financial intermediary investment behaviour. Our aim is to develop a framework which brings together the rôle of the pension funds as financial intermediaries within the environmental and institutional factors which govern their behaviour.

If we are to attempt to model the pension funds' investment behaviour we must make a simple choice among two alternative methods regarding their coverage. Firstly, an "industry" level approach may be chosen whereby aggregate time-series data is used; or, alternatively, a "micro" approach may be adopted, which considers the investment behaviour of the individual fund.[1] By nature these two approaches are complementary and, in a more perfect world, both would be chosen since they are not mutually exclusive possibilities. The world, however, is far from perfect and we are therefore required to choose between them with regard to the trade-offs involved. Both approaches have their advantages and disadvantages. Micro-oriented studies, for example, permit a greater degree of analysis of an intermediary's investment intentions, particularly (eg) how a pension fund tries to achieve its objectives against the background of the various constraints it faces. On the negative side, micro studies do not lend themselves very well to aggregation, an approach important because one may then arrive at general conclusions for the industry or, indeed, any wider implications for the economy. Unsurprisingly the reverse of this situation is true for the macro approach.

In consequence, and in full awareness of its limitations, the approach we choose is predominantly of a macroeconomic nature. This is a 'choice' that has been largely imposed on us by the limitations of the data, especially its availability (or lack thereof!). Consequently our study cannot hope to reveal all of the intricacies of the investment process, a constraint that inevitably limits the quality of our results. Nonetheless, we hope that the results obtained will shed some light on the key elements involved in the pension funds' investment choice process. In Section 9.2 we commence the process of modelling the investment behaviour of the U. K. pension funds by considering their investment objectives as well as the constraints faced by them, and how these might usefully be modelled. We also consider the hierarchy of decision-making that seems to prevail in many large firms, including financial intermediaries, and examine whether it is also the case for the pension funds. In Section 9.3 we present individual demand specifications for the major asset categories adopted. While there are many who might regard this as a piecemeal approach that leaves itself open to the criticism that it might neglect the overall portfolio position, it does provide a more-than-useful first step in the modelling process. Furthermore it is our belief that the advantages of this approach outweigh the disadvantages for several reasons. For example, under this approach the individual demand equations are not constrained by the statistical constraints that an aggregate (or simultaneous equations) system would typically impose, and therefore we can explore more fully the possible effects on the demand for each individual asset. In particular, the reader will notice that we shall be considering the hypothesis that the pension funds adopt a *sequential* investment allocation procedure, rather than the simultaneous allocation which is more usually the norm in models of financial intermediary behaviour. If found to be correct, the implication would be that a model composed of individual, separately-derived demand equations is required.

9.2 Objectives and Constraints

While we have already examined the economic rôle of the pension funds and considered their behaviour within the context of the British financial system we now need to put these into more specific terms that lend themselves to the modelling process. In this section, therefore, we shall be attempting to ascertain the goals and objectives pursued by the pension funds, as well as trying to pinpoint the constraints within which they are forced to operate.

9.2.1 Strategy and Tactics

Most models of investment behaviour typically posit a single-period decision-making problem in which the economic agent simultaneously allocates funds across a (broad) range of financial assets. In Chapter Five, for example, we saw how multi-period decision-making could be reduced to a series of single-period decisions, even under conditions of uncertainty. In Chapter Six we saw the application of such modelling procedures to the investment behaviour of various kinds of British financial intermediaries. We also observed there that such an approach led to problems because of the necessity of having to impose statistical limitations on the model that were not based on empirical observation or the theory of the intermediary's behaviour.[2] On the basis of the problems we observed in such models we shall be looking at individual demand specifications of the U. K. pension funds for two major reasons. Firstly, such individual equations do not require the statistical constraints that aggregate or simultaneous equations systems impose, seemingly almost as a matter of course. Secondly, it is both possible and permissible for the overall portfolio position to be taken into account by positing a sequential investment allocation process. Such an approach has been suggested as meaningful and appropriate by a number of authors. For example, in his classic *The British Financial System* Professor Revell argues that, while theory suggests that contemporaneous decisions as to the assets in a portfolio are appropriate,

> [I]n practice, however, there are some constraints, and the actual investment procedure of life funds and pension funds has something of a sequential nature. In logical order the events are: (1) the honouring of lending commitments and payments for assets undertaken some time before, (2) the inspection of investment opportunities brought specially to the notice of the life fund managers, and finally (3) a search for outlets for remaining funds. (1973, pages 441-442)

In a similar vein, H. I. Ansoff (1965) argues that the investment decision is really a hierarchy of decisions. Firstly there is a set of **strategic** decisions, whereby the overall balance of the portfolio between the different classes of security is determined. Secondly, there is a set of **operational** or **tactical** decisions, which determine the allocation of funds within a particular class of assets. This is also the view adopted by J. P. Holbrook, F.I.A. Writing from a position of wide-ranging experience in advising pension funds, in his "Investment Performance of Pension Funds" he paints a lucid picture of the investment decision hierarchy:

> [T]he practical management of a pension fund investment portfolio involves decisions at three levels.
>
> (i) *Policy*, i.e. the proportions of the assets which, as a long-term aim, the trustees wish to hold in the different investment markets. The fundamental element of policy is the split between equity-type and fixed-interest investments. Definition of policy may extend to a split of equity-type investments between U.K. equities, overseas equities and properties, specific proportions being set for each. If the trustees are not experts in long-term investment they will tend to formulate policy in discussion with specialist advisers; it is gratifying to record that actuaries who

advise on the financing of pension schemes are increasingly becoming involved in such discussions.

(ii) *Strategy*, i.e. decisions to depart from policy proportions in the light of current market conditions, including decisions to hold part of the fund on short-term deposit. The trustees will usually seek advice from experts in the various markets regarding the short-term outlook, up to the time of the next investment meeting and over the next year or so. Except where trustees delegate strategic decisions to managers and advisers, investment meetings are usually held at short regular intervals, and arrangements are made for special meetings whenever it is thought that there has been a material change in market prospects. Often trustees authorize the managers concerned to determine the timing of purchases; thus a manager is able to retain part of the assets entrusted to him in the form of short-term deposits.

(iii) *Selection*, i.e. the choice of the particular investments to hold, buy or sell within the various markets. Again, practice varies; many trustees give their managers *carte blanche* in this area—some keep close control over day-to-day transactions.

It therefore follows that if our attempt to model the investment behaviour of the pension funds is to be a valid description of pension fund behaviour it should at least follow the practice of the funds in adopting a sequential allocation procedure. It is important to note that while mean-variance analysis (and its derivatives) may be used effectively to model tactical decisions, its usefulness for modelling the strategic decision is limited. Indeed, as we saw in Chapter Five, it would require us to make very restrictive assumptions about the proportions of each and every security within all of the relevant individual asset classes. That is to say, we would require the portfolio to satisfy the assumptions necessary for a separation theorem. Because we have chosen to model the pension funds' investment behaviour as we observe it, we are therefore restricted to modelling the strategic decision and will not be able to make use of such analytical methods as put forward by (eg) Markowitz.

In such a manner we strive for our model to be a little closer to being based on reality. Thus, given that we have chosen to focus on the strategic decision and thereby neglect the tactical, it is apparent that in trying to piece the individual demand equations together for an overall view of the pension funds' activities, a certain amount of compromise will be necessary. Thus, the incorporation of these specifications into a neat, comprehensive model may necessitate some sacrifices.

9.2.2 Constraints on Investment Behaviour

Elsewhere in this paper we have looked into the objectives of and constraints upon the pension funds' investment behaviour, albeit from an institutional point of view. Now we need to bring these factors into a focus that can be used in the modelling process. We have seen that the pension funds provide a guaranteed retirement income—pensionable benefits—to their members and, in some cases, their immediate dependents. Consequently, it would seem appropriate to suggest that the pension funds act as investment managers via the provision of the pension income, a task which requires them also to guarantee the capital security and long-term yield of the fund. This function leads to the posing, and answering, of the following two questions:

1. What are the factors underlying and constraining the pension funds' investment behaviour?
2. What goals and objectives can be ascribed to their behaviour?

We shall be dealing with the first question here and with the second in Section 9.2.3. We have already observed in Chapters Seven and Eight that, while the pension funds (in each of the three sectors) have quite considerable freedom in their investment decisions, their actions, nonetheless, remain somewhat constrained by a number of factors. In Chapter Eight, for example, we stressed the problem of market dominance, while in other chapters we have discussed such areas as political and social constraints. Thus, although the pension funds can and do influence the environment within which they operate they are unable to control or determine it to any significant degree. Consequently, we can divide those factors recognised as affecting the pension funds' investment decisions into two major groups, viz. external and internal influences. These can be subdivided as follows:

External:

(i) government regulation;
(ii) taxation;
(iii) exchange rate risks and regulations;
(iv) market constraints, especially those on the supply side;
(v) inflation.

Internal:

(i) the nature of the liabilities issued;
(ii) capital risk;
(iii) income risk;
(iv) liquidity considerations;
(v) administrative/organisational constraints.

External:

(i) It has long been common practice for governments to regulate the markets and institutions within the financial sector of a modern "post-industrial" economy, especially within the banking sector because of their rôle in providing a "means of payment" and their ability to create 'money'. In Chapter Four we reviewed the regulations under which the British pension funds operate, and saw that they are largely unregulated in terms of their investment behaviour. Perhaps the only way in which legislation affects pension fund investment is via the various Trustees acts; with pension funds usually being established as a Trust fund their investment behaviour must lie within whatever constraints (if any) are set out in the Trust agreement. Contemporary practice is such that the only constraint they face is the so-called "prudent man" rule, so that the pension funds find their investment behaviour virtually unregulated. However, regulation does deter-mine the nature of the benefits that the pension funds are required to provide, thereby determining their liability structure and, in turn, naturally affecting their investment decisions. Equally, the government, at both national and local levels, has shown itself to be adept at influencing their behaviour by various forms of persuasion. One example of this was the tacit agreement in 1979 between the pension funds and the government that the former would move slowly into various overseas securities upon the removal of exchange restrictions.

(ii) Taxation would seem to be an obvious factor in determining investment policy. A rational investor will be interested in the post-tax yield on their investments. The income that the pension funds receive by way of contributions are generally uninfluenced by taxation because at present there is little incentive via the tax system for an individual to put funds into a pension scheme (largely because of the way the current legislation sets up pensions). However, the rather substantial income that a pension fund receives on its investments is free from taxation while the funds an individual receives as a pension are subject to income tax. A pension fund is therefore unlikely to invest in any asset where the yield is paid on a post-tax basis. Certain local authority securities as well as liquid assets such as Building Society accounts ("shares") are not within the pension fund's feasible set as a result.

(iii) As we have seen in the previous two chapters the pension funds invest a considerable proportion of their portfolio in overseas assets, more so than most British financial intermediaries. Although this has been on an increasing trend for most of the data period, overseas assets have always accounted for a significant fraction of both holdings and net acquisitions by the pension funds. The theory of international finance tells us that overseas investment will be affected by two major factors: yield differentials between the two countries, and the expected exchange rate between the two countries' currencies.[3] In addition there is also the problem of international risk; some countries are regarded as being more politically stable than others and therefore less risky economically. For example, a British pension fund is more likely to have a substantial quantity of its overseas assets in the securities of the United States than those of (eg) Nicaragua or Libya. A final point is that although the pension funds may desire to hold a given quantity of overseas assets it may be unable to do so due to exchange controls imposed either domestically or by foreign governments.

(iv) While it may be the case that a pension fund wishes to pursue a particular type of investment policy, such as buy ordinary shares or sell parts of the existing portfolio, its ability to do so may be affected by the particular market in which it is operating. For example, there may be a supply constraint which limits the availability of a particularly desirable (in terms of its coupon, maturity, etc.) asset in the quantities required. Additionally, pension funds may be prevented from selling assets because of a lack of suitable secondary markets or by other market imperfections which limits their ability to sell. That the pension funds hold such substantial holdings of many assets acts as a market constraint on their activities. For example, as we have previously noted, under portfolio theory it is usually assumed that the investor is a price-taker, whose market actions will not affect the price; this is certainly not true of the pension funds because of their substantial rôle in many of the financial markets in the United Kingdom.[4]

(v) Throughout much of the data period of this study the phenomenon of inflation has been regarded as a considerable problem. Unlike many of the liabilities issued by other financial institutions, the amount of the pensionable benefit is usually linked (in some way or another) to the rate of inflation.[5] However, with the exception of the recently introduced Index-Linked Treasury Stock, the returns on pension fund investments (at least, those of a fixed return!) tend to be denominated in nominal terms.[6] It is sometimes argued that in an inflationary environment variable return securities offer a better prospect than those of fixed return. Such a view is said to be responsible for the "reverse yield gap" that came into existence after 1960.[7] However, the experience of falling stock market values during 1973-1974 and the imposition of dividend controls during much of the 1970s served to re-emphasise the volatility of variable return instruments such as ordinary shares and stress the need for caution in the evaluation of long-term prospects. During the lengthy world-wide economic expansion of the 1980s the picture for equities has brightened considerably more, as evidenced by the five year bull markets up to the various stock market meltdowns of October 19th, 1987. Even since then markets have tended to continue upwards, albeit at a slower pace. Equally, the situation for bonds has benefited from the more stable and lower rates of inflation that have prevailed during the current decade.

Internal:

(i) As we have already seen in earlier chapters, the investment of monies by the pension funds requires that they take account of the liabilities which they issue and the obligations that places upon them in terms of income, capital, and so on. If the liability structure does not change greatly then it would be seem to be the case that it has little influence over changes in the investment policy of the pension funds. It is largely because the pension funds' liability structure is fairly monolithic and unchanging over time that the pension funds differ greatly from virtually all other financial institutions. Thus, the financial structure of a pension fund must not be seen as simply a diversified portfolio of assets designed to meet its contractual liabilities, but as a wholly intertwined relationship between the cash flow of its assets and its liabilities.

(ii) **and** (iii) In fulfilling its obligations the pension fund faces two particular risks—capital risk and income risk—each of which we have dealt with earlier in this paper.

(iv) Any financial intermediary will be subject to a liquidity requirement, the degree of which depends primarily on the nature of their business. Depository intermediaries in the United Kingdom, such as the joint-stock banks and building societies, are subject to statutory liquidity requirements, usually referred to as reserve requirements. The assets eligible to enter the category of reserves is highly specific in terms of statutory requirements, but it is often the case that intermediaries hold a greater amount of reserves (ie, "excess reserves") than that specified by law. In the case of the pension funds there is no externally imposed liquidity requirement so that their holdings of liquid assets may be regarded as a choice variable. In addition, as we saw in Table 7-1, the pension funds generate a substantial net inflow of funds either through contributions or income generated by previous investments and this may provide a cushion against any unforeseen sudden cash drain or if the fund were suddenly subjected to a catastrophic decline in the value of its portfolio holdings. If the pension fund does hold excess short-term assets (that is, over and above those required for normal transactions such as the payment of pensionable benefits, administrative costs, etc) then this will be because they are regarded as a choice asset, a temporary abode of investment funds until more attractive longer-term investments can be made. The holding of short-term, liquid assets gives the pension funds a degree of manœuvrability otherwise unobtainable in their investment process.

(v) Unless a pension fund has a highly specific predetermined investment policy, then its managers require a constant flow of information on assets with respect to their capital and income attributes if they are to perform their task properly. For funds pursuing a "buy-and-hold" strategy only an initial evaluation is necessary, unless portfolio performance measurement is evaluated nonetheless. If, on the other hand, the fund wishes to actively trade in one or other of the financial markets then more information is required, particularly that which will aid forecasts, the appraisal of the existing portfolio, and the disbursal of both new monies and funds available due to the sale of existing assets. As pointed out by P. O. Dietz (1972), such information goes well beyond performance measurement, requiring also the analysis of portfolio performance, the estimation of future cash flows and degrees of risk. Any successful investment policy requires a control framework that can provide feedback for the planning process. The amount of information required by a fund will depend upon two factors: the degree of action its investment policy calls for, and the size of the fund. As we have seen, in many cases the second factor plays a large rôle in determining the first, although overall search costs tend to be higher (as are the potential rewards) the more active and diversified is the fund's investment policy.

9.2.3 Pension Fund Objectives

Elsewhere in this paper we have looked into the investment behaviour of the British pension funds as it manifests itself in terms of their holdings and net acquisitions, and both above as well as in Chapter Four we have considered the institutional framework within which they operate and the constraints that framework imposes upon their investment behaviour. Given that the pension funds regularly invest such large amounts we must recognise that there is an enormous pressure on the investment managers to seek new outlets and fully utilise the existing markets. It is therefore entirely appropriate to enquire why they adopt a particular investment pattern.

Economic theory traditionally emphasises that the behaviour of its component parts is rational. The neoclassical theory of the firm posits this assumption as firms being profit-maximisers. However, this single objective of the firm has come in for much criticism in the post-1945 era for many reasons. For example, in the presence of uncertainty the maximisation of profit becomes an almost meaningless phrase. Equally, in the modern firm there is very often a separation of ownership and control and, while shareholders may look for maximum profits, managerial interests, which may take a different view, are likely to dominate. At this point we need to recognise that pension funds are somewhat different from firms in (say) manufacturing, but also that the similarities likely outweigh the differences. For example, we may list the following similarities:

1. They are both organisational entities.
2. There is a separation of management and ownership. Although a pension fund has no shareholders its contributors may be considered as its owners. This is especially true of the "members"—those who expect to receive a pension in the future—as they have most to lose. Although all contributors are represented on the Board of Trustees (as we saw in Chapter Four) they are generally regarded as having much less input into the policy-making of the pension fund than the shareholders of a corporate entity. One reason for this is that, unlike most firms, especially the corporations, the pension funds are not obligated to publish fully detailed accounts on which their members might act. Also, unlike stockholders, pension fund contributors are not in a position to "vote with their Pounds" by selling if they disagree with the policies adopted by their fund. Such "asymmetric information" and other frictions lead both to a degree of apathy on the part of members and a possible divergence of interests between the fund's managers and those whose interests they are supposed to represent.
3. They are perpetual entities. Although the provision of a pension to a member usually terminates upon death, new members' pension arrangements are constantly being included, so that the pension funds may be considered open funds.

What then are the specific objectives of the U. K. pension funds? Professor Revell suggests that

> ...pension funds aim to maximise the expected return on their assets, subject to the need for diversifying the portfolio to reduce risk. (1973, page 439)

but also recognises the imprecision of the term "maximisation of expected return". Holbrook goes into rather more detail:

> The question of investment objectives for pension funds may be approached by stating two principles which are believed to command fairly wide support:
> (i) The portfolio should be constructed with regard to the nature of the liabilities.
> (ii) Subject to (i), the objective should be to maximize the rate of return by investments which involve an acceptable level of risk. (1976, pages 15-16)

He also offers some alternate approaches, which may be regarded as the dual of that above:

> Pension fund investment should aim to minimize the cost of benefits or, what is much the same thing, to maximize the future surplus assets which may be used to improve benefits, by way of post-retirement increases or otherwise.
> ...it is sometimes argued, the investment objective should be to minimize the contributions which the actuary will recommend at the next valuation. In the meantime, it is necessary to secure at least the 'actuary's rate' (i.e. the rate of investment return assumed in the last valuation); (1976, pages 18-19)

It would seem obvious that the main aim of any pension fund should be the secure provision of pensions to its members, as set out in the Trust agreement. Because of the long-term nature of this commitment we could restate the pension fund's dominant objective as being survival, one which is readily achieved providing the fund can at least remain solvent. To avoid the disaster of insolvency the pension funds need to earn a target rate of return on their investments. Although this implies a static view of investment policy it does provide us with a "safety-first" objective for the pension funds behaviour, much like "securing at least the actuary's rate". More likely, however, is that the target rate of return specified will exceed the minimum which must be earned for solvency, and that this "mark-up" will vary from fund to fund depending upon such factors as size and the specifics of its liabilities.

In addition to being concerned about survival there is some evidence that the pension funds are concerned with the growth of their total business (i.e., the provision of pensions), although this is rather more difficult to substantiate. Nonetheless, the literature alludes to this objective for both industrial firms and financial institutions.[8] There are a number of possible reasons to which we may ascribe this growth objective. Firstly, there is the simple reason that growth of the fund reflects well on the fund's managers, and so growth is likely to be a managerial objective of some priority. It could be argued that, if this is indeed a managerial objective, it might turn out to be to the detriment of the members, especially in view of the relative lack of accountability of the pension fund's investment managers to their members. However, as pointed out by R. L. Marris (1967), the growth and "profit" objectives need not necessarily be in conflict; much of the literature that has revised the theory of the firm to account for organisational and behavioural factors indicates that the rate of return is a satisficing target linked to an aspirational level, rather than a variable which is to be maximised. Indeed, growth could be seen as a proxy for value maximisation. It should also be recognised that, with the financial markets performing less well during the 1970s than in the previous two decades, combined with an ever-increasing number of pensioners, growth of contributions served as a means by which the funds could continue to service their outstanding liabilities.

The ability of a pension fund to achieve these objectives will be constrained by the factors we described earlier. Both the growth and rate of return objectives require planning of all aspects of pension fund behaviour. That the pension funds do plan their activities was seen in the earlier chapters of this paper, and we should take this into account in ascribing objectives to them; we should naturally preface their objectives with the word "expected". Although there is almost nothing in the literature on the objectives of pension funds, we may consider their objectives as being very close to those of (eg) mutual insurance companies.[9] Among this literature we find J. B. H. Pegler (1948) arguing that the main principle of investment should be the expected yield, while a later author, H. G. Clarke (1954), suggests the objective should be "to maximise the expected yield with the minimum of error, having regard to the nature and incidence of the liabilities." Further studies of life insurance companies, such as those by Clayton and Osborn (1965) and G. T. Pepper (1964), expressed the belief that the expected yield was the fundamental objective of investment behaviour. However, because the expected yield is calculated on the basis of uncertain (some would argue, unknown) knowledge of the future it remains an uncertain figure itself . Most attempts to calculate expected values rely on various extrapolations of previous values, such as the Koyck lag (1954) or that put forward by de Leeuw (1965).

Another way for pension funds to consider the expected rate of return is by using the concept of a normal rate of return.[10] If the current rate is below the normal rate then it will be expected to rise, and vice-versa. This gives a linearised demand function of the following form:

$$NA_t = a + b(L - L^N)_t$$

where NA_t is the net acquisition of a given asset, L represents the actual long rate of return, and L^N represents the calculated normal rate of return.[11]

Whichever way we choose to consider the expectations factor there is no denying its very important rôle in the pension funds' investment process. The expected rates of return will yield an optimum portfolio or desired balance sheet which will usually not be directly observable. Equally there is no guarantee that the portfolio will be in equilibrium, and so as new funds become available for investment they are used to close the gaps between actual and desired or optimal values. At one extreme, the portfolio could be characterised as an allocation of funds in fixed proportions like a fixed coefficient input-output model. Some studies of British financial institutions have adopted such an approach,[12] but the evidence from the previous two chapters militates against use of this approach for the pension funds. Of course, in addition to channelling new funds to close gaps, the funds could also switch assets within the existing portfolio to move towards their desired position, but this is a more costly approach in general.

As we suggested quite forcibly in the previous section, we can follow H. I. Ansoff (1965) and posit that the investment decision is split into a hierarchy of strategic decisions—ie, those between the different categories of asset—and tactical decisions—choosing the asset mix within a particular asset group. Such an approach by the pension funds has empirical support especially in the evidence presented to the Wilson Committee (1980). However, under this system the Markowitz mean-variance approach to investment decision-making applies mainly to the tactical decision; it cannot be used for the strategic decision except under highly restrictive assumptions, such as complete foreknowledge of the proportions of the different securities within any category. Should one choose to deny the validity of the Ansoff approach then the only remaining alternative would be to use a linear programming approach to analyse pension fund investment behaviour.

Ansoff recognises a third stratum in the decision-making process, that of the administration in providing information to enable the strategic and tactical decisions to be made effectively. However, we may safely assume this as being implicitly within the strategic and tactical elements of the decision-making process.

As we have already suggested the main objective of measuring portfolio performance would be to test the effectiveness of previous investment decisions given the pension fund's stated objectives, with the information acquired being used to improve future investment performance. Such a "planning and control" framework requires continual supervision and the input and analysis of immense quantities of data. Given the 'two-stage' investment decision process we have posited here, what would be continually under review would be the portfolio division between the major categories we have outlined above; that is to say, it is the strategic decision which would be subject to performance review. Naturally, within any asset category there will always be opportunities for "operational switching", that is changing the mix of securities held within any category. The option of operational switching would appear to be particularly relevant for the gilt-edged securities category and even for ordinary shares, where there are often substantial differences in the rates of return yielded by different securities, as well as substantial secondary markets to facilitate such switching. One consequence of this is the need for a performance measurement process that is both dynamic and static in nature. Empirical evidence, such as that given to the Radcliffe and Wilson Committees, suggests very strongly that continual performance reviews are secondary to the investment of future cash inflows for both the pension funds as well as many other British financial institutions. Naturally, this is somewhat less true of funds heavily invested in assets where yield data is readily available at little or no cost.

From the above, then, it follows that although we need to consider both stock and flow aspects of the pension fund investment decision, primary emphasis should be placed on flow influences, at the same time recognising that it is possible for the pension funds' asset holdings to be in disequilibrium. One popular method of capturing both stock and flow influences is the standard partial stock adjustment mechanism which, for example, is specified and utilised by Ryan (1973). This mechanism usually takes the following form:

$$A_t^a = A_{t-1}^a + \alpha(A_t^* - A_{t-1}^a)$$

where A_t^a represents the actual demand for asset A at time t, and A^* is the desired or optimum holding of that asset. The value of the adjustment coefficient, α lies between zero and one. Taking A_{t-1}^a to the left-hand side of the equation enables us to obtain an expression explaining any change in the holding of asset A between any two consecutive periods, viz:

$$A_t^a - A_{t-1}^a = \alpha(A_t^* - A_{t-1}^a)$$

where $0 < \alpha < 1$. This expression explains the net acquisition of asset A as a partial adjustment from the previous holding level (A_{t-1}^a) towards the desired holding level (A_t^*) by an amount denoted by α. In using this mechanism in the modelling process much depends on the actual specification of the *ex ante* variable A_t^*. While several rather different forms are possible, one which has been employed frequently suggests that a constant proportion of the difference between the actual and desired holding levels of a particular asset is reduced in the period immediately following a change in any of the explanatory variables (eg, such as a change in the term structure of interest rates). This type of adjustment has the beauty of being able to be simplified to the use of a lagged dependent variable, making it a useful econometric device. Adjustment towards the desired portfolio can, of course, be brought about by directing inflows of new funds into the appropriate areas. The net acquisitions data would certainly give credence to this approach in that the pension funds can virtually ignore the market for a given asset in one quarter yet place a substantial proportion of their new monies there in the next quarter. Such an approach to investment appears to be increasingly popular with the pension funds and many other financial intermediaries. In addition, as we have seen, the pension funds certainly seem more than willing to build up substantial holdings of short-term assets, particularly in times of relative uncertainty. Such holdings give the funds room to manoeuvre, and are usually reduced whenever more profitable longer-term avenues for investment are perceived. Of course, when the pension funds do decide to 'go short' they assume the risk that interest rates may move against them, but this may be rationalised as the funds trading off interest rate security for increased capital security.

We may now formalise these ideas in the following expression for the pension funds' net acquisitions (NA) of a given asset category (i):

$$NA_i = a_{i0} + \sum_{j=1}^{n} a_{ij}R_j + \sum_{k=1}^{m} b_{ik}S_k$$

where R_j is a vector of rates of return on various assets and S_k is a vector of other explanatory variables including the constraints on pension fund investment behaviour discussed earlier. The actual elements included within these vectors will depend upon whether the model is focused on stock or flow considerations. As previously suggested, a stock adjustment model could easily be handled by the inclusion of a lagged dependent variable, while a 'pure' flow model would include an income constraint such as the amount of net new funds available for investment.

9.3 Towards Individual Demand Specification

In the foregoing discussion we established that we needed to place major emphasis on the flow aspects of the pension funds' investment decision. The implication being that we needed to include income as an argument in our demand equations. Additionally, the hypothesis of a sequential investment allocation procedure suggests that total income will not be the appropriate measure of income for inclusion in all equations. Rather, some measure of income that recognises that some funds may already have been allocated will be appropriate. We shall be defining this later as "secondary income". It is also the case that, if the pension funds do indeed adopt a sequential investment procedure, demand for those assets which are acquired later in the sequence may not depend upon their own-yield, but rather upon some measure of a "yield-gap" relative to that on assets with a prior claim on funds. Consequently, by adapting the general form of the equation for pension fund net acquisition of a given asset category (as presented in the previous section, on page 381) we may include these characteristics and arrive at the following model:

$$NA_i = a_i + b_i R_i + c_i Y + d_i I_i \qquad \textbf{(9-1)}$$

$$NA_k = a_k + b_k(R_k - R_i) + c_i(Y - NA_i) \qquad \textbf{(9-2)}$$

Equation 9-1 posits that the net acquisition of an asset with a prior claim on funds (NA_i) depends on its own-yield (R_i), total income (Y), and net issues of the asset (I_i). Equation 9-2 posits that the net acquisition of an asset with a secondary claim on funds (NA_k) depends on a yield-gap between its yield and that on assets with a prior claim (R_k - R_i), and a measure of residual income (Y - NA_i).

Although the data period of our study is nominally 1963.I to 1986.IV, many of the estimations we employ in this Chapter only use data up to an earlier period, primarily due to data constraints.[13] We begin by delineating the asset categories we shall be attempting to explain later for net acquisitions; they are:

1. **Government and government guaranteed securities**—overall and split by maturity range to focus on long-term gilts (including Index-Linked Treasury Stock when appropriate);
2. **Ordinary shares** (including unit trust units and property unit trust units)—both aggregated and divided into domestic and overseas;
3. **Corporate bonds** (consisting of debentures and preference shares);
4. **Loans and mortgages**—overall only;
5. **Land, property and ground rent**;
6. **Overseas assets**.

With these asset groupings in mind we can recall the asset characteristics discussed in detail in Chapter Seven and distinguish between:

1) fixed interest securities (gilts and debentures) with variable capital values;
2) equity assets (ordinary shares and property) with variable returns and variable capital values;
3) assets fixed in longer nominal money terms (loans and mortgages); and
4) short-term assets which are fixed in nominal terms but possess little marketability risk due to their maturity.

As we saw in Section 9.2.2 we may think of the portfolio **strategy** as being a decision to allocate funds between these four broad asset groupings, with **operational** or **tactical decisions** being taken within the groupings. Assuming this to be the case then we need to deduce what factors are likely to influence strategic decisions. Investment theory suggests that there are four major factors, which may be listed as:

(i) changes in the liability structure and adjustment to the "desired" portfolio;
(ii) issues of securities;
(iii) movements in yields, including any pertinent inflation trends;
(iv) the availability of funds—the income or wealth constraint.

We now turn our attention to a review of these factors before we attempt to include them in the individual demand specifications.

We have already discussed the importance that the liability structure may have in determining a financial intermediary's investment portfolio strategy. For example, fixed interest stocks offer income security while equity securities can provide capital growth, etc. Given the rather homogeneous nature of the liability issued by the pension funds—the pensionable benefit—it seems logical to assume that they would be predominantly interested in capital growth with a keen interest in a stable income over the long term, ie, in equity securities and low-risk fixed interest assets. This would appear to be borne out by the data we reviewed in Chapter Seven and Chapter Eight. If the liability structure had not changed greatly over the data period then it would be safe to assume that, while the liability structure is a significant factor in the strategic investment decision, it has played little part in moulding the changing policy of the pension funds over our data period. It is in this respect that the pension funds differ greatly from almost all other financial institutions. Almost every other intermediary possesses a liability structure that changes over time in response to the changing demands of savers in the economy and the changing competition from other financial institutions. This is not the case for pension funds in the United Kingdom for two reasons: firstly, the provision of pensionable benefits has been and remains the sole liability of the pension fund; and secondly, due to the legal framework within which the pension funds operate no real competition for pension contributions has manifested itself.[14] Thus, for the pension funds we may regard the liability structure as being within the usual *ceteris paribus* assumption of economic theory, ie, as if possessing no influence on the investment behaviour of the pension funds.

Also included within the first major factor outlined above is the pension funds' adjustment to their "desired" portfolio. In theory there are a number of factors which contribute to the choice of a desired portfolio. If a financial intermediary practices a policy of matching-immunisation (or strict hedging) then its liability structure will dominate the choice of both the desired portfolio and the allocation of new monies. In such a situation the major constraint on the pension funds' actions will come from the supply side. If a more speculative investment approach is taken by the pension funds, then other factors such as yields (in particular) will assume greater importance, even if the emphasis is on the redirection of new monies to approach the desired portfolio rather than attempting to change the current portfolio by more active trading. It is also the case that the availability of stock within a given asset category will play a primary rôle in the strategic decision-making process, as we have suggested earlier. This supply constraint will play a larger rôle for asset markets in which the pension funds are a dominant force, and also where there exists a well-established formal primary market, such as is the case in the United Kingdom for fixed interest securities and equities. Because the supply constraint is usually regarded as a 'market imperfection' we must, therefore, recognise the possibility that the portfolio of the pension funds may be continuously in disequilibrium.[15] For the most part, time-series data exists on the volume of issues and we can readily use these to test for their significance on the pension funds' net acquisitions. This we have done using ordinary least squares, and the results are set out below in Table 9.1.[16]

While we have attempted to regress net acquisitions of a given asset against its own issues figure, because of data restrictions, for British government securities we have made use of the overall issues figure, which includes **all** maturities. To a very large degree the results obtained by regressing the net acquisitions of a particular asset against its current net issues confirm the findings of our investigations into market dominance.[17] That is to say, we may summarise our regression results as being that issues are of

Table 9-1: The Impact of Issues on Net Acquisitions (OLSQ)

Dependent Variable	Constant	NET (self) ISSUES	R^2	DW	F-statistic	data period
Private Sector:						
GILTS	11.0756	0.1103	0.6938	1.6850	199.4090	1963.I-
	(0.9167)	(14.1212)				1985.II
GS	1.1892	-0.0034	0.0131	1.7331	1.1714	1963.I-
	(0.2472)	(-1.00211)				1985.II
GM	-0.5036	0.1156	0.0349	2.3830	3.1867	1963.I
	(-.050275)	(1.7851)				1985.II
GL	8.2067	0.0876	0.5692	1.9045	116.2740	1963.I-
	(0.6531)	(10.7830)				1985.II
GLONG	10.3899	0.1022	0.3420	0.8959	18.7134	1963.I-
	(0.7637)	(11.6094)				1985.II
ILTS	147.4080	0.0062	0.0074	1.5013	0.0667	1982.IV
	(2.3411)	(-.258301)				1985.II
ORDH	40.7834	0.3935	0.6236	1.3143	149.1340	1963.I-
	(3.6085)	(12.2120)				1985.IV
COMMON	56.5157	0.5944	0.5342	1.0190	103.2230	1963.I-
	(2.8152)	(10.1603)				1985.IV
ORDS	61.7581	0.6008	0.5317	1.0180	102.1080	1963.I-
	(3.0283)	(10.1000)				1985.IV
DEBS	1.0262	0.0845	0.2698	1.4546	28.8134	1963.I-
	(0.6079)	(5.3678)				1982.IV
PREFS	-0.1914	0.0848	0.1320	1.9576	11.8645	1963.I-
	(-.885785)	(3.4445)				1982.IV
Public Sector:						
GILTS	10.3761	0.0575	0.6032	1.4575	133.7780	1963.I-
	(1.3502)	(11.5662)				1985.II
GS	3.1035	-0.0001	0.0000	2.3034	0.0018	1968.I-
	(0.6545)	(-.042403)				1985.II
GM	1.3198	0.0171	0.1365	1.1704	10.7484	1968.I-
	(0.1446)	(3.2785)				1985.II
GL	14.0803	0.0284	0.2093	1.1035	17.9981	1968.I-
	(1.2012)	(4.2424)				1985.II
GLONG	7.6324	0.0399	0.4398	1.3720	69.0895	1963.I-
	(1.0282)	(8.3120)				1985.II
ILTS	25.0507	0.0170	0.2825	2.6630	3.5427	1982.IV
	(1.0948)	(1.8822)				1985.II
ORDH	38.7666	0.1967	0.5063	1.1391	92.3085	1963.I-
	(5.5175)	(9.6077)				1985.IV
COMMON	39.3583	0.2979	0.5547	1.0711	112.0930	1963.I-
	(4.0761)	(10.5874)				1985.IV
ORDS	41.9174	0.2950	0.5422	1.0261	106.5850	1963.I-
	(4.2750)	(10.3240)				1985.IV
DEBS	2.4685	0.0218	0.1097	1.3455	9.6078	1963.I-
	(3.2769)	(3.0996)				1982.IV
PREFS	0.0056	0.0198	0.0591	1.9382	4.8986	1963.I-
	(0.0709)	(2.2133)				1982.IV

Dependent Variable	Constant	NET (sdf) ISSUES	R^2	DW	F-statistic	data period
Local Authority Sector:						
GILTS	6.6402	0.0264	0.6835	1.3248	190.0630	1963.I-
	(2.2398)	(13.7863)				1985.II
GS	-1.6269	0.0003	0.0010	1.9339	0.0757	1968.I-
	(-.969232)	(0.2746)				1986.IV
GM	-2.5180	0.0018	0.0019	1.3852	0.1386	1968.I-
	(-.539145)	(0.3722)				1986.IV
GL	11.4760	0.0222	0.4182	1.2582	53.1917	1968.I-
	(2.2415)	(7.2933)				1986.IV
GLONG	5.7104	0.0272	0.6098	1.3084	137.5240	1963.I-
	(1.5939)	(11.7271)				1985.II
ILTS	10.7217	0.0043	0.0417	0.9102	0.3912	1982.IV-
	(0.5924)	(0.6255)				1985.II
ORDH	24.2458	0.1226	0.5081	1.0063	92.9630	1963.I-
	(5.5564)	(9.6417)				1985.IV
COMMON	26.9784	0.1928	0.5316	0.8386	102.1320	1963.I-
	(4.1218)	(10.1060)				1985.IV
ORDS	29.1564	0.1969	0.5198	0.8207	97.4167	1963.I-
	(4.2586)	(9.8699)				1985.IV
DEBS	1.1572	0.0123	0.1360	1.0287	12.2781	1963.I-
	(3.0769)	(3.5040)				1982.IV
PREFS	0.2609	0.0195	0.0156	1.6147	1.2346	1963.I-
	(1.6949)	(1.1111)				1982.IV
All Pension Funds:						
GILTS	5.4978	0.2475	0.5851	0.8570	124.1020	1963.I-
	(0.1600)	(11.1401)				1985.II
GS	30.2669	-0.0168	0.0608	1.4934	2.3310	1976.I
	(1.2060)	(-1.5267)				1985.II
GM	17.9441	0.0234	0.0288	2.0525	1.0670	1976.I
	(0.3468)	(1.0331)				1985.II
GL	122.5470	1.0440	0.2607	1.5512	12.8942	1976.I
	(1.8300)	(3.5628)				1985.II
GLONG	93.8733	0.2087	0.3420	0.8959	18.7134	1976.I
	(0.8513)	(4.3259)				1985.II
ILTS	306.0420	0.1410	0.5387	1.5755	10.5110	1982.IV
	(2.6880)	(3.2421)				1985.II
ORDH	183.9660	0.6885	0.6378	1.2723	154.9380	1963.I-
	(5.7409)	(12.4474)				1985.II
COMMON	121.7530	1.0471	0.5887	0.8129	125.9500	1963.I-
	(3.9859)	(11.2227)				1985.II
ORDS	131.2380	1.0570	0.5822	0.8075	122.6230	1963.I-
	(4.1991)	(11.0735)				1985.II
DEBS	4.98618	0.118723	0.2796	1.3732	30.2727	1963.I-
	(2.1533)	(5.5020)				1982.IV
PREFS	0.140874	0.124783	0.1444	1.7642	13.1615	1963.I-
	(0.4669)	(3.62789)				1982.IV

Key: see next page.

Key: **GS** = short-term government securities	**ILTS** = Index-Linked Treasury Stock
GM = medium-term government securities	**GLONG** = GL + ILTS
GL = long-term government securities	**GILTS** = GS + GM + GL + ILTS
COMMON = domestic and overseas ordinary shares	**ORDH** = domestic ordinary shares
DEBS = debentures	**PREFS** = preference shares
BONDS = debentures and preference shares	

importance to the pension funds' investment activities only in those markets in which they are a dominant investor. But this should not come as any surprise. In all cases it is noticeable that the equations with high values of R^2 have as their dependent variable assets which figure prominently in the funds' portfolio, and in which they may be seen as a dominant investor. Thus, variations in net acquisitions of British government securities, both of all maturities, and especially those long-dated, as well as domestic ordinary shares can be explained to a degree of at least fifty per cent by variations in their net issues. The equations for net acquisitions of fixed interest company securities and for short- and medium-dated British government securities show very poor fit by virtue of very low R^2 values. These results also are confirmed by reference to the t-statistics.[18] Let us examine in detail the results for each of the three sectors of the pension fund movement as well for the movement on aggregate.

Starting with the private sector pension funds we notice that the best fit is obtained in the equations for net acquisitions of British government securities and for ordinary shares. The British government securities equations perform well for both all maturities (GILTS) and for long-term securities (GL). When we include Index-Linked Treasury Stock as a component of long-term securities (GLONG) the value of R^2 is reduced from 0.5692 to 0.3420. The equations for net acquisitions of British government securities of short- and medium-term maturities show very poor fit in terms of R^2; in the case of medium-term gilts the t-statistic (1.7851) indicates significance at the 95% confidence level, while with short-term gilts the insignificance of issues is confirmed by the very low t-statistic (-1.002) which is insignificant at the 90% confidence level (but not at the 80% level). The low fit of these two equations is confirmed by the F-statistics which, in both cases indicates that we cannot rule out the insignificance of issues, even at the 95% level. In the case of the equations for net acquisitions of Index-Linked Treasury Stock (ILTS) we again find a poor fit indicated by the R^2, t- and F-statistics, but given that there are but eleven quarterly observations this is not entirely surprising. While the evidence here does seem to suggest quite strongly that net acquisitions of Index-Linked Treasury Stock are not influenced by issues, it would be wrong to make such a firm conclusion on the basis of only a few years' data. Rather, at this time we should reserve judgment for a future occasion when a longer time-series is available.

It is particularly interesting to note that the issues variable is negatively signed in the short-term gilts equation. This would seem to indicate that the pension funds increase their net acquisitions of short-term gilts when the government is issuing less securities. This is entirely plausible, given that the majority of gilts issued are long-term. Furthermore, it is during periods of economic uncertainty that the government tends to restrain its issuance of securities; during these same periods, as we have seen, the pension funds tend to react to the uncertainty by moving their portfolio towards assets of shorter maturity (ie, greater liquidity).

Turning to the equations for net acquisitions of ordinary shares by the private sector pension funds we find some rather good fits. The equation for domestic ordinary shares (ORDH) has extremely good fit indicated by the R^2, t- and F-statistics. Indeed, the R^2 statistic suggest that some 62% of the variance of the private sector pension funds' net acquisitions can be explained by variances in their issues. When the equation was re-estimated including overseas ordinary shares in the dependent variable (COMMON) we still got a good fit, but somewhat reduced. This suggests that net acquisitions of overseas ordinary shares are not influenced by the issue of domestic ordinary shares. Similarly, we re-estimated the equation using the combined net acquisitions of domestic ordinary shares, authorised unit trust units and property unit trust units (ORDS) as the dependent variable. The rationale for this was that while the larger pension funds tend to purchase shares directly, many of the smaller funds purchase ordinary shares indirectly through the acquisition of unit trust and property unit trust units. The result here was once again an equation of good fit, but less so than for domestic ordinary shares alone. This would tend to indicate that pension fund acquisitions of unit trust and property unit trust units are not influenced by issues of ordinary shares. Indeed, it would seem to be the case that these units may be properly regarded as a limited substitute for ordinary shares. The same may, of course, also be said of overseas ordinary shares.

Turning to the remaining equations, those for fixed-interest company securities, we find that while the R^2 indicates a rather small influence by issues on the net acquisitions of both debentures and preference shares, this influence cannot be deemed insignificant due to the t- and F-statistics. In both equations, the t-statistics on issues are significant at the 99% confidence level, while the F-statistic confirms that the null hypothesis is not significant at the 99% level.

Moving on to the public sector pension funds we notice that, once again, the best fit is obtained in the equations for net acquisitions of British government securities and for ordinary shares. As with the private sector funds, the British government securities equations perform well for all maturities (GILTS) although, unlike the private funds, not quite so well for long-term securities (GL). Here, when we include Index-Linked Treasury Stock as a component of long-term securities (GLONG) the value of R^2 is increased from 0.2093 to 0.4398. The equations for net acquisitions of British government securities of short- and medium-term maturities show very poor fit in terms of R^2; in the case of medium-term gilts the t-statistic (3.2785) does indicate significance at the 99% confidence level, while with short-term gilts the insignificance of issues is confirmed by the very low t-statistic (-.0424) which is insignificant even at the 70% confidence level (but not at the 60% level). The low fit of the short-term gilts equation is confirmed by the F-statistics, but with the medium-term gilts equation we cannot rule out the significance of issues. In the case of the equation for net acquisitions of Index-Linked Treasury Stock (ILTS) we again find a poor fit indicated by the R^2, t- and F-statistics, but as, once again, there are only eleven quarterly observations this is not entirely surprising. While the evidence here again suggests quite strongly that net acquisitions of Index-Linked Treasury Stock are not influenced by issues, it would be wrong to make such a firm conclusion on the basis of a few years data. Again, at this time we should reserve judgment for a future occasion when a longer time-series is available.

As with the private sector funds, it is again interesting to note that the issues variable is negatively signed in the short-term gilts equation. As before, this indicates that the pension funds increase their net acquisitions of short-term gilts when the government is issuing less securities, for the reasons previously cited.

Turning to the equations for net acquisitions of ordinary shares by the public sector pension funds we find some rather good fits yet again. The equation for domestic ordinary shares (ORDH) has extremely good fit indicated by the R^2, t- and F-statistics. Indeed, the R^2 statistic suggest that some 50% of the variance of the public sector pension funds' net acquisitions can be explained by variances in their issues. While this is not quite as good as the R^2 obtained by the private sector funds, it should be remembered that the public sector funds form a much smaller proportion of the pension fund industry. Unlike the private sector, when the equation was re-estimated including overseas ordinary shares in the dependent variable (COMMON) we got a somewhat improved fit. This implies that net acquisitions of overseas ordinary shares by the public sector funds are influenced by the issue of domestic ordinary shares. Similarly, we re-estimated the equation using the combined net acquisitions of domestic ordinary shares, authorised unit trust units and property unit trust units (ORDS) as the dependent variable. The rationale for this was that while the larger pension funds tend to purchase shares directly, many of the smaller funds purchase ordinary shares indirectly through the acquisition of unit trust and property unit trust units. The result here was an equation of better fit, probably due to the much greater number of smaller pension funds within the public sector. Indeed, the diversity of pension fund size within this sector may largely account for these results; the larger public sector funds (often the largest in the country!) tend to be major purchasers of ordinary shares, often new issues, while the smaller funds tend to purchase ordinary shares indirectly, via the trusts.

Turning to the remaining equations, those for fixed-interest company securities, we find that the R^2 indicates a terribly small influence on the net acquisitions of both debentures and preference shares by issues. However, this influence cannot be deemed entirely insignificant due to the t-statistics. In both equations, the t-statistics on issues are significant at the 95% confidence level, but the F-statistics in both cases confirm the significance of the null hypothesis.

The results for net acquisitions by the local authority sector pension funds are very similar to those of both the other sectors, but closer to those for the public sector. Once again we find good fits in the overall gilts and ordinary shares equations. The equations for short- and medium-term gilts tend to be insignificant, while the equations for long-term gilts show remarkably good fit. Like the public sector funds, the equation for long-term gilts inclusive of Index-Linked Treasury Stock (GLONG) performs slightly better than that for long-gilts alone (GL). We get the same kind of poor results for the equation for local authority funds' net acquisitions of Index-Linked Treasury Stock as we did for the other two sectors, and probably for the same reasons. The equations for net acquisitions of ordinary shares all have R^2 values above 0.5 and, in common with the public sector funds, performance is improved in those equations which include either the acquisitions of trusts or overseas ordinary shares. With the two fixed-interest equations we find mostly insignificant results, once again with the exception of the t-statistic indicating that issues may be significant in the debentures equation (DEBS). Unlike the public sector funds, in this case the F-statistic tends to confirm the significance of debentures issues.

Unsurprisingly, the results obtained for all pension funds aggregated together mirror those for the individual sectors, and in some cases the issues appear to be a rather more significant factor at this level of aggregation. This is not entirely surprising, because of the larger proportion of the financial markets accounted for by the pension funds *in toto*. Once again, the best fits occur in the equations for net acquisition of long-gilts, gilts of all maturities, and ordinary shares. The short- and medium-term gilts equations have very poor fit, with the negative sign appearing yet again on the issues coefficient in the short-gilts equation. Inclusion of Index-Linked Treasury Stock improves the results for the longer-term gilts equation. The major area where we get totally different results for all pension funds than for any of the individual sectors is in the equation for net acquisitions of Index-Linked Treasury Stock. When estimated for each of the sectors individually we got poor results, implying that issues were not a significant factor in determining the pension funds' acquisitions of Index-Linked Treasury Stock, yet for all the funds together we now obtain an R^2 of 0.5387, t-statistics which are significant at the 97.5% level (the coefficient on issues is significant at the 99% level), and an F-statistic which is significant at the 95% level and almost significant at the 99% level. Thus, while issues did not appear to play a significant rôle for any of the sectors individually, on aggregate they do appear to be an important factor in determining the net acquisitions of Index-Linked Treasury Stock. Similar results occur in the equations for corporate fixed-interest securities. For the sectors individually we found issues to be virtually insignificant as a factor determining their net acquisitions of either debentures or preference shares, yet for the pension funds *in toto* we find the results somewhat improved. In the equations for debentures (DEBS) we find an R^2 of 0.2796, while in that for preference shares (PREFS) the figure is 0.1444. This compares with 0.2698 and 0.1320 respectively for the private sector funds, and R^2s below 0.1 for the other two sectors. In both equations we obtain significant t-statistics at the 99% level for the issues coefficient, and F-statistics which suggest that the null hypothesis is not significant at the 99% confidence level. Thus, like Index-Linked Treasury Stock, the issues of debentures and preference shares are a much greater factor at the level of the pension funds *in toto* than at the level of the individual sectors.

Once again, the equations for net acquisitions of ordinary shares show remarkably good fit. As with the private sector funds, though not the public or local authority funds, the inclusion of trusts or overseas ordinary shares lowers the R^2 value somewhat. The importance of issues for the net acquisitions of ordinary shares is emphasised by the high t- and F-statistic values obtained.

While the results obtained in Table 9-1 are much as we might have expected given what we observed and deduced in Chapter Eight, there is a problem and it centres on the Durbin-Watson statistics. In nearly all cases, the equations estimated revealed evidence of positive autocorrelation of the error terms with the Durbin-Watson statistic being below the lower limit (d_L) at most significance levels. Because we are dealing with time-series data expressed in nominal currency units this is not entirely surprising. However, the existence of autocorrelation does give cause for concern for several reasons. Firstly, our ordinary least squares (OLSQ) estimators are no longer "best", as they will no longer have minimum variance; some other estimator will now have smaller sampling variance, thereby being more efficient. Secondly, given the evidence for (positive) autocorrelation, ordinary least squares will tend to give under-estimates of the variances. As a result over-optimistic results for the significance of the coefficients will be obtained, the F-statistics will be incorrect, and the R^2 will give an overly optimistic view of the success of the least squares regression. There are several methods for estimating equations in models in which there is the presence of autocorrelation. We have chosen to make use of the Cochrane-Orcutt iterative procedure.[19] The results of those equations re-estimated using this procedure are presented in Table 9-2.

It is interesting to note that for all three sectors and pension funds on aggregate the various equations for net acquisitions of ordinary shares all exhibited autocorrelation of the error terms. The same is true for the equations for net acquisitions of debentures and for some maturities of British government securities. Across all sectors and on aggregate the equations for net acquisitions of preference shares consistently showed no evidence of autocorrelation. The private sector equations typically were less prone to

Table 9-2: The Impact of Issues on Net Acquisitions (CORC)

Dependent Variable	Constant	NET (self) ISSUES	R^2	DW	F-statistic	data period
Private Sector:						
ORDH	78.7483 (3.5818)	0.2391 (5.8527)	0.6865	2.2933	194.902	1963.I- 1985.IV
COMMON	201.567 (2.3594)	0.1254 (2.1591)	0.7556	2.1787	275.173	1963.I- 1985.IV
ORDS	210.433 (2.4079)	0.1218 (2.0728)	0.7560	2.1749	275.701	1963.I- 1985.IV
DEBS	3.7214 (1.3687)	0.0336 (1.8762)	0.3473	2.1248	40.9728	1963.I- 1982.IV
Public Sector:						
GILTS	43.9880 (2.5626)	0.0278 (4.5925)	0.6602	2.3835	168.996	1963.I- 1985.II
GM	8.5157 (0.6607)	0.0130 (2.2068)	0.2586	2.0180	23.3701	1968.I- 1985.II
GL	26.7352 (1.5166)	0.0176 (2.4023)	0.3786	2.0725	40.8713	1968.I- 1985.II
GLONG	19.4443 (1.7477)	0.0279 (4.9000)	0.5101	2.0512	90.5756	1963.I- 1985.II
ORDH	94.9525 (3.0311)	0.0286 (1.3020)	0.6952	2.6540	202.951	1963.I- 1985.I
COMMON	127.381 (2.3918)	0.0767 (2.5639)	0.7270	2.4064	237.015	1963.I- 1985.IV
ORDS	131.912 (2.3849)	0.0761 (2.5476)	0.7283	2.3670	238.615	1963.I- 1985.IV
DEBS	2.8515 (2.8204)	0.0169 (2.1665)	0.2836	2.2714	19.6867	1963.I- 1982.IV
Local Authority Sector:						
GILTS	8.2324 (2.0285)	0.0247 (11.0893)	0.7179	1.8520	221.440	1963.I- 1985.II
GM	-2.8470 (-0.4772)	0.0010 (0.3278)	0.0888	1.8954	7.1147	1968.I- 1986.IV
GL	14.0583 (2.8318)	0.0202 (5.9256)	0.4961	1.8587	71.8707	1968.I- 1986.IV
GLONG	10.0103 (1.9204)	0.0229 (8.4403)	0.6620	1.7841	170.404	1963.I- 1985.II
ILTS	3.7263 (0.1177)	0.0058 (1.0564)	0.3372	1.5943	4.0706	1982 IV- 1985.II
ORDH	38.3751 (4.0815)	0.06261 (4.3143)	0.6733	2.8357	183.450	1963.I- 1985.IV
COMMON	98.4693 (2.1633)	0.0212 (1.5621)	0.8660	2.8284	575.251	1963.I- 1985.IV
ORDS	102.541 (2.1836)	0.0181 (1.3041)	0.8693	2.7487	591.691	1963.I- 1985.IV
DEBS	1.4568 (2.3971)	0.0070 (1.8953)	0.3466	2.0986	40.8535	1963.I- 1982.IV

Dependent Variable	Constant	NET (self) ISSUES	R^2	DW	F-statistic	data period
<u>All Pension Funds:</u>						
GILTS	290.724	0.0894	0.8238	2.3284	406.761	1963.I-
	(1.4979)	(4.9518)				1985.II
GLONG	93.8733	0.2087	0.3420	0.8959	18.7134	1976.I
	(0.8513)	(4.3259)				1985.II
ORDH	183.9660	0.6885	0.6378	1.2723	154.9380	1963.I
	(5.7409)	(12.4474)				1985.II
COMMON	121.7530	1.0471	0.5887	0.8129	125.9500	1963.I-
	(3.9859)	(11.2227)				1985.II
ORDS	131.2380	1.0570	0.5822	0.8075	122.6230	1963.I-
	(4.1991)	(11.0735)				1985.II
DEBS	4.98618	0.118723	0.2796	1.3732	30.2727	1963.I-
	(2.1533)	(5.5020)				1982.IV

<u>Key</u>: GS = short-term government securities; GM = medium-term government securities; GL = long-term government securities; COMMON = domestic and overseas ordinary shares; DEBS = debentures; BONDS = debentures and preference shares; ILTS = Index-Linked Treasury Stock; GLONG = GL + ILTS; GILTS = GS + GM + GL + ILTS; ORDH = domestic ordinary shares; PREFS = preference shares

autocorrelation, while the local authority equations seemed to exhibit autocorrelation in almost every case.

In the private sector equations we find improved performance in almost every aspect: higher R^2s, higher F-statistics, and lower t-statistics, as well as Durbin-Watson statistics that suggest that we cannot reject the null hypothesis concerning the presence of autocorrelation. Indeed, with the exception of the debentures equation, the t-statistics imply that all the coefficients are significant at (at least) the 95% level. In the debentures equation we find that issues are significant at the 90% level, while the constant is only significant at the 80% level. A similar picture emerges from the re-estimated public sector equations. The R^2s and F-statistics are typically higher and the t-statistics are lower. In the various gilts equations the t-statistics suggest that issues are significant at the 95% confidence level, while the constant is only significant in the GILTS equation. Perhaps surprisingly, in the equation for net acquisitions of domestic ordinary shares (ORDH) we find the t-statistic indicating that issues are not significant. This is not the case when overseas ordinary shares or the trusts are added to the dependent variable (COMMON and ORDS respectively). In the debentures equation, while the R^2 and F-statistic imply that issues are important in determining net acquisitions, the t-statistics only indicate the significance of issues at the 90% level; at the 95% level the null hypothesis cannot be rejected.

With regards to the re-estimated equations for the local authority pension funds, while we are consistently finding higher R^2s and F-statistics, and while the t-statistics are mostly lower, there are some occasions where they are higher under Cochrane-Orcutt estimation than under ordinary least squares. Nonetheless, the new results tend to confirm those which we found under ordinary least squares estimation. For gilts of all maturities and longer-term gilts, issues appear to be a significant factor according to the t-statistics. For medium-term gilts and Index-Linked Treasury Stock, the t-statistics still suggest that the null hypothesis cannot be rejected. The F-statistic for the Index-Linked Treasury Stock equation confirms this finding. In the equations for the net acquisitions of ordinary shares, it is only when the dependent variable is domestic ordinary shares alone that the t-statistic shows issues to be significant. When overseas ordinary shares or trusts are included the t-statistic reveals issues to be insignificant. While the debentures equation shows a much-improved performance in terms of R^2 and the F-statistic, the t-statistic shows issues to be significant only at the 90% confidence level.

Turning to the equations re-estimated for the pension funds on aggregate we arrive at much the same conclusions. Again there is much-improved performance in terms of R^2s and F-statistics, and generally lower t-statistics. However, in all cases the t-statistics show issues to be significant at (at least) the 95% level, thus confirming and strengthening the results of our ordinary least squares estimations.

In conclusion then, we may make the following inferences. The pension funds, both *in toto* and when disaggregated into the three component sectors, appear to find themselves constrained on the supply side in those markets in which we found them to be dominant in Chapter Eight. In all cases, we found the net issues to be a highly significant influence on net acquisitions behaviour in the markets for British government-issued securities, particularly those of long-term maturity, and ordinary shares, in all of the three measures used. The equations for net acquisition of short- and medium-term gilts show net issues to be a relatively unimportant influence, but given that the issues are aggregated over all maturities this is not surprising. (It would be interesting to see how they would perform against net issues data disaggregated by maturity.) At the level of the pension funds on aggregate we found the net issues of Index-Linked Treasury Stock to be highly significant, although this was not the case for any of the three sectors taken individually. This may be due in part to the relatively short data-period (necessarily) employed. Given that the long term nature of the pension fund's liabilities are the most likely influence on its investment portfolio behaviour (as we have seen), we should not be surprised that they find their portfolio activities significantly influenced by the net issues of long-term maturity assets. It is also worth noting that in terms of the R^2 and F-statistics (in particular), the equations for net acquisition of ordinary shares performed consistently better than those for government-issued securities. This would seem to support our hypothesis that the pension funds prioritize their investments, with ordinary shares being considered first. It would, of course, be interesting to see if such conclusions could also be borne out by regressing land against its net issues data, but alas such data does not appear to be readily available. Finally, it should be noted that these regression equations have given somewhat better performance than in similar studies for other British financial intermediaries, but in view of the dominance exhibited by the pension funds in the gilts and ordinary shares markets that is not entirely surprising.

The next step is to estimate the impact of own-yield on the pension funds' net acquisition of various assets. To a large degree the own-yield can be seen as a proxy for the price of a given financial asset, and thus its place as a parameter in the demand equation is secured. While the own-yield on most assets is relatively easy to define, there are some assets for which there exists a multitude of possible proxies, all equally valid *a priori*. In consequence, for some assets we have regressed against that multitude of possible proxies; for example, in the net acquisition of ordinary shares equations we have used the dividend rate (DIVORD), the earnings rate (ENORD), and the *Financial Times* share index (FTINDEX) as proxies for the own-yield.[20] The results of these estimations using ordinary least squares are presented in Table 9-3.

The results obtained in Table 9-3 bear a certain similarity to those found in Table 9-1, in that those equations that performed well with net issues as a regressor also perform well for the own-yield regressor, and vice-versa. Thus, once again, the equations for net acquisition of short- and medium-term gilts (GS and GM) and Index-Linked Treasury Stock (ILTS) have no significant parameters as measured by the t-statistic and the F-statistic, while the equation for overseas loans and mortgages does have the exchange rate (EXCDOL) significant at the 5% level, but not at the 1% level. Nonetheless, given that this equation has an F-statistic of 3.40046, we cannot rule out the impact of the exchange rate on net acquisitions of overseas loans and mortgages. However, each of these equations returns an R^2 of less than 0.1, indicating a rather poor performance overall. Of these equations, only that for short-term gilts exhibits autocorrelation as measured by the Durbin-Watson statistic (DW).

Table 9-3: The Impact of Yields on Net Acquisitions (OLSQ)

Dependent Variable	constant	RGS	RGM	RGL	RGU		R^2	DW	F-statistic	data period	corr. R^2
GILTS	-46.6254 (-1.6782)	-0.71105 (-0.0478)	-20.8651 (-0.5339)	2.80351 (0.0935)	25.7935 (2.3030)		0.1686	2.3149	4.0649	1963.I - 1985.II	0.1378
GS	9.87701 (0.5862)	-1.1791 (-0.7139)					0.0058	1.6189	0.5098	1963.I - 1985.II	0.0058
GM	-12.701 (-0.3497)		3.89916 (1.1608)				0.0151	1.867	1.3474	1963.I - 1985.II	0.0151
GL	-220.76 (-3.1344)			34.4414 (5.3629)			0.2463	0.9127	28.716	1963.I - 1985.II	0.2463
GL2	-2.7992 (-2.7395)			34.7717 (5.0228)			0.2228	0.7991	25.229	1963.I - 1985.II	0.2228
ILTS	-239.22 (-0.1771)	54.7 (0.5791)	260.594 (0.8325)	-151.14 (-0.2991)	-154.42 (-0.3788)		0.2052	1.7171	0.3873	1982.IV -1985.II	-0.987
		RGL	DIVORD	ENORD	FTINDEX	RDEBS					
PREFS	-3.4798 (-1.8625)	0.6992 (1.0691)	0.1934 (0.4083)	-0.1903 (-1.3158)	0.0022 (0.5166)	-0.2159 (-0.3608)	0.2055	1.7957	3.827	1963.I - 1982.IV	0.1594
ORDH	-75.369 (-1.042)		-36.358 (-1.4642)	19.1003 (3.0589)	1.2042 (11.9308)		0.8053	2.0981	119.96	1963.I - 1985.IV	0.8007
COMMON	-359.892 (-3.1592)		10.5603 (0.3138)	13.9755 (1.6891)	2.0894 (15.8813)		0.8031	0.6934	119.64	1963.I - 1985.IV	0.7985
ORDS	-333.667 (-2.8882)		1.36514 (0.04)	16.8159 (2.0041)	2.09083 (15.6709)		0.8025	0.6912	119.17	1963.I - 1985.IV	0.7979
DEBS	39.2761 (5.6029)					-2.35362 (-3.9742)	0.1684	0.9454	15.795	1963.I - 1982.IV	0.1684
BONDS	36.1177 (5.2173)					-2.13788 (-3.6553)	0.1318	0.8652	13.362	1963.I - 1985.II	0.1318
		RUKLA	HPI63	EXCDOL							
UKLA	-9.81279 (-1.9595)	0.86974 (2.002)					0.0549	1.466	4.0083	1965.III - 1983.I	0.0549
LAND	-14.9415 (-1.639)		0.261864 (12.191)				0.7335	1.577	148.62	1967.I - 1980.IV	0.7335
OVERSEAS	409.144 (10.1422)			-145.177 (-7.7619)			0.3906	0.5628	60.248	1963.I - 1986.IV	0.3906
GOVOV	32.6956 (5.5357)			-12.618 (-4.6078)			0.1843	1.7974	21.232	1963.I - 1986.IV	0.1843
ORDOV	350.592 (6.1829)			-85.2507 (-2.4355)			0.1165	0.7526	5.932	1975.II - 1986.IV	0.1165
LMOV	-0.76057 (-0.3992)			2.26894 (1.844)			0.0863	2.117	3.4005	1977.III 1986.IV	0.0863

Table 9-4: The Impact of Yields on Net Acquisitions (CORC)

Dependent Variable	constant	RGS	RGM	RGL	RGU	R^2	DW	F-statistic	data period	corr. R^2
GILTS	-51.3755 (-2.0895)	-3.02292 (-0.2239)	-15.1775 (-0.4335)	-1.88446 (-0.0715)	27.5661 (2.8238)	0.1822	1.9932	4.6779	1963.I - 1985.II	0.1515
GS	9.06892 (0.4402)	-1.09317 (-0.5459)				0.042	2.0342	3.8179	1963.I - 1985.II	0.042
GM	-11.1618 (-0.2859)		3.77114 (1.0492)			0.0167	1.9638	1.475	1963.I - 1985.II	0.0167
GL	-38.0567 (-0.2889)			17.6115 (1.5018)		0.4735	2.1906	78 254	1963.I - 1985.II	0.4735
GL2	79.4728 (0.5062)			8.61012 (0.62470		0.5184	2.3487	90.7038	1963.I - 1985.II	0.5184
ILTS	1033.7 (0.968)	304.702 (2.588)	-314.632 (-0.9935)	160.162 (0.425)	-253.456 (-0.7769)	0.6083	2.3281	1.9414	1982.IV -1985.II	-0.5668
		DIVORD	ENORD	FTINDEX						
ORDH	-62.2482 (-0.7402)	-36.3579 (-1.4642)	19.1803 (3.0589)	1.28415 (11.9388)		0.8053	2.0981	119.96	1963.I - 1985.IV	0.8007
COMMON	-174.977 (-1.1456)	-42.9973 (-0.9598)	25.0416 (1.86010	1.95567 (7.8321)		0.8886	2.045	231.272	1963.I - 1985.IV	0.8859
ORDS	-151.946 (-0.9018)	-50.7522 (-1.1181)	27.3537 (2.0054)	1.96496 (7.7675)		0.8884	2.0432	230.759	1963.I - 1985.IV	0.8857
		RDEBS	RUKLA	HPI63	EXCDOL					
DEBS	44.0891 (3.6517)	-2.77727 (-2.7731)				0.3988	2.2695	51.0852	1963.I - 1982.IV	0 3988
BONDS	39.6549 (3.2195)	-2.4531 (-2.4015)				0.4098	2.3386	60.4044	1963.I - 1985.II	0.4098
UKLA	-12.1396 (-1.8488)		1.06338 (1.0828)			0.1278	2.1735	9.9667	1965.III - 1983.I	0 1278
LAND	-14.9833 (-1.2958)			0.262613 (9.8152)		0.7483	2.0545	151.09	1967.I - 1980.IV	0.7483
OVERSEAS	382.829 (3.2906)				-87.4469 (-2.0732)	0.7093	2.1345	226.941	1963.I - 1986.IV	0 7093
GOVOV	32.8633 (5.3869)				-12.6991 (-4.4728)	0.1838	1.8359	20.9467	1963.I - 1986.IV	0 1838
ORDOV	299.167 (2.79760				-37.5577 (-0.57)	0.4573	2.1465	37.0711	1975.II - 1986.IV	0.4573
LMOV	-0.744635 (-0.40940				2.32321 (1.971)	0.0929	2.0119	3.5861	1977.III 1986.IV	0.0929

While the performance of the other equations is rather better, many of them exhibit autocorrelation and have therefore been re-estimated by the Cochrane-Orcutt method. Results of this re-estimation are presented in Table 9-4. While we find an improved F-statistic for the short-term gilts equation, both coefficients remain insignificant and the R^2 remains at a terribly low 0.042. As already suggested, the equation for medium-term gilts shows abysmal results. However, the equation for long-term gilts (GL) is a different story. When estimated by ordinary least squares this equation gave us two significant coefficients as measured by the t-statistic, but exhibited autocorrelation.. Re-estimation gave a much-improved R^2 (from 0.2463 to 0.4735), but coefficients that were no longer significant, even at the 5% level. Yet an F-statistic of 78.254 suggests that we cannot rule out the impact of these coefficients on the net acquisition of long-term gilts by the pension funds. Exactly the same commentary can be applied to the equations for net acquisitions of **all** long-term gilts (ie, including Index-Linked Treasury Stock). This is not entirely surprising in view of the very poor performance of the Index-Linked Treasury Stock equation itself.

Turning to company securities we find much better results in the equations for ordinary shares. While the coefficients on the constant and dividend rate (DIVORD) are insignificant, the equation for net acquisition of domestic ordinary shares (ORDH) performs rather well, with an R^2 of .8053 ($\overline{R}^2$ of .8007), an F-statistic of 119.96, and no sign of autocorrelation. Both the earnings rate (ENORD) and the FTINDEX are significant, even at the 1% level, according to their t-statistics. When overseas ordinary shares are included in the dependent variable (COMMON) ordinary least squares estimation throws up auto-correlation. Cochrane-Orcutt re-estimation gives similar results to those for domestic ordinary shares, with a high R^2 (0.8886; $\overline{R}^2$ of .8859), significant F-statistic, and the coefficients on earnings and FTINDEX significant at the 5% level. However, at the 1% level only FTINDEX is significant. When unit trust and property unit trusts are included in the dependent variable (ORDS) we again find autocorrelation under ordinary least squares estimation, and high R^2 and $\overline{R}^2$, significant F-statistic, and the coefficients on both earnings and FTINDEX significant even at the 1% level. Thus, it would seem reasonable to suggest that the own-yield on ordinary shares is a significant influence upon the pension funds' net acquisitions of ordinary shares, particularly when the own-yield is proxied by the *Financial Times* index, and to a lesser extent by the earnings rate. Perhaps the only anomalous finding from the various ordinary shares equations is the negative sign on the constant term, which occurs consistently. The only plausible explanation for this must lie with the pension funds' attitudes towards risk. Given that the return on ordinary shares is likely to reflect the condition of the macroeconomy, particularly over the longer term, then the negative constant indicates that during severe recessions, when the return on ordinary shares in general is likely to be low, if not negative, the pension funds would prefer to reduce their risks by placing their funds in safer investment media such as those promising a fixed rate of interest.[21]

The equations modelling net acquisitions of other company securities typically perform rather less well than those for ordinary shares. Thus, for example, while the coefficients on the two parameters are found to be significant, the ordinary least squares estimation of net acquisition of debentures (DEBS) exhibits first-order *autocorrelation*, as indicated by the Durbin-Watson statistic (DW). Perhaps surprisingly, re-estimation using the Cochrane-Orcutt method still returns these coefficients as significant, even at the 1% level. An F-statistic of 51.0852 and an R^2 of 0.3988 give us an equation of rather good fit. However, this equation does have some rather strange results, particularly the negative sign on the own-yield factor (RDEBS). The only possible explanation for a negatively-signed own-yield must deal with the term structure of interest rates and, to a lesser extent, the sequential allocation procedure of the pension funds. Thus, we may suggest that while we would normally expect an increase in the return on debentures to bring about increased net acquisitions of debentures, such an expectation *rests on the* assumption of *ceteris paribus*. It may be asserted that the negatively-signed own-yield on debentures reflects the violation of this assumption. Typically, interest rates tend to move together. Consequently, when the return on debentures is high we would also expect a high return on other financial assets. Given the relatively small size of the debentures market, and the additional risk that corporate securities are seen as incurring vis-á-vis British government-issued securities, it is likely that any increase in overall interest rates will make debentures less, rather than more attractive. That the pension funds regard them as inherently less attractive can be seen by the relatively small and declining proportion of the pension funds' portfolio for which they account. Of course, to prove this point would require re-estimation of the equation using some measure of the yield on debentures relative to other assets, such as a 'yield gap', which we postpone until later in the chapter. Turning to the ordinary least squares estimation of the preference shares equation we find no evidence of autocorrelation, an R^2 of 0.2055, and a low but significant F-statistic of 3.827. However, as measured by the t-statistic, the only coefficient that is significantly different from zero at the 5% level is that on the constant. Given the rather residual nature with which we have observed the pension funds regarding these assets, this is not altogether surprising. When we combine debentures and preference shares into BONDS, we obtain results not unlike that for the debentures equation. Again, ordinary least squares estimation exhibits serial correlation of the error term, and Cochrane-Orcutt re-estimation gives us a significant equation (F-statistic of 60.4044), with rather good fit (R^2 of 0.4098), and significant coefficients on the two parameters, with the return on debentures (RDEBS) negatively signed once again.

Ordinary least squares estimation of the equation for net acquisition of United Kingdom local authority securities (UKLA) yields serial correlation problems. Re-estimation using the Cochrane-Orcutt method is significant (F-statistic of 9.9667), but with a rather poor fit (R^2 of 0.1278). The own-yield coefficient is insignificant at the 5% level, while that on the constant becomes insignificant at the 1% level, as measured by the t-statistic. This rather poor performance could once again be taken as an indication of the residual rôle played by United Kingdom local authority securities in the pension funds' portfolio. At the other end of the pension funds' investment priority is net acquisitions of land. By way of proxy for the own-yield on land we have made use of the official House Price Index, with 1963 as its base year (HPI63).[21A] Estimated by ordinary least squares we find that the Durbin-Watson statistic gives us inconclusive results as to the existence of serial correlation of the error term.[22] Nonetheless, re-estimation by the Cochrane-Orcutt method does little to change the overall good results obtained. The F-statistic (151.09) shows the equation to be significant, with rather good fit exhibited by an R^2 of 0.7483. The t-statistics reveal the constant to be insignificant, but the coefficient on the own-yield proxy is significantly different from zero, even at the 1% level.

Looking at the first of the equations estimating net acquisitions of overseas assets (OVERSEAS) by the pension funds we again find evidence of autocorrelation in the ordinary least squares estimation. Re-estimation by the Cochrane-Orcutt method gives us a rather high R^2 (0.7093), and an F-statistic of 226.941. Using the dollar exchange rate (EXCDOL) by way of proxy for the own-yield on overseas assets,[22A]we find its coefficient to be significant at the 5% but not at the 1% level, and correctly (ie, negatively) signed. The constant term is also significant, even at the 1% level but, in view of the steady level of net acquisitions of overseas assets we saw in Chapter Seven, unsurprising. When we disaggregate the overseas assets the results remain similar, albeit with lower R^2s. In the overseas government-issued securities (GOVOV) equation we find that ordinary least squares estimation gives us no evidence of autocorrelation, a significant F-statistic, but a rather poor R^2 of 0.1843. However, both the constant term and the correctly signed own-yield proxy (EXCDOL) have coefficients significantly different from zero at the 1% level. The overseas ordinary shares (ORDOV) equation exhibits autocorrelation under ordinary least squares estimation. Cochrane-Orcutt re-estimation gives a significant F-statistic (37.0711) and a surprisingly high R^2 of 0.4573 in view of the insignificant coefficient on the correctly signed own-yield proxy. Finally, the overseas loans and mortgages (LMOV) equation, estimated by ordinary least squares, exhibits no evidence of autocorrelation, has a low but significant F-statistic of 3.4005 and an extremely low R^2 of 0.0863. The own-yield coefficient is significant at the 5% level, but not at the 1% level, while that on the constant is not significantly different from zero. This is the only equation for net acquisition of overseas assets in which the own-yield proxy (EXCDOL) is positively signed. One suspects that this may largely be due to the use of the exchange rate as a proxy for the own-yield.

To summarise the results for regression of net acquisition against own-yields, we typically got rather good results from those assets which account for substantial proportions of the pension funds' portfolio. The best results were for the various net acquisitions of ordinary shares equations, with those for land and (all) overseas assets also showing strong fit. While the gilts equation did not perform particularly well, when disaggregated we got fairly good results for gilts of long-term maturity and, somewhat surprisingly, for Index-Linked Treasury Stock. All of the other assets equations performed rather poorly, giving further credence to their status as residual assets and the hierarchical investment decision-making process of the United Kingdom pension funds.

Given that we are positing that a sequential investment procedure is adopted by the United Kingdom pension funds, it is important in the construction of our model to test for such a sequence. Let us call that asset group which has first call on the pension funds' investment funds the "primary asset", and those that have next priority "secondary assets"; it therefore follows that the demand for secondary assets would likely depend less on their own-yield than on a yield-gap between their own-yield and that on the primary asset. Similarly, any income or wealth constraint upon demand for secondary assets would have to use a residual measure of income that excludes those funds that have previously been allocated to investment in the primary asset. We might refer to such a measure as "secondary income". The next step, then, is to estimate the impact of the relevant yield-gap on the pension funds' net acquisition of various assets, followed by estimation of the the impact of "secondary income".

Elsewhere (Cohen, 1981) we have attempted to model a sequential investment procedure where, following the Dodds' model for U.K. life insurance companies, British-government securities were the primary asset.[23] While the results obtained there were quite good, there is no doubt that the evidence of earlier chapters of this Thesis suggests quite strongly that it is ordinary shares that form the pension funds' primary asset and not British-government securities. Thus, in Table 9-5 we present results for net acquisitions of various assets against their relevant yield-gap (own-yield minus ordinary shares yield). Because our previous estimations have indicated the *Financial Times* share index (FTINDEX) to be the best proxy for the own-yield on ordinary shares it is employed in the estimations recorded below. For obvious reasons, there is no equation estimated for net acquisitions of ordinary shares.

Looking first at the equations for net acquisitions of government securities, we find that in regressing net acquisitions of all gilts against the various possible yield-gaps we get an improved performance over the own-yield equation. The correlation coefficients show improvement, the F-statistic reveals that the null hypothesis can be safely rejected, and the Durbin-Watson statistic suggests that there is no serial correlation in the error terms. However, the t-statistics show that only the coefficients on the constant, the long yield-gap ("longap") and the undated yield-gap ("undgap") are significantly different from zero at the five per cent level. This is not really surprising given the results of the own-yield equations. What is surprising, however, is the negative sign on the undated yield-gap coefficient; *a priori* we would expect this to be positively signed (like that on long-term gilts), showing a relative increase in the yield on undated securities leading to increased net acquisition of gilts *ceteris paribus*. One plausible explanation is that undated gilts tend to account for a very small percentage of total gilt acquisitions, so that the negative sign may be the reflection of a statistical anomaly due to a violation of the *ceteris paribus* assumption. The net acquisitions of short-term gilts and medium-term gilts equations likewise both show some improvement over their own-yield counterparts. The equation for net acquisition of medium-term gilts has t-statistics showing the coefficients to be significantly different from zero at the five per cent level, a significant F-statistic, no evidence of serial correlation, and a low but not insignificant R^2. The sign on the yield-gap (medgap) is negative, however, in contradiction of our *a priori* expectations. In the short-term gilts equation the Durbin-Watson statistic shows that there is positive serial correlation and so this equation was re-estimated using the Cochrane-Orcutt (CORC) procedure (see Table 9-6). While re-estimation does remove the problem of serial correlation, the t-statistics still reveal that the coefficients are not significantly different from zero, a point enhanced by the rather low F-statistic (2.783) and extremely low R^2.

Table 9-5: The Impact of Yield-Gaps on Net Acquisitions (OLSQ)

Dependent Variable	constant	shortgap	medgap	longap	undgap	R^2	DW	F-statistic	data period	corr. R^2
GILTS	-220.319	23.3893	-231.956	371.016	-163.925	0.5378	2.1914	24.721	1963.I -	0.5207
	(-2.9803)	(0.3922)	(-1.0908)	(2.2131)	(-4.7404)				1985.II	
GS	-24.4642	-0.429906				0.0134	1.547	0.5721	1963.I -	0.0134
	(-1.16370	(-0.75630							1985.II	
GM	-105.863		-0.464982			0.2131	2.1169	11.376	1963.I -	0.2131
	(-2.0777)		(-3.3728)						1985.II	
GL	431.599			0.1632		0.0065	2.0747	0.2734	1963.I -	0.0065
	(3.7391)			(0.5227)					1985.II	
GL2	-75.5217			-1.23492		0.271	1.6642	32.854	1963.I -	0.271
	(-1.3584)			(-5.7318)					1985.II	
ILTS	105.428	188.419	-188.592	0	0	0.1507	1.3691	0.2218	1982.IV	-1.1232
	(0.2932)	(0.7564)	(-0.7578)	(0)	(0)				-1985.II	
					debgap					
DEBS	14.197				0.0096	0.0015	0.8232	0.1187	1963.I -	0.0015
	(2.652)				(0.3439)				1982.IV	
PREFS	0.13958	-0.686119	1.01799	0	-0.3338	0.0424	1.6184	0.9417	1963.I -	-0.0131
	(0.1827)	(-1.6255)	(1.1062)	(0)	(-0.5752)				1982.IV	
BONDS	13.5639	12.3332	-5.02145	-21.7658	14.4679	0.3331	1.5103	9.3663	1963.I -	0.3331
	(1.7635)	(2.779)	(-0.3254)	(-1.8569)	(3.0988)				1985.II	
		uklagap	HPgap	excgap						
UKLA	0.42054	0.002775				0.0005	1.4231	0.0323	1965.III	0.0005
	(0.1319)	(0.1792)							1983.I	
LAND	55.0052		0.224096			0.2913	0.4947	28.363	1967.I -	0.2913
	(5.753)		(5.3255)						1980.IV	
OVERSEAS	91.3478			-0.230484		0.0153	0.3206	1.4598	1963.I -	0.0153
	(2.5926)			(-1.2081)					1986.IV	
ORDOV	302.121			0.127532		0.0071	0.8046	0.2701	1975.II -	0.0071
	(5.2337)			(0.5194)					1986.IV	
LMOV	-0.318384			-0.012584		0.0646	2.0956	2.4879	1977.III	0.0646
	(-0.1685)			(-1.5773)					1986.IV	

Table 9-6: The Impact of Yield-Gaps on Net Acquisitions (CORC)

Dependent Variable	constant	shortgap	medgap	longap	undgap	R^2	DW	F-statistic	data period	corr. R^2
GILTS	-225.707	18.2461	-225.117	373.71	-168.392	0.5407	1.9959	24.7206	1963.I -	0.5235
	(-3.2564)	(0.3227)	(-1.11040	(2.3475)	(-5.2861)				1985.II	
GS	-22.604	-0.0378				0.0636	2.05	2.783	1963.I -	0.0636
	(-0.8786)	(-0.5581)							1985.II	
GM	-122.027		-0498			0.2462	2.0462	13.3934	1963.I -	0.2462
	(-2.5727)		(-3.9838)						1985.II	
GL	460.26			0.224		0.021	1.96	0.8776	1963.I -	0.021
	(4.3022)			(0.778)					1985.II	
GL2	-72.1008			-1.221		0.2898	2.0285	35.4976	1963.I -	0.2898
	(-1.08520			(-4.8023)					1985.II	
ILTS	-819.249	128.696	142.427	-103.997	-168.436	0.5128	2.5173	1.0525	1982.IV	-0.9488
	(-1.3459)	(0.5456)	(0.18190	(-0.1182)	-0.3955)				-1985.II	
					debgap					
DEBS	11.9169				-0.0005	0.3451	2.4201	40.5832	1963.I -	0.3451
	(1.2482)				(-0.0109)				1982.IV	
PREFS	-0.0272	-0.3772	0.1368	0.4581	-0.2203	0.0808	2.0765	1.8453	1963.I -	0.0275
	(-0.0286)	(-0.6066)	(0.0635)	(0.2724)	(-0.3353)				1982.IV	
BONDS	10.328	14,159	-22.9883	-0.1432	8.958	0.3862	2.2203	11.6418	1963.I -	0.3862
	(1.0472)	(2.9134)	(-1.3704)	(-0.0106)	(1.6655)				1985.II	
		uklagap	HPgap	excgap						
UKLA	-0.0665	0.0006				0.083	2.1937	6.1539	1965.III	0.083
	(-0.0156)	(0.0274)							- 1983.I	
LAND	78.6431		0.1185			0.6963	2.602	155.907	1967.I -	0.6963
	(3.2527)		(1.8236)						1980.IV	
OVERSEAS	9.2689			0.0868		0.0014	1.4691	0.1275	1963.I -	0.0014
	(2.0643)			(0.3569)					1986.IV	
ORDOV	280.977			-0.0782		0.3609	2.147	20.8931	1975.II -	0.3609
	(2.9266)			(-0.2223)					1986.IV	
LMOV	0.3173			-0.013		0.0688	2.0134	2.5857	1977.III	0.0688
	(-0.1732)			(1.971)					1986.IV	

Out of all the equations estimating net acquisition of government securities, only that for long-term gilts (GL) gives worse results using yield-gaps rather than own-yields. Here, while the coefficient on the yield-gap is correctly signed, there is an R^2 that is close to zero (0.0065), and t- and F-statistics that suggest that the null hypotheses cannot be rejected. However, when we incorporate Index-Linked Treasury Stock as an element of long-term gilts (GL2) the results are markedly improved, both over the previous incarnation and over the equation using the own-yield. The t-statistic now indicates that the coefficient on the yield-gap (longap) is significantly different from zero, the F-statistic suggests that the null hypothesis should be rejected, and the R^2 is now at 0.271. However, the sign on the yield-gap and the Durbin-

Watson statistic, which lies in the region of indeterminate results, both give cause for concern. Re-estimation using the Cochrane-Orcutt procedure eliminates the problems of serial correlation and raises the R^2 value (0.2898), but leaves an incorrectly-signed yield-gap and an equation that is outperformed by its own-yield counterpart. The equation for net acquisitions of Index-Linked Treasury Stock also performs worse than its own-yield counterpart in terms of all statistical measures.

Of the remaining equations only two perform better using yield-gaps than own-yields: that for BONDS, ie, debentures and preference shares together, and that for LAND. However, in the BONDS equation, using ordinary least squares estimation results in a Durbin-Watson statistic that reveals positive serial correlation of the error terms. Perhaps surprisingly, re-estimation by the Cochrane-Orcutt method implies that the own-yield is a better regressor than the yield-gap postulated here. In the equation for net acquisition of LAND estimated by ordinary least squares, the Durbin-Watson statistic reveals there to be positive serial correlation of the error terms. While re-estimation using Cochrane-Orcutt does not entirely eliminate the problem, the results obtained do reveal a high R^2 statistic (0.6963) and an F-statistic that suggests that the null hypothesis should be rejected. However, these results should be viewed with caution. In all other equations the results of the yield-gap estimation typically under-perform their own-yield counterparts.

In summary then, we may suggest that for the most part the yield-gap between an assets own-yield and that on ordinary shares is not a relevant parameter in the demand equation. The only exceptions to this result are the equations for net acquisition of government securities. The implication of this finding is quite apparent: that is that government securities are considered by the pension funds as substitutes for ordinary shares to a high degree, whereas the other assets are not considered as direct substitutes for ordinary shares. An additional possibility that comes to mind is that there is more than a two-stage sequence involved in the pension funds' investment allocation procedure. In the first stage they decide how much to allocate to ordinary shares, although this seems to depend partly on the yield on gilts; in the second stage funds are allocated to fixed-rate instruments, especially gilts; and in the third stage, the remaining funds are allocated to the remaining asset categories.

As we have already suggested, for a sequential investment procedure as well as considering the impact of yield-gaps, a measure of "secondary" or "residual income" is also required. Estimation by the ordinary least squares method of the impact of total income on the pension funds' net acquisition of ordinary shares and of secondary income on their net acquisitions of various other assets is presented below in Table 9-7.

Table 9-7: The Impact of Income on Net Acquisitions (OLSQ)

			TOTAL - COMMON	TOTAL - ORDH				
Dependent Variable	constant	TOTAL	INCOME2	INCOME3	R^2	DW	F-statistic	data period
ORDH	25.8873 (1.6971)	0.318892 (20.5935)			0.8249	1.7114	424.092	1963.I - 1985.IV
COMMON	-32.1786 (-1.9495)	0.536061 (31.9791)			0.9191	1.1134	1022.66	1963.I - 1985.IV
ORDS	-26.3856 (-1.6155)	0.543837 (32.7858)			0.9227	1.1834	1074.91	1963.I - 1985.IV
GILTS	-51.1557 (-1.3744)		0.760138 (9.8922)		0.5265	1.9325	97.8557	1963.I - 1985.II
GS	-44.1616 (-1.3919)		0.0500365 (1.1167)		0.0288	1.5945	1.24716	1963.I - 1985.II
GM	-107.848 (-1.2831)		0.224887 (1.8945)		0.0787	1.7244	3.58939	1963.I - 1985.II
GL	234.376 (1.3383)		0.217375 (0.8789)		0.0181	2.0286	0.77267	1963.I - 1985.II
GL2	-33.6063 (-0.8349)		0.63686 (7.6632)		0.4002	2.0548	58.7248	1963.I - 1985.II
ILTS	258.477 (1.4101)		-0.0542429 (-0.2619)		0.0085	1.4081	0.06863	1982.IV - 1985.II
DEBS	15.6077 (5.0627)		-0.106602 (-1.4088)		0.024	0.9172	1.98528	1963.I - 1982.IV
PREFS	0.021469 (0.0627)		0.0016922 (2.3919)		0.0611	1.5781	5.72194	1963.I - 1982.IV
BONDS	15.4184 (4.8993)		-0.0075736 (-0.981)		0.0122	0.9683	0.96273	1963.I - 1985.II
UKLA	-2.33587 (-1.2384)		0.0068047 (1.5725)		0.0346	1.452	2.47307	1965.III - 1983.I
LAND	18.1765 (2.5561)		0.210831 (13.0076)		0.7103	1.7486	169.28	1967.I - 1980.IV
LM	22.5855 (5.2322)		-0.0320294 (-3.2554)		0.1331	1.5752	10.5975	1963.I - 1985.II
OVERSEAS	-21.9326 (-0.871)		0.4033297 (7.8608)		0.3966	0.6604	61.7931	1963.I - 1986.IV
ORDOV	-195.28 (-2.7115)			0.490477 (6.9982)	0.5631	1.0127	48.9756	1975.II - 1986.IV
LMOV	3.9506 (1.0048)			-0.0020135 (-0.5365)	0.0079	1.975	0.28789	1977.III 1986.IV
GOVOV	-0.513414 (-0.1392)			0.0177153 (3.2627)	0.1017	1.7726	10.6454	1963.I - 1986.IV

The proxy measure of the pension funds' income chosen was TOTAL, which measures the total amount spent on investments and on short-term assets, including cash. It could be argued that the NETTOT variable might be a better proxy for income as it also includes long-term liabilities, such as borrowing from both domestic and foreign monetary and financial institutions. However, the position was taken that the TOTAL variable better represents the amount of income that the pension funds *expect* to be able to allocate to the purchases of investment assets, any shortfall being made up by long-term borrowing from domestic and foreign monetary and financial institutions. Indeed, this is borne out by the econometric evidence (not shown here), which found TOTAL to be a more significant regressor than NETTOT in the equations for net acquisitions of virtually all asset categories.

Turning to the results in Table 9-7 we note first the very high R^2s in the equations for the net acquisition of ordinary shares. These are much higher than in any equation previously estimated. Indeed, such a high degree of correlation tends to confirm the hypothesis that the pension funds do indeed operate a sequential investment procedure with ordinary shares as their "primary asset". Before commenting on the equations estimating the impact of residual income on net acquisition of "secondary assets", for comparison purposes we should comment on the results of estimating net acquisition of "secondary assets" against the pension funds' income (TOTAL). In all cases, the secondary assets' equations exhibited radically inferior performance to those of the ordinary shares' equations, and consequently we do not present those results here.

Of the three equations for net acquisition of ordinary shares, the best performance is by that for all ordinary shares, both domestic and foreign and inclusive of unit trust units (ORDS). One inference we might draw from this is that the same hierarchy of investment sequence—ordinary shares first, etc—is adopted by all (or, at least, most) pension funds, regardless of size. Despite the Durbin-Watson statistics' evidence of autocorrelation in the ordinary least squares estimates of the latter two equations, these same conclusions are suggested by the revised Cochrane-Orcutt estimates in Table 9-8. However, because of the relatively small impact of the various unit trust units on the overall portfolio of the pension funds *in toto* the measure of residual income used was that of total income after allocation of funds to domestic and foreign ordinary shares (INCOME2 = TOTAL - COMMON). The only exceptions to this are the equations estimating the net acquisition of non-domestic assets; these are regressed against income after expenditure on domestic ordinary shares alone (INCOME3).

Table 9-8: The Impact of Income on Net Acquisitions (CORC)

			TOTAL - COMMON	TOTAL - ORDH				
Dependent Variable	constant	TOTAL	INCOME2	INCOME3	R^2	DW	F-statistic	data period
ORDH	27.6472	0.316874			0.8270	2.0468	425.443	1963.I - 1985.IV
	(1.5576)	(17.833)						
COMMON	-25.0148	0.526264			0.9329	2.0534	1237.13	1963.I - 1985.IV
	(-0.9509)	(20.9724)						
ORDS	-20.4587	0.538304			0.9336	2.0225	1251.89	1963.I - 1985.IV
	(-0.8203)	(22.3042)						
GILTS	-50.6194		0.758647		0.5248	1.9945	96.0831	1963.I - 1985.II
	(-1.3031)		(9.5342)					
GS	-35.4029		0.037195		0.0694	2.0645	3.05791	1963.I - 1985.II
	(-1.0141)		(0.7738)					
GM	-127.324		0.244748		0.1085	1.9692	4.98892	1963.I - 1985.II
	(-1.435)		(1.9836)					
GL	276.495		0.164833		0.0174	1.9626	0.726537	1963.I - 1985.II
	(1.59)		(0.6739)					
GL2	-34.4885		0.639351		0.3985	2.0	57.6382	1963.I - 1985.II
	(-0.8665)		(7.8069)					
ILTS	79.5926		0.12366		0.1378	1.8745	1.1185	1982.IV - 1985.II
	(0.4259)		(0.6287)					
DEBS	-0.667272		0.0381163		0.3995	2.5071	51.2293	1963.I - 1982.IV
	(-0.0798)		(3.357)					
PREFS	-0.023708		0.00173251		0.1046	2.0834	10.1596	1963.I - 1982.IV
	(-0.0566)		(2.0623)					
BONDS	1.08695		0.036155		0.3446	2.5087	40.4887	1963.I - 1985.II
	(0.1419)		(3.0583)					
UKLA	-2.67523		0.00747575		0.1083	2.1912	8.26113	1965.III - 1983.I
	(-1.0881)		(1.3978)					
LAND	23.7225		0.195532		0.7135	2.0181	169.345	1967.I - 1980.IV
	(2.7858)		(10.3586)					
LM	21.4347		-0.0283407		0.1734	1.9806	14.2649	1963.I - 1985.II
	(3.9973)		(-2.4026)					
OVERSEAS	-32.3987			0.340885	0.8325	2.0964	462.173	1963.I - 1986.IV
	(-0.984)			(9.3304)				
ORDOV	-114.766			0.420539	0.6599	2.002	71.7832	1975.II - 1986.IV
	(-1.3717)			(5.7654)				
LMOV	4.27978			-0.0022661	0.01	1.9961	0.354711	1977.III 1986.IV
	(1.8381)			(-0.5815)				
GOVOV	-0.518204			0.0177464	0.1087	1.7666	10.4135	1963.I - 1986.IV
	(-0.1391)			(3.2511)				

In looking at the overall impact of residual income on net acquisitions of those assets we have hypothesised as being "secondary assets" there are a number of observations we might make. First, as we have already suggested, in many cases the use of secondary income typically gives superior performance to the use of total income as a regressor. In those cases where the reverse appears to be true, Table 9-7 reveals either an F-statistic that validates the null hypothesis or a Durbin-Watson statistic that reveals there to be serial correlation of the error terms. These cases include the equations for short-term gilts (GS), medium-term gilts (GM), Index-Linked Treasury Stock (ILTS), debentures (DEBS), United Kingdom local authority securities (UKLA), land, property and ground rent (LAND), and the various overseas assets. In the cases where serial correlation occurs, re-estimation using the Cochrane-Orcutt method does little to change the conclusion that total income works better than secondary income, as a comparison of Table 9-8 with 9-7 reveals. However, as the R^2 values are remarkably low (below 0.1) there is little of value that we might infer from this. The equations for net acquisition of short-term gilts, long-term gilts, Index-Linked Treasury Stock, and overseas loans and mortgages all result in F-statistics that confirm the null hypothesis. This indicates that income, in either of the forms chosen here is not a serious candidate for inclusion in the regression equation. The implication here is that these are considered by the pension funds to be a residual part of their portfolio. Indeed, the evidence of Chapter Eight in terms of the percentage of the portfolio accounted for by these assets tends to confirm this view. One possible conclusion we might draw is that the pension funds adopt a more than two-stage sequence in their investment allocation process, with these assets being considered almost as an afterthought.

Perhaps the most surprising result obtained above, given the postulated sequential investment procedure, is the equation for the net acquisition of land, property and ground rent, which does better with the total income regressor. At first, one might be tempted to suggest that this implies that land, etc, should be considered as a "primary asset" alongside ordinary shares. Indeed, as we noted in Chapters Seven and Eight, both of these asset categories involve holdings of equity. However, a second possible explanation that also seem likely in view of the evidence of Chapter Eight is that land, property and ground rent is considered by the pension funds to be highly complementary to ordinary shares.

In summary then, we might offer the following inferences. The evidence of the regressions estimated above suggest very strongly that the United Kingdom pension funds do indeed practice a sequential investment procedure. The extremely superior performance of the various equations for net acquisition of ordinary shares tends to confirm their status as the "primary asset" of the pension funds. The slightly reduced performance of the equation for net acquisition of land, property and ground rent, in combination with the superior impact of total income suggests that land is either a close "secondary asset" or a highly complementary asset to ordinary shares. The performance of the equation for net acquisition of gilts also suggests that it is considered a "secondary asset" of quality. However, disaggregation suggests that it is the longer-term gilts that are the real "secondary asset", with short-term gilts in particular being almost residual. Similarly for the equation for net acquisition of overseas assets, although this result is coloured to a degree by inclusion of overseas ordinary shares!

We have now completed an examination of the individual impact of net issues, yield, yield-gaps, income and residual income on net acquisition of the various asset categories which form the portfolio of the United Kingdom pension funds. Thus, we are now in a position to bring together the individual elements we have just examined and begin specification of the individual demand equations for the major asset classes we are considering.

9.4 Individual Demand Specification

In the previous section we have attempted to isolate some of the variables that play a significant rôle in the determination of the net acquisitions of various assets by the United Kingdom pension funds. Bearing in mind the usual caveats concerning the limitations of econometric evidence and those necessarily imposed due to data inadequacy we bring together the variables we have considered in the previous section to consider their joint impact on the pension funds' net acquisitions. We commence by examining demand for the pension funds' "primary asset", ordinary shares.

9.4.1 Pension Fund Demand: Ordinary Shares

What then are the parameters that influence the demand for ordinary shares by the United Kingdom pension funds? Based on the evidence of Chapters Seven and Eight we have postulated that ordinary shares constitutes the "primary asset" of the portfolio held by the pension funds. In Chapter

Seven we suggested that this might be the case as a result of 'maturity matching' or 'hedging' on the part of the pension funds. That is to say, that with their liabilities increasing in line with the general level of economic activity, it makes sense to purchase assets whose values are also likely to increase in tandem with the general level of economic activity. It is quite apparent that equity assets typically exhibit these characteristics. The superior appeal of ordinary shares over other equity assets (eg, land, property and ground rent) lies particularly in their greater marketability, and hence lower risk. It therefore follows that the acquisition of ordinary shares by the pension funds will reflect their future liabilities, and this in turn is reflected by incoming monies to the pension funds. These incoming funds will also act as an income constraint on the pension funds' investment behaviour, as we have already discussed. Given that the objective of the pension funds is to "...maximise the expected return on their assets, subject to the need for diversifying the portfolio to reduce risk",[24] the degree to which the portfolio is added to by the net acquisition of ordinary shares should be influenced by the return on ordinary shares. As suggested earlier, this corresponds to the impact of own-price on quantity demanded in a traditional demand equation. Finally, as we saw in Chapter Eight, the pension funds exhibit dominance to a high degree in the United Kingdom ordinary shares market, and thus we must include a supply-side constraint in our demand equation.

In summary, then, the parameters that are posited as influencing the demand for ordinary shares by the United Kingdom pension funds are the pension funds' income (TOTAL), the yield on ordinary shares (FTINDEX), and net issues of ordinary shares (ORDISS). We have already examined the influence each of these exerts individually on the pension funds' demand for ordinary shares; now we examine the extent of their combined influence. In Table 9-9 we present the results of ordinary least squares estimation of such demand equations.

Table 9-9: The Demand for Ordinary Shares (OLSQ)

Dependent Variable	constant	NET ISSUES	OWN-YIELD	INCOME	R^2	DW	F-statistic	data period	corr. R^2
ORDH	14.0416 (0.7682)	0.26338 (5.1953)	0.14035 (1.0744)	0.20838 (7.4445)	0.8639	2.0133	181.99	1963.I - 1985.II	0.8606
ORDS	-17.1747 (-0.839)	0.23831 (4.1974)	-0.046 (-0.3144)	0.47013 (14.9965)	0.9339	1.1856	405.01	1963.I - 1985.II	0.9323
COMMON	-24.7841 (-1.2152)	0.24748 (4.3748)	-0.02449 (-0.168)	0.45468 (14.5568)	0.9324	1.1235	395.23	1963.I - 1985.II	0.9308

Table 9-10: The Demand for Ordinary Shares (CORC)

Dependent Variable	constant	NET ISSUES	OWN-YIELD	INCOME	R^2	DW	F-statistic	data period	corr. R^2
ORDH	14.5628 (0.8084)	0.26275 (5.184)	0.13808 (1.0767)	0.20871 (7.5799)	0.863	1.9528	178.47	1963.I - 1985.II	0.8597
ORDS	-24.4095 (-0.78)	0.24044 (4.5089)	0.07655 (0.3808)	0.44012 (10.7372)	0.9447	1.9794	483.76	1963.I - 1985.II	0.9434
COMMON	-32.416 (-1.0089)	0.24793 (4.7496)	0.09813 (0.4825)	0.42588 (10.3305)	0.9451	2.0012	487.71	1963.I - 1985.II	0.9438

Based on the Durbin-Watson statistics in Table 9-9, the only equation not exhibiting autocorrelation is that for net acquisitions of domestic ordinary shares alone (ORDH). Re-estimation by the Cochrane-Orcutt method seems to eliminate this problem, as evidenced by the data in Table 9-10. In all three cases we find similar results, with extremely high measures of "goodness of fit", with corrected R^2s in the high 0.9s for the two 'inclusive' equations and in the high 0.8s in the domestic shares equation. The significance of each of these equations is strongly implied by the three-figure F-statistics. However, a consideration of the t-statistics reveals a slightly different picture. In each of the three equations the coefficients on the net issues and income variables prove to be significantly different from zero, while that on the own-yield does not. This latter finding does pose something of a quandary in view of the high R^2s obtained when we regressed net acquisitions against yield earlier (Tables 9-3 and 9-4). A number of possible interpretations may be gleaned from these results. Firstly, it is pleasing to record that, with the exception of the negatively signed constants in the more inclusive equations (ORDS and COMMON as earlier), all coefficients are positively signed as one would expect *a priori*. It would also seem to be the case that the primary influences on the net acquisition of ordinary shares are the total income of the pension funds and the net issues of ordinary shares, with the own-yield playing a much smaller (apparently statistically insignificant) rôle. What is perhaps surprising is that this applies to each of our categories of net acquisition of ordinary shares: domestically, overseas, and including those acquired via unit trust units. While one can readily see how the pension funds' net acquisitions of overseas ordinary shares and unit trust units are (positively) influenced by the pension funds' income, it is less easy to explain the manner in which they are influenced by net issues of *domestic* ordinary shares. Presumably it is the much larger proportion of domestic ordinary shares in both ORDS and COMMON that brings about these results.

9.4.2 Pension Fund Demand: Land, Property and Ground Rent

Land, property and ground rent shares similar characteristics with the "primary asset" of the pension funds' portfolio, ordinary shares. In particular, because they are both equity assets their values are likely to increase in tandem with the general level of economic activity. We have also seen in Chapters Seven and Eight that land, property and ground rent constitutes a significant proportion of the pension funds' portfolio, averaging around ten per cent of both total holdings and net acquisitions. However, as pointed out in Chapter Seven (page 7-22), the need for specialised knowledge, the low marketability, and the high costs of land and property, both initially and in terms of commitment to a series of future payments, make it an attractive investment only for the much larger pension funds. An additional investment incentive is the relatively scarce supply of land and property in the United Kingdom, making it a virtual certainty that prices will increase so long as their is no major decline in the population.

As with ordinary shares, the pension funds' ability to acquire land and property will be largely influenced by the amount of monies flowing into the funds. This was confirmed by our earlier econometric tests (using TOTAL rather than NETTOT, as was the significant influence of the "own yield" on land and property as proxied by a house price index. The scarce supply of land and property does indicate that "issues" should be considered as a parameter of the demand equation, however, the paucity of data forces this to be an untestable proposition, as we discussed earlier. Thus, taking the pension funds' net acquisitions of land, property and ground rent and regressing against income and yield we obtain the results shown in Table 9-11.

Table 9-11: The Demand for Land, Property and Ground Rent

ESTIMATION METHOD	constant	OWN-YIELD	INCOME	R^2	DW	F-statistic	data period	corr. R^2
OLSQ	-8.60015 (-1.1837)	0.155392 (3.0624)	0.058231 (2.32040	0.8027	1.6751	140.326	1963.I - 1980.IV	0.7998
CORC	-8.78975 (-1.-273)	0.160131 (2.8663)	0.055557 (2.0482)	0.8059	2.0395	141.155	1963.I - 1980.IV	0.803

While ordinary least squares (OLSQ) estimation reveals autocorrelation, re-estimation by the Cochrane-Orcutt method (CORC) eliminates it, as evidenced by the Durbin-Watson statistic (DW). Even with our inability to include "issues" as an independent variable, we find that the equation performs remarkably well. A corrected R^2 of 0.803 suggests that over eighty per cent of the variation in net acquisitions of land, property and ground rent by the pension funds can be explained by variations in the yield on land and the pension funds' total income. Both the F-statistic and the t-statistics on both variables imply the significance of these parameters. Furthermore, the coefficients on yield and income are both correctly (ie, positively) signed as theory suggests. However, while the t-statistic suggests it is not significantly different from zero, once again we are posed with a quandary by a negatively-signed coefficient on the constant term.

9.4.3 Pension Fund Demand: British Government Securities

The evidence of Chapters Seven and Eight revealed the high degree of importance of British government securities, or gilts, in the portfolio of the United Kingdom pension funds. The combination of issuer and extreme ease of marketability make these a virtually risk-free asset for their holder. Some eighteen per cent of pension fund holdings were accounted for by gilts on average, although the percentage of net acquisitions was somewhat higher but vastly more variable. Thus, we would anticipate that the pension funds' income would play a significant rôle in influencing their net acquisitions of British government securities. The evidence of Chapters Seven and Eight together with the econometric evidence earlier in this chapter suggested that gilts were a "secondary asset" to the pension funds. Thus, the appropriate measure of income which would influence net acquisitions would be residual income. In the case of British government securities we established that INCOME2 (= TOTAL - COMMON)—ie income after net acquisition of **all** categories of ordinary shares—was the appropriate measure of residual income. The inclusion of British government securities as a "secondary asset" also implied that the yield-gap[25] would be an appropriate parameter, a finding which was somewhat substantiated by the econometric evidence when incorporating Index-Linked Treasury Stock as a component of gilts (GL2), but not otherwise. We also saw that the gilts component of the pension funds' portfolio was composed to a very large degree of long-term gilts. Chapter Eight showed that the pension funds were a dominant force in the gilt-edged markets, but not to as great an extent as the insurance companies. Thus, we would expect new issues of gilts to have some bearing on the pension funds net acquisitions of gilts. Putting all of this together we estimate the pension funds' demand for British government securities, and present the results in Table 9-12.

Table 9-12: The Demand for British Government Securities

Dependent Variable	constant	NET ISSUES	OWN-YIELD	YIELD-GAP	INCOME	RESIDUAL INCOME	R^2	DW	F-statistic	data period	corr. R^2
ORDINARY LEAST SQUARES:											
GILTS	-81.4102	0.093674		-0.44493		0.317068	0.564	2.1158	37.0782	1963.I -	0.5535
	(-1.7754)	(2.3454)		(-1.5337)		(1.76)				1985.II	
GM	-33.4491			-0.01982		0.051567	0.1883	2.1454	10.0889	1963.I -	0.1788
	(-1.8972)			(-1.7759)		(1.0895)				1985.II	
GL	-72.4814		6.0883		0.409978		0.3031	1.9185	18.9214	1963.I -	0.2949
	(-0.6995)		(0.555)		(4.7694)					1985.II	
GL2	-45.0541			-0.11824		0.596902	0.4012	2.0474	29.1398	1963.I -	0.3942
	(-0.8801)			(-0.3649)		(4.3342)				1985.IV	
ILTS	-1562.48	0.032694	161.07		-0.013675		0.1958	1.3858	0.56826	1963.I -	-0.206[illegible]
	(-0.6732)	(0.8689)	(0.8097)		(-0.0419)					1985.IV	
COCHRANE-ORCUTT:											
GILTS	-81.4035	0.102222		-0.44185		0.294073	0.564	1.9907	36.6445	1963.I -	0.5534
	(-1.8689)	(2.5551)		(-1.593)		(1.6585)				1985.II	
GM	-33.719			-0.21328		0.042605	0.1928	2.0197	10.2727	1963.I -	0.1832
	(-2.0439)			(-2.0251)		(0.9484)				1985.II	
GL	-73.0321		6.22959			0.487025	0.3021	2.0001	18.6176	1963.I -	0.2938
	(-0.665)		(0.542)			(4.5811)				1985.II	
GL2	-44.8236			-0.10836		0.602267	0.3993	2.0086	28.5816	1963.I -	0.3921
	(-0.8842)			(-0.3386)		(4.418)				1985.IV	
ILTS	-1614.82	0.029519	148.624		0.190902		0.3524	1.6692	1.0882	1963.I -	-0.079[illegible]
	(-0.9428)	(0.9616)	(1.0106)		(0.7266)					1985.IV	

Perhaps the most striking feature of these equations is how much poorer the results are than those we obtained for the demand for ordinary shares and for land, property and ground rent. It is quite apparent that of the various demand functions for British government securities, the best performance is that of the demand for gilts *in toto* (GILTS). For example, this is the only equation that results with a corrected R^2 above 0.5. Nonetheless, the t-statistics suggest that the only variable which is significant at all confidence levels is net issues. When estimated by ordinary least squares, the coefficient on residual income is significant at the 90% level, although not at any higher level. However, there is some consolation in finding the coefficients correctly signed. Finally, it should be noted that there are really nowhere near enough observations to warrant comment on the equation for net acquisitions of Index-Linked Treasury Stock (ILTS); these results have been included mostly by way of record.

9.4.4 Pension Fund Demand: Corporate Bonds

The nature of the pension funds' demand for corporate bonds—debentures and preference shares—has proved rather elusive so far. The evidence of Chapters Seven and Eight revealed that both debentures and preference shares had declined dramatically as an investment instrument of choice for the pension funds, accounting for less than five per cent of holdings and net acquisitions in the 1980s; down from around twenty per cent in the early 1960s. Some of this decline was due to the supply side of the market for corporate bonds. This was confirmed by both F- and t-statistics suggesting that the null hypothesis was not valid using issues as an argument in the demand function, but only at the 90% level of confidence. When we considered the impact of own-yield on net acquisition we were surprised to find the coefficient negatively signed, but significant even at the 1% level. We suggested earlier that this phenomenon might be as a result of the term structure of interest rates (page 9-39), and this was borne out to some degree by the regression of net acquisitions of bonds against the yield-gap.[26] Residual income did show some promise as a variable influencing the pension funds' demand for corporate bonds. Regressing this demand against these combined parameters gives us the results shown in Table 9-13.

Table 9-13: The Demand for Corporate Bonds (Debentures and Preference Shares)

Dependent Variable	constant	OWN-YIELD	YIELD-GAP	INCOME	RESIDUAL INCOME	R^2	DW	F-statistic	data period	corr. R^2
ORDINARY LEAST SQUARES:										
BONDS	16.5679 (4.51)		0.0064423 (0.2759)		-0.009707 (-0.9784)	0.0438	0.9725	1.99189	1963.I - 1985.IV	0.0326
DEBS	9.66851 (1.6574)		-0.052816 (-1.1979)		-0.021885 (-1.8191)	0.0427	1.0196	1.71567	1963.I - 1982.IV	0.0299
	43.4054 (5.7336)	-3.0325 (-3.9586)			0.01216 (1.3476)	0.1897	0.8879	9.01453	1963.I - 1982.IV	0.1789
PREFS	-0.426125 (-0.6234)		-0.002035 (-0.394)		0.0026541 (1.8827)	0.1381	1.7093	6.17079	1963.I - 1982IV	0.1266
COCHRANE-ORCUTT:										
BONDS	15.4653 (1.8323)		0.0685933 (1.9093)		0.0305744 (2.7684)	0.3701	2.5291	25.263	1963.I - 1985.IV	0.3626
DEBS	12.7244 (0.989)		0.0760285 (1.1766)		0.0415998 (3.3431)	0.4091	2.4844	26.3119	1963.I - 1982.IV	0.4011
	46.1675 (3.4889)	-3.71655 (-3.3121)			0.0285706 (2.7995)	0.4546	2.2164	31.6756	1963.I - 1982.IV	0.4472
PREFS	-0.521968 (-0.8842)		-0.002465 (-0.3386)		0.0026268 (4.418)	0.1612	2.0471	7.3023	1963.I - 1982.IV	0.1499

Once again we find all equations estimated by ordinary least squares to be suffering, either from serial correlation of the error terms as indicated by the Durbin-Watson statistic (DW), or from F-statistics which indicate that the null hypothesis cannot be ruled out. However, re-estimation by the Cochrane-Orcutt method gives us much improved results, with the exception of the equation for net acquisition of preference shares (PREFS). It is interesting to note that in all of the equations for net acquisition of corporate bonds the residual income variable is significant (as measured by the t-statistic) at the 99% level (at the 95% level for PREFS), giving credence to our hypothesis of a sequential investment allocation procedure. Against this, however, the yield-gap, while correctly signed, appears to be insignificant in both the debentures (DEBS) and preference shares (PREFS) equations, yet is significant at the 95% level in the aggregate corporate bonds (BONDS) equation. It is particularly intriguing that the own-yield variable, while incorrectly signed, gives us slightly better overall results, with higher R^2s, F- and t-statistics. Of course, this is not entirely surprising, as it tends to confirm our earlier findings. In summary then, it would appear that residual income plays an important rôle in determining the pension funds' demand for non-equity corporate securities with all other variables still open to question. While the yield on debentures plays a significant rôle in influencing the demand for debentures, the relationship does appear to be paradoxical, the only possible explanation being that we proffered earlier pertaining to the term structure of interest rates. It is also intriguing to find the yield-gap as a significant parameter in the aggregate (BONDS) equation, as it does not appear a significant influence on the demand for either component. At this juncture the only explanation that comes to mind is that the pension funds do not really consider debentures and preference shares as separate portfolio categories. While this conveniently allows the econometric results above to fit in with our hypothesis of a sequential investment procedure, it does seem to be the case given the rather small (and declining) rôle played by these assets in the portfolio of the United Kingdom pension funds.

9.4.5 Pension Fund Demand: Overseas Assets

Elsewhere in this Thesis we have discussed the increasing importance of the global financial community to the British economy and, in particular, the pension funds. Indeed, as we saw, the pension funds have been among the first and foremost British financial intermediaries to take advantage of the increasing globalization of the world's capital markets. Nonetheless, while there may be distinct advantages of higher return accruing to those who invest overseas, there is typically also extra risk to be incurred, both economic and political. We have previously suggested that demand for overseas assets will be determined by their relative risk-adjusted return vis-á-vis domestic assets and, given that a large percentage of the pension funds overseas assets have traditionally been dollar-denominated, we use the dollar exchange rate as a proxy for this relative return. We have also established that overseas assets seem to be considered "secondary assets" by the pension funds, thus a measure of residual income (INCOME3) is utilised. Because our overseas assets category includes overseas ordinary shares, our residual income measure is adjusted accordingly.[27] The results of these estimations are presented in Table 9-14.

Table 9-14: The Demand for Overseas Assets

Dependent Variable	constant	EXCHANGE RATE	RESIDUAL INCOME	R^2	DW	F-statistic	data period	corr. R^2
ORDINARY LEAST SQUARES:								
OVERSEAS	-187.189	53.1993	0.385874	0.7895	1.0415	163.12	1963.I -	0.787
	(-4.5735)	(3.5276)	(15.2494)				1985.II	
GOVOV	6.5336	-3.09859	0.0109284	0.1831	1.4292	9.75228	1963.I -	0.1735
	(0.8604)	(-1.1075)	(2.3279)				1985.II	
ORDOV	-162.594	-17.1281	0.478318	0.568	1.0209	24.3283	1977.I -	0.5557
	(-1.8424)	(-0.6509)	(6.5477)				1986.IV	
LMOV	-0.992963	2.20048	0.00016455	0.081	2.0957	1.63015	1977.I -	0.0547
	(-0.2364)	(1.7571)	(0.0473)				1986.IV	
COCHRANE-ORCUTT:								
OVERSEAS	-120.281	31.1508	0.340869	0.8395	2.1489	224.832	1963.I -	0.8376
	(-2.1391)	(1.4318)	(10.4974)				1985.II	
GOVOV	13.3849	-5.36124	0.00619226	0.2535	1.8586	14.6053	1963.I -	0.2446
	(1.4143)	(-1.5097)	(1.0797)				1985.II	
ORDOV	-93.8406	-17.148	0.419081	0.6613	2.0621	35.1513	1977.I -	0.6513
	(-0.9315)	(-0.4047)	(5.6603)				1986.IV	
LMOV	-0.675964	2.21982	-0.0001132	0.0859	2.0156	1.69217	1977.I -	0.059
	(-0.1621)	(1.8313)	(-0.0327)				1986.IV	

It is immediately noticeable that, while once again there is evidence of autocorrelation in the ordinary least squares estimates, the Cochrane-Orcutt estimates give us rather good results for the aggregate (OVERSEAS) and overseas ordinary shares (ORDOV) equations. Indeed, the results for the aggregate equation are particularly good: an F-statistic of 224.832 and corrected R^2 of 0.8376 suggest a high degree of significance and fit. The t-statistics reveal that the coefficients on all the variables are significantly different from zero, although the coefficient on the exchange rate is only significant up to the 90% level. Equally, the coefficients are all correctly signed as expected, *a priori*. The next best equation in terms of overall performance is that for net acquisition of overseas ordinary shares. As we saw in earlier chapters, particularly during the 1980s, these have accounted for a steadily increasing percentage of the pension funds' portfolio, both in holdings and net acquisition terms. Once again, there is a fairly high degree of "goodness of fit" as indicated by an R^2 of 0.6613, while the F-statistic (35.1513) suggests that the null hypothesis should be rejected. However, the t-statistics suggest that only the coefficient on the residual income variable is significantly different from zero, and we also note that the coefficient on the exchange rate is signed differently than we would expect *a priori*.

The equations estimating net acquisition of overseas government securities (GOVOV) and overseas loans and mortgages (LMOV) typically perform less well. In terms of the F-statistic we can reject the null hypothesis for the former equation, but not for the latter. In fact, the equation for net acquisitions of overseas loans and mortgages can best be described as performing abysmally! However, in view of the remarkably small fraction of the pension funds' portfolio for which it accounts, this cannot be entirely surprising. Perhaps some more eclectic choices of independent variable are appropriate. As with the overseas ordinary shares equation, the exchange rate variable in the overseas government securities equation appears to be "incorrectly" signed; it is also only significant up to the 90% level. Nonetheless, in light of the fact that these securities also occupy only a small fraction of the pension funds' portfolio these results are not too disheartening.

9.4.6 Pension Fund Demand: Loans and Mortgages

Like many of the assets comprising the "overseas assets" category, loans and mortgages can be considered as a minority investment in the pension funds' portfolio because of the small percentage for which it accounts. Indeed, this percentage has been declining over much of the data period. In Chapter Seven we saw that one of the major reasons for this was because of the high marketability risk involved due to the lack of a well-established secondary market. Because the concepts of "new issues" and "own-yield" are somewhat amorphous to this particular asset category, it is best to concentrate on the impact of income on the demand for loans and mortgages. (Results of these estimations have already been presented in Table 9-7 and 9-8.) What we discovered was an equation with a rather poor fit ($R^2 = 0.1734$), but with an F-statistic (14.2649) that suggested the null hypothesis be rejected. The t-statistics indicated that both the constant and residual income (INCOME2) were significant arguments in the demand function. However, it should be noted that the coefficient on residual income was negatively signed, suggesting that loans and mortgages are an inferior asset in the pension funds' portfolio.

9.5 Conclusion

In this chapter we have made a first attempt at constructing an econometric model of the pension funds' investment behaviour. We have eschewed the more rigorous approach adopted by the "Essex School" in order to test the hypothesis that the pension funds adopt a sequential approach to their allocation of funds to the various categories of investment media. This was not an easy choice to make in view of the widespread popularity of the "Essex School" approach, particularly in studies undertaken in the United States. Nonetheless, while it cannot be denied that this approach is more rigorous in terms of its theoretical underpinning, it does appear to suffer from several shortcomings. First and foremost, it needs to be recognised that the theoretical background of the "Essex School" is essentially neoclassical microeconomics. Thus, such an approach is implicitly based on the view that the financial system consists of perfect capital markets, where all participants are price-takers, and that all investment decisions can be regarded as if they were made simultaneously. In other words, the "Essex School" approach is implicitly embedded in the general equilibrium world of Arrow-Debreu-Hahn-McKenzie. The evidence of Chapters Seven and Eight have shown us that in many of the United Kingdom's capital markets the pension funds are not price-takers, and so the "Essex School" approach may not be valid. Furthermore, while that approach may still be favoured by so-called 'purists' within the Economics profession, it is also at odds with reality as described by both financial economists, such as Professor Revell, and practitioners, such as we saw in the evidence presented to the Wilson Committee and the writings of actuaries and other pension fund advisers. These people constantly and consistently offered the opinion that the pension funds adopted a sequential strategic investment procedure. And that is what we have attempted to model in this chapter.

Perhaps the most significant factor to come to light during our estimations was the overall dominance of the various income variables as a demand parameter. As we suggested earlier in this chapter, it is more common for some measure of yield to be considered the major influence on demand for a financial asset, yet we would argue that in cases where the investor exhibits dominance in so many financial markets it is apparent that yield must play a secondary rôle. Certainly this is what we found in the equations for net acquisition of those assets we categorised as "primary assets". It was also pleasing to find that our various measures of residual income typically performed better than total income in the equations for net acquisition of those assets we categorised as "secondary assets"; this offered evidence towards the sequential investment hypothesis. Against this, the evidence from using yield-gaps rather than own-yields remains somewhat inconclusive. Finally, it was also pleasing to find new issues to be a significant argument in those equations for assets in which markets the pension funds had been found to exhibit dominance in Chapter Eight. This significance, combined with the secondary nature of yield as a parameter, suggests that the pension funds are aware of the dominant rôle they play in the United Kingdom's capital markets, and act accordingly. As a first step in modelling the investment behaviour of the United Kingdom pension funds we believe these are significant findings.

Chapter Nine Endnotes

1 We have seen both approaches used to model the investment behaviour of British financial intermediaries in Chapter Six. The industry-level, or "macro", approach is that adopted by what we have referred to as the "Sheffield School" models. The "Essex School" models, however, characteristically begin with the "micro" approach by constructing a model of the behaviour of the typical individual intermediary (analogous to Marshall's "representative firm"), which is then aggregated to produce a "macro" model that can be tested using aggregate data.

2 This was particularly the case with the Essex School models. In Chapter Six we also reviewed the critique of imposing (eg) cross-equation restrictions by authors such as V. Vance Roley (1983).

3 While this can be confirmed by a glance at any text on international economics, a particularly good example is Heller (1974).

4 We considered the issue of market dominance by the pension funds throughout Chapter Eight.

5 See Chapter Three for an historical perspective, and Chapter Four for a review of the current position regarding the inflation-proofing of pension benefits.

6 Of course, the periodic returns on ordinary shares—dividends—are uncertain by nature. However, the overall return on ordinary shares—dividends plus capital gains/losses—generally mirrors the rate of inflation because the prices of most shares tend to move with the general price level of the economy. The same is also true of property. Thus, equities offer a better hedge against inflation than most fixed-interest securities. They, therefore, offer the pension funds a fine investment vehicle for maintaining their ability to meet liabilities whose value depends on the general level of prices.

7 See, for example, J. L. Carr's "Yield Difficulties and Inflation, 1960-74", *Investment Analyst*, September 1975, pages 30-35. Many analysts have suggested that the existence of a reverse yield gap indicates that investors believe that they incur less risk (in terms of movements in profits and stock market values) from holding ordinary shares than by holding fixed-interest securities.

8 The evidence presented to the Wilson Committee seems to suggest that the pension funds are interested in growth.

9 We have already discussed extensively the similarities and differences between the pension funds and insurance companies. The similar nature of their liabilities indicates a high degree of likelihood that their objectives will also be similar.

10 This approach has been put forward by a number of well-known authors, from Irving Fisher to J. M. Keynes.

11 A fuller discussion of this approach is to be found in Dodds (1979, pages 93-96).

12 See, for example, Clayton, Dodds, Driscoll and Ford (1973).

13 In some cases the period used for estimation is smaller because of the lack of published data. In some cases this is due to the publisher, while in others it is because (eg) the asset has not been in existence for very long. Index-Linked Treasury Stock provides a good example of the latter case; we cannot estimate the demand for Index-Linked Treasury Stock before it came into being towards the end of 1982.

14 As we have pointed out before, for most contributors there is little choice in the allocation of their funds for pensions. Even in the area of discretionary allocation of monies the

individual has little choice. While recent legislation has made the possibility of non-pension fund issued individual retirement accounts (similar to the set-up in the United States), this does not yet appear to have made any significant difference to the British financial scene. Indeed, it could probably be argued that the majority of the great British public are either unaware or simply do not care that such possibilities exist, although more recently the situation has begun to change with greater mass media advertising by the financial institutions.

15 There are other reasons as well as dominance that can account for portfolios in disequilibrium. These include all of the various market frictions, such as transactions costs, etc. Such disequilibrium can be modelled by use of stock adjustment mechanisms, such as that we have already seen, which has the elegance of being able to to be included by way of a lagged dependent variable.

16 For the purpose of comparison with the analysis in Chapter Eight we have performed these estimations for the pension funds both on aggregate and as separate sectors. For the remainder of this Chapter we shall be estimating for the pension funds *in toto* based on our earlier observations.

17 See Chapter Eight.

18 Given that there is only a single independent variable, there is little point in making reference to the F-statistic as well as the t-statistic. We have chosen to concentrate here on the latter measure.

19 D. Cochrane and G. H. Orcutt (1949), "Application of Least Squares Regressions to Relationships Containing Autocorrelated Error Terms", *Journal of the American Statistical Association*, volume 44, pages 32-61. We have adopted this particular method due to its ease of use within the TSP package available at several installations in both the United Kingdom and the United States.

20 Financial theory would suggest that there is some connection between each of these variables in addition to their connection to the price of ordinary shares. For example, via the "dividend growth model" there is a connection between the dividend rate (DIVORD) and the price of stock; a company's earnings (ENORD) will influence demand for a given stock, and therefore its price; the *Financial Times* index reflects the (weighted) average price of stock in the United Kingdom. While these are all *a priori* valid proxies for the own-price or yield on ordinary shares, there is also the possibility of multicollinearity occurring when all three are used as regressors in the same equation.

21 After all, as we have seen in Chapter Seven in particular, even if the real rate of interest is negative during periods of economic uncertainty, it will still be a **certain** return that will allow investors to minimise their losses, unlike the uncertain return available on (eg) ordinary shares.

21A The House Price Index (**HPI63**) is used as a proxy for the yield on land, property and ground rent in the same manner as (eg) the *Financial Times* Index is used as proxy for the yield on ordinary shares. Its use is further justified because of relationships between the components, land, property and ground rent; house prices are determined in part by the price of land and are, in turn, significant in determining the value of rent. Additionally, possible capital gains/losses are best proxied in terms of a price variable. Thus, while choice of **HPI63** is partly determined by pragmatism (data availability), its choice is also sound on economic grounds.

22 $d_L = 1.53 < 1.577 < 1.60 = d_U$.

22A A number of reasons may be cited for use of the dollar exchange rate as a proxy for the yield on overseas assets. Firstly, despite limited data availability, there is evidence—both anecdotal and in reports to government committees, Commissions, etc.)—to suggest that the major pension funds' overseas purchases are in the United States or are dollar-denominated.

(See also page 419). With similar real yields available on U.S. and U.K. financial assets over much of the data-period, the attraction of overseas assets can be seen as due to gains resulting from exchange rate movements (in addition to the advantages of geographical portfolio diversification). Additionally, the dollar exchange rate tends to strengthen as does the U.S. economy *ceteris paribus*,. And, as a strong economy typically reflects a strong performance by its firms, the exchange rate can be seen as a reasonable proxy for returns available as a result of the strength of the U.S. economy.

23 In fact, Dodds makes use of several possible yield-gaps in his studies on the investment behaviour of British life insurance companies. Thus, in his 1979 book, *The Investment Behaviour of British Life Insurance Companies*, Dodds considers both long-term gilts and two proxies for ordinary shares (dividend yield and earnings yield) before settling on long-term gilts as his primary security.

24 This, according to Professor Revell (1973, page 439), as quoted on page 9-12.

25 It will be recalled that the appropriate yield-gap for both long-term and aggregated gilts was that between the yield on long-term gilts and the Financial Times Index (RGL - FTINDEX). For gilts of shorter term to maturity the own-yield was substituted for RGL.

26 The yield gap was that between the yield on debentures and the Financial Times Index (RDEBS - FTINDEX).

27 In our earlier equations we used INCOME2 as our residual income proxy. This variable measured the pension funds' incoming funds after investment in both domestic and overseas ordinary shares. Here we make use of INCOME3= TOTAL - ORDH, which measures incoming funds after investment in domestic ordinary shares only.

Chapter Ten: Conclusion and AfterThoughts

10.1 Introduction

Throughout this Thesis we have examined the nature and rôle of the pension funds in the United Kingdom, in theory and in practice, from within and without, and from a contemporary and historical perspective. To a very large degree each chapter of this work forms a complete study of its own, yet this group of broad surveys was entirely appropriate for giving us the necessary insight into the behaviour of the pension funds and their operational environment that a study of this nature demands. Thus, in our earlier chapters—particularly Chapters One to Four—we examined the institutional context of British pension fund behaviour. The middle chapters—Five and Six—constitute surveys of the literature on investment portfolio theory and theoretical and empirical studies of British financial intermediation. Finally, the remaining chapters—Seven through Nine—offer us an empirical view of the U. K. pension funds' behaviour over the period 1963 - 1985. In particular, in Chapter Nine we have endeavoured to draw together the salient features from earlier chapters in order to attempt to model the investment behaviour of the United Kingdom pension funds. In this final chapter we shall look back at what we have learned from the research we have undertaken, consider the implications, and make suggestions for further research in the area.

10.2 Insights

In what might be regarded as the first section of this Thesis—Chapters Two through Four—we examined the growth and development of pension funds in the United Kingdom from a number of perspectives. Each of these chapters were an attempt to gain some insight into the institutional environment within which the pension funds operate, as well as to examine the nature of the pension funds as an institution *per se*. We considered this to be important for a number of associated reasons. Firstly, it is one area which is usually neglected in the literature; in most of the studies of British financial intermediaries that we examined in Chapter Six, little or no account is taken of the background to their operations. Secondly, and by way of corollary, the pension funds do not operate in a vacuum; they must act within a set of constraints imposed by the nature of the markets in which they choose to operate as well as by (government) regulation. As we have seen, these constraints can vary from direct government regulation to the self-regulation within a particular market to behavioural constraints brought on by political or public opinion considerations. To consider the operations of the pension funds without first examining their environment would be analogous to examining the operations of a firm without regard to its market structure, for example. Thus, in Chapter Two we concentrated on pension funds as one amongst a group of financial intermediaries.

By a theoretical exposition of the rôle played by financial intermediaries we were able to discern the similarities between the operations of the pension funds and those of other financial intermediaries. Because we followed a schematic historical approach we were also able to distinguish how the differing forms of financial intermediary developed in response to a particular need of society over a given period of time. By this approach we were able to examine the differences that exist between the different forms of financial intermediary, which manifest themselves primarily through an intermediary's sources and uses of funds. In consequence we were able to consider the various alternative methods by which a pension fund might be financed, and evaluate that method which was ultimately adopted by the pension funds in the United Kingdom. We saw that the British pension funds were investment funded, unlike their counterparts in continental Europe where, for example, the West Germans prefer book funding and the French have adopted Pay-As-You-Go.

In Chapter Three we continued our examination of the nature and rôle of the pension fund via a historical view of their growth and development in the United Kingdom. In particular, we were able to see how this had been spurred on by two major factors. Firstly, we saw that over the long run of history (at least since Mediaeval times) there has been an increasing proportion of the population accounted for by the elderly. This appears to have been at an ever-increasing rate during the Twentieth Century! Secondly, despite the occasional 'step backward', the march of history has been one of inexorably increasing levels of economic activity and therefore higher standards of living for society as a whole. Taken together we can see that there has been both an increasing demand for economic welfare for the elderly as well as an increasing supply of wealth with which to supply those needs. Thus we were able to discern the march towards the universal provision of pensions as one part of the "welfare state" that have become commonplace in most developed economies in the second half of the Twentieth Century. It was also apparent that the growth and development of pension funds in the private sector was largely spurred on by earlier developments in the public sector. It is the opinion of this author that this is one illustration of "market failure" due to high transactions and information costs (in particular), whereby government provision acts as an impetus to private sector provision of a particular good, albeit with a lag.[1]

By examining in Chapter Three some of the more important legislative actions behind the increasing provision of pensions in Twentieth Century Britain, we were then in a position to consider the major elements of the current legal environment within which the pension funds operate. Despite the passage of more than a decade and a change from a Labour to a Conservative government that professed itself to be radical and "free-market-oriented", there has been relatively little change to the provisions of the 1975 Social Security Pensions Act, more commonly referred to as the "Castle scheme". The major objective of the Castle scheme was to provide an integrated system within which the provision of pensions by the private and public sectors would peacefully coexist and still universally offer a pension to all citizens so that they might live out their twilight years with some dignity regardless of their economic or social standing. There can be no doubt that, while the current system is not perfect, it has largely achieved the goals it set for itself, and is a definite improvement over earlier regimes in that respect.

Thus, in the first section we were able to ascertain the historical development and nature of the pension funds in the United Kingdom and the institutional environment within which they operate. We were thereby able to deduce the objectives of pension fund behaviour, particularly on the investment side, as well as the constraints which limit their actions.

In the second section of this Thesis—Chapters Five and Six—we conducted two surveys of the literature that might have provided us with some insight into the pension funds' investment behaviour. In Chapter Five we examined the 'pure' theory of portfolio selection with two thoughts in mind. Firstly, in the hope that it might shed some light on the motivations underlying the investment behaviour of the pension funds in the United Kingdom. And secondly, because an understanding of portfolio theory was considered necessary as a prerequisite for surveying the literature examining the investment behaviour of various types of British financial intermediary. In common with the approach taken in previous chapters, the literature on portfolio selection was examined chronologically.

In Chapter Six we examined the literature on the investment behaviour of British financial intermediaries in light of the knowledge gained from the previous chapter on portfolio theory. In this chapter, rather than adopt an historical approach, we reviewed the literature by the type of intermediary with which any given paper was concerned. Most of the major intermediaries in the British economy were considered in the anticipation that both differences from and similarities to the pension funds would lead to some insight into the kind of model best suited to examining the pension funds' investment behaviour. It was immediately apparent that in almost all cases considered little or no use was made of the kind of portfolio theory we examined in Chapter Five. Indeed, most of the models of financial intermediary behaviour appeared to be much closer to the more 'traditional' models of orthodox demand theory.

For the most part we found that works on British financial intermediary investment behaviour could be divided into two "schools of thought". The "Essex school", as exemplified by various works from the pen of Michael Parkin (often co-authored) take the maximisation of an expected utility function as their theoretically rigorous starting point. From this a set of reduced form equations for the demand for a given asset category is estimated, with the relative rates of return on the feasible asset set as the major arguments. The "Sheffield school" commences from a less theoretically rigorous foundation, yet one which is much more obviously a reflection of 'real world' observation, with the intermediary's environment taken into consideration (for example). Here the maximisation of expected utility or of expected net revenue is considered to be the intermediary's objective. A set of demand equations based on these real world observations is estimated. One of the major differences between the two approaches we found was that "Essex school" models typically had various cross-equation restrictions imposed to facilitate the estimation process. Yet it seemed to be the case that these restrictions detracted from the model's reliability as a reflection of the observed behaviour of the intermediaries examined. Nonetheless, in the case of both schools of thought similar reduced from equations were obtained, with marginally better results on average under the Sheffield approach.

In the third section of the Thesis—Chapters Seven through Nine—we commenced our empirical appraisal of the behaviour of pension funds in the United Kingdom between 1963 and 1985. In Chapter Seven we examined the flow of funds through the pension funds in order to gain some insight into their behaviour that might help with the modelling process to be undertaken in Chapter Nine. The sources of funds were readily pinpointed, coming predominantly in equal proportion from investment income and employers contributions (thus enhancing the view that pensions are somehow "deferred wages"). This (approximate) equivalence of investment income and contributions income suggests quite strongly that these are indeed mature funds.[2] The data in Table 7-1 also confirmed the view that the U. K. pension funds do indeed operate as trust funds, with surpluses of income over expenditure being invested for the provision of future pensions. The only exception to this general rule seemed to be during 1982, when employers were asked for "additional contributions" to top up the funds at a time when they were considered to be somewhat underfunded, probably due to the prevailing recession.

We established that the private sector funds are the largest component of the U. K. pension funds, accounting for at least fifty per cent, whether measured by total holdings or by net acquisitions of assets. The Local Authority funds were the smallest component, accounting for not less than ten per cent of all pension fund holdings or net acquisitions. Other public sector funds were found to hold between twenty per cent and one-third of all pension fund holdings. It seemed to be the case that the administrative costs of the pension funds were minimal, accounting for less than two per cent of income. However, the funds in the public sector appeared prone to higher administrative costs than those in the private sector. We also ventured the opinion that, based on *a priori* evidence, there were economies of scale in the administrative costs of the U. K. pension funds.

Following a survey of asset characteristics and relationships we were able to argue against using the Essex school approach, largely on the grounds that it meant the imposition of a cross-equation symmetry restriction that seemed at odds with both theoretical and empirical findings. We then delineated the asset categories with which we were concerned. While these may well have been the categories we would have selected ourselves in a situation of complete freedom of choice, the asset categories were in fact selected because they are the categories in which pension fund data are published by the government statistician at the Central Statistical Office.

Consideration of the trends in U. K. pension fund investment revealed a number of striking features. First, we found a high degree of similarity between the investment behaviour of the three pension fund sectors—private, Local Authority, and other public sector. One possible inference that might be made is that, unlike administrative costs, the pension funds find few economies of scale (if any) in their investment activities. Given that even the smallest of the U. K. pension funds has substantial monies available for investment, this is hardly surprising. Second, the pension funds increased their holdings of short-term assets in both absolute and percentage of portfolio terms during periods of recession, an increase that was more pronounced in the public and Local Authority funds than those in the private sector. Thirdly, the assets whose holdings exhibited the most growth were unit trust units and overseas government securities, possibly due to their increased availability over the data period.

It was readily apparent that the most popular asset with the pension funds was ordinary shares, accounting for over fifty per cent of the holdings' portfolio. The only other assets that occupy a highly significant proportion of the pension funds' portfolio are British government securities (fifteen to twenty per cent) and land, property and ground rent (ten per cent). All other assets account for rather minimal and declining percentages of the pension funds' portfolio, with rather noticeable declines in loans and mortgages and fixed-interest corporate securities (debentures and preference shares).

In terms of the pension funds holdings of British government securities we saw an increasing preference for the long- and medium-term gilts over the short-term variety. This changing maturity preference was substantiated by the net acquisitions data. Overall it seemed that British government securities were (if at all) only poor substitutes for ordinary shares, whereas land, property and ground rent exhibited a high degree of substitutability with ordinary shares. The only asset that showed a high degree of complementarity with ordinary shares were unit trust units. The apparent predilection of the pension funds for ordinary shares, British government securities and land, property and ground rent also manifested itself in the immensely stable net acquisitions of these assets over time. We suggested that this stability reflected the long-term view adopted by the pension funds in their investment strategy, largely in response to the long-term nature of their liabilities, but also because these three asset groups tended to exhibit less risk over time. Finally, the analysis in Chapter Seven suggested that the U. K. pension funds, while trading actively in a large number of financial markets, typically are pursuing a "buy and hold" investment strategy.

In Chapter Eight we examined the rôle played by the U. K. pension funds in the capital markets of the United Kingdom. While traditional portfolio theory is typically based on the assumption that the investor is a price-taker, the size of pension fund holdings and net acquisitions suggested that this is not the case for the pension funds. Thus, we needed to examine the degree of monopsony exhibited in the markets for various financial assets by the pension funds, largely to establish if their investment behaviour would be constrained by "supply-side limitations". Our investigation of possible market dominance was conducted by looking at holdings, net acquisitions and trading (purchases and sales). Our investigation led us to some surprising results. For example, while the pension funds have substantial investments in ordinary shares, British government securities, and land, property and ground rent, we only found them to be the dominant investor in the market for ordinary shares. In the markets for land, property and ground rent and for British government securities, while the pension funds could be regarded as a highly significant investor whose actions would likely influence price, they were not the dominant investor, that accolade belonging to the insurance companies. The same result was obtained in the markets for corporate fixed-interest securities (debentures and preference shares). In the markets for both local authority securities and loans and mortgages we found the pension funds to be a non-dominant participant, with the building societies being the dominant investor. Finally, while we were not able to establish dominance as such, we did find the pension funds to be the most significant British investor in overseas assets, particularly overseas ordinary shares.

In Chapter Nine we attempted to bring together the salient features of the information gleaned from the surveys and analyses undertaken in earlier chapters to commence construction of a model of the investment behaviour of the U. K. pension funds. Based on the evidence of (especially) Chapters Six and Eight we chose to adopt an aggregative or "macro" approach, rather than follow the "Essex School" and build up from a theoretically rigorous but empirically false set of behavioural equations for the individual pension fund. One major reason for adopting this approach was due to the empirical evidence of Chapters Seven and Eight, which implied that there is a sequential decision-making procedure (the "Essex School" approach quite strongly suggests that investment decisions are simultaneous). In this we were following such as H. I. Ansoff (1965) who argued that the investment decision is split into a hierarchy of strategic decisions—ie, those between the different categories of asset—and tactical decisions—choosing the asset mix within a particular asset group. We found this approach by the pension funds to have empirical support in the evidence presented to the Wilson Committee (1980). The notion of a sequential decision-making process is also consistent with the objective usually ascribed to pension funds, such as by Professor Revell:

> ...pension funds aim to maximise the expected return on their assets, subject to the need for diversifying the portfolio to reduce risk. (1973, page 439)

The reduction of risk can be seen to occur in two ways: firstly, by allocation of monies to different categories of financial (and other) assets, such as fixed-interest, equities, and so on; secondly, by appropriate diversification within a particular asset category according to the principles first established by Harry Markowitz. Given that the pension funds must pursue their objective with a view to matching their liabilities, the risk-reduction element could also incorporated into the construction of a "target rate of return". Such a view seemed to underlay the pension funds' apparent strong propensity for securities that showed long-term capital growth and stable income, such as ordinary shares.

It was also found to be the case that the availability of stock within a given asset category played a primary rôle in the strategic decision-making process, with the supply constraint playing a larger rôle for asset markets in which the pension funds are a dominant force, and also where there exists a well-established formal primary market.

With these thoughts (in particular) in mind, we set out to construct a simple model of U. K. pension fund investment behaviour. We commenced by examining the various factors that had emerged in earlier chapters as significant on the demand for the different asset categories, prior to combining their influence in a series of demand equations that reflected the sequential decision-making process. Perhaps the most significant finding to emerge from our estimations was the overall dominance of the various income variables as a demand parameter, a dominance that was particularly noticeable in the equations for net acquisition of "primary assets". This was in contrast to the usual financial literature, where it is common for yield to be the major influence on demand. We suggested that in cases where the investor exhibits dominance in so many financial markets it is apparent that yield is likely to play a secondary rôle. We also found that the various measures of residual income typically performed better than total income in the equations for net acquisition of "secondary assets", offering evidence in favour of the sequential investment hypothesis.

On the negative side, the evidence from using yield-gaps rather than own-yields was somewhat inconclusive. New issues were found to be a significant argument in those equations for assets in which markets the pension funds had been found to exhibit dominance in Chapter Eight. We argued that this significance, together with the secondary rôle played by yield indicates that the pension funds are aware of the dominant rôle they play in the United Kingdom's capital markets, and act accordingly.

To summarise, we had hypothesised that the pension funds, being dominant long-term investors in many of the United Kingdom's capital markets, would adopt a sequential investment procedure with little concern for yield as a major influence on their behaviour. The evidence from our simple model appeared to strongly confirm our hypothesis. As a first step in modelling the investment behaviour of the United Kingdom pension funds we believe our findings to be significant.

10.3 AfterThoughts

A study as broad as this has the potential to lead the author down many different channels if he does not remain alert to the original task in hand. We set out to examine the economics of the United Kingdom pension funds with a view ultimately to constructing a model of their investment behaviour. Along the way a number of questions and issues arose which were simply beyond the scope of this work to cover, but we believe this work offers a good first step in the direction of their solution.

The model we have constructed here could be construed as simple, and yet it seems to offer a reasonable explanation of the behaviour of the pension funds. Nonetheless, there are a number of areas in which this research might be taken further. For example, the explicit inclusion of expectations might serve to strengthen the model, although our preliminary estimates (which do not appear here[3]) suggest otherwise. We believe that the appropriate way to include expectations is not via the yield parameter, but as expected income or perhaps even as expected net issues of the primary assets. The model would also benefit if data on issues of various types of financial asset on a global basis to examine the degree to which the U. K. pension funds 'dominate' the world's financial markets. In these days of increasing globalization of the international financial scene this would seem a fruitful exercise.

The fact that the pension funds were dominant in many financial markets has both political and economic ramifications that we were unable to investigate here. The political ramifications, with particular reference to the control aspects of pension fund investment in ordinary shares, have been considered by (eg) Peter Drucker (1976) for the United States and Richard Minns (1980) for the United Kingdom. Nonetheless, given the ever-increasing relative importance of ordinary shares in the corporate fund-raising arsenal this is an area that requires further attention of a contemporary nature. On the economic side, in this study we have concentrated on the influence of yield on the pension funds' demand, yet given their dominance this influence must also run in the opposite direction. That is to say, that the actions of the pension funds (and other dominant investors) will likely influence the price and hence the yield of various financial assets. There have been several commentators who have ascribed the bull markets of the 1980s, and the various 'meltdowns' of October 1987, to the institutional investors, such as the pension funds. Indeed, the pension funds' influence in the market for government securities could have a profound effect on the conduct of government policy. Yet there would appear to have been very few (if any) studies that examine these implications. Perhaps our simple model could be put to use in a study of the impact of the pension funds on the financial markets, or even the macroeconomy.

In Britain there have been times, usually during severe recessions, when there has been a public outcry because the pension funds appear to have such huge sums invested overseas. The argument is usually couched that these funds could (and should) have been employed in the United Kingdom to build up the capital base, eg, in manufacturing. The counter-argument runs that the members of the fund are better served if monies flow to where they will receive the best return. If the monies were invested in the U. K. at a lower return it might be necessary to raise contributions or lower pension payments, thus making members worse off, and perhaps reducing national aggregate demand in the process. Nonetheless, despite the vigour with which the various debaters pursue their points, very little solid evidence seems to be on offer on either side. Some quality research here would serve as a sublime substitute for the rhetoric that has dominated thus far.

Finally, it should be remembered that the pension funds exist to provide their members with a stable income during their retirement years. One thought that has come to mind during this study is that the growth of the pension funds has coincided with the post-War diminution of the business cycle, and leads one to ponder if perhaps there is some connection.

Chapter Ten Endnotes

1 The public provision of welfare services such as pensions appears to provide information to the public that would otherwise be so costly as to virtually be unobtainable. Thus, public provision of such goods acts over time to lower information costs to a large enough degree that private provision eventually becomes feasible. One parallel to this lies with the origins of coinage. Before coinage, *specie* was used as a medium of exchange, but it possessed high information costs as it needed to be both weighed and assayed before a trade could occur. Coinage, including the stamp of the monarch to attest to a metallic disc's quantity and quality, brought about a major reduction in the information costs, leading to the eventual displacement of a barter economy by a monetary economy. A similar parallel can be found with the replacement of commodity money, such as *specie*, with paper money.

2 In a less mature fund the majority of the income would have to be by way of contributions. It is only after a fund has been successfully established, with interest and dividend reinvested, that the investment income will become sizable.

3 We believe that the inclusion of expected yields serves no real purpose for the pension funds for a couple of related reasons. Firstly, as our estimations revealed, yield is of minor importance in determining the demand for a particular asset by the pension funds. Secondly, because the pension funds face liabilities that are particularly long-term in nature, their investments are also particularly long-term. Were the pension funds to truly consider expected yields, they would need to estimate the expected yields over this particularly long-term horizon. Yet as we know, the future is uncertain, and becomes increasingly more uncertain the farther into thc future one looks. Thus, any attempts to calculate expected yields over such a long horizon would be virtually futile. Keynes' comment on uncertainty (quote d in Chapter Six) is particularly sagacious here.

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Appendix A-1

AGGREGATE PENSION FUNDS: BALANCE SHEET AT MARKET VALUES

(£ millions)

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
British government and government-guaranteed securities:																
<5 years*					282	506	456	642	503	462	298	240	361	866	1,033	488
5-15 years					320	453	478	1,370	2,135	2,433	3,561	4,150	7,013	9,372	10,672	12,716
15 + years					611	1,567	3,226	4,809	5,297	6,600	8,126	7,227	9,275	9,331	8,993	9,914
Index-Linked Treasury Stock											6	1,386	2,309	3,017	3,820	4,344
TOTAL	931	1,295	1,231	1,162	1,213	2,526	4,160	6,821	7,935	9,495	11,991	13,003	18,958	22,586	24,518	27,462
UK Local Authority Securities	241	195	182	171	211	355	335	299	252	248	198	156	160	151	129	139
UK Public Corporation Securities													18	33	35	36
Company Securities:																
Domestic Ordinary Shares					3,001	7,426	8,708	13,517	15,987	18,564	24,607	28,616	37,293	48,385	63,017	78,845
Overseas Ordinary Shares					391	704	1,037	1,139	1,614	1,947	4,251	6,164	9,705	15,207	16,906	20,997
TOTAL	3,900	5,962	7,176	5,313	3,392	8,130	9,745	14,656	17,601	20,511	28,858	34,780	46,998	63,592	79,923	99,842
Debentures	1,026	1,210	1,221	998	724	1,027										
Preference Shares	37	33	37	37	29	3										
TOTAL	1,063	1,243	1,258	1,035	753	1,030	1,035	1,195	1,071	969	1,165	1,265	1,581	1,829	2,063	2,536
Authorised Unit Trust Units		15	15	9	9	16	74	98	126	156	266	354	526	797	1,154	1,235
Overseas government etc securities	36	34	28	26	17	42	17	17	70	46	104	120	437	511	701	1,030
LAMIT...	117	179	173	136	76	80	83	85	74	104	116	141	79	89	124	108
Domestic Loans and Mortgages	488	450	446	443	344	242	196	230	432	424	269	285	284	275	287	257
Overseas Loans and Mortgages					11	12	3	16	169	147	133	120	141	150	140	119
TOTAL	488	450	446	443	355	254	199	246	601	571	402	405	425	425	427	376
Property Unit Trust Units	120	150	218	276	263	401	501	775	947	1,238	1,444	1,682	2,083	2,318	2,444	2,257
Land, Property, Ground rent	645	785	915	1,296	1,581	2,059	2,708	4,070	4,913	6,224	8,284	9,751	10,618	11,256	12,182	13,190
Other	22	30	25	53	21	8	43	189	432	701	1,154	2,055	2,757	3,743	4,457	3,830
TOTAL OF INVESTMENTS	7,563	10,338	11,667	9,920	7,890	14,901	18,900	28,451	34,022	40,263	53,982	63,712	84,640	107,330	128,157	152,041
Total Current Assets	323	293	536	907	1,517	979	1,505	1,925	2,073	2,712	2,570	2,694	3,188	4,952	6,796	6,928
Short-term Liabilities	40	75	135	145	91		192	237	303	337	442	361	447	896	1,092	1,174
Long-term Liabilities			38	83	57		198	242	401	373	365	387	381	416	536	419
	7,846	10,556	12,030	10,559	9,259	15,880	20,015	29,897	35,391	42,265	55,745	65,658	87,000	110,970	133,325	157,376

Appendix A-2

AGGREGATE PENSION FUNDS: BALANCE SHEET AT MARKET VALUES

(percentages)

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
British government and government-guaranteed securities:																
<5 years*					3.05%	3.19%	2.28%	2.15%	1.42%	1.09%	0.53%	0.37%	0.41%	0.78%	0.77%	0.31%
5 -15 years					3.46%	2.85%	2.39%	4.58%	6.03%	5.76%	6.39%	6.32%	8.06%	8.45%	8.00%	8.08%
15 + years					6.60%	9.87%	16.12%	16.09%	14.97%	15.62%	14.58%	11.01%	10.66%	8.41%	6.75%	6.30%
Index-Linked Treasury Stock											0.01%	2.11%	2.65%	2.72%	2.87%	2.76%
TOTAL	11.87%	12.27%	10.23%	11.00%	13.10%	15.91%	20.78%	22.81%	22.42%	22.47%	21.51%	19.80%	21.79%	20.35%	18.39%	17.45%
UK Local Authority Securities	3.07%	1.85%	1.51%	1.62%	2.28%	2.24%	1.67%	1.00%	0.71%	0.59%	0.36%	0.24%	0.18%	0.14%	0.10%	0.09%
UK Public Corporation Securities													0.02%	0.03%	0.03%	0.02%
Company Securities:																
Domestic Ordinary Shares					32.41%	46.76%	43.51%	45.21%	45.17%	43.92%	44.14%	43.58%	42.87%	43.60%	47.27%	50.10%
Overseas Ordinary Shares					4.22%	4.43%	5.18%	3.81%	4.56%	4.61%	7.63%	9.39%	11.16%	13.70%	12.68%	13.34%
TOTAL	49.71%	56.48%	59.65%	50.32%	36.63%	51.20%	48.69%	49.02%	41.41%	48.53%	51.77%	52.97%	54.02%	57.31%	59.95%	63.44%
Debentures																
Preference Shares																
TOTAL	13.55%	11.78%	10.46%	9.80%	8.13%	6.49%	5.17%	4.00%	3.03%	2.29%	2.09%	1.93%	1.82%	1.65%	1.55%	1.61%
Authorised Unit Trust Units		0.14%	0.12%	0.09%	0.10%	0.10%	0.37%	0.33%	0.36%	0.37%	0.48%	0.54%	0.60%	0.72%	0.87%	0.78%
Overseas government etc securities	0.46%	0.32%	0.23%	0.25%	0.18%	0.26%	0.08%	0.06%	0.20%	0.11%	0.19%	0.18%	0.50%	0.46%	0.53%	0.65%
LAMIT...	1.49%	1.70%	1.44%	1.29%	0.82%	0.50%	0.41%	0.28%	0.21%	0.25%	0.21%	0.21%	0.09%	0.08%	0.09%	0.07%
Domestic Loans and Mortgages	6.22%	4.26%	3.71%	4.20%	3.72%	1.52%	0.98%	0.77%	1.22%	1.00%	0.48%	0.43%	0.33%	0.25%	0.22%	0.16%
Overseas Loans and Mortgages				4.20%	0.12%	0.08%	0.01%	0.05%	0.48%	0.35%	0.24%	0.18%	0.16%	0.14%	0.11%	0.08%
TOTAL	6.22%	4.26%	3.71%	4.20%	3.83%	1.60%	0.99%	0.82%	1.70%	1.35%	0.72%	0.62%	0.49%	0.38%	0.32%	0.24%
Property Unit Trust Units	1.53%	1.42%	1.81%	2.61%	2.84%	2.53%	2.50%	2.59%	2.68%	2.93%	2.59%	2.56%	2.39%	2.09%	1.83%	1.43%
Land, Property, Ground rent	8.22%	7.44%	7.61%	12.27%	17.08%	12.97%	13.53%	13.61%	13.88%	14.73%	14.86%	14.85%	12.20%	10.14%	9.14%	8.38%
Other	0.28%	0.28%	0.21%	0.50%	0.23%	0.05%	0.21%	0.63%	1.22%	1.66%	2.07%	3.13%	3.17%	3.37%	3.34%	2.43%
TOTAL OF INVESTMENTS	7,563	10,338	11,667	9,920	7,890	14,901	18,900	28,451	34,022	40,263	53,982	63,712	84,640	107,330	128,157	152,041
Total Current Assets	4.12%	2.78%	4.46%	8.59%	16.38%	6.16%	7.52%	6.44%	5.86%	6.42%	4.61%	4.10%	3.66%	4.46%	5.10%	4.40%
Short-term Liabilities	0.51%	0.71%	1.12%	1.37%	0.98%		0.96%	0.79%	0.86%	0.80%	0.79%	0.55%	0.51%	0.81%	0.82%	0.75%
Long-term Liabilities			0.32%	0.79%	0.62%		0.99%	0.81%	1.13%	0.88%	0.65%	0.59%	0.44%	0.37%	0.40%	0.27%
MARKET VALUE OF PFs (net assets)	7,846	10,556	12,030	10,559	9,259	15,880	20,015	29,897	35,391	42,265	55,745	65,658	87,000	110,970	133,325	157,376

Appendix A-3

PRIVATE SECTOR PENSION FUNDS: BALANCE SHEET AT MARKET VALUES

(£ millions)

	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
British government and government-guaranteed securities:			-									
<5 years	21	23	27	51	44	91	69	51	47	59	70	107
5 -15 years	147	148	158	223	143	126	98	90	122	139	142	193
15 + years	387	386	341	288	373	403	392	384	349	542	441	537
undated	52	64	56	49	46	44	41	37	34	46	31	
TOTAL	607	621	582	611	606	664	600	562	552	786	684	837
UK Local Authority Securities	137	159	154	171	166	164	156	150	139	112	105	123
UK Public Corporation Securities												
Company Securities:												
Domestic Ordinary Shares	1,109	1,370	1,421	1,594	1,507	1,988	2,698	2,443	2,368	3,466	4,020	3,518
Overseas Ordinary Shares									113	150	321	360
TOTAL	1,109	1,370	1,421	1,594	1,507	1,988	2,698	2,443	2,481	3,616	4,341	3,878
Debentures	315	413	452	519	601	632	675	689	726	841	857	906
Preference Shares	68	84	75	78	54	50	45	34	29	22	22	
TOTAL	383	497	527	597	655	682	720	723	755	863	879	906
Authorised Unit Trust Units												
Overseas government etc securities	52	59	50	47	38	44	40	38	27	25	21	22
LAMIT...												
Domestic Loans and Mortgages	40	53	53	65	47	57	46	48	46	40	44	46
Overseas Loans and Mortgages												
TOTAL	40	53	53	65	47	57	46	48	46	40	44	46
Property Unit Trust Units						20	50	75	107	125	179	263
Land, Property, Ground rent	58	64	88	104	138	167	246	322	382	477	545	822
Other	5	3	11	14	4	12	6	11	10	16	12	48
TOTAL OF INVESTMENTS	2,381	2,826	2,886	3,203	3,161	3,798	4,562	4,372	4,499	6,060	6,810	6,845
Total Current Assets	57	72	107	105	98	96	115	129	213	170	321	662
Short-term Liabilities	8	16	8	14	13	14	26	31	25	54	104	118
Long-term Liabilities												
MARKET VALUE OF NET ASSETS	2,440	2,883	2,985	3,293	3,245	3,879	4,648	4,468	4,687	6,175	7,028	7,489

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
British government and government-guaranteed securities:												
<5 years	217	370	293	469	406	365	233	172	250	497	543	305
5 -15 years	239	190	304	856	1,411	1,768	2,586	2,797	4,669	5,988	6,789	8,207
15 + years	416	968	1,915	2,882	3,230	3,737	4,784	4,331	5,264	5,540	5,486	6,430
undated					Index-Linked	Treasury	Stock	739	1,214	1,614	2,048	2,892
TOTAL	872	1,528	2,512	4,207	5,047	5,870	7,603	8,039	11,397	13,639	14,866	17,834
UK Local Authority Securities	128	113	105	135	138	130	98	76	64	60	52	61
UK Public Corporation Securities									16	13	9	13
Company Securities:												
Domestic Ordinary Shares	2,106	4,574	5,008	7,901	9,533	10,764	14,528	16,854	21,992	28,731	37,161	50,427
Overseas Ordinary Shares	337	544	732	734	974	1,159	2,404	3,779	6,038	9,494	10,446	13,208
TOTAL	2,443	5,118	5,740	8,635	10,507	11,923	16,932	20,633	28,030	38,225	47,607	63,635
Debentures	678	778										
Preference Shares												
TOTAL	678	778	793	946	867	824	905	933	1,153	1,249	1,444	1,848
Authorised Unit Trust Units			51	60	87	96	164	231	376	601	879	961
Overseas government etc securities	16	31	15	16	61	40	58	91	256	319	488	611
LAMIT...												
Domestic Loans and Mortgages	33		62	147	242	242	200	204	216	202	202	170
Overseas Loans and Mortgages					51	27	10	1	1	2	2	2
TOTAL	33		62	147	293	269	210	205	217	204	204	172
Property Unit Trust Units	223	290	356	527	638	830	980	1,080	1,380	1,634	1,696	1,551
Land, Property, Ground rent	892	1,081	1,459	2,171	2,423	3,279	4,415	5 143	5,282	5,846	6,454	7,925
Other	38	73			302	423	716	1,332	1,783	2,485	2,671	2,770
TOTAL OF INVESTMENTS	5,323	8,012	11,093	16,844	20,363	23,684	32,081	37,763	48,854	64,275	76,370	97,381
Total Current Assets	1053	737	894	1297	1300	1672	1542	1628	1962	2965	3880	4510
Short-term Liabilities	69	107	52	42	187	168	206	190	282	455	667	599
Long-term Liabilities			88	129	181	239	224	247	222	234	259	251
MARKET VALUE OF NET ASSETS	6,307	9,642	11,847	17,970	21,295	24,949	33,193	38,954	51,412	66,551	79,324	101,041

Appendix A-4

PRIVATE SECTOR PENSION FUNDS: BALANCE SHEET AT MARKET VALUES

(percentages)

	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
British government and government-			-									
guaranteed securities:												
<5 years"	0.86%	0.80%	0.90%	1.55%	1.36%	2.35%	1.48%	1.14%	1.00%	0.96%	1.00%	1.43%
5 - 15 years	6.02%	5 13%	5.29%	6.77%	4.41%	3.25%	2.11%	2.01%	2.60%	2.25%	2.02%	2.58%
15 + years	15.86%	13 39%	11.42%	8.75%	11.49%	10.39%	8.43%	8.59%	7.45%	8.78%	6.27%	7.17%
Index-Linked Treasury Stock	2.13%	2 22%	1.88%	1.49%	1.42%	1.13%	0.88%	0.83%	0.73%	0.74%	0.44%	
TOTAL	24.88%	21.54%	19.50%	18.55%	18.67%	17.12%	12.91%	12.58%	11.78%	12.73%	9.73%	11.18%
UK Local Authority Securities	5.61%	5.52%	5.16%	5.19%	5.12%	4.23%	3.36%	3.36%	2.97%	1.81%	1.49%	1.64%
UK Public Corporation Securities												
Company Securities:												
Domestic Ordinary Shares	45.45%	47.52%	47.60%	48.41%	46.44%	51.25%	58.05%	54.68%	50.52%	56.13%	57.20%	46.98%
Overseas Ordinary Shares									2.41%	2.43%	4.57%	4.81%
TOTAL	45.45%	47.52%	47.60%	48.41%	46.44%	51.25%	58.05%	54.68%	52.12%	58.56%	61.77%	51.78%
Debentures												
Preference Shares												
TOTAL	15.70%	17.24%	17.65%	18.13%	20.18%	17.58%	15.49%	16.18%	16.11%	13.98%	12.51%	12.10%
Authorised Unit Trust Units												
Overseas government etc securities	2.13%	2.05%	1.68%	1.43%	1.17%	1.13%	0.86%	0.85%	0.58%	0.40%	0.30%	0.29%
LAMIT...												
Domestic Loans and Mortgages	1.64%	1.84%	1.78%	1.97%	1.45%	1.47%	0.99%	1.07%	0.98%	0.65%	0.63%	0.61%
Overseas Loans and Mortgages				1.97%								
TOTAL	1.64%	1.84%	1.78%	1.97%	1.45%	1.47%	0.99%	1.07%	0.98%	0.65%	0.63%	0.61%
Property Unit Trust Units						0.52%	1.08%	1.68%	2.28%	2.02%	2.55%	3.51%
Land, Property, Ground rent	2.38%	2.22%	2.95%	3.16%	4.25%	4.31%	5.29%	7.21%	8.15%	7.72%	7.75%	10.98%
Other	0.20%	0.10%	0.37%	0.43%	0.12%	0.31%	0.13%	0.25%	0.21%	0.26%	0.17%	0.64%
TOTAL OF INVESTMENTS	2,391	2,826	2,886	3,203	3,161	3,798	4,562	4,372	4,499	6,060	6,810	6,945
Total Current Assets	2.34%	2.50%	3.58%	3.19%	3.02%	2.47%	2.47%	2.89%	4.54%	2.75%	4.57%	8.84%
Short-term Liabilities	0.33%	0.55%	0.27%	0.43%	0.40%	0.36%	0.56%	0.69%	0.53%	0.87%	1.48%	1.58%
Long-term Liabilities												
MARKET VALUE OF PFs (net assets)	2,440	2,883	2,985	3,293	3,245	3,879	4,648	4,468	4,687	6,175	7,028	7,489

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
British government and government-												
guaranteed securities:												
<5 years"	3.44%	3.84%	2.47%	2.61%	1.91%	1.46%	0.70%	0.44%	0.49%	0.75%	0.68%	0 30%
5 - 15 years	3.79%	1.97%	2.57%	4.76%	6.63%	7.09%	7.79%	7.18%	9.08%	9.00%	8.56%	8.12%
15 + years	6.60%	10.04%	16.16%	16.04%	15.17%	14.98%	14.41%	11.12%	10.24%	8.32%	6.92%	6.36%
Index-Linked Treasury Stock								1.90%	2.36%	2.43%	2.58%	2.86%
TOTAL	13.83%	15.85%	21.20%	23.41%	23.70%	23.53%	22.91%	20.64%	22.17%	20.49%	18.74%	17.65%
UK Local Authority Securities	2.03%	1.17%	0.89%	0.75%	0.65%	0.52%	0.30%	0.20%	0.12%	0.09%	0.07%	0.06%
UK Public Corporation Securities									0.03%	0.02%	0.01%	0.01%
Company Securities:												
Domestic Ordinary Shares	33.39%	47.44%	42.27%	43.97%	44.77%	43.14%	43.77%	43.27%	42.78%	43.17%	46.85%	49.91%
Overseas Ordinary Shares	5.34%	5.64%	6.18%	4.08%	4.57%	4.65%	7.24%	9.70%	11.74%	14.27%	13.17%	13.07%
TOTAL	38.73%	53.08%	48.45%	48.05%	49.34%	47.79%	51.01%	52.97%	54.52%	57.44%	60.02%	62.98%
Debentures												
Preference Shares												
TOTAL	10.75%	8.07%	6.69%	5.26%	4.07%	3.30%	2.73%	2.40%	2.24%	1.88%	1.82%	1.83%
Authorised Unit Trust Units			0.43%	0.33%	0.41%	0.38%	0.49%	0.59%	0.73%	0.90%	1.11%	0.95%
Overseas government etc securities	0.25%	0.32%	0.13%	0.09%	0.29%	0.16%	0.17%	0.23%	0.50%	0.48%	0.62%	0.60%
LAMIT...												
Domestic Loans and Mortgages	0.52%		0.52%	0.82%	1.14%	0.97%	0.60%	0.52%	0.42%	0.30%	0.25%	0.17%
Overseas Loans and Mortgages					0.24%	0.11%	0.03%	0.00%	0.00%	0.00%	0.00%	0.00%
TOTAL	0.52%		0.52%	0.82%	1.38%	1.08%	0.63%	0.53%	0.42%	0.31%	0.26%	0.17%
Property Unit Trust Units	3.54%	3.01%	3.00%	2.93%	3.00%	3.33%	2.95%	2.77%	2.68%	2.46%	2.14%	1.54%
Land, Property, Ground rent	14.14%	11.21%	12.32%	12.08%	11.38%	13.14%	13.30%	13.20%	10.27%	8.78%	8.14%	7.84%
Other	0.60%	0.76%			1.42%	1.70%	2.16%	3.42%	3.47%	3.73%	3.37%	2.74%
TOTAL OF INVESTMENTS	5,323	9,012	11,093	16,844	20,363	23,684	32,081	37,763	49,954	64,275	76,370	97,381
Total Current Assets	16.70%	7.64%	7.55%	7.22%	6.10%	6.70%	4.65%	4.18%	3.82%	4.46%	4.89%	4.46%
Short-term Liabilities	1.09%	1.11%	0.44%	0.23%	0.88%	0.67%	0.62%	0.49%	0.55%	0.68%	0.84%	0.59%
Long-term Liabilities			0.74%	0.72%	0.85%	0.96%	0.67%	0.63%	0.43%	0.35%	0.33%	0.25%
MARKET VALUE OF PFs (net assets)	6,307	9,642	11,847	17,970	21,295	24,949	33,193	38,954	51,412	66,551	79,324	101,041

Appendix A-5

PRIVATE SECTOR PENSION FUNDS: ANNUAL NET ACQUISITIONS

(£ millions)

	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
British government and government-guaranteed securities:												
<5 years	-3.1	-1.7	11.7	-9.2	-14.7	-36.3	-23.9	-7.2	7.3	-1.5	-15.5	25.1
5-15 years	-6.5	-8.5	45.0	-74.4	-9	-15.6	-5.7	31.4	-24.8	0.7	32.4	66.5
15 + years	-7 5	9.6	-3.3	112.1	53.6	40.4	39.2	-43.4	192.8	-30.1	81.8	-10.1
Index-Linked Treasury Stock												
TOTAL	-17.1	-0.6	53.4	28.5	29.9	-11.5	9.6	-19.2	175.3	-30.9	98.7	81.5
UK Local Authority Securities	15.7	4	19.9	0.5	-1.6	3.4	-1	-9.4	-22.2	-4.6	-3.7	18.5
UK Public Corporation Securities												
Company Securities:												
Domestic Ordinary Shares	134.3	133.3	101.6	124.5	121.9	166.9	83.3	164.7	169.7	276.3	125.5	89
Overseas Ordinary Shares												4
TOTAL	134.3	133.3	101.6	124.5	121.9	166.9	83.3	164.7	169.7	276.3	125.5	93.0
Debentures	57.3	41.3	93.9	106.6	59.2	32.8	81.8	50.5	48.6	-1.1	19.2	-22.6
Preference Shares	1.5	1.6	-7	-2.9	-2.8	-11.4	2.9	3.9	0.2	3.4	6.8	-0.6
TOTAL	58.8	42.9	86.9	103.7	56.4	21.4	84.7	54.4	48.8	2.3	26.0	-23.2
Authorised Unit Trust Units												
Overseas government etc securities	0.3	-4.1	-3.4	-4.5	3.8	-0.3	-0.5	-2.7	-3.6	-3.2	-0.7	-5.2
LAMIT...												
Domestic Loans and Mortgages	3.3	1.8	5.1	3.3	0.8	-0.5	2.8	2.2	0.5	-5.1	30.9	6
Overseas Loans and Mortgages												
TOTAL	3.3	1.8	5.1	3.3	0.8	-0.5	2.8	2.2	0.5	-5.1	30.9	6.0
Property Unit Trust Units						25.2	20.9	17.7	27.6	30.4	13	0.7
Land, Property, Ground rent					50.6	63.2	69.6	51.9	44.7	68.5	89.5	112.1
Other	17.7	15.7	22.7	26.1	0.9	0.1	1.8	0.9	2.2	1.8	2.9	4.4
TOTAL OF INVESTMENTS	213.0	193.0	286.2	282.1	262.7	267.9	271.2	260.5	443.0	335.5	382.1	287.8
Total Short-Term Assets	1.5	46.3	-12.7	10	-6.9	15	5.9	89.2	-75.2	148.1	157	405.5
Net Balances with Stockbrokers												
Short-term Liabilities										-74.2	13.3	43.9
Long-term Liabilities												
TOTAL NET INVESTMENT	214.5	239.3	273.5	282.1	255.8	282.9	277.1	349.7	367.8	409.4	552.4	737.2

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
British government and government-guaranteed securities:												
<5 years	72.3	-104.1	51.8	-31.8	-92.5	-164	-65	52	173	143	-199	-168
5-15 years	-17.5	92.8	92.3	120.2	77.9	283.5	-181	-240	84	330	-55	-524
15 + years	397.2	626	429.7	640.8	1301.1	1202.7	523	162	638	627	1,654	924
Index-Linked Treasury Stock							745	378	604	338	388	315
TOTAL	452.0	614.7	573.8	729.2	1,286.5	1,322.2	1,022	352	1,499	1,438	1,788	547
UK Local Authority Securities	-3	-4.2	14.5	-9.2	-12	-14.8	3	-1			-4	-2
UK Public Corporation Securities									-1	-5	2	
Company Securities:												
Domestic Ordinary Shares	583.3	388.1	505.3	456.5	751.4	1205.4	998	1,145	697	1,415	1,956	1,926
Overseas Ordinary Shares	84.8	21.1	47.9	138.7	260.3	827.8	1,113	1,318	816	107	1,087	1,296
TOTAL	668.1	409.2	553.2	595.2	1,011.7	2,033.2	2,111	2,463	1,513	1,522	3,043	3,222
Debentures	-30.4	-17.7	-56.2	-36.9	-21.9							
Preference Shares	13.4	4.7	-1.9	-3.1	0.7							
TOTAL	-17.0	-13.0	-58.1	-40.0	-21.2	5.9	47	98	65	153	174	237
Authorised Unit Trust Units			4.8	7	4.1	11.1	12	34	62	34	31	21
Overseas government etc securities	11.8	-5.5	-6	44	-7.4	12.8	25	101	-64	148	104	-39
LAMIT...												
Domestic Loans and Mortgages	1.1	-19.9	1.7	-4.8	1.1	-36.7	3	12	-14		-32	-10
Overseas Loans and Mortgages			0.3	46.4	7.5	4.8	4	2	1	-5	-1	
TOTAL	1.1	-19.9	2.0	41.6	8.6	-31.9	7	14	-13	-5	-33	-10
Property Unit Trust Units	45.5	21.8	68.6	22.4	41.5	26.8	52	20	9	13	-16	-100
Land, Property, Ground rent	154.6	226.2	258.8	164.5	237.2	330.2	448	436	283	362	266	78
Other	7.5	6.7	25.5	29.2	68.3	61	211	203	90	-32	-235	66
TOTAL OF INVESTMENTS	1,320.6	1,236.0	1,437.1	1,583.9	2,617.3	3,756.5	3,938	3,720	3,443	3,628	5,120	4,020
Total Short-Term Assets	-288.2	-17.7	35.9	229.1	242.5	-162.4	36	229	853	858	-21	2,068
Net Balances with Stockbrokers			-8.1	2.2	6	-8.7	30	-8	28	-9	183	-304
Short-term Liabilities	-39.7	13.5	12	-60.1	45.5	-14	2	-29	-57	-125	152	58
Long-term Liabilities			-22.7	-68.1	8.7	21.5	-12	5	23	3	17	2
TOTAL NET INVESTMENT	892.7	1,231.8	1,454.2	1,687.0	2,920.0	3,592.9	3,994	3,817	4,290	4,355	5,451	5,844

Appendix A-6

PRIVATE SECTOR PENSION FUNDS: ANNUAL NET ACQUISITIONS

(percentages)

	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
British government and government-guaranteed securities.		-										
<5 years"	-1 45%	-0.71%	4.28%	-3.15%	-5.75%	-12.83%	-8.63%	-2.06%	1.98%	-0.37%	-2.81%	3.40%
5 -15 years	-3 03%	-3.55%	16.45%	-25.47%	-3.52%	-5.51%	-2.06%	8 98%	-6.74%	0.17%	5.87%	9.02%
15 + years	-3.50%	4.01%	-1.21%	38.38%	20.95%	14.28%	14.15%	-12.41%	52.42%	-7.35%	14.81%	-1.37%
Index-Linked Treasury Stock												
TOTAL	-7.97%	-0.25%	19.52%	9.76%	11.69%	-4.07%	3.46%	-5.49%	47.66%	-7.55%	17.87%	11.06%
UK Local Authority Securities	7.32%	1.67%	7.28%	0.17%	-0.63%	1.20%	-0.36%	-2.69%	-6.04%	-1.12%	-0.67%	2.51%
UK Public Corporation Securities												
Company Securities:												
Domestic Ordinary Shares	62.61%	55.70%	37.15%	42.62%	47.65%	59.00%	30.06%	47.10%	46.14%	67.49%	22.72%	12.07%
Overseas Ordinary Shares												0.54%
TOTAL	62.61%	55.70%	37.15%	42.62%	47.65%	59.00%	30.06%	47.10%	44.78%	67.49%	22.72%	12.62%
Debentures												
Preference Shares												
TOTAL	27.41%	17.93%	31.77%	35.50%	22.05%	7.56%	30.57%	15.56%	13.27%	0.56%	4.71%	-3.15%
Authorised Unit Trust Units												
Overseas government etc securities	0.14%	-1.71%	-1.24%	-1.54%	1.49%	-0.11%	-0.18%	-0.77%	-0.98%	-0.78%	-0.13%	-0.71%
LAMIT...												
Domestic Loans and Mortgages	1.54%	0.75%	1.86%	1.13%	0.31%	-0.18%	1.01%	0.63%	0.14%	-1.25%	5.59%	0.81%
Overseas Loans and Mortgages				1.13%								
TOTAL	1.54%	0.75%	1.86%	1.13%	0.31%	-0.18%	1.01%	0.63%	0.14%	-1.25%	5.59%	0.81%
Property Unit Trust Units						8.91%	7.54%	5.06%	7.50%	7.43%	2.35%	0.09%
Land, Property, Ground rent					19.78%	22.34%	25.12%	14.84%	12.15%	16.73%	16.20%	15.21%
Other	8.25%	6.56%	8.30%	8.94%	0.35%	0.04%	0.65%	0.26%	0.60%	0.44%	0.52%	0.60%
TOTAL OF INVESTMENTS	213	193	286	282	263	268	271	261	443	335	382	288
Total Current Assets	0.70%	19.35%	-4.64%	3.42%	-2.70%	5.30%	2.13%	25.51%	-20.45%	36.17%	28.42%	55.01%
Short-term Liabilities										-18.12%	2.41%	5.95%
Long-term Liabilities												
TOTAL NET INVESTMENT	215	239	274	292	256	283	277	350	368	409	552	737

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
British government and government-guaranteed securities.												
<5 years"	7.28%	-8.45%	3.56%	-1.89%	-3.17%	-4.56%	-1.63%	1.33%	4.03%	3.28%	-3.65%	-2.87%
5 -15 years	-1.76%	7.53%	6.35%	7.13%	2.67%	7.89%	-4.53%	-6.13%	1.96%	7.58%	-1.01%	-8 97%
15 + years	40.01%	50.82%	29.55%	37.98%	44.56%	33.47%	13.09%	4.14%	14.87%	14.40%	30.34%	15 81%
Index-Linked Treasury Stock								9.65%	14.08%	7.76%	7.12%	5.39%
TOTAL	45.53%	49.90%	39.46%	43.22%	44.06%	36.80%	25.59%	8.99%	34.94%	33.02%	32.80%	9.36%
UK Local Authority Securities	-0.30%	-0.34%	1.00%	-0.55%	-0.41%	-0.41%	0.08%	-0.03%			-0.07%	-0.03%
UK Public Corporation Securities									-0.02%	-0.11%	0 04%	
Company Securities:												
Domestic Ordinary Shares	58.76%	31.51%	34.75%	27.06%	25.73%	33.55%	24 99%	29.23%	16.25%	32.49%	35.88%	32.96%
Overseas Ordinary Shares	8.54%	1.71%	3.29%	8.22%	8.91%	23.04%	27 87%	33.65%	19.02%	2.46%	19.94%	22.18%
TOTAL	67.30%	33.22%	38.04%	35.28%	34.65%	56.59%	52.85%	62.88%	35.27%	34.95%	55.82%	55.13%
Debentures												
Preference Shares												
TOTAL	-1.71%	-1.06%	-4.00%	-2.37%	-0.73%	0.16%	1.18%	2.50%	1.52%	3.51%	3.19%	4.06%
Authorised Unit Trust Units			0.33%	0.41%	0.14%	0.31%	0.30%	0.87%	1.45%	0.78%	0.57%	0.36%
Overseas government etc securities	1.19%	-0.45%	-0.41%	2.61%	-0.25%	0.36%	0.63%	2.58%	-1.49%	3.40%	1.91%	-0.67%
LAMIT...												
Domestic Loans and Mortgages	0.11%	-1.62%	0.12%	-0.28%	0.04%	-1.02%	0.08%	0.31%	-0.33%		-0.59%	-0.17%
Overseas Loans and Mortgages			0.02%	2.75%	0.26%	0.13%	0.10%	0.05%	0.02%	-0.11%	-0.02%	
TOTAL	0.11%	-1.62%	0.14%	2.47%	0.29%	-0.89%	0.18%	0.36%	-0.30%	-0.11%	-0.61%	-0.17%
Property Unit Trust Units	4.58%	1.77%	4.72%	1.33%	1.42%	0.75%	1.30%	0 51%	0.21%	0.30%	-0.29%	-1.71%
Land, Property, Ground rent	15.57%	18.36%	17.80%	9.75%	8.12%	9.19%	11.22%	11.13%	6.60%	8.31%	4.88%	1.33%
Other	0.76%	0.54%	1.75%	1.73%	2.34%	1.70%	5.28%	5.18%	2.10%	-0.73%	-4.31%	1.13%
TOTAL OF INVESTMENTS	1,321	1,236	1,437	1,584	2,617	3,757	3,938	3,720	3,443	3,628	5,120	4,020
Total Current Assets	-29.03%	-1.44%	2.47%	13.58%	8.30%	-4.52%	0.90%	5.85%	19.88%	19.70%	-0.39%	35.39%
Short-term Liabilities	-4.00%	1.10%	0.83%	-3.56%	1.56%	-0.39%	0.05%	-0.74%	-1.33%	-2.87%	2.79%	0.99%
Long-term Liabilities			-1.56%	-4.04%	0.30%	0.60%	-0.30%	0.13%	0.54%	0.07%	0.31%	0.03%
TOTAL NET INVESTMENT	993	1,232	1,454	1,687	2,920	3,593	3,994	3,917	4,290	4,355	5,451	5,844

Appendix A-7

LOCAL AUTHORITY PENSION FUNDS: BALANCE SHEET AT MARKET VALUES

(£ millions)

				#####	end-year										
	1972	1973	1974	1975	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
British government and government-guaranteed securities:			-												
<5 years				93	72	60	62	23	20	13	10	17	58	9	10
5 -15 years				50	53	85	174	282	275	367	480	916	1,109	1,327	1,500
15 + years				196	360	572	933	922	1,116	1,465	1,378	1,764	1,839	1,575	1,698
undated							Index-Linked	Treasury	Stock		109	228	243	307	352
TOTAL	327	336	282	339	485	717	1,169	1,227	1,411	1,845	1,977	2,925	3,249	3,218	3,560
UK Local Authority Securities	51	50	54	99	196	167	118	102	94	85	66	66	68	67	58
UK Public Corporation Securities												2	3	1	3
Company Securities:															
Domestic Ordinary Shares	849	888	590	571	982	1,245	1,891	2,167	2,390	3,383	4,071	5,525	7,200	9,563	11,226
Overseas Ordinary Shares				25	44	83	145	125	158	508	701	1,247	1,806	2,365	3,179
TOTAL	849	888	590	596	1,026	1,328	2,036	2,292	2,548	3,891	4,772	6,772	9,006	11,928	14,405
Debentures	129	141	99	75											
Preference Shares	9	14	8	4											
TOTAL	138	155	107	79	78	71	79	75	42	92	97	125	168	214	304
Authorised Unit Trust Units				4	7	8	6	7	14	26	31	61	88	110	113
Overseas government etc securities	4	4	4	1	1	1	1	1	1	2	5	22	28	87	145
LAMIT...	179	173	136	76	80	83	85	74	104	116	141	79	89	124	108
Domestic Loans and Mortgages	198	192	174	105	4		1	1	1	2	1	1			
Overseas Loans and Mortgages							1	2	2	2	1				
TOTAL	198	192	174	105	4		2	3	3	4	2	1			
Property Unit Trust Units	9	15	20	29	41	43	106	123	160	172	258	363	400	452	432
Land, Property, Ground rent	16	17	24	17	57	90	140	210	287	387	493	613	692	833	967
Other	9	11	15	2	1	3	4	15	20	47	52	77	103	129	125
TOTAL OF INVESTMENTS	1,780	1,841	1,406	1,347	1,976	2,511	3,746	4,129	4,684	6,667	7,894	11,106	13,894	17,163	20,220
Total Current Assets	65	93	181	290	181	163	138	205	279	263	304	306	446	755	906
Short-term Liabilities				6	23	22	35	30	21	39	31	47	66	103	153
Long-term Liabilities															
MARKET VALUE OF NET ASSET!	1,845	1,934	1,587	1,631	2,134	2,652	3,849	4,304	4,942	6,891	8,167	11,365	14,274	17,815	20,973

Appendix A-8

LOCAL AUTHORITY PENSION FUNDS: BALANCE SHEET AT MARKET VALUES

(percentages)

	1972	1973	1974	##### 1975	end-year 1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
British government and government-guaranteed securities:															
<5 years				5.70%	3.37%	2 26%	1.61%	0.53%	0.40%	0.19%	0.12%	0.15%	0.41%	0.05%	0.05%
5 -15 years				3.07%	2.48%	3.21%	4.52%	6.55%	5 56%	5.33%	5.88%	8 06%	7.77%	7.45%	7.15%
15 + years				12.02%	16.87%	21 57%	24.24%	21.42%	22.58%	21.26%	16.87%	15.52%	12.88%	8.84%	8.10%
Index-Linked Treasury Stock											1.33%	2.01%	1.70%	1.72%	1.68%
TOTAL	17.72%	17.37%	17.77%	20.78%	22.73%	27.04%	30.37%	28.51%	28.55%	26.77%	24.21%	25.74%	22.76%	18.06%	16.97%
UK Local Authority Securities	2.76%	2.59%	3.40%	6.07%	9.18%	6.30%	3.07%	2.37%	1.90%	1.23%	0.81%	0.58%	0.48%	0.38%	0.28%
UK Public Corporation Securities												0.02%	0.02%	0.01%	0.01%
Company Securities:															
Domestic Ordinary Shares	46.02%	45.92%	37.18%	35.01%	46.02%	46.95%	49.13%	50.35%	48.36%	49.09%	49.85%	48.61%	50.44%	53.68%	53.53%
Overseas Ordinary Shares				1.53%	2.06%	3.13%	3.77%	2.90%	3.20%	7.37%	8.58%	10.97%	12.65%	13.28%	15.16%
TOTAL	46.02%	45.92%	37.18%	36.54%	48.08%	50.08%	52.90%	53.25%	51.56%	56.46%	58.43%	59.59%	63.09%	66.95%	68.68%
Debentures	6.99%	7.29%	6.24%	4.60%											
Preference Shares	0.49%	0.72%	0.50%	0.25%											
TOTAL	7.48%	8.01%	6.74%	4.84%	3.66%	2.68%	2.05%	1.74%	0.85%	1.34%	1.19%	1.10%	1.18%	1.20%	1.45%
Authorised Unit Trust Units				0.25%	0.33%	0.30%	0.16%	0.16%	0.28%	0.38%	0.38%	0.54%	0.62%	0.62%	0.54%
Overseas government etc securities	0.22%	0.21%	0.25%	0.06%	0.05%	0.04%	0.03%	0.02%	0.02%	0.03%	0.06%	0.19%	0.20%	0.49%	0.69%
LAMIT...	9.70%	8.95%	8.57%	4.66%	3.75%	3.13%	2.21%	1.72%	2.10%	1.68%	1.73%	0.70%	0.62%	0.70%	0.51%
Domestic Loans and Mortgages	10.73%	9.93%	10.96%	6.44%	0.19%		0.03%	0.02%	0.02%	0.03%	0.01%	0.01%			
Overseas Loans and Mortgages							0.03%	0.05%	0.04%	0.03%	0.01%				
TOTAL	10.73%	9.93%	10.96%	6.44%	0.19%		0.05%	0.07%	0.06%	0.06%	0.02%	0.01%			
Property Unit Trust Units	0.49%	0.78%	1.26%	1.78%	1.92%	1.62%	2.75%	2.86%	3.24%	2.50%	3.16%	3.19%	2.80%	2.54%	2.06%
Land, Property, Ground rent	0.87%	0.88%	1.51%	1.04%	2.67%	3.39%	3.64%	4.88%	5.81%	5.62%	6.04%	5.39%	4.85%	4.68%	4.61%
Other	0.49%	0.57%	0.95%	0.12%	0.05%	0.11%	0.10%	0.35%	0.40%	0.68%	0.64%	0.68%	0.72%	0.72%	0.60%
TOTAL OF INVESTMENTS	1,780	1,841	1,406	1,347	1,976	2,511	3,746	4,129	4,684	6,667	7,894	11,106	13,894	17,163	20,220
Total Current Assets	3.52%	4.81%	11.41%	17.78%	8.48%	6.15%	3.59%	4.76%	5.65%	3.82%	3.72%	2.69%	3.12%	4.24%	4.32%
Short-term Liabilities				0.37%	1.08%	0.83%	0.91%	0.70%	0.42%	0.57%	0.38%	0.41%	0.46%	0.58%	0.73%
Long-term Liabilities															
MARKET VALUE OF PFs (net assets)	1,845	1,934	1,587	1,631	2,134	2,652	3,849	4,304	4,942	6,891	8,167	11,365	14,274	17,815	20,973

Appendix A-9

LOCAL AUTHORITY PENSION FUNDS: ANNUAL NET ACQUISITIONS

(£ millions)

	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
British government and government-guaranteed securities												
<5 years						-0.8	-2.4	-0.7	-3.3	-0.3	2.9	23.2
5-15 years						1.4	0.4	6.8	-4.6	3.2	26.7	14
15 + years						21.7	25	8.2	60.7	32.5	37.1	-48.5
Index-Linked Treasury Stock												
TOTAL	3 8	5.2	4.9	13.4	22.9	22.3	23.0	14.3	52.8	35.4	66.7	-11.3
UK Local Authority Securities	2.3	0.7	6.4	4.3	1.7	0.1	-2.6	-11.2	-25.7	-12.5	5.9	-12.4
UK Public Corporation Securities												
Company Securities:												
Domestic Ordinary Shares	34.3	34	36	33.7	38.1	52.3	52.6	70.8	82.9	84.3	54.5	42.7
Overseas Ordinary Shares												
TOTAL	34.3	34.0	36.0	33.7	38.1	52.3	52.6	70.8	82.9	84.3	54.5	42.7
Debentures	7	8.5	10.5	14.1	12.6	11.6	24.5	17.6	12	10.7	3.7	-15.1
Preference Shares	2.4	0.6	0.2	0.3	0.3	0.1	1.2	0.4	-0.4		0.4	-1.4
TOTAL	9.4	9.1	10.7	14.4	12.9	11.7	25.7	18.0	11.6	10.7	4.1	-16.5
Authorised Unit Trust Units												
Overseas government etc securities	-1.4	-1	-0.4	-0.9	0.4	-0.1	-0.8	-0.6	-1	-0.2		-0.6
LAMIT...	12.8	12.3	10.5	13.8	11.3	8.6	1.7	8.1	11.2	12.5	4.3	-26.7
Domestic Loans and Mortgages	-1.1	4	4									
Overseas Loans and Mortgages												
TOTAL	-1.1	4.0	4.0									
Property Unit Trust Units								1.1	3.8	7.6	4.4	0.8
Land, Property, Ground rent								2.2	8.6	0.3	-0.4	8.7
Other	0.9	0.4	0.8	0.9	0.3	2.9	5.2	1.1	2.4	2.3	1.2	3.6
TOTAL OF INVESTMENTS	61.0	64.7	72.9	79.6	84.2	97.6	104.8	103.8	146.6	140.4	140.7	-11.7
Total Short-Term Assets	1.2	1.9	2	10	-6.9	15	5.9	89.2	-75.2	148.1	157	405.5
Net Balances with Stockbrokers												
Short-term Liabilities										-74.2	13.3	43.9
Long-term Liabilities												
TOTAL NET INVESTMENT	62.2	66.6	74.9	89.6	77.3	112.6	110.7	193.0	71.4	214.3	311.0	437.7

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
British government and government-guaranteed securities												
<5 years	-8	-18.5	-40.2	-35	5.5	10.2	-4	10	56	-50	8	19
5-15 years	14.6	42.3	20.2	15	55 9	2.1	5	85	101	81	2	253
15 + years	187.7	223.5	218.2	252.5	382.4	327.4	218	170	238	55	67	204
Index-Linked Treasury Stock							101	65	42	54	113	89
TOTAL	194.3	247.3	198.2	232.5	321.0	319.3	310	330	235	140	186	21
UK Local Authority Securities	-27.2	-19.8	-21.7	15.5	-12.1	-9.5	-6	5	1	-7	-9	-5
UK Public Corporation Securities										-2	1	
Company Securities:												
Domestic Ordinary Shares	208.3	207.2	293.1	233.3	275.7	352.3	400	540	510	473	435	390
Overseas Ordinary Shares	22.7	22.9	38.2	27.7	34.6	204.7	186	211	227	307	428	499
TOTAL	231.0	230.1	331.3	261.0	310.3	557.0	586	751	737	780	863	889
Debentures	3.6	-2.6	-2.2									
Preference Shares	1.7	3.2	6.7									
TOTAL	5.3	0.6	4.5	-2	1.2	12.6	22	22	20	45	29	46
Authorised Unit Trust Units		0.7	2.2	4.1	7.4	6.2	7	8	19	-7	-13	-7
Overseas government etc securities	0.1	-0.5	-0.3	0.1	0.2	0.7	4	14	-4	54	33	-52
LAMIT...	-8	0.6	5.5	-15.2	5.4	8.7	10	9	12	10	3	7
Domestic Loans and Mortgages		0.2	-0.4	-0.3	-0.1	1	-1	-1	-1			
Overseas Loans and Mortgages			0.7	0.9	1					4		
TOTAL		0.2	0.3	0.6	0.9	1.0	-1	-1	-1	4		
Property Unit Trust Units	26.4	9.5	31	11.8	13	15	44	18	11	33	14	-1
Land, Property, Ground rent	11.2	43.7	31.6	38.8	38	109.2	81	68	76	98	105	114
Other	0.2	0.7	-0.1	8.9	5.6	8	13	13	8	11	26	13
TOTAL OF INVESTMENTS	433.3	513.1	582.5	525.1	690.9	1,028.2	1,070	1,227	1,112	1,159	1,238	1,025
Total Short-Term Assets	-288.2	-35.4	-33	58.4	65	-29.8	52	-24	113	258	109	78
Net Balances with Stockbrokers		5.4	-7.4	6.2	-1.6	-5.4	7	-1	6	2	-11	26
Short-term Liabilities	-39.7	1.1	-1.5	1.2	0.2	0.1	-1		-2		-3	7
Long-term Liabilities				0.8								
TOTAL NET INVESTMENT	105.4	484.2	540.6	591.7	754.5	993.1	1,128	1,202	1,229	1,419	1,333	1,136

Appendix A-10

LOCAL AUTHORITY PENSION FUNDS: ANNUAL NET ACQUISITIONS

(percentages)

	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
British government and government-guaranteed securities:												
<5 years*						-0.71%	-2.17%	-0.36%	-4.62%	-0.14%	0.93%	5.30%
5-15 years						1.24%	0 36%	3.52%	-6.44%	1.49%	8.59%	3 20%
15 + years						19.27%	22.58%	4.25%	85.01%	15.17%	11.93%	-11.08%
Index-Linked Treasury Stock												
TOTAL	6.11%	7.81%	6 54%	14.96%	29.62%	19.80%	20.78%	7.41%	73.95%	16.52%	21.45%	-2.58%
UK Local Authority Securities	3.70%	1.05%	8.54%	4.80%	-2.20%	-0.09%	-2.35%	-5.80%	-35.99%	-5.83%	1.90%	-2.83%
UK Public Corporation Securities												
Company Securities:												
Domestic Ordinary Shares	55.14%	51.05%	48.06%	37.61%	49.29%	46.45%	47.52%	36.68%	116.11%	39.34%	17.52%	9.76%
Overseas Ordinary Shares												
TOTAL	55.14%	51.05%	48.06%	37.61%	49.29%	46.45%	47.52%	36.68%	99.16%	39.34%	17.52%	9.76%
Debentures												
Preference Shares												
TOTAL	15.11%	13.66%	14.29%	16.07%	16.69%	10.39%	23.22%	9.33%	16.25%	4.99%	1.32%	-3.77%
Authorised Unit Trust Units												
Overseas government etc securities	-2.25%	-1.50%	-0.53%	-1.00%	0.52%	-0.09%	-0.72%	-0.31%	-1.40%	-0.09%		-0.14%
LAMIT...	20.58%	18.47%	14.02%	15.40%	14.62%	7.64%	1.54%	4.20%	15.69%	5.83%	1.38%	-6.10%
Domestic Loans and Mortgages	-1.77%	6.01%	5.34%									
Overseas Loans and Mortgages												
TOTAL	-1.77%	6.01%	5.34%									
Property Unit Trust Units								0.57%	5.32%	3.55%	1.41%	0.18%
Land, Property, Ground rent								1.14%	12.04%	0.14%	-0.13%	1.99%
Other	1.45%	0.60%	1.07%	1.00%	0.39%	2.58%	4.70%	0.57%	3.36%	1.07%	0.39%	0.82%
TOTAL OF INVESTMENTS	61	65	73	80	84	98	105	104	147	140	141	-12
Total Current Assets	1.93%	2.85%	2.67%	11.16%	-8.93%	13.32%	5.33%	46.22%	-105.32%	69.11%	50.48%	92.64%
Short-term Liabilities										-34.62%	4.28%	10.03%
Long-term Liabilities												
TOTAL NET INVESTMENT	62	67	75	90	77	113	111	193	71	214	311	438

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
British government and government-guaranteed securities:												
<5 years*	-7.59%	-3.82%	-7.44%	-5.92%	-0.73%	-1.03%	-0.35%	0.83%	4.56%	-3 52%	0.60%	1.67%
5-15 years	13.85%	8.74%	3.74%	2.54%	-7.41%	0.21%	-0.44%	7.07%	-8.22%	5.71%	-0.15%	22 27%
15 + years	178.08%	46.16%	40.36%	42.67%	50.68%	32.97%	19.33%	14.14%	19.37%	3.88%	5.03%	17.96%
Index-Linked Treasury Stock								5.41%	3.42%	3.81%	8.48%	7 83%
TOTAL	184.35%	51.07%	36.66%	39.29%	42.54%	32.15%	27.48%	27.45%	19.12%	9.87%	13.95%	1.85%
UK Local Authority Securities	-25.81%	-4.09%	-4.01%	-2.62%	-1.60%	0.96%	-0.53%	-0.42%	-0.08%	-0.49%	-0.68%	0.44%
UK Public Corporation Securities										-0.14%	0.08%	
Company Securities:												
Domestic Ordinary Shares	197.63%	42.79%	54.22%	39.43%	36.54%	35.47%	35.46%	44.93%	41.50%	33.33%	32.63%	34.33%
Overseas Ordinary Shares	21.54%	4.73%	7.07%	4.68%	4.59%	20.61%	16.49%	17.55%	18.47%	21.63%	32.11%	43.93%
TOTAL	219.17%	47.52%	61.28%	44.11%	41.13%	56.09%	51.95%	62.48%	59.97%	54.97%	64.74%	78.26%
Debentures												
Preference Shares												
TOTAL	5.03%	0.12%	0.83%	-0.34%	0.16%	1.27%	1.95%	1.83%	1.63%	3.17%	2.18%	4.05%
Authorised Unit Trust Units		0.14%	0.41%	0.69%	0.98%	0.62%	0.62%	0.67%	1.55%	-0.49%	-0.98%	-0.62%
Overseas government etc securities	0.09%	-0.10%	-0.06%	0.02%	0.03%	0.07%	0.35%	1.16%	-0.33%	3.81%	2.48%	-4.58%
LAMIT...	-7.59%	0.12%	1.02%	-2.57%	0.72%	0.88%	0.89%	0.75%	0.98%	0.70%	0.23%	0.62%
Domestic Loans and Mortgages		0.04%	-0.07%	-0.05%	-0.01%	0.10%	-0.09%	-0.08%	-0.08%			
Overseas Loans and Mortgages			0.13%	0.15%	0.13%					0.28%		
TOTAL		0.04%	0.06%	0.10%	0.12%	0.10%	-0.09%	-0.08%	-0.08%	0.28%		
Property Unit Trust Units	25.05%	1.96%	5.73%	1.99%	1.72%	1.51%	3.90%	1.50%	0.90%	2.33%	1.05%	-0.09%
Land, Property, Ground rent	10.63%	9.03%	5.85%	6.56%	5.04%	11.00%	7.18%	5.66%	6.18%	6.91%	7.88%	10.04%
Other	0.19%	0.14%	-0.02%	1.50%	0.74%	0.81%	1.15%	1.08%	0.65%	0.78%	1.95%	1.14%
TOTAL OF INVESTMENTS	433	513	583	525	691	1,028	1,070	1,227	1,112	1,159	1,238	1,025
Total Current Assets	-273.43%	-7.31%	-6.10%	9.87%	8.61%	3.00%	4.61%	-2.00%	9.19%	18.18%	8.18%	6.87%
Short-term Liabilities	-37.67%	0.23%	-0.28%	0.20%	0.03%	0.01%	-0.09%		0.16%		-0.23%	0.62%
Long-term Liabilities				0.14%								
TOTAL NET INVESTMENT	105	484	541	592	755	993	1,128	1,202	1,229	1,419	1,333	1,136

Appendix A-11

PUBLIC SECTOR PENSION FUNDS: BALANCE SHEET AT MARKET VALUES

(£ millions)

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
British government and government-guaranteed securities:															
<5 years	4	28	18	31	64	103	111	74	77	52	58	94	311	481	173
5 -15 years	43	48	59	82	210	89	340	442	390	608	873	1,428	2,275	2,556	3,009
15 + years	136	135	135	88	239	739	994	1,145	1,747	1,883	1,518	2,247	1,952	1,932	1,786
undated								Index-Linked	Treasury	Stock	538	867	1,160	1,465	1,100
TOTAL	183	211	212	201	513	931	1,445	1,661	2,214	2,543	2,987	4,636	5,698	6,434	6,068
UK Local Authority Securities	32	27	26	20	46	63	46	12	24	15	14	30	23	10	20
UK Public Corporation Securities													17	25	20
Company Securities:															
Domestic Ordinary Shares	1,441	1,803	1,347	700	1,870	2,455	3,725	4,287	5,410	6,696	7,691	9,776	12,454	16,293	17,192
Overseas Ordinary Shares	56	144	113	76	116	222	260	515	630	1,339	1,684	2,420	3,907	4,095	4,610
TOTAL	1,497	1,947	1,460	776	1,986	2,677	3,985	4,802	6,040	8,035	9,375	12,196	16,361	20,388	21,802
Debentures	240	223	189	132	173										
Preference Shares	2	1	1	1	1										
TOTAL	242	224	190	133	174	171	170	129	103	168	235	303	412	405	384
Authorised Unit Trust Units	15	15	9	5	9	15	32	32	46	76	92	89	108	165	161
Overseas government etc securities	5	3	2	2	10	1		8	5	44	24	159	164	126	274
LAMIT...															
Domestic Loans and Mortgages	212	210	223	206	165	134	82	189	181	67	80	67	73	85	87
Overseas Loans and Mortgages				11	12	3	15	116	118	121	118	140	148	138	117
TOTAL	212	210	223	217	177	137	97	305	299	188	198	207	221	223	204
Property Unit Trust Units	16	24	52	66	70	102	142	186	248	292	344	340	284	296	274
Land, Property, Ground rent	292	353	549	765	921	1,159	1,883	2,280	2,658	3,482	4,115	4,723	4,718	4,895	4,298
Other	5	2	2	2	7	40	61	115	258	391	671	897	1,155	1,657	935
TOTAL OF INVESTMENTS	**2,499**	**3,016**	**2,725**	**2,187**	**3,913**	**5,296**	**7,861**	**9,530**	**11,895**	**15,234**	**18,055**	**23,580**	**29,161**	**34,624**	**34,440**
Total Current Assets	58	121	208	413	366	448	490	568	761	765	762	920	1541	2161	1512
Short-term Liabilities	22	31	37	22	72	118	160	86	148	197	140	118	375	322	422
Long-term Liabilities		38	83	57	103	110	113	220	134	141	140	159	182	277	168
MARKET VALUE OF NET ASSET!	**2,535**	**3,068**	**2,813**	**2,521**	**4,104**	**5,516**	**8,078**	**9,792**	**12,374**	**15,661**	**18,537**	**24,223**	**30,145**	**36,186**	**35,362**

Appendix A-12

PUBLIC SECTOR PENSION FUNDS: BALANCE SHEET AT MARKET VALUES

(percentages)

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
British government and government-guaranteed securities:															
<5 years"	0.16%	0.91%	0.64%	1.23%	1.56%	1.87%	1.37%	0.76%	0.62%	0.33%	0.31%	0.39%	1.03%	1.33%	0.49%
5 -15 years	1.70%	1.56%	2.10%	3.25%	5.12%	1.61%	4.21%	4.51%	3.15%	3.88%	4.71%	5.90%	7.55%	7.06%	8.51%
15 + years	5.36%	4.40%	4.80%	3.49%	5.82%	13.40%	12.31%	11.69%	14.12%	12.02%	8.19%	9.28%	6.48%	5.34%	5.05%
Index-Linked Treasury Stock											2.90%	3.58%	3.85%	4.05%	3.11%
TOTAL	7.22%	6.88%	7.54%	7.97%	12.50%	16.88%	17.89%	16.96%	17.89%	16.24%	16.11%	19.14%	18.90%	17.78%	17.16%
UK Local Authority Securities	1.26%	0.88%	0.92%	0.79%	1.12%	1.14%	0.57%	0.12%	0.19%	0.10%	0.08%	0.12%	0.08%	0.03%	0.06%
UK Public Corporation Securities													0.06%	0.07%	0.06%
Company Securities:															
Domestic Ordinary Shares	56.84%	58.77%	47.88%	27.77%	45.57%	44.51%	46.11%	43.78%	43.72%	42.76%	41.49%	40.36%	41.31%	45.03%	48.62%
Overseas Ordinary Shares	2.21%	4.69%	4.02%	3.01%	2.83%	4.02%	3.22%	5.26%	5.09%	8.55%	9.08%	9.99%	12.96%	11.32%	13.04%
TOTAL	59.05%	63.46%	51.90%	30.78%	48.39%	48.53%	49.33%	49.04%	48.81%	51.31%	50.57%	50.35%	54.27%	56.34%	61.65%
Debentures															
Preference Shares															
TOTAL	9.55%	7.30%	6.75%	5.28%	4.24%	3.10%	2.10%	1.32%	0.83%	1.07%	1.27%	1.25%	1.37%	1.12%	1.09%
Authorised Unit Trust Units	0.59%	0.49%	0.32%	0.20%	0.22%	0.27%	0.40%	0.33%	0.37%	0.49%	0.50%	0.37%	0.36%	0.46%	0.46%
Overseas government etc securities	0.20%	0.10%	0.07%	0.08%	0.24%	0.02%		0.08%	0.04%	0.28%	0.13%	0.66%	0.54%	0.35%	0.77%
LAMIT...															
Domestic Loans and Mortgages	8.36%	6.84%	7.93%	8.17%	4.02%	2.43%	1.02%	1.93%	1.46%	0.43%	0.43%	0.28%	0.24%	0.23%	0.25%
Overseas Loans and Mortgages				0.44%	0.29%	0.05%	0.19%	1.18%	0.95%	0.77%	0.64%	0.58%	0.49%	0.38%	0.33%
TOTAL	8.36%	6.84%	7.93%	8.61%	4.31%	2.48%	1.20%	3.11%	2.42%	1.20%	1.07%	0.85%	0.73%	0.62%	0.58%
Property Unit Trust Units	0.63%	0.78%	1.85%	2.62%	1.71%	1.85%	1.76%	1.90%	2.00%	1.86%	1.86%	1.40%	0.94%	0.82%	0.77%
Land, Property, Ground rent	11.52%	11.51%	19.52%	30.35%	22.44%	21.01%	23.31%	23.28%	21.48%	22.23%	22.20%	19.50%	15.65%	13.53%	12.15%
Other	0.20%	0.07%	0.07%	0.08%	0.17%	0.73%	0.76%	1.17%	2.09%	2.50%	3.62%	3.70%	3.83%	4.58%	2.64%
TOTAL OF INVESTMENTS	2,499	3,016	2,725	2,187	3,913	5,296	7,861	9,530	11,895	15,234	18,055	23,580	29,161	34,624	34,440
Total Current Assets	2.29%	3.94%	7.39%	16.38%	8.92%	8.12%	6.07%	5.80%	6.15%	4.88%	4.11%	3.80%	5.11%	5.97%	4.28%
Short-term Liabilities	0.87%	1.01%	1.32%	0.87%	1.75%	2.14%	1.98%	0.88%	1.20%	1.26%	0.76%	0.49%	1.24%	0.89%	1.19%
Long-term Liabilities		1.24%	2.95%	2.26%	2.51%	1.99%	1.40%	2.25%	1.08%	0.90%	0.76%	0.66%	0.60%	0.77%	0.48%
MARKET VALUE OF PFs (net assets)	2,535	3,068	2,813	2,521	4,104	5,516	8,078	9,792	12,374	15,661	18,537	24,223	30,145	36,186	35,362

Appendix A-13

PUBLIC SECTOR PENSION FUNDS: ANNUAL NET ACQUISITIONS

(£ millions)

	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
British government and government-guaranteed securities												
<5 years						-6.6	-4.4	-4.0	12.0	16.1	13.0	14.0
5 -15 years						10.8	2.4	-4 3	6.2	6 3	10.1	30.8
15 + years						20.1	-34.4	-5.1	33.7	-9.0	24.9	-26.3
Index-Linked Treasury Stock												
TOTAL	-1.6	-0.3	3.2	-8.1	16.6	2 7	36.4	-13.4	39.5	13 4	22.0	18.5
UK Local Authority Securities	2.6	1.2	3.5	1.1	0.5	2.7	1.5	-3.5	13.5	2.9	-0.3	1.2
UK Public Corporation Securities												
Company Securities:												
Domestic Ordinary Shares	40.2	40.9	37.1	33.8	36.6	61.7	83.6	157.0	159.1	237.0	233.4	92.0
Overseas Ordinary Shares												16.0
TOTAL	40.2	40.9	37.1	33.8	36.6	61.7	83.6	157.0	159.1	237.0	233.4	108.0
Debentures	10.6	9.3	22.8	27.1	23.1	17.1	36.7	10.3	-3.1	2.8	6.0	6.7
Preference Shares	1.2	0.1	-0.5	-0.9	-1.5	-0.4	-0.3	0.1	-0.3	-0.3	-0.3	-0.7
TOTAL	11.8	9.4	22.3	26.2	21.6	16.7	36.4	10.4	-3.4	2.5	5.7	6.0
Authorised Unit Trust Units												
Overseas government etc securities	-0.1	-0.5	-1.7	-0.8	0.7	-1.0	-0.6	-1.1	-0.8	-0.5	0.4	-0.5
LAMIT...												
Domestic Loans and Mortgages	13.2	13.3	9.6	12.3	-1.9	2.9	-0.6	-21.8	2.2	-6.7	8.9	-5.7
Overseas Loans and Mortgages												
TOTAL	13.2	13.3	9.6	12.3	-1.9	2.9	-0.6	-21.8	2.2	-6.7	8.9	-5.7
Property Unit Trust Units							4.0	3.4	0.1	4.3	26.8	15.0
Land, Property, Ground rent	9.3	16.1	16.3	21.0	28.5	27.2	36.8	43.3	29.5	42.8	158.5	184.3
Other	0.1		-0.2	0.7	0.4	1.5	-0.2	-0.1	1.1	0.8	-0.2	4.4
TOTAL OF INVESTMENTS	75.5	80.1	83.7	86.2	103.0	114.4	124.5	174.2	213.8	290.7	454.4	331.2
Total Short-Term Assets	-0.3	1.0	-0.1	4.7	-3.6	2.3	1.5	29.7	-9.8	41.1	52.9	186.9
Net Balances with Stockbrokers												4.1
Short-term Liabilities												3.0
Long-term Liabilities						-1.3	-2.6				-45.2	49.5
TOTAL NET INVESTMENT	75.2	81.1	83.6	90.9	99.4	115.4	123.4	203.9	204.0	331.8	462.1	574.7

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
British government and government-guaranteed securities												
<5 years	54 5	55.2	13.2	27.8	28 3	-35.4	1	23	115	75	-164	36
5 -15 years	49 4	137.7	173.9	128.3	-125.3	138.1	30	150	424	179	902	198
15 + years	180.5	231.1	190.8	194.1	784.0	339.2	209	225	164	171	-161	114
Index-Linked Treasury Stock							513	282	267	211	198	296
TOTAL	284.4	313.6	351.5	350.2	687.0	441.9	693	680	970	636	775	248
UK Local Authority Securities	29.4	121.3	6.0	-4.2	28.5	11.7	-1	22	8	1	16	2
UK Public Corporation Securities										4	2	
Company Securities:												
Domestic Ordinary Shares	259.6	424.8	519.5	363.9	505.4	617.0	606	414	406	778	1162	629
Overseas Ordinary Shares	28.0	49.8	83.2	139.1	147.2	354.7	373	359	260	-96	548	462
TOTAL	287.6	474.6	602.7	503.0	652.6	971.7	979	773	666	682	1,710	1,091
Debentures	15.5	6.8	-13.8									
Preference Shares	1.5	-0.1	-0.4									
TOTAL	17.0	6.7	-14.2	-9.1	3.4	22.9	38	75	34	5	68	162
Authorised Unit Trust Units	-0.4	9.7	2.2	6.8	7.5	7.5	2	12	10	11	9	-14
Overseas government etc securities	6.0	-4.0	1.4	7.7	10.7	21.8	18	109	33	-58	118	185
LAMIT...												
Domestic Loans and Mortgages	-27.1	20.0	-9.6	75.3	-7.9	-100.1	19	-20	6	12	2	-4
Overseas Loans and Mortgages	10.8	5.0		2.0		1.0	10	11	9		-7	
TOTAL	-16.3	25.0	-9.6	77.3	-7.9	-99.1	29	-9	15	12	-5	-4
Property Unit Trust Units	9.5	20.0	35.0	16.8	24.3	18.3	-1	-25	-23	-9	-19	-3
Land, Property, Ground rent	176.3	249.9	247.7	358.0	260.7	468.1	314	293	210	218	118	114
Other	2.4	16.4	27.8	51.2	122.5	55.5	94	127	51	93	-111	-33
TOTAL OF INVESTMENTS	795.9	1,233.2	1,250.5	1,357.7	1,789.3	1,920.3	2,165	2,057	1,974	1,585	2,681	1,748
Total Short-Term Assets	118.6	43.7	-9.8	75.2	138.6	-141.6	149	153	401	643	-359	349
Net Balances with Stockbrokers	-8.9	1.1	-70.8	61.6	-62.6	35.4	26	11	-9	-8	-61	85
Short-term Liabilities	-17.4	17.2	15.5	-13.9	-21	16.6	-33	25	27	-21	5	19
Long-term Liabilities	-27.7	-39.6	22.6	-25.3	62	37.3	10	13			1	4
TOTAL NET INVESTMENT	860.5	1,255.6	1,208.0	1,455.3	1,906.3	1,868.0	2,317	2,259	2,393	2,199	2,267	2,205

Appendix A-14

PUBLIC SECTOR PENSION FUNDS: ANNUAL NET ACQUISITIONS

(percentages)

	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
British government and government-guaranteed securities:												
<5 years*						-5.72%	-3.57%	-1.96%	5.88%	4.85%	-2.81%	2.44%
5 -15 years						-9.36%	1.94%	-2.11%	-3.04%	1.90%	2.19%	5.36%
15 + years						17.42%	-27.88%	-2.50%	16.52%	-2.71%	5.39%	-4.58%
Index-Linked Treasury Stock												
TOTAL	-2.13%	-0.37%	-3.83%	-8.91%	16.70%	2.34%	-29.50%	-6.57%	19.36%	4.04%	4.76%	3.22%
UK Local Authority Securities	3.46%	1.48%	4.19%	1.21%	0.50%	2.34%	1.22%	-1.72%	-6.62%	-0.87%	-0.06%	0.21%
UK Public Corporation Securities												
Company Securities:												
Domestic Ordinary Shares	53.46%	50.43%	44.38%	37.18%	36.82%	53.47%	67.75%	77.00%	77.99%	71.43%	50.51%	16.01%
Overseas Ordinary Shares												2.78%
TOTAL	53.46%	50.43%	44.38%	37.18%	36.82%	53.47%	67.75%	77.00%	76.96%	71.43%	50.51%	18.79%
Debentures												
Preference Shares												
TOTAL	15.69%	11.59%	26.67%	28.82%	21.73%	14.47%	29.50%	5.10%	-1.67%	0.75%	1.23%	1.04%
Authorised Unit Trust Units												
Overseas government etc securities	-0.13%	-0.62%	-2.03%	-0.88%	0.70%	-0.87%	-0.49%	-0.54%	-0.39%	-0.15%	-0.09%	-0.09%
LAMIT...												
Domestic Loans and Mortgages	17.55%	16.40%	11.48%	13.53%	-1.91%	2.51%	-0.49%	-10.69%	1.08%	-2.02%	1.93%	-0.99%
Overseas Loans and Mortgages												
TOTAL	17.55%	16.40%	11.48%	13.53%	-1.91%	2.51%	-0.49%	-10.69%	1.08%	-2.02%	1.93%	-0.99%
Property Unit Trust Units							3.24%	1.67%	0.05%	1.30%	5.80%	2.61%
Land, Property, Ground rent	12.37%	19.85%	19.50%	23.10%	28.67%	23.57%	29.82%	21.24%	14.46%	12.90%	34.30%	32.07%
Other	0.13%		-0.24%	0.77%	0.40%	1.30%	-0.16%	-0.05%	0.54%	0.24%	-0.04%	0.77%
TOTAL OF INVESTMENTS	76	80	84	86	103	114	124	174	214	291	454	331
Total Current Assets	-0.40%	1.23%	-0.12%	5.17%	-3.62%	1.99%	1.22%	14.57%	-4.80%	12.39%	11.45%	32.52%
Short-term Liabilities												0.52%
Long-term Liabilities						-1.13%	-2.11%				-9.78%	8.61%
TOTAL NET INVESTMENT	75	81	84	91	99	115	123	204	204	332	462	575

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
British government and government-guaranteed securities:												
<5 years*	6.33%	-4.40%	-1.09%	1.91%	1.48%	-1.90%	0.04%	1.02%	4 81%	3.41%	-7.23%	1.63%
5 -15 years	5.74%	10.97%	14.40%	8.82%	-6.57%	7.39%	-1.29%	6.64%	17.72%	8.14%	39.79%	-8.98%
15 + years	20.98%	18.41%	15.79%	13.34%	41.13%	18.16%	9.02%	9.96%	6.85%	7.78%	-7.10%	5.17%
Index-Linked Treasury Stock								12.48%	11.16%	9.60%	8.73%	13.42%
TOTAL	33.05%	24.98%	29.10%	24.06%	36.04%	23.66%	29.91%	30.10%	40.53%	28.92%	34.19%	11.25%
UK Local Authority Securities	3.42%	9.66%	0.50%	-0.29%	1.50%	0.63%	-0.04%	0.97%	0.33%	0.05%	0.71%	0.09%
UK Public Corporation Securities										0.18%	0.09%	
Company Securities:												
Domestic Ordinary Shares	30.17%	33.83%	43.00%	25.01%	26.51%	33.03%	26.15%	18.33%	16.97%	35.38%	51.26%	28.53%
Overseas Ordinary Shares	3.25%	3.97%	6.89%	9.56%	7.72%	18.99%	16.10%	15.89%	10.87%	-4.37%	24.17%	20.95%
TOTAL	33.42%	37.80%	49.89%	34.56%	34.23%	52.02%	42.25%	34.22%	27.83%	31.01%	75.43%	49.48%
Debentures												
Preference Shares												
TOTAL	1.98%	0.53%	-1.18%	-0.63%	0.18%	1.23%	1.64%	3.32%	1.42%	-0.23%	3.00%	7.35%
Authorised Unit Trust Units	-0.05%	0.77%	0.18%	0.47%	0.39%	0.40%	0.09%	0.53%	0.42%	0.50%	0.40%	-0.63%
Overseas government etc securities	0.70%	-0.32%	0.12%	0.53%	0.56%	1.17%	0.78%	4.83%	1.38%	-2.64%	5.21%	8.39%
LAMIT...												
Domestic Loans and Mortgages	-3.15%	1.59%	-0.79%	5.17%	-0.41%	-5.36%	0.82%	-0.89%	0.25%	0.55%	0.09%	-0.18%
Overseas Loans and Mortgages	1.26%	0.40%		0.14%		0.05%	0.43%	0.49%	0.38%		-0.31%	
TOTAL	-1.89%	1.99%	-0.79%	5.31%	-0.41%	-5.31%	1.25%	-0.40%	0.63%	0.55%	-0.22%	-0.18%
Property Unit Trust Units	1.10%	1.59%	2.90%	1.15%	1.27%	0.98%	-0.04%	-1.11%	-0.96%	-0.41%	-0.84%	-0.14%
Land, Property, Ground rent	20.49%	19.90%	20.50%	24.60%	13.68%	25.06%	13.55%	12.97%	8.78%	9.91%	5.21%	5.17%
Other	0.28%	1.31%	2.30%	3.52%	6.43%	2.97%	4.06%	5.62%	2.13%	4.23%	-4.90%	-1.50%
TOTAL OF INVESTMENTS	796	1,233	1,251	1,358	1,789	1,920	2,165	2,057	1,974	1,585	2,681	1,748
Total Current Assets	13.78%	3.48%	-0.81%	5.17%	7.27%	-7.58%	6.43%	6.77%	16.76%	29.24%	-15.84%	15.83%
Short-term Liabilities	-2.02%	1.37%	1.28%	-0.96%	-1.10%	0.89%	-1.42%	1.11%	1.13%	-0.95%	0.22%	0.86%
Long-term Liabilities	-3.22%	-3.15%	1.87%	-1.74%	3.25%	2.00%	0.43%	0.58%			0.04%	0.18%
TOTAL NET INVESTMENT	861	1,256	1,208	1,455	1,906	1,868	2,317	2,259	2,393	2,199	2,267	2,205

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AGGREGATE PENSION FUNDS: ANNUAL NET ACQUISITIONS

(£ millions)

	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
British government and government-guaranteed securities:																								
<5 years						-43.7	-30.7	11.9	16.0	14.3	-25.6	62.3	118.8	-177.8	-1.6	-39.0	69.7	209.6	68	85	344	168	355	-151
5 -15 years						-25.0	-2.9	33.9	-35.6	10.2	69.2	111.3	46.5	272.8	286.4	263.5	-103.3	423.7	216	-5	407	590	845	-975
15 + years						82.2	29.8	-40.3	287.2	-6.6	143.8	-84.9	765.4	1,080.6	838.7	1,087.4	2,467.5	1,869.3	950	557	1,040	853	1,560	1,242
Index-Linked Treasury Stock																			1,359	725	913	603	699	700
TOTAL	-14.9	4.3	55.1	33.8	69.4	13.5	3.8	-18.3	267.6	17.9	187.4	88.7	930.7	1,175.6	1,123.5	1,311.9	2,294.5	2,083.4	2,025	1,362	2,704	2,214	2,749	816
UK Local Authority Securities	20.6	5.9	29.8	5.9	-2.8	6.0	-2.1	-24.1	-61.4	-20.0	1.9	7.3	-0.8	97.3	-1.2	-28.9	4 4	-12.6	-4	16	7	-6	3	-5
UK Public Corporation Securities																					-1	-3	5	
Company Securities:																								
Domestic Ordinary Shares	208.8	208.2	174.7	192.0	196.6	280.9	219.5	392.5	411.7	597.6	413.4	223.7	1,051.2	1,020.1	1,317.9	1,053.7	1,532.5	2,174.7	2,004	2,099	1,613	2,666	3,553	2,945
Overseas Ordinary Shares												20.0	135.5	93.8	169.3	305.5	442.1	1,387.2	1,672	1,888	1,303	318	2,063	2,257
TOTAL	208.8	208.2	174.7	192.0	196.6	280.9	219.5	392.5	411.7	597.6	413.4	243.7	1,186.7	1,113.9	1,487.2	1,359.2	1,974.6	3,561.9	3,676	3,987	2,916	2,984	5,616	5,202
Debentures	74.9	59.1	127.2	147.8	94.9	61.5	143.0	78.4	57.5	12.4	28.9	-31.0	-11.3	-13.5	-72.2	-36.9	-21.9							
Preference Shares	5.1	2.3	-7.3	-3.5	-4.0	-11.7	3.8	4.4	-0.5	3.1	6.9	-2.7	16.6	7.8	4.4	-3.1	0.7							
TOTAL	80.0	61.4	119.9	144.3	90.9	49.8	146.8	82.8	57.0	15.5	35.8	-33.7	5.3	-5.7	-67.8	-51.1	-16.6	41.4	107	195	119	193	271	445
Authorised Unit Trust Units													-0.4	10.4	9.2	17.9	19.0	24.8	21	54	91	38	27	
Overseas government etc securities	-1.2	-5.6	-5.5	-6.2	4.9	1.4	-1.9	-4.4	-5.4	-3.9	-1.1	-6.3	17.9	-10.0	-4.9	51.8	3.5	35.3	47	224	-35	144	255	94
LAMIT...	12.8	12.3	10.5	13.8	11.3	8.6	1.7	8.1	11.2	12.5	4.3	-26.7	-8.0	0.6	5.5	-15.2	5.4	8.7	10	9	12	10	3	7
Domestic Loans and Mortgages	15.4	19.1	18.7	15.6	-1.1	2.4	2.2	-19.6	2.7	-11.8	39.8	0.3	-26.0	0.3	-8.3	70.2	-6.9	-135.8	21	-9	-9	12	-30	-14
Overseas Loans and Mortgages													10.8	5.0	1.0	49.3	8.5	5.8	14	13	10	-1	-8	
TOTAL	15.4	19.1	18.7	15.6	-1.1	2.4	2.2	-19.6	2.7	-11.8	39.8	0.3	-15.2	5.3	-7.3	119.5	1.6	-130.0	35	4	1	11	-38	-14
Property Unit Trust Units						25.2	24.9	22.2	31.5	42.3	44.2	16.5	81.4	51.3	134.6	51.0	78.8	60.1	95	13	-3	37	-21	-104
Land, Property, Ground rent	9.3	16.1	16.3	21.0	79.1	90.4	106.4	97.4	82.8	111.6	247.6	305.1	342.1	519.8	538.1	561.3	535.9	907.5	843	797	569	678	489	306
Other	18.7	16.1	23.3	27.7	1.6	4.5	6.8	1.9	5.7	4.9	3.9	12.4	10.1	23.8	63.2	89.3	196.4	124.5	318	343	149	72	-320	46
TOTAL OF INVESTMENTS	349.5	337.8	442.8	447.9	449.9	479.9	500.5	538.5	803.4	766.6	977.2	607.3	2,549.8	2,982.3	3,270.1	3,466.7	5,097.5	6,705.0	7,173	7,004	6,529	6,372	9,039	6,793
Total Short-Term Assets	2.4	49.2	-10.8	24.7	-17.4	32.3	13.3	208.1	-160.2	337.3	366.9	997.9	-457.8	-9.4	-6.9	362.7	446.1	-333.8	237	358	1,367	1,759	-271	2,495
Net Balances with Stockbrokers												4.1	-8.9	6.5	-86.3	70.0	-58.2	21.3	63	2	25	-15	111	-193
Short-term Liabilities										-148.4	26.6	90.8	-96.8	31.8	26.0	-72.8	24.7	2.7	-32	-4	-32	-146	154	84
Long-term Liabilities						-1.3	-2.6				-45.2	49.5	-27.7	-39.6	-0.1	-92.6	70.7	58.8	-2	18	23	3	18	6
TOTAL NET INVESTMENT	351.9	387.0	432.0	472.6	432.5	510.9	511.2	746.6	643.2	955.5	1,325.5	1,749.6	1,958.6	2,971.6	3,202.8	3,734.0	5,580.8	6,454.0	7,439	7,378	7,912	7,973	9,051	8,185

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AGGREGATE PENSION FUNDS: ANNUAL NET ACQUISITIONS

(percentages)

	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
British government and government-guaranteed securities:			-									
<5 years"						-8.55%	-6.01%	-1.59%	2.49%	1.50%	-1.93%	3.56%
5 -15 years						-4.89%	-0.57%	4.54%	-5.53%	1.07%	5.22%	6.36%
15 + years						16.09%	5.83%	5.40%	44.65%	-0.69%	10.85%	-4.85%
Index-Linked Treasury Stock												
TOTAL	-4.23%	1.11%	12.75%	7.15%	16.05%	2.64%	-0.74%	-2.45%	41.60%	1.87%	14.14%	5.07%
UK Local Authority Securities	5.85%	1.52%	6.90%	1.25%	-0.65%	1.17%	-0.41%	-3.23%	9.55%	-2.09%	0.14%	0.42%
UK Public Corporation Securities												
Company Securities:												
Domestic Ordinary Shares	59.34%	53.80%	40.44%	40.63%	45.46%	54.98%	42.94%	52.57%	64.01%	62.54%	31.19%	12.79%
Overseas Ordinary Shares												1.14%
TOTAL	59.34%	53.80%	40.44%	40.63%	45.46%	54.98%	42.94%	52.57%	61.02%	62.54%	31.19%	13.93%
Debentures												
Preference Shares												
TOTAL	22.73%	15.87%	27.75%	30.53%	21.02%	9.75%	28.72%	11.09%	8.86%	1.62%	2.70%	-1.93%
Authorised Unit Trust Units												
Overseas government etc securities	-0.34%	-1.45%	-1.27%	-1.31%	1.13%	-0.27%	-0.37%	-0.59%	-0.84%	-0.41%	-0.08%	-0.36%
LAMIT...	3.64%	3.18%	2.43%	2.92%	2.61%	1.68%	0.33%	1.08%	1.74%	1.31%	0.32%	-1.53%
Domestic Loans and Mortgages	4.38%	4.94%	4.33%	3.30%	-0.25%	0.47%	0.43%	-2.63%	0.42%	-1.23%	3.00%	0.02%
Overseas Loans and Mortgages				3.30%								
TOTAL	4.38%	4.94%	4.33%	3.30%	-0.25%	0.47%	0.43%	-2.63%	0.42%	-1.23%	3.00%	0.02%
Property Unit Trust Units						4.93%	4.87%	2.97%	4.90%	4.43%	3.33%	0.94%
Land, Property, Groundrent	2.64%	4.16%	3.77%	4.44%	18.29%	17.69%	20.81%	13.05%	12.87%	11.68%	18.68%	17.44%
Other	5.31%	4.16%	5.39%	5.86%	0.37%	0.88%	1.33%	0.25%	0.89%	0.51%	0.29%	0.71%
TOTAL OF INVESTMENTS	350	338	443	448	450	480	500	539	803	767	977	607
Total Current Assets	0.68%	12.71%	-2.50%	5.23%	-4.02%	6.32%	2.60%	27.87%	-24.91%	35.30%	27.68%	57.04%
Short-term Liabilities										-15.53%	2.01%	5.19%
Long-term Liabilities						-0.25%	-0.51%				-3.41%	2.83%
TOTAL NET INVESTMENT	352	387	432	473	433	511	511	747	643	955	1,326	1,750

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
British government and government-guaranteed securities:												
<5 years"	6.07%	-5.98%	-0.05%	-1.04%	-1.25%	-3.25%	-0.91%	1.15%	4.35%	2.11%	-3.92%	-1.64%
5 -15 years	2.37%	9.18%	8.94%	7.06%	-1.85%	6.56%	-2.90%	-0.07%	5.14%	7.40%	9.34%	-10.62%
15 + years	39.08%	36.36%	26.19%	29.12%	44.21%	28.96%	12.77%	7.55%	13.14%	10.70%	17 24%	13.52%
Index-Linked Treasury Stock								9.83%	11.54%	7.56%	7.72%	7.62%
TOTAL	47.52%	39.56%	35.08%	35.13%	41.11%	32.28%	27.22%	18.46%	34.18%	27.77%	30.37%	8.88%
UK Local Authority Securities	-0.04%	3.27%	-0.04%	-0.77%	0.08%	0.20%	0.05%	0.22%	0.09%	-0.08%	0.03%	-0.05%
UK Public Corporation Securities									-0.01%	-0.04%	0.06%	
Company Securities:												
Domestic Ordinary Shares	53.67%	34.33%	41.15%	28.22%	27.46%	33.70%	26.94%	28.45%	20.39%	33.44%	39.26%	32.06%
Overseas Ordinary Shares	6.92%	3.16%	5.29%	8.18%	7.92%	21.49%	22.48%	25.59%	16.47%	3.99%	22.79%	24.57%
TOTAL	60.59%	37.48%	46.43%	36.40%	35.38%	55.19%	49.42%	54.04%	36.86%	37.43%	62.05%	56.64%
Debentures												
Preference Shares												
TOTAL	0.27%	-0.19%	-2.12%	-1.37%	-0.30%	0.64%	1.44%	2.64%	1.50%	2.42%	2.99%	4.84%
Authorised Unit Trust Units	-0.02%	0.35%	0.29%	0.48%	0.34%	0.38%	0.28%	0.73%	1.15%	0.48%	0.30%	
Overseas government etc securities	0.91%	-0.34%	-0.15%	1.39%	0.06%	0.55%	0.63%	3.04%	-0.44%	1.81%	2.82%	1.02%
LAMIT...	-0.41%	0.02%	0.17%	-0.41%	0.10%	0.13%	0.13%	0.12%	0.15%	0.13%	0.03%	0.08%
Domestic Loans and Mortgages	-1.33%	0.01%	-0.26%	1.88%	-0.12%	-2.10%	0.28%	-0.12%	-0.11%	0.15%	-0.33%	-0.15%
Overseas Loans and Mortgages	0.55%	0.17%	0.03%	1.32%	0.15%	0.09%	0.19%	0.18%	0.13%	-0.01%	-0.09%	
TOTAL	-0.78%	0.18%	-0.23%	3.20%	0.03%	-2.01%	0.47%	0.05%	0.01%	0.14%	-0.42%	-0.15%
Property Unit Trust Units	4.16%	1.73%	4.20%	1.37%	1.41%	0.93%	1.28%	0.18%	-0.04%	0.46%	-0.23%	-1.13%
Land, Property, Groundrent	17.47%	17.49%	16.80%	15.03%	9.60%	14.06%	11.33%	10.80%	7.19%	8.50%	5.40%	3.33%
Other	0.52%	0.80%	1.66%	2.39%	3.52%	1.93%	4.27%	4.65%	1.88%	0.90%	-3.54%	0.50%
TOTAL OF INVESTMENTS	2,550	2,982	3,270	3,467	5,098	6,705	7,173	7,004	6,529	6,372	9,039	6,793
Total Current Assets	-23.37%	-0.32%	-0.22%	9.71%	7.99%	-5.17%	3.19%	4.85%	17.28%	22.06%	-2.99%	27.16%
Short-term Liabilities	-4.94%	1.07%	0.81%	-1.95%	0.44%	0.04%	-0.43%	-0.05%	-0.40%	-1.83%	1.70%	0.91%
Long-term Liabilities	-1.41%	-1.33%		-2.48%	1.27%	0.91%	-0.03%	0.24%	0.29%	0.04%	0.20%	0.07%
TOTAL NET INVESTMENT	1,959	2,972	3,203	3,734	5,581	6,454	7,439	7,378	7,912	7,973	9,051	9,185