MODELLING PENSION FUND ASSET ALLOCATION IN THE UK:

AN EMPIRICAL ANALYSIS

Submitted by

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To my best friends, the greatest gifts and sources of my happiness, Prince Thabo (my son) Caeser (my father) and Jester (my late mother), I dedicate this thesis for collectively making it worthwhile, and hope that they all ensure that all other preoccupations and sacrifices are kept in perspective. I wish to thank them for their patience and encouragement during the brief but tumultuous years in London.

The errors and omissions that remain despite all the expert guidance are, naturally, my sole responsibility.

ABSTRACT

In this thesis I examine UK pension fund asset allocation and stock selection processes, with the main aim of identifying portfolio bias determinants and particularly to investigate excessive home asset, home equity and large-cap investment. The second motive is to analyse the management structure influence on the above phenomena. The third and final motive is to explore for any significance of differences in the financial characteristics between the fund invested stocks and those they do not disclose investing in. The research reflects on risk, portfolio monitoring capabilities, costs and sentimentality; traits that impact on investment attractiveness. The overconfidence premium imbedded within the popular stocks reduces potential returns.

Such portfolio construction practices are interesting for various reasons. First, extensive home bias has been comprehensively documented. It is also widely reported that while funds concentrate in large fund managers, stock selection is large-cap biased. It is also widely acknowledged that diversification eliminates risk and enhances return and that intensely held stocks under-perform. In this study, I use data of about 2000 UK pension funds and analyse the asset allocation of each fund over the period 1994 to 2000. At the aggregate level, I find significant UK bias, dominated by extreme large-cap UK equity investment. I find slightly significant differences between the financial characteristics of fund invested and stocks in which they do not disclose investing. However, I doubt whether the bias levels enjoyed by the former are warranted. I therefore, hypothesize that fund asset allocation and stock selection processes are not entirely driven by portfolio efficiency requirements in the Modern Portfolio Theory context.

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ABBREVIATIONS

1. BEME – Book Value of Equity Divided By Market Value of Equity
2. CAPS – Combined Actuarial Performance Service
3. CFP – Cash Flow Yield
4. DAA – Dynamic Asset Allocation
5. DB – Defined Benefit Pension Scheme
6. DC – Defined Contribution Pension Scheme
7. DER – Debt Equity Ratio
8. DIV – Cash Dividends
9. DPR – Dividend Pay Out Ratio
10. DY – Dividend Yield
11. EP – Earnings Yield
12. EPS – Earnings Per Share
13. FCF – Free Cash Flow
14. ISAS – Individual Savings Accounts
15. LSPD – London Share Price Database
16. ME – Market Value of Equity Capital
17. MFR – Minimum Funding Requirement
18. MPT – Modern Portfolio Theory
19. NAPFD – National Association of Pension Funds Database
20. NCD – Negotiable Certificate of Deposit
21. NITA – Net Investment-to-Total Book Assets
22. PER – Price Earnings Ratio

23. PEPS – Personal Equity Plans

24. PFTA - Pension Funds and Their Advisers Database

25. RBOC – Regional Bell Operating Company

26. ROCE – Return on Capital Employed

27. ROE – Return on Equity

28. ROSA – Return on Sales

29. ROTA – Return on Total Assets

30. SIP – Statement of Investment Principles

31. TAA – Tactical Asset Allocation

32. TB – Treasury Bill

33. TESSAS – Tax Exempt Special Savings Accounts

34. WBM – World Bond Market

35. WEM – World Equity Market

36. WMP – World Market Portfolio

37. WMUF – WM Universe of Funds

CHAPTER ONE

INTRODUCTION AND RESEARCH MOTIVATION

CHAPTER 1: INTRODUCTION AND RESEARCH MOTIVATION

1. Introduction.

The purpose of this thesis is to study the asset allocation of pension funds in the UK. Although the topic of asset allocation is widely analysed in the previous literature, I focus specifically on pension funds, the largest investor category in the UK markets, to assert the extent to which these funds display the biases document in previous studies namely equity and home bias and whether the management structure impacts on their asset allocation. In this section, I first start by providing a brief overview of the review of the literature on the various issues involved in the asset allocation. I will then present the main research questions and motivations, the contribution of my research and a summary of the remaining chapters.

1.1. Asset Management and Investment Styles

Brinson, Hood and Beebower (1986) study asset management and attribute performance to asset allocation. Following this landmark study, numerous studies have appeared on the investment scene. Recently, Brinson, Singer and Beebower 1991, Hansel, Ezra and Ilkiw 1991 and Ibbotson and Kaplan 2000, have singled out asset allocation as the most fundamental explanatory factor for performance. Further studies, Leibowitz and Kogelman (1991), Odier and Solnik (1993), Cooper and Kaplanis (1995), Minns (1980), Coval and Moskowitz (1996) and Kang and Stulz (1997), extend the argument to include three investment anomalies; home, equity and large-cap bias. Further, Hearth and Zaima (1998), argue that asset type (equity, bonds, etc.) explains portfolio structure. Bloommestein (1998) observes that asset management (the process of managing money for investors in order to maximise financial return) has evolved to be the major activity

within the financial services sector. This has seen an explosive growth in investment styles and asset management structures (in-house, external, specialist or balanced).

According to Downe and Goodman (2003) investment style defines the approach fund managers employ to select individual stocks. For example, capital growth managers search for stocks that exhibit rapid, sustainable revenues and earnings growth patterns, while value managers are biased towards income generating stocks and aim to preserving capital over the longer term and therefore, search for undervalued stocks. Macedo (1995) and Bernstein (1995) view value investing as buying out of favour stocks relative to book value, earnings or dividends. Asset management structures encompass specific investment managements structures of the fund management team overseeing the investment process which comprises a blend of investment styles tailored to the investors' investment mandate.

Another related issue debated in the literature is the link between the asset allocation and types of management of the funds. In-house management entails directly engaging the necessary skills-set and enables the sponsor asset control and flexibility in switching and rotation. This structure is the domain of, though not always exclusively for, large funds, mainly because of the costs involved. Small funds whose sponsors are involved in financial services do adopt in-house management as well. External management is by no means the most common approach with funds acceding control to an external manager who assumes partial discretion in investment matters. While the small-to-medium funds populate the external structure, a small proportion of the smallest funds prefer insured management, through pooled unitised insurance funds. Management structure returns

can be differentiated both by geographic region (e.g., Far East versus Europe), size (e.g., small versus large-caps) and style (value versus growth) or further partitioned by whether managers are balanced or specialist. Previous studies (e.g., Haight (1980), Clowes (1979), Hager and Lever (1989) and PDFM 1997)), provide incontestable empirical evidence on investment style existence and external and balanced structure dominance. Conceptually, the latter means that the manager is skilled in all aspects of investment and can optimally execute asset allocation and stock selection. Babcock (1978) indicates that it is only the largest institutions with teams for each specialist area that can claim a balanced status. On the other hand, the specialist structure acknowledges the inherent difficulty for being expert in both asset allocation and stock selection and appoints experts with separate mandates for asset exposure and stock selection. Those investors uncomfortable with these structures usually capture style benefits through middle-of-the-road structures (part-in-house-part-external, part-insured-part-managed, and part-balanced-part-specialist) as characterised in Hager and Lever (1989) and PDFM (1997), which split assets between internal and external teams. Structure splitting has been researched, though, on a minuscule scale, to the extent that there are no robust results on its impact on asset allocation.

While previous studies test management structure influence on asset allocation, there is still no consensus on the results. For example, Clowes (1979) and Haight (1980) argue that in-house management by large public funds is bond-passive style biased, Paustian (1985) and Baker (1984) assert that bonds are being actively managed on an external basis, with in-house equity being reduced. Furthermore, while explanations for size and

value effects tend to divide researchers, (Chan, Hamao and Lakonishok (1991), Cook and Rozeff (1984) and Fama and French (1992)) almost all of them agree that significant excess returns can be generated through style-based strategies e.g., passive, active, balanced, value, growth, small-cap and large-cap, among others. Hinging much on forecasting ability and seeking out-performance, the active strategy believes that markets are semi-strong efficient and exploits short-term market anomalies through either market timing or stock selection with frequent portfolio reviews. The passive strategy believes that markets are efficient and that all stocks are correctly valued, or at least that investors can not discover undervalued stocks before everyone else does. A strong belief in market efficiency implies that any portfolio will provide the appropriate return based on its risk level. Bodie, Kane and Marcus (1986) argue that the passive strategy is less expensive precisely because it requires minimal managerial effort and for this, generates average performance. The other popular style is associated with size (market capitalisation) as typified by Bhushan (1989), Reinganum (1983) and Rosenberg (1985) who observe that small-caps are structurally differently from large-caps, have greater specific and total volatility, higher betas, are thinly traded and suffer frequent and significant mis-pricing anomalies. Freeman (1987) and Brown, Richardson and Schwager (1987) observe that size determines the aggregate supply of investment managers' services because of the high value of potential transactions business they offer. Size also affects the cost of service provision through its direct influence on the cost of information acquisition.

1.2. **Research Question and Motivation**

The main research question of this thesis is to investigate the existence and extent of home bias, excessive equity allocation and whether management structures impact on UK

occupational pension fund asset allocation. To disentangle the relevant effects and present a clearer distinction between these anomalies, I employ disaggregated data in my tests. This is because previous studies (Blake, Lehman and Timmerman (1998, 1999), Coval and Moskowitz (2000), Brinson et al (1986) and Ibbotson and Kaplan (2000)) employ aggregated data and advance various conclusions to explain these anomalies without probing their existence independent of other portfolio constituents. For example, while Blake, Lehman and Timmerman (1998, 1999) and Coval and Moskowitz (2000), report intense home bias, and indicate that it is subsumed by equity bias, Brinson et al (1986) and Ibbotson and Kaplan (2000) indicate a strong link between asset allocation, market timing, stock selection and performance. Further studies, Jahnke (1997), Surz et al (1999) and Hansel et al (1991), are critical of the Brinson et al (1986) method, but they do not dismiss asset allocation significance as a determinant of performance. The methods employed above have resulted in numerous academic disagreements concerning the existence, causes and extent of home bias. Home bias is reported without indicating which assets drive it. Furthermore, since at aggregate level, all funds are considered to face the same investment constraints, such assumptions, even if they are correct, are likely to be biased as they ignore the different risk investment mandates of different funds and the different purposes different assets serve in a portfolio. Similarly, the accessible asset universe is a situation specific variable, and as such different funds should not be treated as having the same accessibility to the different assets classes.

Management structure and investment style analysis have other important applications since interest in them is part of a growing need by investors to better understand manager

performance and specialisation. Sharpe (1992) observes that investment style (i.e., growth, value, large-cap, small-cap) explains 98% of performance, and that on average, 90% of return variability is attributable to asset class exposure and the remainder to stock selection. Recent evidence, Bauman, Conover and Miller (1998), on out-performance of large and growth stocks sheds some light to another aspect of style investing: structure and style drift, to which Fama (1998), Ball and Kothari (1989), Bhardwaj and Brooks (1993), Ferson, Kandel and Stambaugh (1987), and Foerster and Porter (1992), argue that should be solved by style switching to maintain or enhance performance. Despite the above body of evidence, management structure analysis remains a necessity in the UK as numerous queries still remain unanswered and few results are considered puzzling as it is still not clear whether style works in bear markets and whether anomalies, e.g., size are sample period dependent.

1.3. **The Objectives, Rationale and Contributions of the Research**

The decision to analyse the UK pension fund asset allocation and performance instead of other institutional investors, e.g., mutual funds, insurance or banking sectors or the US market, is motivated by the following arguments. First, of the three largest institutional sectors (banking, insurance and pension funds) in the UK, pension funds account for above 34% of equity (London Stock Exchange 1995). Despite this significant share of the UK equity market, there is still a gap in our appreciation of management structure influence on UK pension fund asset allocation. Furthermore, while providing strong results in the UK experiment, recent studies, e.g., Timmerman and Blake (1999), concentrate on home bias, and foreign equity and handicap their studies by employing a small sample of 247 large UK funds. Other related studies, e.g., Davies (1988), classify

the fund sector as a sub-part of the insurance sector or focus entirely on the corporate governance aspect, e.g., Faccio and Lasfer (2000). This study fills this apparent gap and in the process, enhances our understanding of:

(a) Funds as independent institutional investors by focussing on their asset allocation,

(b)The influence of fund management structures on the asset allocation decision and,

(c) Stock financial characteristics as determinants of fund investment.

Second, the uniqueness of the UK institutional framework, e.g., the large pension fund holdings, their long-term investments and their lack of monitoring (e.g., Faccio and Lasfer 2000) offers a further opportunity to investigate this sector. I have avoided the mutual fund, banking and insurance or US markets in a bid to eliminate the problem of developing a hypothesis and testing it on the same data. For example, the dilemma of testing the hypothesis on the other leading markets, e.g., the US and Japan, is that most of the hypothesis or variations thereof have been extensively tested using popular databases like CRSP and COMPUSTAT. Furthermore, prominent studies on institutional investment and stock financial characteristics focus on Japan and the US, e.g., Arbel and Strebel (1983), Hessel and Norman (1992) and Cleary (1999), for the US and Hoshi, Kashyap and Scharfstein (1991), for Japan. In the UK, the WM Universe of Funds (WMUF), is the most extensively utilised database in performance analysis, e.g., Brown, Draper and Mckenzie (1997) and Blake, Lehman and Timmerman (1998a,b). However, its major flaw is its aggregated data, which does not permit individual shareholdings analysis. To avoid this drawback, this study uses an admixture of the Pension Funds and Their Advisers (PFTA), the National Association of Pension Funds Member List (NAPFD) and the Extel Financial Company Analysis database.

Third, the different institutional and regulatory structures, e.g., the 1974 Employee Retirement Income Security Act, (ERISA, US) and the 1995 Pension Fund Act (UK) do not only make this experiment unique, but relevant and essential. US results are not likely to apply in the UK because they are based on a different regulatory framework and are achieved under a different economic system and different financial market conditions. For example, the World Resources Institute (2003) indicates that the US pension fund industry is highly regulated and that ERISA is too prescriptive with specific requirements for guaranteed income contract investments which reduce the proportion of equity based investments. Further, some results may be achieved under bear market and tight monetary conditions. Fourth, there is a limited amount of related research in the UK, with the quoted studies focussing either mainly on performance evaluation or implying asset allocation utilising the WMUF database. Fourth, the UK pension fund industry is a very important market-player, being the largest single institutional shareholder of the UK listed equities, (LSE 1995). Further research on this unique institutional investor with the assembled data set would, by itself, constitute a useful contribution to the appreciation of asset management. Furthermore, to correct for the observed asset bias hypothesis flaws, the main research design of the thesis mitigates sample selection bias by testing individual fund shareholdings, both young and mature and small and large funds. On performance and investment flows, the main research design covers a significantly wide-range of stocks, the small and large-cap, and a long sample period. Such diversity is important, since it concentrates on potential cross-sectional differences in investment. Furthermore, a large sample ensures that the results are not period or size specific, an observable weakness on the related studies, e.g., Minns (1980) and Brown et al (1997).

However, given the data availability constraints, this study incorporates an assumption that funds investing in the PFTA-NAPFD sample for 1997-98 have been investing in the sample stocks since 1984.

The empirical contribution of the thesis is separated into two major parts. In the first part, I discuss market anomalies. I record asset allocation trends in the UK, with the major objective being the evaluation and comparison of the asset allocation features of funds and the examination of whether there is any concentration at asset class level. I also examine whether home bias remains (or becomes) significant after controlling for the prevalence of extreme equity investment among funds. Another major objective of the thesis is to test the validity of the management structure hypothesis for explaining the differences in concentration between equities and other assets and between home and foreign stocks. The second part of the thesis focuses on size-biased asset allocation by funds. Existing literature, e.g., Minns (1980), recognises large-cap bias by the UK funds. I re-examine this hypothesis using a new sample and investigate another aspect of bias: the performance of the fund invested stocks compared with stocks in which funds do not disclose investment[1]. I test whether funds-invested stocks possess different financial characteristics from those in which they do not disclose investment. Prior empirical evidence, Cleary (1999) and Hessel and Norman (1992) indicates irrefutable evidence symptomatic of financial characteristic differences. Arbel et al (1983b) indicate that stocks in which investors do not invest exhibit superior financial status compared with strongly-held stocks. Over a 10-year period, 1970-79, stocks in which investors do not

[1] Stocks in which funds do not disclose investment are regarded as stocks in which funds do not invest. However, this may mask reality as funds only disclose a certain number of stocks in which they invest, and

invest generate excess statistically significant returns (16.4% versus 9.4%) compared with strongly-held stocks. In summary, the main objectives of the thesis are:

1. Following Brinson, et al (1986, 1991), Ibbotson and Kaplan (2000), Hansel et al (1991), and Blake (1995), I examine the asset allocation process and analyse the fundamental characteristics of assets desirable for pension funds, (Chapter 2).
2. In conjunction with Timmerman and Blake (1999), Griffin (1997), Cooper and Kaplanis (1995) and Coval and Moskowitz (1996), I investigate whether asset allocation is biased towards either home or foreign markets, (Chapter 3, Home bias).
3. As in Griffin (1997), Blake et al (1998a,b), and PDFM (1997), I investigate whether asset allocation is biased towards any asset class or market using an approach that allows us to disentangle home bias from extreme equity allocation (Chapter 3, Excess home equity allocation,).
4. Consistent with Haight (1980), Lewis (1979), and Scott (1980), I examine whether management structures influence asset allocation and whether funds concentrate in large fund managers, (Chapter 4).
5. In line with Cleary (1999), Coval and Moskowitz (1996), Falkenstein (1996) and Brennan and Cao (1997), I investigate the existence of large-cap bias and financial characteristic differentials of stocks in which funds do not disclose investment and fund invested stocks, (Chapter 5).

The main theoretical and empirical issues associated with these objectives, the technical tools and methods employed to achieve them, form the basis of all subsequent chapters and are briefly summarised in the following section.

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not their entire portfolios.

1.4. **The Variation and Uniqueness of the Utilised Databases**

An additional contribution of this thesis is in the uniqueness of the database. To test the above hypotheses, I constructed a database from various sources including the PFTA, NAPFD, Extel Financial Company Analysis and the LSPD as presented in **Table 1.1**.

Table 1.1: **Database, Hypothesis and Variable Specification.**

Databse	Hypothesis	Variables	Period
1. Pension Funds & Their Advisers (PFTAD)	1. Domestic Bias 2. Excess Equity Allocation 3. Management Structure Bias	1. Fund Portfolio Holdings	1994 - 2000
2. National Association of Pension Funds (NAPFD)	4. Size Bias	2. Pension Fund Shareholdings	1997 - 2000
3. Extel Company Analysis & 4. London Share Price Database (LSPD)	5. Performance Differential Between Fund Invested & Stocks in Which They Do Not Disclose Investment	3. Financial Ratios 4. Equity Returns	1984 - 2000 1994 - 2000

Stretching from 1994-2000, the 1st database, PFTA provides fund portfolio data including solicitors, trustees, investment management/advice type/name, auditors, actuaries, the performance index and sponsor company business activity. To investigate management structure bias and time series portfolio influence the data sub-set subdivides structure: in-house, external, part-in-house-part-external, insured, part-insured-part-managed, self-insured, external-insured, multi-managed, single-managed, balanced, specialist and part-balanced-part-specialist. The classification's uniqueness is that it gives further structures that are undetectable in any publicised database and are not covered in any previous study and data on portfolio structure by asset class and market origin. Portfolio analysis is indicative of market and asset bias. Even though research, (Davies (1995), Blake (1995), Blake et al (1998a,b), PDFM (1997) and Timmerman and Blake (1999)) agrees on UK fund asset allocation home and equity bias, the likely driving influences behind these trends are not yet clear. Recording such effects is not as important as rationalising their determinants. Moreover, where studies provide evidence of either equity or home bias,

they entangle both of them. This study disentangles them and treats them as independent anomalies. The 2nd data set, the NAPFD, provides financial statement data for a number UK pension funds. The data includes fund name, investment objectives, management structure, asset by geographic location and individual holdings. The shareholdings are given by name either as an absolute amount and/or proportion of the equity portfolio or of the aggregate assets. A number of funds do not however disclose all their holdings. The average holding disclosed is 60.3%, ranging between 55.2% and 100%. The 3rd data set, Extel Financial Company Analysis provides a sufficient coverage of financial data of UK listed stocks, while the 4th data source, LSPD, provides monthly stock returns.

Summary results indicate extreme equity allocation, with a 7-year mean of 72.5% in equity, of which 53.1% comprises the UK equity. While UK equity decreases monotonically from a sample-period high of 55% (1994) to an all-time low of 50.1% (1998), results indicate that pension funds pursue foreign diversification through equity and intensify domestic investment through UK bonds and trusts. Second, pension funds exhibit a high predilection for UK assets, which stand at 77.7% of the portfolio. By size, it is the smallest funds that are more home-biased, with a 7-year mean of around 79% in home assets, compared to 75% for the largest funds. Tests on management structure influence on asset allocation indicate the external structure dominance over emphasised, especially among small funds. Further, the largest funds are concentrated in the part-internal-part-external structure, while small funds whose sponsors are involved in fund management are found in in-house. Generally, UK assets dominate fund portfolios, with in-house management dominating UK asset and real estate bias, while the part-internal-

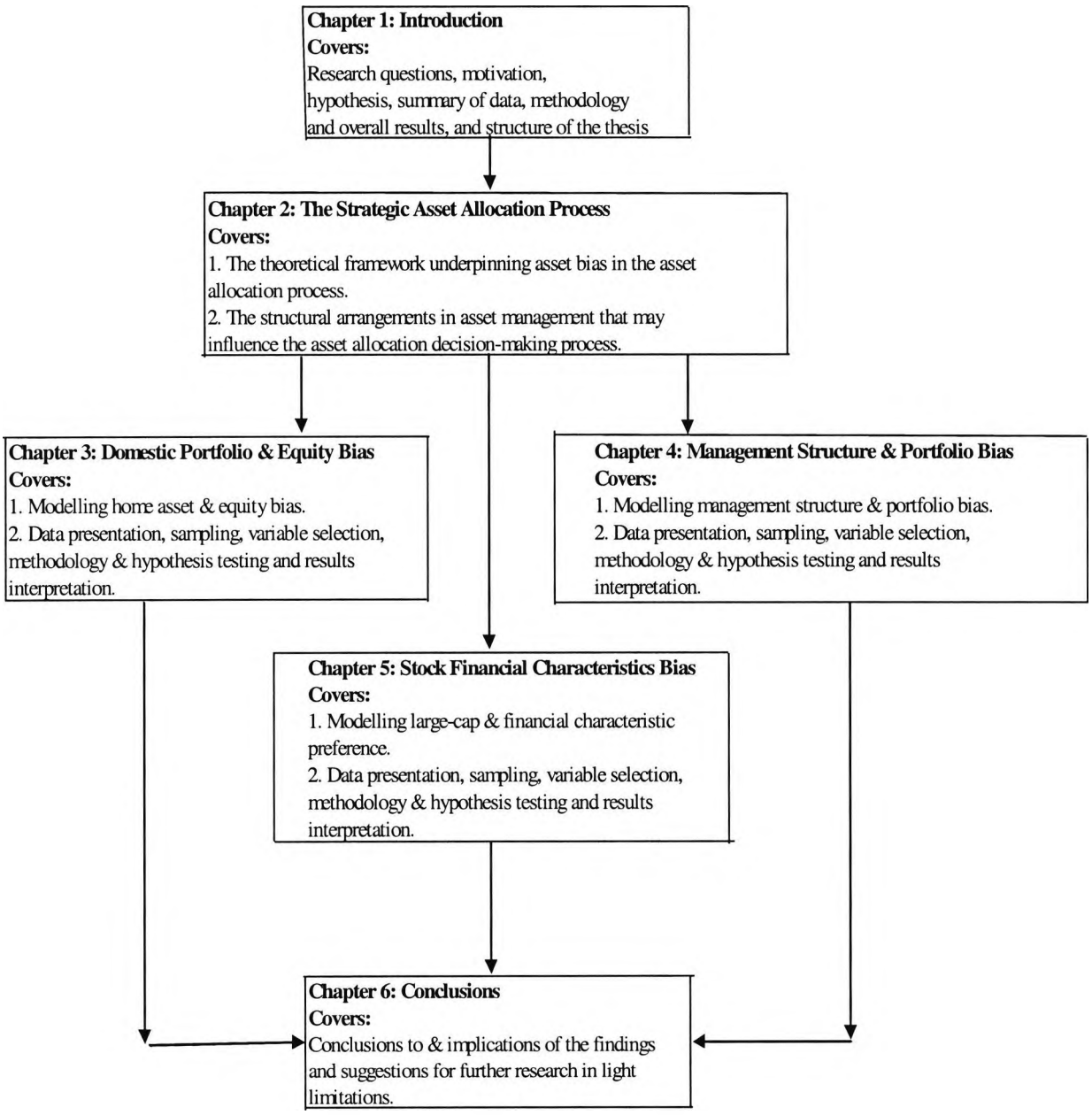
part-external structure dominates in foreign assets, the insured dominates in equity, UK equity and bonds. The results also indicate that while funds concentrate their assets in the large fund managers and mainly the part-balanced-part-specialist fund managers, their proportions of the entire portfolios is lower than fund portfolio components in the smaller fund managers. Tests on the differences in financial status between fund invested stocks and those they do not disclose investing in indicates that while fund invested stocks are large-cap biased, there is a presence of mid-and-small-caps as well, especially those involved in financial services. Results also indicate growth and return variation between stocks in which funds do not indicate investment and the fund-invested stocks. Further, while the fund-invested stocks are predominantly large-caps, stocks in which funds do not indicate investment also contain large-caps, though dominated by small-caps. The results further indicate that there are significant differences between the financial variables of the two samples, but an absence of sample period higher returns for small, or stocks in which funds do not indicate investment as suggested elsewhere. However, stocks in which funds do not indicate investment do at times outperform some levels of intensity of holding and size segments, have higher growth, investment and pay out ratios.

1.5. **The Structure of the Thesis**

This thesis is divided into 6 independent but linked chapters as shown in Figure 1.1. Chapter 2 provides the theoretical framework on asset allocation determinants. Chapters 3-5, are divided into 3 sections to cover the theoretical framework, the data, and methodology, the empirical results and the conclusions. Finally, Chapter 6 provides the

general conclusions and limitations of the thesis. In the remaining part of this section, I provide a brief summary of each chapter.

Figure 1.1: **Thesis Flow and Chapter Structure**



Chapter 3

Chapter 3 tests the hypotheses that UK fund portfolios have excessive equity allocation and are home biased. The 1st section presents a detailed analysis of the empirical

literature on extreme equity allocation and home bias. On home bias, we analyse the aggregated cross-section of fund portfolios and to test for extreme equity allocation, I analyse the portfolios at individual asset class level by market origin. To disentangle the two effects, I present results on both fronts, and emphasise extreme equity investment implications independent of home bias. The regressions for bias determinants indicate time series home bias, slackening UK equity investment and a sluggish shift into UK bonds, meaning that UK bias is not only driven in UK equity.

Chapter 4

Chapter 4 tests the hypotheses that different structures are major asset allocation drivers and generate pressure on portfolio composition. The 1st section presents a detailed analysis of the empirical literature on the diverse structure characteristics and places much emphasis on the distinctions between the structures. However, unlike previous studies, Hager et al (1989) and PDFM (1997), Chapter 4 broadens the analysis further, (**See Appendix 1**) and identifies further structures that have long been ignored or mis-classified. The final split, though not covered here, generates the passive-active strategy, sub-divided into tactical allocation and market timing, etc. The intention is to generate a more detailed and clearer picture of the differences in fund portfolios. The 2nd section presents the hypothesis, data, methodology and results. Regressions are carried to test structure and time series influence on asset bias and the results indicate that UK asset bias and extreme equity allocation are more prevalent in self-insured, in-house, specialist and part-balanced-part-specialist. There is a cross-sectional and time series bond shift. Further, contrary to previous evidence, in-house is not the preserve of large funds. Most large funds are in part-internal-part-external structure.

Chapter 5

Chapter 5 is the pivotal empirical chapter and tests the 3rd and 4th hypothesis, examining size bias and differences in the financial characteristics of the fund invested stocks and those in which funds do not disclose investing. The first section reviews the literature on size bias and shows that the reported extreme home equity investment is all explained by large-cap bias. The hypothesis recognises that the wide variation in investment raises questions: Do large-caps perform better, and of not, why do pension funds prefer them? The second section of presents the hypothesis, data, methodology, tests the hypothesis and presents the results. The most important part of the second section is the second sub-part of the results where I test for the significance of the financial characteristic differentials of the two sub-samples. This comes in the background of the superior small-caps performance, (Banz (1981) and Reinganum (1981). To check the correlation between size and performance on the two sub-samples, I use market capitalisation to rank stocks according to small, medium and large size categories and compute performance measures for each of the samples at the end of each financial year. The results indicate large-caps bias, with the intensity of the phenomenon being clearer when measured by the number of funds per stock. While funds must, by regulation, invest in healthy stocks that pay dividends, such stocks actually out perform for all sizes more often, have lower debt equity, sales growth and investment ratios, however, there are instances when it is profitable to combine large and mid-caps of the two samples at the expense of small-cap fund invested stocks.

Chapter 6

Chapter 6 summarises the empirical findings, draws the main conclusions, offers some implications and generalisations, emphasises the limitations of the study and presents investment policy recommendations and suggestions for further research. This chapter indicates a statistically significant UK asset bias and extreme equity allocation. Further, there is management structure bias, for the external, multi manager and part-balanced-part-specialist. Large-caps also dominate fund portfolios. Further, while funds also hold a large proportion of small-caps and neglect a significant proportion of large-caps, the intensely held fund invested stocks outperform large-caps, though at higher risk levels.

CHAPTER 2

THE STRATEGIC ASSET ALLOCATION PROCESS

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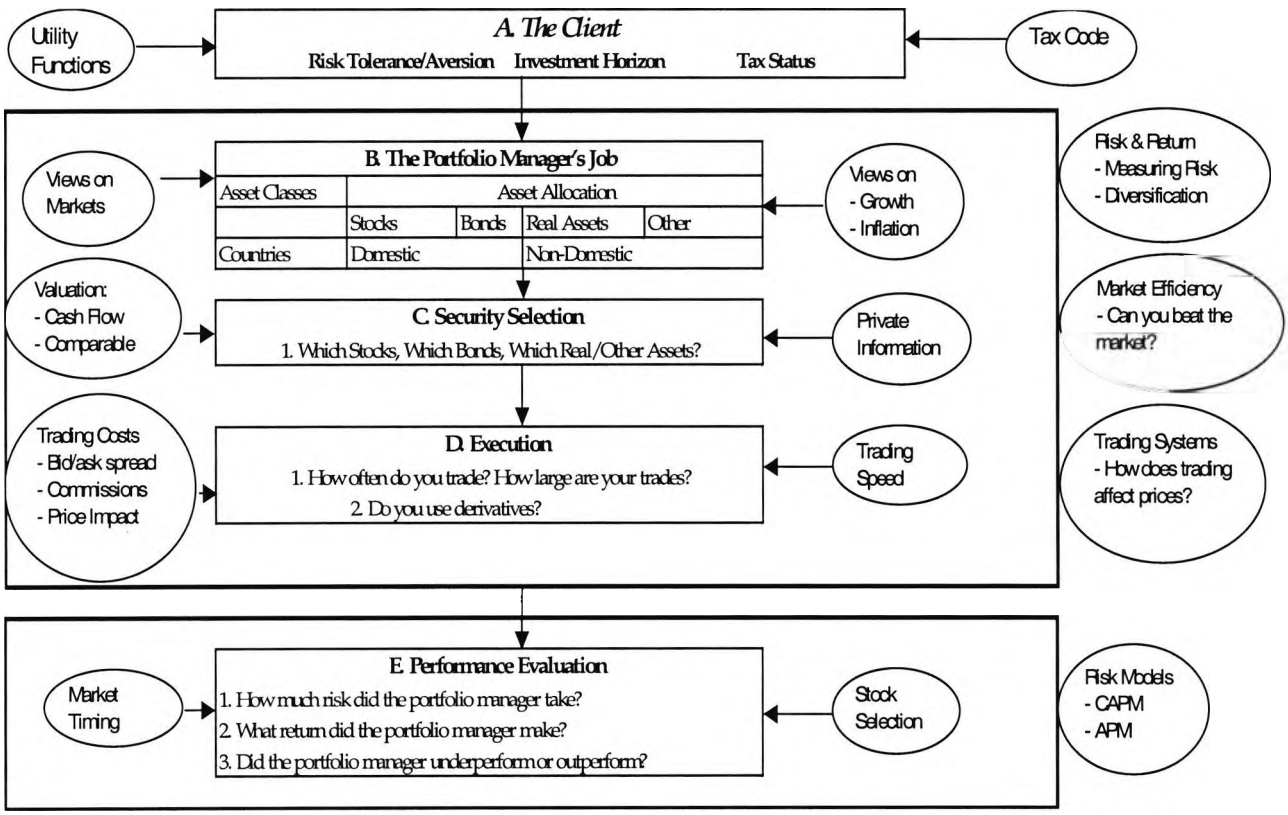
1. **Introduction: Theoretical Background**

While asset allocation is the most talked about process, Ibbotson and Kaplan (2000) and Brinson et al (1991) indicate that a great deal of confusion still remains about its implications. Furthermore, while specific claims about the depth of understanding vary, research (Brinson et al (1986)), asserts that it is the most important determinant of performance variation. This chapter provides an insight into the factors shaping asset allocation and is structured as follows. Section 1 presents an overview of asset management and Section 2 the asset allocation (investment process) definition. The generalised description encompasses the investment philosophy and process. While the former indicates the overall set of principles or strategies (technical, value, growth, fundamental and contrarian) guiding an investor, the latter consists of reviewing investor characteristics and the actual asset allocation, i.e., planning (strategic asset allocation) implementation (portfolio optimisation, asset selection, asset analysis) and managing (performance attribution and risk analysis). For the investment process, Barclays Capital (2001) includes sector analysis and stock selection, Sharpe, Alexander and Bailey (1995), security selection, asset allocation, rotation and market timing, and Droms (1994) and Arnott and Fabozzi (1990) and Farrell (1997), policy, tactical asset allocation and style rotation. **Figure 2.1,** presents an example of the process as in Bernstein and Damodaran (1998).

In line with, Bernstein (1995), the chapter widens the definition and incorporates the client's risk appetite, investment horizon and tax status, asset classes and countries,

security selection, execution and performance evaluation. The willingness and ability to bear risk varies widely among investors; low-risk and aged investors exhibit a high bond posture, while young and high-risk investors prefer equity and foreign assets. Views on risk-return are sought, leading to the assemblage of a portfolio of preferred assets.

Figure 2.1: **The Asset Allocation Process**



Source: Bernstein and Damodaran (1998).

SECTION ONE

2.1. **The Asset Allocation Process**

Drawing relevant comparisons between the US, OECD and the UK, this section reviews literature on the asset management institutional structure and its influence on asset allocation. The section opens with an assessment of asset management in a flow-of-funds framework and identifies different participants (investment banks, stockbrokers, etc), discusses their functions and principal sectors of the industry[2]. The section concludes by focussing on the UK, showing the prevalent, strong inter-linkages and crosscurrents triggered by the 1986 Financial Services Act liberalisation.

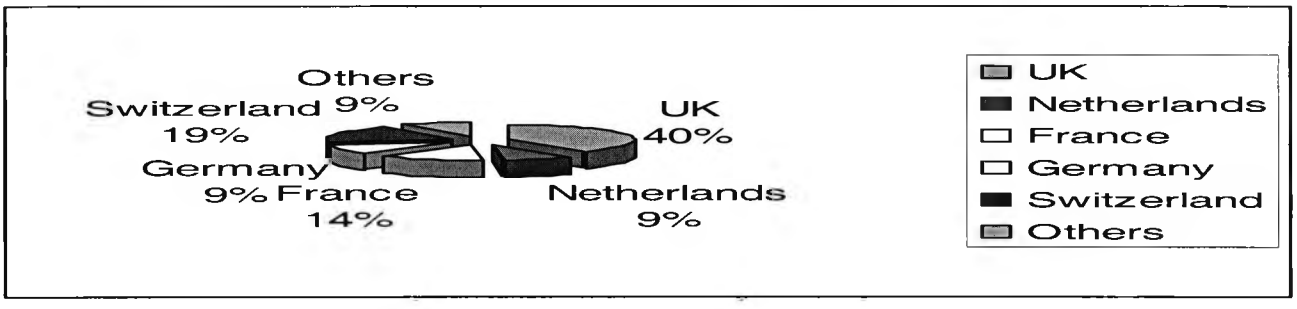
2.1.1. **The Evolution of Asset Management Structures**

Minns (1980) indicates that small funds invest through an insurance policy in a "house philosophy" approach and as it grows, it transfers into a managed fund. This means that different fund assets are pooled and invested in the same pot regardless of the diversity of their distinct statuses. Pensions Forum (1979), Williams (1985) and Myners (2001) concur and indicate that the early stages of funded pensions are characterised by bond biased in-house management and that funds must grow to a certain size before externalising assets. Presenting contrarian evidence, WM (1998) indicates that fund management evolution is a consequence of under-performance by bond-balanced mandates. The Financial Times (FT) (1997) indicates that by 1996, managed global assets were US$30 trillion, comprised of 27.3% pension funds, 17.1% mutual funds and 25% insurance companies and offshore private client assets. Of pension assets, 67% were private sector, with UK funds accounting for almost 50%. In the most recent UK study,

[2]These range from mutual funds, pension funds, and private clients, as well as foundations, endowments, central bank reserves and other large financial pools requiring institutional asset management service.

Fund Management (2000), indicates that by December 1999, UK fund assets accounted for over 65% of all managed assets (£2,500 billion). **Figure 2.2** presents a comparative analysis of the asset market size for selected European countries as of May 2000 and indicates that the UK accounts for 40% of the managed assets, translating to over 50% of the quoted equity markets or £800 billion.

Figure 2.2 **Asset Management in Europe, by Country ($billion)**



There has been a steady institutionalisation of the UK equity market, since the early 1960s, (See **Table 2.1**.).

Table 2.1 **The Institutionalisation of the UK Equity Market: 1963-99**

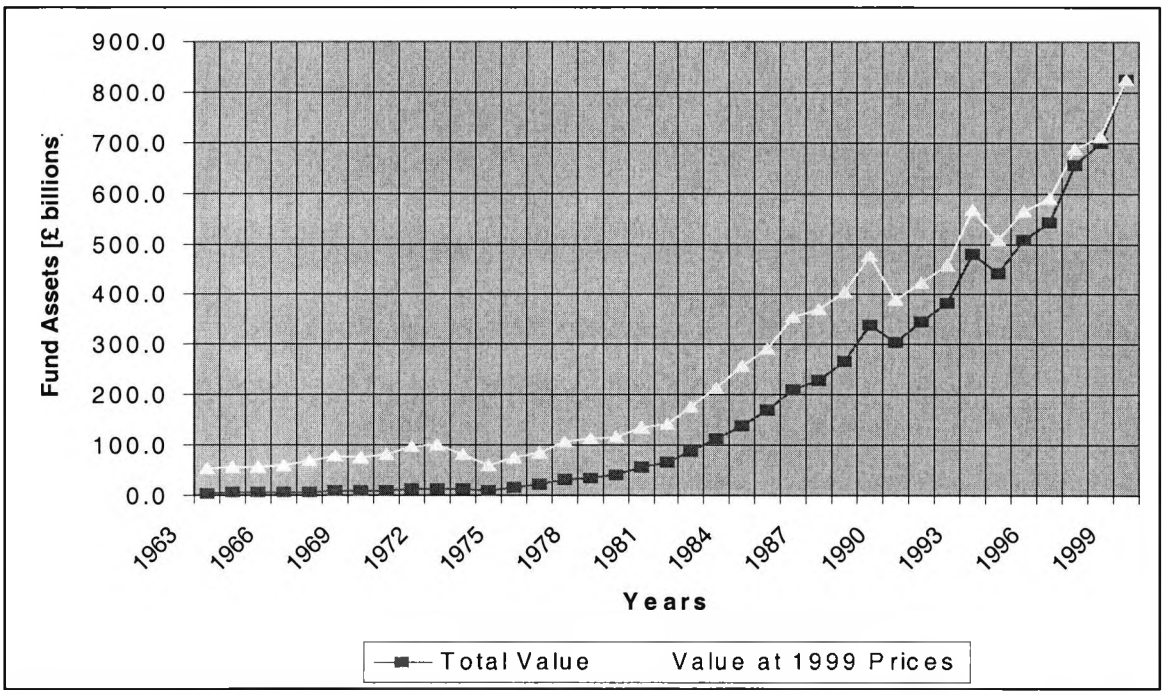
	End Year							
Institution	**1963**	**1975**	**1981**	**1989**	**1994**	**1997**	**1998**	**1999**
	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]
Pension Funds	6.4	16.8	26.7	30.6	27.8	22.1	21.7	19.6
Insurance Companies	10.0	15.9	20.5	18.6	21.9	23.5	21.6	21.6
Unit trusts, investment trusts & other financial institutions	12.6	14.6	10.4	8.6	10.1	10.6	9.0	9.7
Banks	1.3	0.7	0.3	0.7	0.4	0.1	0.6	1.0
Total UK Institutions	**30.3**	**48.0**	**57.9**	**58.5**	**60.2**	**56.3**	**52.9**	**51.9**
Individuals	54.0	37.5	28.2	20.6	20.3	16.5	16.7	15.3
Other Personal Sector	2.1	2.3	2.2	2.3	1.3	1.9	1.4	1.3
Public Sector	1.5	3.6	3.0	2.0	0.8	0.1	0.1	0.1
Industrial & Commercial Sector	5.1	3.0	5.1	3.8	1.1	1.2	1.4	2.2
Overseas	7.0	5.6	3.6	12.8	16.3	24.0	27.6	29.3
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Source: ONS, "Share Ownership:- A Report on the Ownership of Shares at 31, December, 1999", pp.8.

While institutional share ownership has risen from 30.3% in 1963 to 51.9% in 1999, pension fund holdings rose from 6.4% in 1963 to peak at 30.6% in 1989 before slackening to 19.6% in 1999. This increase is mainly driven by the UK occupational

pension funds. This is confirmed by PDFM (1999) and ONS (1999). **Figure 2.3** illustrates the trends in market value of aggregate pension funds assets.

Figure 2.3 **Market Value of Total Pension Fund Assets: 1963-99**

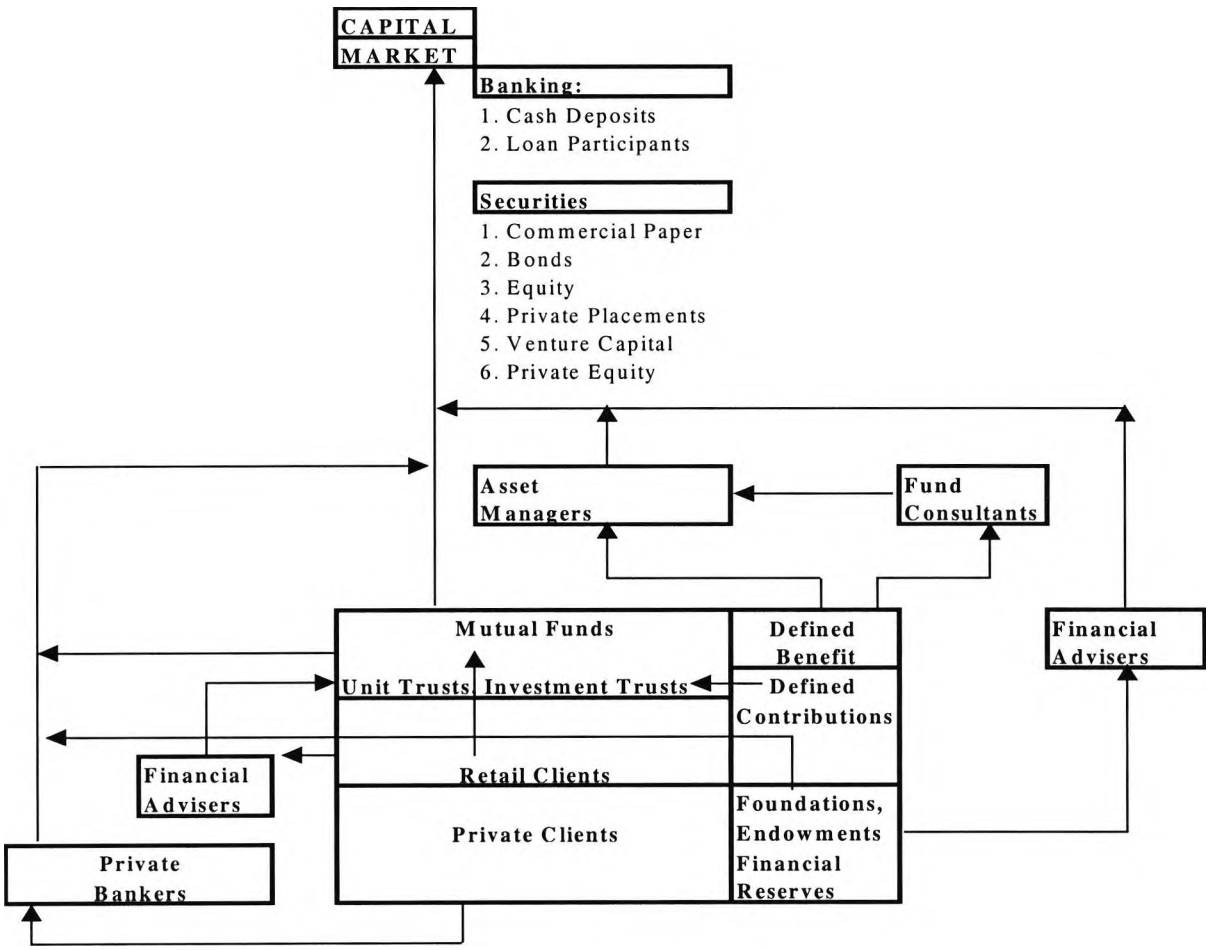


Source: ONS, PDFM, (2000), "Pension Fund Indicators, A Long Term Perspective on Pension Fund Investment 2000"

2.1.2. **The Role of Fund Managers and Their Influence on Asset Allocation**

Bloommestein (1998) argues that it is important to distinguish between the legal and economic definitions of the different types of "institutional investors". The author observes that investors delegate their assets to different, but inter-linked, experts (banks, stockbrokers, advisers, solicitors, actuaries, consultants, etc,) with different, and at times, conflicting interests, which shape asset allocation, as indicated in **Figure 2.4.** With strong links between defined contribution *(DC)* and mutual funds, and a correlation between their growth. There is a similar, but perhaps weaker link, between private clients, mutual and pension funds.

Figure 2.4 **The Organisation of Asset Management: Investment Vehicles**

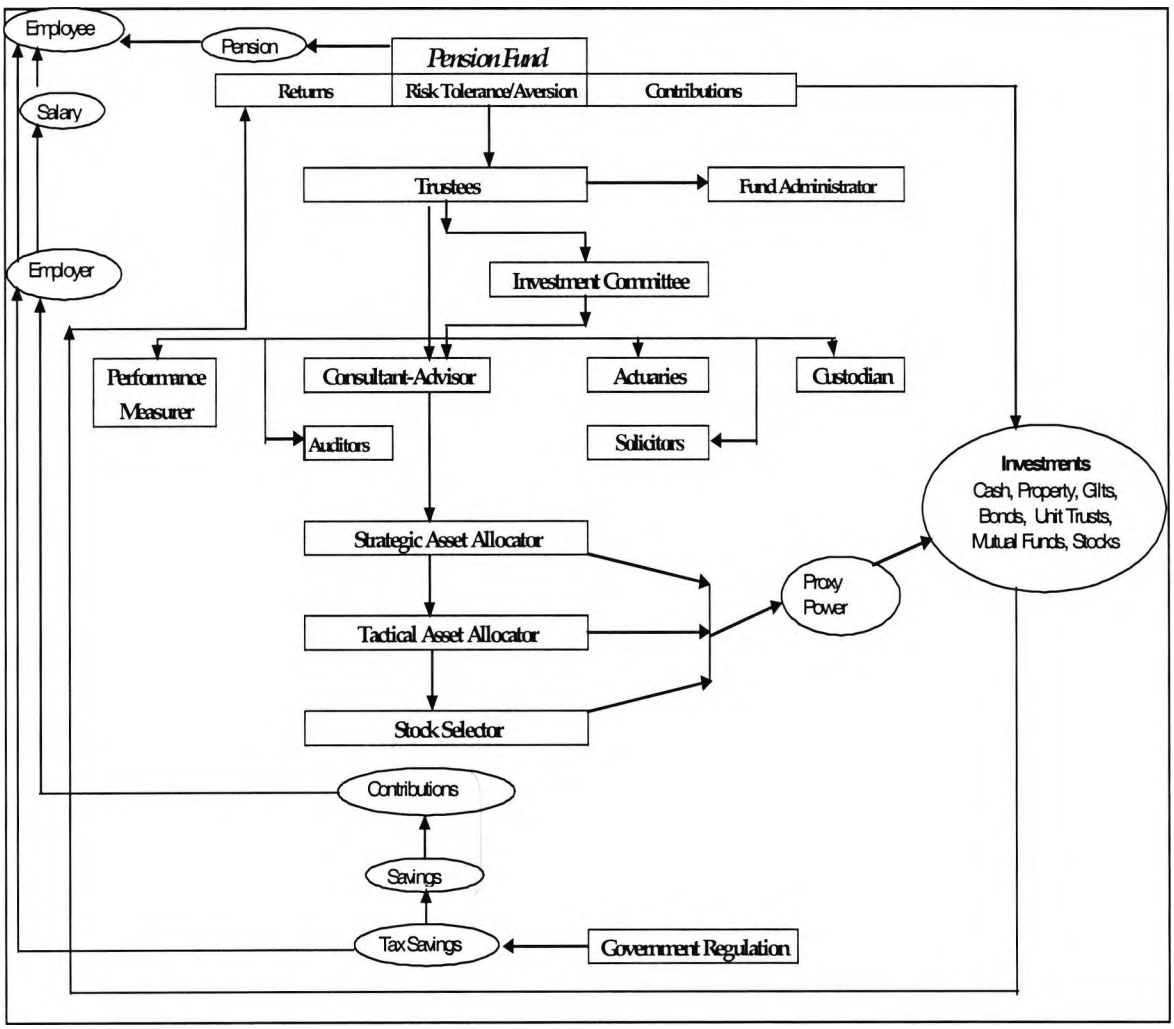


Source: Walter, Ingor (1999)

Because of these inter-links, retail clients can place assets directly with managers or purchase stocks from broker-dealers, possibly with the help of advisers. Alternatively, retail investors place funds in mutual funds or unit trusts, who in turn buy stocks from broker-dealers. Private clients are managed by bankers who include tax planning, estate and trust management. Foundations, endowments, and reserves held by non-financial firms rely on in-house expertise to purchase stocks directly from banks or broker-dealers and use advisers to help them build portfolios, or place funds with investment and unit

trusts. Lee (2002), Pension Fund Partnership (2000) and WIR (2002) assert that investment exhibits influence as illustrated in **Figure 2.5,** below.

Figure 2.5 Institutional Influences on Asset Allocation



Source: Lee P., "Strategic Asset Allocation: All Change Every Quarter?", InQA Limited, September 2002.

The establishment of a pension fund is subject to a set of regulations such as the Trustee Act (1925), Trustee Investment Act (1961) and Pension Fund Act 1995, which designates basic law, prudence duties and trustee powers. The sponsor can appoint some of the trustees (from directors, employees, pensioners or independent specialists), however at least a third must be member-elected for schemes with at least 100 members (and a

minimum of 2 for smaller schemes). The trustees assemble a body of experts, (asset managers, actuaries, solicitors, etc), to take responsibility in areas where it lacks appropriate knowledge, Brown et al (1997) and Myners (2001). Pension Fund Partnership (2000), Myners (2001) and Pratten and Stachell (1998) report that while the number of trustees depends on pension fund size, a third of all schemes have no elected trustees. The average number of elected trustees is 2, and the largest schemes have three as many, among whom are specialists. Myners (2001) surveys 226 funds, of different sizes. He found that a staggering 62% lack investment management qualifications, 26% have received less than 1 day's training, 69% have received less than 2 days and 49% spend 3 hours or less of preparation for trustee meetings focusing on investment. In funds with scheme-specific benchmarks, 23% of the trustees are ignorant of their benchmark, 60% are in disagreement about whether the fund employs segregated or pooled funds or both and 40% are unaware of the number of managers employed. Brown et al (1997) concur and indicate that while the majority of trustees possess appropriate backgrounds, 16.7% possess very little relevant skills and as many as 33.3% have not attended a training course in the last 10 years. The authors further indicate that while 20.9% view advice to members as their most important activity, 51.3% cite investment guidelines, 44.5% performance, 53.4% fund manager selection, 18% asset allocation and 16.2% division of funds between fund managers.

Next is the consultant or advisor, who is almost always an actuary or someone from the same organisation[3]. The major players in the UK are W. M. Mercer, Watson Wyatt,

[3] This is changing following the publication of the government's "Voluntary Code for Pension Fund Investment", in response to Myners Report, which proposes that investment advice should be separated

Bacon & Woodrow, Hymans Robertson and Aon Consulting. Consultant-fund relationships tend to be very long, 10-15 years for over 50% of funds and over 25 years for 13% of funds. Pratten and Stachell (1998) and Pension Fund Partnership (2000) indicate that about 50% of funds use the consultant for manager selection, while 67% of small schemes invite the consultant to meetings at which investment matters are deliberated on and also charge them with the task of assembling teams of experts (audit, legal services, custody, etc), through a "beauty parade presentation". At the next level is the investment manager, or actuary, or strategic asset allocator, who sets up benchmark asset allocation (as described above). According to Lee (2002) there is an overlap between the strategic asset allocator, tactical allocator and stock selector. Tactical asset allocation is concerned with the day-to-day (or more frequently at times of significant market fluctuations) investment of the assets into precise stocks by the stock selector in each major asset class i.e., UK or US equities etc within a given range of targets. Pension Fund Partnership (2000) indicates that Merrill Lynch, Legal & General, Schroder, Phillps & Drew, Deutsche and Barclays Global are the most popular, Prudential, Fidelity, Scottish Equitable, Friends Ivory and Sime and Scottish Widows are popular with small schemes below £50 million.

Another professional is the custodian who is responsible for master-record keeping, securities lending, settlement, proxy voting etc. Pension Fund Partnership (2000) indicates that while just 32% of UK funds employ a custodian, 67% use one chosen by the investment manager. This is only 33% for the largest funds. While 56% of funds use 1 custodian, 22% use 2, and 9% employ 3 or more, 33.3% employ their custodian for less

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from the provision of actuarial services.

than 3 years, while 48% employ theirs for 5 years or more. The major players in the UK are Bank of New York with 40%, Chase Manhattan 21% and HSBC 18%, while the largest schemes concentrate on Chase Manhattan. Another set of experts are the pension law firm, which advise funds on all aspects of pension law including merger activity, general compliance and trustee training. Pension Funds Partnership indicates that 68% of UK funds engage the services of an external pension law firm, Rowe and Maw being the most popular followed by Nabarro-Nathanson & Sackers. Following them is the performance measurer, who sets benchmarks e.g., CAPS, WM, FTSE-All Share and FTSE Index Linked Gilt indices, to be outperformed by 1% annually over rolling 3-year periods and not to be under-performed by more than 2% annually, Pratten and Stachell (1998). The final set of experts comprises the accountants who offer a wide range of services encompassing audit and internal control systems, taxation and corporate governance advice.

2.1.2.1. **The Types of External Managers**

Funds can place assets with investment or retail banks, stockbrokers, independent managers or insurance companies. Using a sample of large UK funds held by *CAPS*, Hager et al (1989) indicate that by December 1988, over 150 institutions were supplying fund management services in the UK. Further, as shown in **Table 2.2**, they observe that 4% of funds are in-house managed, whist 96% is external. Of the latter 25% is managed through the insured structure, 39% is split between investment and retail banks, 7% stockbrokers and 24% independent managers, the remainder is spread amongst the "others". Hager et al (1989) and PFTAD (1999, 2000) indicate that investment banks indirectly dominate external management in the UK through their subsidiaries, e.g.,

Barclays Global Investors and BZW (Barclays Group); Gartmore Global and NatWest Portfolio Managers (NatWest), Hill Samuel Asset Management and Abbey Life Investment (LloydsTSB), and HSBC Securities and HSBC Asset Management (HSBC Group) and attribute this to cross-selling, high calibre staff and contacts with key specialists. PDFM (1994, 1996, and 1998) indicates that while retail banks maintain contact with virtually every UK firm, they only hold a small proportion of fund assets due to their staid image and perceived lack of flair.

Table 2.2: **Management by Type of Institution and Proportion of Fund Assets**

Type of Organisation	Proportion of Portfolios [%]
[1]. In-house Managed	4
[2]. Externally Managed	96
Of Which:	
[a]. Insurance Companies	23
[b]. Stockbrokers	7
[c]. Independent Managers	24
[d]. Merchant & Retail Banks	39
[e]. Others	3
	100

Source: Hager and Lever (1989)

A consequence of deregulation is the disposal of major stockbrokers to various financial institutions, resulting in almost all stockbrokers being subsidiaries of large financial conglomerates, with only Cazenove Stockbrokers among the major stockbrokers remaining independent. Christman (1985a, 1985b) indicates that small independent managers usually find it difficult to attract large funds. Size and independence of advice become a major handicap because of doubts about the extent of independence and the stringent compliance aspects of the 1986 FSA. The most popular are Ballie Gifford, Govett Investments, Cazenove Fund Management, Edinburgh Fund Managers, Fleming Asset Managers, Marathon Asset Management, Putnam Investments, M & G Investment

Management, Stewart Ivory Fund Managers and Pensions Investment Research Consulting, among others. Finally, there are insurance companies and managed funds, which have experienced an explosive growth e.g., the Association of British Insurers (2000) indicates that insurance assets have grown from £276 billion in 1989 to £977 billion in 1999 and Myners (2001) observes that by 1999 small funds in the UK had invested £200 billion (25% of their assets) in pooled funds Schwimmer and Malca (1986), Shepherd (1987) and Brown (1994) argue that these possess diversification levels otherwise inaccessible for small funds. The NAPF (1989) indicates that fund managers influence asset allocation with 10% of schemes investing through insurance policies, 20% in pooled funds and 70% wholly self-administered. While Brown et al (1997) and FT (1990)[4], observe that restrictions are not onerous in the UK, with the most frequent on real estate, self-investment and active-passive partitioning, the NAPF (1997, 1998) indicates that the most common restrictions govern bias as per Section 134 of the 1989 Companies Act. The NAPF (1997, 1998) and Brown et al, (1997) further indicate that Local Authority funds are the most home biased, have rigid and homogeneous limits, with only 33% of funds free of restrictions and considerably more constraints set by large Local Authority funds.

[4] Financial Times, April 18, 1990.

SECTION TWO

This section presents a schematic review of literature on asset allocation and in line with Blake (1985), Farrell (1997) and Bernstein (1995) discusses the asset characteristics shaping the fund portfolios and the various stages of the asset allocation process.

2.2. **The Asset Allocation Process and Investment Policy**

Ezra (1998) and Reilly and Brown (2000) define strategic asset allocation as the determination of long-term asset weights, resulting in a constant-mix portfolio. The Nelson Investment Management Network provides an example of the mix, as presented in **Table 2.3**, for (Panel A and B) defined benefit (corporate, union and public) schemes. The display lists 2-year mean assets for 1997-98 and indicates cross-sectional equity bias for large funds; while corporate and public funds are more equity biased, union schemes are home biased. Furthermore, Hearth and Zaima (1998) observe that the optimal blending of dissimilar asset characteristics shapes portfolio behaviour. For example while an income (growth) fund concentrates on liquid (capital growth) assets they are by no means the only ones it invests in. Funds can either invest in financial or real assets, directly or indirectly. Such assets can either be non-marketable bank deposits and whole life insurance policies or marketable securities[5] like composite money market, capital market, and complex assets such as derivatives.

[5]Marketable securities are those assets that can be sold to another investor in an organised secondary market.

Table 2.3: **Strategic Asset Allocations For Defined Benefit Schemes**

Panel B: Sponsors of US$10 Million - US$100 Million						
	Corporate		Union		Public	
Asset Class	1998 (%)	1997 (%)	1998 (%)	1997 (%)	1998 (%)	1997 (%)
Cash	4.2	4.7	5.4	5.9	2.4	2.7
US Equity	49.1	46.9	37.4	35.1	45.7	43.8
Foreign Equity	6.6	6.8	8.0	1.0	7.5	7.6
US Bonds	30.4	30.0	42.7	42.0	35.1	35.4
Foreign Bonds	0.8	0.8	0.1	0.3	1.6	1.7
US Balanced Accounts	2.1	2.3	2.4	2.5	2.8	3.4
Foreign Balanced Accounts	0.2	0.2	-	-	0.1	-
Equity Real Estate	1.3	1.5	2.1	2.0	2.2	2.3
Mortgages	0.2	0.2	1.7	2.4	0.5	0.6
Company's Own Stock	0.9	0.9	0.2	0.2	-	-
Convertibles	0.1	0.1	-	-	-	-
GIC's	1.0	1.2	0.6	1.3	0.5	0.6
Venture Capital	0.3	0.3	-	0.1	0.4	0.5
General Insurance Account	1.3	2.0	3.5	3.6	0.3	0.1
Other	1.8	1.9	3.3	3.6	0.7	1.1
Total	**100**	**100**	**100**	**100**	**100**	**100**
Panel B: Sponsors of US$10 Million - US$100 Million						
Cash	8.4	9.1	7.2	7.5	6.2	6.1
US Equity	37.9	36.2	32.1	29.1	39.3	38.3
Foreign Equity	1.8	2.4	0.4	0.3	2.4	2.5
US Bonds	32.6	30.6	46.4	44.5	44.6	45.5
Foreign Bonds	0.4	0.5	-	0.1	0.6	0.2
US Balanced Accounts	3.0	2.9	0.4	0.6	3.9	3.5
Foreign Balanced Accounts	0.1	0.1	-	-	-	-
Equity Real Estate	0.4	0.3	0.7	0.8	0.8	0.9
Mortgages	0.4	0.3	0.5	0.6	-	0.1
Company's Own Stock	0.6	0.6	0.1	0.1	-	-
Convertibles	0.2	0.2	0.1	0.1	-	-
GIC's	1.6	2.1	1.2	1.7	1.0	1.1
Venture Capital	0.1	0.2	-	-	0.3	0.3
General Insurance Account	9.5	10.1	7.4	9.4	0.3	0.3
Other	4.0	4.3	4.3	5.0	0.6	1.2
Total	**100**	**100**	**100**	**100**	**100**	**100**

Source: Nelson Investment Management Network, in Investment Analysis and Portfolio Management, Frank, K Reilly and Keith C. Brown, 6th Eds, 2000, 932.

2.2.2. The Fund, Asset Classification, Sector Analysis and Stock Selection

Portfolio structure is driven by a combination of factors, for example, fund size, age, risk and macroeconomic factors, which help in the design of a saving-consumption utility function. Farrell (1975) argues that the fund models an optimal portfolio for assets (e.g. UK stocks, bonds etc), markets, stocks and economic sectors. Barclays Capital (2001) models the portfolio with core stocks that out-perform their sector peers and invest in

either 1 of the 4 house mandates; (high income with safety, balanced, capital growth with safety and high level of capital growth) as indicated in **Table 2.3** below. While high income with safety emphasises bond bias, high level of capital growth stresses equity. The next step is the determination of dealing frequency, size, hedging ratio and performance attribution. These are pertinent questions, especially within efficient markets where active management and/or over-trading can erode performance.

Table 2.4 **Investment Mandates By Objective: Optimum Weights**

Target Weightings for New Portfolios

Assets	High Income With Safety [%]	Balanced Balanced [%]	Capital Growth With Safety [%]	High Level Capital Growth [%]
Bonds	40.5	27	19.5	9.5
UK Equities	49.5	52	55	60
International**	4	13.5	17	21
a. Europe	1	3	4	5
b. USA	3	10.5	13	16
c. Japan	0	0	0	0
d. Far East/Emerging Markets	0	0	0	0
Liquidity	6	7.5	8.5	9.5
		Ongoing Management		
	Min-Max	**Min-Max**	**Min-Max**	**Min-Max**
Bonds	36-58	24-34	15-28	6-19
UK Equities	42-62	44-64	46-66	51-71
International**	0-9	10-21	14-25	17-29
a. Europe	0-3	2-6	3-8	4-9
b. USA	0-6	8-15	11-17	13-20
c. Japan	0-0	0-0	0-0	0-0
d. Far East/Emerging Markets	0-0	0-0	0-0	0-0
Liquidity	6-8	7.5-9.5	8.5-10.5	9.5-11.5

Source: Barclays Stockbrokers, page 1, June 2001.

**International is the summation of Europe, USA, Japan and the Far East

2.2.2.1. **Portfolio Construction: Diversification or Bias**

Ankrim and Hensel (1994) employ a mean-variance model to investigate asset allocation in the US, Australia, Germany, Canada and UK for the decade 1980-90 and indicate portfolio inefficiency attributable to home and equity bias. The authors argue that given

the Jorion (1989), Solnik (1974) and Solnik and Noetzlin (1982) studies this is surprising because unconstrained investment entails diversification. However, Solnik (1994) argues that home bias is not an anomaly as some home stocks have global activities. Barclays Capital (2001) justifies home bias based on the notion that fund portfolios are designed to match domestic liability returns, and characterises this in the manner in which the UK equity content of new funds are invested as presented in **Table 2.4** below. For a £1 million fund, a band 1 portfolio, the most preferred stock (as determined by market capitalisation) is allocated 10% of the £700,000 allocated to UK equity and the figures decrease as one descends the band lines. The same is repeated for Bands 2-4 up to a point where all bands are fully invested. The fact that portfolios buy into house positions, when read with **Table 2.3** indicates the extent of large-cap bias. Taking the high level of capital growth target of 60%, a £1 million fund allocates around £60,000 (10% of £600,000) in the largest domestic stock. There is no room for small-cap investment. Either small-caps are represented by small-cap or FTSE 250 trusts, which are restricted to 7.5% of equity (7.5% of £600,000 = £45,000), which is 4.5% of the £1 million funds. Research argues that it is necessary to move with the wave, because should the market go against you, it is difficult to justify your presence in such stocks. In harmony with the Clowes (1979), Haight (1980), Williams (1979) and Hager et al (1989), Turner and Hensel (1993) analyse returns for Australia, Canada, Germany, Japan, the UK and the US for the period 1980-89 and report that returns are statistically identical across countries and variance differences are attributable to economic factors, which justify home or equity bias. Droms (1989) and Barclays Capital (2001) argue that asset allocation is a function of the liability structure.

Table 2.5. **Equity Content For New Portfolios**

Equity Target Weightings for New Portfolios

Bands	UK Eqity Value [£]	Trusts & Other [%]	Core Stocks [%]
[a]. Band 1	Up to £700,000	7.50%	1 stock @ 10.0% 1 stock @ 9.5% 1 stock @ 9.0% 2 stocks @ 6.5% 1 stock @ 6.0% 1 stock @ 5.5% 3 stocks @ 5.0% 1 stock @ 4.0% 3 stocks @ 3.5% 2 stocks @ 3.0% 2 stocks @ 2.0%
[b]. Band 2	£700,000-£1,000,000	7.50%	1 stock @ 10.0% 1 stock @ 9.5% 1 stock @ 7.0% 1 stocks @ 6.0% 1 stock @ 5.5% 3 stocks @ 5.0% 1 stock @ 4.0% 1 stock @ 3.5% 3 stocks @ 3.0% 6 stocks @ 2.5% 4 stocks @ 2.0%
[c]. Band 3	£1,000,000-£5,000,000	7.50%	1 stock @ 9.5% 1 stock @ 9.0% 2 stocks @ 6.5% 1 stock @ 6.0% 1 stock @ 5.5% 1 stock @ 5.0% 1 stock @ 4.0% 1 stock @ 3.5% 2 stocks @ 3.0% 9 stocks @ 2.5% 6 stocks @ 2.0% 2 stocks @ 1.5%
[d]. Band 4	Over £5,000,000	7.50%	1 stock @ 9.5% 1 stock @ 8.0% 2 stocks @ 6.0% 1 stock @ 5.5% 1 stock @ 5.0% 3 stocks @ 4.0% 1 stock @ 3.5% 3 stocks @ 3.0% 10 stocks @ 2.5% 4 stocks @ 2.0% 6 stocks @ 1.5%

Source: Barclays Stockbrokers, Mode Portfolios, June 2001, page 7

For pension funds, the liability structure is dependent on maturity and scheme type (defined contribution or defined benefit). While mature funds require bond-gilt tilted

portfolios, Schwimmer and Malca (1976) and Thorley (1995) indicate that liability structure longevity facilitates the construction of a diversified, growth focused and illiquid portfolio. According to Blake (1995) defined contribution scheme asset allocation depends on the performance expectations, with cash in-flows closely tracking the guaranteed liabilities. This is more common where contractual liabilities are denominated in monetary terms (sterling). Here it is likely that substantial monetary based assets (e.g., conventional gilts) will be held. On the other hand, defined benefit schemes provide final salary related retirement benefits, with members relying on the sponsor to make good any shortfall in cases of under-performance. If salary increments match the national trend then retirement liabilities follow suit. Deferred liabilities, though long term and real in nature, may out-perform salary increments. If inflation-matched increments are granted benefits may be regarded as real liabilities, hence the need to at worst, invest in index linked gilts. Empirical evidence from Hale (1998) indicates that movement of assets away from such schemes, new assets falling from 8% to 1% of contributions per annum for the decade 1987-96.

2.2.3. **Market Efficiency, Passivity and Active Asset Allocation**

The trustees decide on an investment style to exploit anomalous return effects (stock fundamentals, economic conditions and managerial skill) indicative of inefficient markets. It can choose to execute and rebalance the fund either actively or passively (index tracker). If it chooses the latter, it buys into an index, or assets tracking an index, believing that markets are efficient. In this scenario, Lee (2000) indicates that the fund expects to attain a target performance at or within very close margins (typically within at most 0.5% annually) of the index. The belief in passivity is that frequent trading erodes

performance through the transaction costs incurred. A passive fund may choose to match the FTSE-All Share Index or median UK pension fund performance. However, if its predictive models signal inefficient markets with exploitable arbitrage opportunities, funds engage in active management and repetitively change portfolios through tactical asset allocation *(TAA)* and market timing *(MT).* The re-balancing frequency depends on volatility, liquidity and the macro-economy. An active fund may choose to outperform the FTSE-All Share Index or a benchmark notional index fund.

As a form of active management, *TAA* (Phillips and Lee (1989) is "the process of tilting strategic asset allocation in recognition of valuations embedded in, and intent on exploiting the cyclical nature of the financial markets through varying portfolio exposure to particular assets, currencies and stocks". Despite numerous arguments against *TAA*, its potential rewards can be quite attractive, but whether it is worthwhile to attempt depends on the investors' predictive ability. As a test of *TAA,* Breen, Glosten and Jagannathan (1989) use the 1-month interest rate, and the variance of the excess stock returns, to evaluate forecasting ability using the Cumby-Modest (1987) and Henriksson-Merton (1981) tests. They confirm a negative correlation between interest rates and stock returns. However, an equally weighted index is used instead used. The model does not show any significant predictive capability, which the authors attribute to leptokurtosis and the January seasonal. Lee (1997) replicates the Breen et al (1989) results. He extends the sample to 1994 and indicates that while *TAA* out-performs passivity in earlier periods, all value added is eroded by 1989 and if the strategy is employed throughout the sample period, it under-performs by 3.65 basis points monthly on average.

Macbeth and Emmanuel (1993), examine the dividend yield (*DY*), price-earnings, *(PE)* and book-equity-to-market *(BEME)* based *TAA* portfolios. They find that the compound returns from the *DY* and *BEME* portfolios are just slightly better than the 50-50 stock-treasury bill passive portfolio. On the other hand, the *PE* rule has a higher compound growth rate and standard deviation, but a lower Sharpe ratio, remarkably all strategies under-perform a 100% equity index. The authors indicate that because the variable that needs prediction (price) is used to compute each of the ratios, virtually all the variability in *DY* and *BEME (*and partial variability in *PE),* originates from the price. Because book values and dividends have been steadily sluggish since 1945, price changes have driven fluctuations in *DY* and *BEME,* leading to non-synchronized results. Employing the *S&P 500* treasury bill portfolio, and using a logit regression model, Nam and Branch (1994) concur and establish a predictive precision rate of 73.8% for bullish and 43.3% for bearish periods, with active strategies outperforming even with a modest 58.6% prediction. Pesaran and Timmerman (1995) argue that returns are predictable, by means of stock and macroeconomic indicators, and establish a forecasting model in which the active strategy outperforms at all cost levels. Even with just 60% precision most of the models outperform. Focussing on the UK Miles and Timmerman (1996) formulate *BEME,* size, and *DY*–based portfolios over the period 1978-89 and indicate that *TAA* exceeds or equals the index 63% of the time, with the best strategy composed of 20% stocks and generating a mean annual excess return 2.6%.

A variant of active management is market timing, which Reilly and Brown (2000) define as a market fluctuation based style focused on market cycle prediction and placing active

bets based on such forecasts. There is disagreement in literature on market timing efficiency. Focussing on the UK Levis and Liodakis (2000) report that style rotation generates 17.47% mean annual return above the FTSE-All Share Index during the sample period. The value style outperforms growth across the sample period and all size categories at 35% forecasting ability. Sharpe (1975) examines the efficacy of this style for the period 1933-72 and concludes that market timing does not produce incremental annual returns of more than 4% over the long-term and forecasts must be right 75% of the time merely to match passivity. Jeffrey (1984) and Sy (1990) argue that high predictive accuracy does not necessarily correspond to high returns and that although there are more "good" than "bad" markets, the best "good" markets are compressed into just a few periods. Furthermore, Droms (1989) extends Sharpe's sample period from 1926-86 and formulates annual, quarterly and monthly timing strategies. He concludes that successful switching requires forecasting precision beyond the abilities of most managers and, that while increased frequency enhances potential return, superior rewards are easily negated by high transaction costs. Consistent with Sy (1990), Clarke, FiztGerald and Statman (1989) argue that the information advantage required by a market timer to overcome the return and transaction cost advantages of a passive investor, is much lower than Sharpe's claims. Clarke et al (1989) test portfolios from the ex post and ex ante perspectives. They indicate that simple *GNP*-based rules outperform, and ex post tests indicate that 100% accuracy in bear markets prediction easily maintains 63% ability bull markets prediction.

2.2.4. **Asset Characteristics Relevant for Fund Portfolio Behaviour**

Asset liquidity is the cost and time involved for an asset to be converted into cash at a price close to its intrinsic value. This depends on many factors including marketability,

transaction costs, asset volumes, number and size of active traders, accurate, widely and quickly distributed price and value information, confidence among traders about market freedom, fairness and price continuity. Cash and money market assets are almost always perfectly liquid, as they are more or less accessible on demand to cover benefits, whilst the fund functions as a going concern. Blake (1995) indicates that funds maintain substantial transitory liquidity in high-yielding cash equivalents (to cover for benefits, ad hoc withdrawals, fees, speculation, profitable *TAA* and market timing). The author argues that fund size and maturity levels exert the main influence on liquidity, with small and mature funds likely to prefer liquidity, though for different reasons. While small funds have limited latitude to invest in illiquid and lumpy assets old and mature funds are less risk tolerant.

The concept of liquidity is such that the resultant returns depend on capital stability, (the degree of time series variation) and marketability (the extent to which value can be realised in cash). While few assets, for example, cash deposits, possess almost perfect capital stability, most are subject to fluctuations. Their response to interest rate changes varying with expectations and term to maturity. Since expectations fluctuate with business cycles, market thinness, asset differentiation, communication and issuer credibility, all assets, except cash, are imperfectly liquid, and incur some cost or time delay to realise their values. A good example of this is an investor selling a house and receiving an offer not justified by market conditions. Apart from lacking homogeneity, problems arise because real estate is traded infrequently, in a non-continuous market fraught with slow communication, market thinness and with higher prices entailing long

disposal intervals or protracted negotiations (in which case, cost and patience become substitutes). Imbedded in liquidity, is reversibility; a distinct attribute related to market efficiency, which recognises investor interest in the correlation between disposal value, acquisition cost and the time taken to reverse a transaction. In perfectly reversible assets, the two are equal but for the highly irreversible, the former is much lower. Some assets are imperfectly irreversible, for example, pension policies, with costs involving both fixed and variable elements, (charges and time taken to cash a cheque, minimum brokerage and bid-ask price spread). Further, because of the need to optimally diversify, funds are interested in divisibility, e.g., owning shares. Because few assets are completely divisible, this is an important factor imposing minimum trading volumes, affecting diversification levels, asset values and their attractiveness. While stock splits, unit trusts and mutual funds provide very good examples for curtailing this problem, real estate is an extreme example of indivisibility. Diversification through unit trusts may cause neglect for small-caps, resulting in illiquidity and widening of the bid-ask spread within the latter. Grossman and Miller (1988) and Handa and Schwartz (1996) indicate that this occurs because trading turnover, the pound value of trading, number of shareholders and total market value of outstanding shares is at minimum. Since the pound value of trading correlates highly with the market value of outstanding shares and the number of shareholders, there are more shareholders to trade, more trading turnover at any time for a variety of purposes and numerous traders providing liquidity.

Furthermore, returns are enhanced by asset value predictability. This recognises that whilst interested in high returns, funds are also interested in the level of certainty with

which capital is returned and income realised. Capital value uncertainty (price risk) is the degree of confidence with which future asset capital value can be anticipated. If the future asset capital value is known with complete certainty, then it is perfectly predictable (e.g., money market assets, loans (in nominal terms) and mortgages (in real terms)). While capital asset value is partially predictable (if it can be forecast with certainty at some future dates for example, maturing marketable government bonds), it is imperfectly predictable (if it is unknowable at any date in the future for example, equities, options and real estate). Income value certainty is another critical feature of asset allocation, exhibited by money market securities, bonds and preference shares. It possesses a high degree of income certainty if there is no prepayment compared with equity dividends and derivatives. There are several causes of this imperfect capital value and income predictability. These include uncertainty about the interest rate (at which future payments are discounted) default risk on both interest and principal for debt-type instruments, insolvency risk on equities, inflation uncertainty and exchange rate risk.

Another important characteristic to consider is yield; a multidimensional concept that can only be valued in cash if all of its components (interest or dividend, including the "use" of a house, car etc) net of carrying costs (insurance, safety deposit costs, taxes, etc) are valuable. Yield is subject to uncertainty because capital and income values themselves are uncertain. Return division into yield and capital gain is also of concern if the two are taxed at different rates or if there is a different cost of interest receipts and capital gains conversion. Funds are also interested in the elimination or reduction of yield risk (the possibility that the actual return underperforms liabilities). Potential capital losses should

also be viewed within this class of risk since they can result in negative returns. Defaults on both capital and income are a direct cause of yield loss and the probability of such a loss arising depends clearly on the creditworthiness of the issuer. Government securities possess the highest security. Corporate securities are more exposed to defaults (e.g., equities) in view of their residual claims. Furthermore, interest rate fluctuations and the maturity pattern of fixed interest holdings are a less obvious, but important latent cause of yield loss (especially when reinvestment is considered). An example of this is if interest rates fall before reinvestment a yield loss results. Furthermore, ceteris paribus, maturity longevity results in a lower yield risk, due to long-term interests being less volatile. The final characteristic shaping portfolio behaviour is marketability, which is determined by technical considerations and focuses on whether an asset has a market or not. More generally it embraces a variety of market quality factors-: size, organisation, trading volumes, etc) that determine the rate at which the asset value can be converted into cash. Since market factors affect trading, the actual size of an investor's holding and the specific individual assets are also important. Sharp differences exist in marketability. For example, whilst Government securities have the highest degree of marketability (with large and active markets) real estate rarely has an efficient secondary market and corporate securities fall between these two extremes.

2.2.5. **Economic Fundamentals as Determinants of Asset Allocation**

It is necessary to appreciate that stock returns are driven by a blend of factors, (stock fundamentals, behavioural elements, economic factors, etc) which, either alone or in a multivariate context, have been tested. Research, Farrell (1997) and Rielly and Brown (2000), reports a correlation between asset allocation, performance and economic cycle

effects, and that process implementation needs socio-economic trend variable prediction at least 3-months ahead. Furthermore the Merton (1973) and Breeden (1979) inter-temporal equilibrium models predict that investors optimise expected utility by switching portfolios to smoothen consumption and inter-period purchasing power transfers. In both single and multi-period asset-pricing models (e.g., Sharpe (1964), Litner (1965), Merton (1973), Rubinstein (1976), and Cox, Ingersoll and Ross (1985)) the risk premium is a positive function of the aggressive risk parameter and investors hold assets if expected returns are high. Chen (1991) argues that the current *DY*, short-term interests, term structure, lagged industrial production and default premium (the difference between the yield on a corporate and Aaa bonds) are good indicators of changes in future *GNP* growth rates. According to Fama and Schwert (1977), changes in expected inflation affect interest returns and real cash flows negatively and therefore asset allocation. Fama (1981) and Geske and Roll (1983) (point out that the correlation between excess returns and inflation is 'spurious' (in the sense that expected returns and inflation are both endogenous variables, simultaneously determined exogenously).

Hearth and Zaima (1998) use the S&P 500 and Federal Reserve data, between 1967 and 1996 and indicate that inflation increases (actual or expected) are considered bad for the market since they depress returns, via the interest rate parameter. The authors argue that whereas the cyclical credit and consumer sectors outperform the early phases of bull markets, the growth consumer sector outperforms in later stages, and energy, defensive sectors and utilities outperform late in bear markets. Chen (1991) views industrial production as the most direct indicator of past and current macro-economy, with expected

returns reflective of productivity shocks on capital goods demand, and current versus future consumption. While specifically increased capital productivity leads to higher expected returns and increased asset allocation flows, individuals smoothen consumption by borrowing against expected future output, bidding up interest rates. While interest rates rise with expansion generally, the spread of long over short-term rates and expected returns, vary counter-cyclical and the variation in long term rates is less extreme. Fama and French (1989) examine the correlation of expected returns with economic conditions, using the *DY*, term spread[6] and default premium[7]. They conclude that (indicative of expected returns), the *DY*, term and default spreads are high when economic conditions are poor, but expected to improve. Ferson and Harvey (1991) study various proxies for economic risks influencing returns[8] and find that they capture predictable variations in returns.

2.2.6. **Equity Style Asset Allocation and Portfolio Performance**

Some equity return regularities (e.g., the return reversal effect) produce persistent payoffs and represent exploitable, anomalous signs of market inefficiency. For example, the correlation between returns and size has received considerable attention in the finance literature (Gordon (1962), Banz (1981), Reinganum (1981), Basu (1983) and Fama and French (1993, 1995, 1998)). Size is negatively correlated with returns, and small outperform large-caps of equivalent risk, in beta *(β)* terms. While Gordon (1962) showed that returns are inversely correlated to firm's size, Banz (1981) later found that NYSE

[6]The term or maturity premium variable is defined as the difference between the Aaa yield and the one month Treasury Bill.

[7] The default-premium variable is defined as the difference between the yield on a market portfolio of corporate bonds and the yield on Aaa bonds.

[8]Monthly real per capita growth of consumption expenditure for non-durable goods, the difference between monthly return on Baa corporate bonds, long-term treasury bonds, the change in difference between the average monthly yield

small-caps significantly outperform (even when adjusted for risk using the Capital Asset Pricing Model *(CAPM)).* Surprisingly, the correlation between risk-adjusted returns and size was comparable in magnitude to that between mean return and systematic risk as measured by beta *(β).* Using daily data over the period 1963-77, Reinganum (1981) concurs and reports a difference in returns of about 30% between the smallest and the largest-caps. Using a different sample period and model, Basu (1983) re-examines Reinganum's (1981) results and indicates that small-caps out-performance is commensurate with β levels. Keim (1983a) concurs but reports a significant January effect associated with the size effect in the Reinganum (1981) returns. Roll (1983) also documents this turn of the year behaviour and notes that, in addition, small-caps have abnormally large returns on the last trading day in December, which Roll (1981) and Reinganum (1983) partially attribute to tax-loss selling pressure. Brown, Kleidon and Marsh (1983) and Levis (1985) concur and indicate that while there is a linear correlation between the log size and mean risk-adjusted returns, the size and sign of the relation is unstable over time. Fama and French (1993, 1995) use the Fama and French (1992) database for the period 1963-92 to examine whether stock prices, in correlation to *BEME* and size, reflect return behaviour. The authors report that low *BEME* stocks remain more profitable 5-years post rank and, consistent with Lakonishok et al (1994), report long-term convergence of earnings growth rates of low-and-high *BEME* stocks (with small-caps generating lower earnings on book equity). Recent evidence, however, shows a disappearance, or even reversal, of the size effect for international markets. Bergstrom, Frashure and Chilshom (1991) report the size effect for French stocks (small and large-

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of a 10-year Treasury bond and a 3-month Treasury Bill, the unexpected inflation rate, the 1-month real interest rate and the value weighted NYSE index return less 1-month Treasury Bill return.

caps generate 32.3% and 23.5% annually between 1975 and 1989 respectively), and a much smaller size effect in Germany while Hamao (1989) reports a small-cap premium of 5.1% for Japan between 1971 and 1988. Using COMPUSTAT for the US, Ragsdale, Rao and Fotchman (1993) record small-cap under-performance compared to the S&P-500 from 1973-92, although on average they are more profitable for the period 1983-90.

Corhay, Hawawini and Michel (1988) examine the size effect in the UK for 1955-83, using the Fama-Macbeth (1973) regressions. They find that the correlation between mean returns and size is negative and statistically insignificant, and that the size effect is seasonal (May is the only month most of the small-cap premium is earned). Dimson and Marsh (1998) present results using a broad, value-weighted small-cap index (which covers the smallest tenth, by size, of the UK market) Hoare Govett Small Caps (HGSC) and a companion index, the Hoare Govett 1000 (HG1000). The HGSC Index indicates a size premium of 6.3% over the FTSE-Actuaries All Share Index between 1955 and 1988, but a dramatic reversal of small-caps' performance in the most recent years. Two recent review papers by Levis (1999) and Dimson and Marsh (1999) provide further evidence on the reversal of the size effect, with the FTSE-Actuaries All Share Index outperforming the HGSC and the HG1000, by 6% and 9% respectively, over the period 1989-97.

One further stock market anomaly that has received a lot of attention is the impressive performance of the value strategy, which calls for buying stocks with low prices relative to value measures such as earnings, cash flows, book values or dividends. Basu (1977), Fama and French (1995) and Lakonishok et al (1994) document that strategies based on

such variables produce superior returns. Basu (1977) asserts that the earnings yield (*PE)* ratios explain the violations of the *CAPM* and finds a significant negative correlation between the *PE* and mean risk adjusted returns. Ball (1978) concurs and argues that earnings related variables (like *PE)* are proxies for expected returns, and that the *PE* is a proxy for omitted risk-return factors in asset pricing models. An alternative of the *PE* is the cash flow-to-price *(CFP)* ratio, where cash flow is defined as reported accounting earnings plus depreciation. Accounting earnings may be a misleading and biased estimate of the economic earnings, but cash flow per share is less able to be manipulated, and therefore a less biased estimate of economically important income flows accruing to the shareholders. Chan et al (1991) investigate the cross-sectional correlation between Japanese stock returns and four fundamental variables: *EP,* size, *BEME* and *CFP* from 1971-88. They conclude that while the *BEME* and *CFP* have the strongest impact on expected returns, the *EP* has the weakest link. Although the high *EP* stocks out-perform the variable loses its significance when the *BEME* is added to the model. However, the most revolutionary of all studies is the work of Fama and French (1992). They create a sample of non-financial stocks in the intersection of the NYSE, AMEX and NASDAQ merged with COMPUSTAT return files to investigate the correlation between *BEME* and size to returns. The authors report that for the 1963-90 period size and *BEME* capture the cross-sectional return variation (with a strategy tilted towards high *BEME* stocks generating excess returns). Focussing on long-term returns (5-year passive returns) Lakonishok et al (1994) examine the same strategy, using a sample of NYSE and AMEX stocks from 1963-90, and find a mean annual return difference of 10.5% between high *BEME* (value) and low *BEME* (growth) stocks. Contrary to Fama and French (1992) they

argue that *BEME* may not be the most approximate proxy for value stocks since it possibly captures factors other than value or growth[9]. The authors test the *CFP* and *EP* and find that value strategies based on these ratios, or their interaction with past sales growth, are more effective and produce higher returns (about 10%-11% annually) than those based exclusively on *BEME.*

Focussing on the UK, Levis (1989, 1995) employs a variety of portfolio formation procedures, analyses several market irregularities (from 1965-85) and finds that *PE, DY* and price-based strategies are at least as profitable, if not more, than size-based strategies. Furthermore, Miles and Timmerman (1996) investigate the cross-sectional distribution of UK returns using a panel of non-financial stocks a list of variables encompassing *BEME,* size, debt-to-equity ratio (*DER*), *PE* and *DY)* for the period 1977-89. The authors find that coefficients on the lagged value of the *BEME* and size logs are significant (whatever estimation method) and conclude that *BEME* is correlated with future returns. Capaul, Rowley and Sharpe (1993) analyse *BEME* performance in France, Germany, Switzerland, UK, Japan and US for the period 1982-92. They conclude that a substantial tilt towards high *BEME* is attractive, especially if implemented on a global scale. Bauman et al (1998) employ the *BEME, PE, CFP* and *DY* for 1986-96 and include the 20 MSCI, MSCI Europe and MSCI-EAFE index markets. The authors find that high *BEME* stocks outperform for the majority of markets, and that when growth is dominant, the return difference is very small. Whereas when value outperforms it does so by a significant margin for all size categories except the smallest. Chen and Zhang (1998) examine value

[9] For example, a low *BEME* ratio may characterize a stock with many intangible assets (e.g., research and development) that are not reflected in book value or a low risk stock whose future cash flows are discounted at a low

strategies in the US, Japan, Hong Kong, Malaysia, Taiwan and Thailand for the period 1970-93. They report that high mean returns for high *BEME* stocks persist for US, are less robust for Japan, Hong Kong and Malaysia and are non-existent for Taiwan and Thailand. These results are confirmed by Fama and French (1998) who test for the value premium in an international context by examining 13 developed and 16 emerging markets for the 1975-95 period. They conclude that value stocks generate higher returns, outperforming in 12 out of 13 developed countries.

2.2.7. **Performance, Transaction Costs and Risk-Return Measurement**

With the above evidence, the next question to ask is whether the size effect simply reflects transaction costs. Is it risk measurement, or the product of deficiencies in asset pricing models, or is it a proxy for other return effects? Berk (1995) shows that size necessarily reflects equity risks (whatever its source). Jegadeesh (1992) and Hawawini and Keim (1999) argue that the size effect is a statistical artefact, attributable to measurement errors in βs and spurious explanations. Chan, Chen and Hsieh (1985) use the Chen, Roll and Ross (1985) and Fama and French (1973) framework to test whether the size effect is attributed to other factors apart from β. The authors form 20 size ranked portfolios and regress their returns cross-sectionally on βs of six variables[10]. They conclude that excess small-cap returns compensate higher risk. Small-caps and marginal stocks suffer excessively higher bankruptcies[11] during economic downturn which, when priced in an equilibrium asset-pricing model, indicates high aggregate risk premiums.

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rate.

[10] An equally weighted market index, the seasonally adjusted monthly growth rate of industrial production, the change in expected inflation and a measure of the change in the slope of the yield curve.

[11] Queen and Roll (1987) find a strong negative relationship between unfavourable mortality size. Evidence shows that about 25% of the smallest stocks are halted, de-listed or suspended from trading within a decade, and about 5% actually meet this fate within one year. On the other hand, stocks in the largest-cap size decile are much more likely to be around for a long time. Only 1% expire in the first year, and around 80% survive for more than 20 years.

Chan and Chen (1991) concur and indicate that small-caps under-perform and have high financial leverage and cash flow problems. For all these reasons small-caps are riskier, and this risk is not captured by a market index tilted towards large-caps. Fama and French (1992, 1995, 1996) offer various explanations to the economic implications of the roles of *BEME* and size in mean returns. They argue that if prices are rational *BEME* should be a direct indicator of the relative prospects of stocks. The authors argue that high *BEME* stocks outperform because they are riskier and indicate that both *BEME* and size are related to profitability (with common factors driving risk, market and size effects showing up in returns). Levis (1995) employs the Arbitrage Pricing Theory and the Fama and French (1973) methodology to explore the sensitivity of 20 size portfolios to five macro-economic factors[12] in the UK. The author points out that while large-caps are more sensitive to unexpected changes (in industrial production, inflation and default premium), there is little variation in the β coefficients for changes in term structure across different size portfolios.

As an empirical matter, Roll (1977, 1980, 1981a and 1981b) evaluates return variability and observes that performance mis-specification arises when the selected index is not ex ante mean variance efficient, and that that size is a statistical artefact attributable to non-synchronous trading. Blume and Stambaugh (1983) concur and demonstrate that returns stabilise with investment horizon. The authors show that short rebalance interval returns are upwards biased due to the bid-ask spread, especially for small-caps, and that since a passive portfolio is best mimicked by a specific rebalance interval any shorter rebalance

[12] These are the equally weighted market index, the monthly growth in industrial production, changes in expected inflation, changes in the yield difference between long corporate bonds and long government gilts and changes in the

interval returns overstate style and stock differences. Chan and Chen (1988a) and Chan and Chen (1988b) agree, but they propose a model with changing risk premiums over a longer time series to overcome stationarity and non-synchronous trading. Mounting evidence supports the proposition that risk, hence expected return, varies over time. Ferson, Kandel and Stambaugh (1987) examine weekly returns of 10 portfolios, of NYSE and AMEX securities, ranked by size over the 1963-82 period. They find a single-premium, time varying risk model capable of explaining the return differences. Handa (1989), Kothari, Shanken and Sloan (1995) and Fama (1998) concur and indicate that excess returns are sensitive to the return interval (daily, monthly, etc), and that return anomalies are fragile and disappear when exposed to more robust methods (overreaction is as common as under-reaction, post event continuation of pre-event excess returns is as frequent as post-event reversal). Stoll and Whaley (1983) assess the impact of transaction costs on the Banz (1981) and Renganum (1981) results and find that a quarterly round trip transaction eliminates the size effect. However, examining both the NYSE and AMEX stocks, Schultz (1983) finds that small-caps exhibit significant risk-adjusted returns after transaction costs, even over short horizons (with a 1-year horizon earning small-caps 31% net returns). Shultz also notes that transaction costs cannot explain the Brown et al (1983) periodic sign reversal or the abnormal January behaviour of small-caps. Similarly, Sinquefield (1991) argues that although transaction costs erode performance, small-cap styles overcome trading costs obstacles. The author argues that the implication for the observable mean returns cannot be fully assessed without knowing the market equilibrium induced by differential transaction costs. This implication is difficult to determine, since for passive small-caps (which do not require immediacy in

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yield difference between 20-year gilts and 3-mothns TBS.

executing orders) the effective bid-ask spread is probably different from the quoted one. Differential transaction costs will, under such circumstances, induce a clientele effect with investment anticipated to turn over frequently being placed with low transaction cost assets

Amihud and Mendelson (1986a, b) hypothesise that investors demand compensation for liquidity and that the size effect proxies for an illiquidity premium. They employ the bid-ask spread as a measure of market thinness. This spread is inversely correlated with attributes that reflect liquidity such as:- trading volume, number of shareholders, number of dealers making a market and degree of price continuity. Chiang and Venkatesh (1988) maintain that the higher spread for small-caps is not due to illiquidity. It results from the higher proportion of insider trading, which leads dealers to raise the spread, in turn causing investors to require higher expected returns. Barry and Brown (1984, 1985 and 1986) propose that different information across stocks accounts for the size effect. That is, there is more risk involved in small-caps valuation parameter estimation because there is less information available on them. As a measure of information availability, Barry and Brown (1984, 1985 and 1986) use the period of listing on an exchange, β and size. The authors report a period-of-listing effect present for NYSE stocks over the 1926-80 period, but unlike the size effect, this has no January effect. Also, Barry and Brown (1984, 1985 and 1986) find the interaction between size and period of listing to be more significant than the size effect. Merton (1987) develops a model of capital market equilibrium with incomplete information, where each investor has information about only some of the available stocks. Available information is the same for all stocks, i.e., risk estimation

does not differ across securities. However, information about a particular stock is not available to all investors. Merton proves that expected returns are higher, the smaller a stock's investor base, the larger firm-specific variances and firm size. The positive correlation between expected return and size appears contrary to empirical evidence. But Merton compares small and large-caps having identical investor bases and firm-specific variances. Small-caps tend to have less investor recognition and larger specific variances. Arbel et al (1983b) findings on neglected stocks also support Merton. Stratifying stocks by risk, size and degree of institutional ownership, they find higher returns associated with less investor following, even after controlling for size, and conclude that the small-cap effect is subsumed by neglect.

2.3. **Conclusions**

This first section of the chapter indicates that while there are many influential, inter-linked parties to the asset allocation strategy, the trustees are the utmost. The chapter further indicates that while there are variant definitions of asset allocation, all point to its longevity in view and significance as a determinant of performance. The chapter further shows the benefits of diversification and the disparate stocks and investment styles to achieve it. It details a number of market anomalies that generate controversial but significant relationships between stock factors and risk-adjusted returns. Because such factors are the basis of most definitions of style frameworks, determining their practical investment value is of great interest. A review of anomaly studies indicates evidence not entirely consistent with the irrational behavioural hypothesis, but consistent with a market culture or sociologically biased behavioural hypothesis. This supports a limited market inefficiency prior. While the view that large active returns are available from constant factor weighting with little investment risk appears to be largely a hoax, successful active investment is more if related to effective management of the dynamic character of markets than identification of anomalous factors. Further, while managers possess useful exogenous information on style factors, the issue is less whether such information exists and more it can be effectively implemented. A rigorous procedure for mixing active factor-tilt priors with historical data should be adopted, with benefits of a reduction in forecast variability and the likelihood of more reliable information ensuing.

CHAPTER THREE

DOMESTIC & EQUITY PORTFOLIO BIAS

CHAPTER 3: DOMESTIC AND EQUITY PORTFOLIO BIAS

3. **Introduction: Theoretical Background**

As formulated in Markowitz's (1952) landmark paper, the single most important concept in portfolio theory is diversification. This, when interpreted in an International Capital Asset Pricing Model *(ICAPM)* context, predicts that return optimisation necessitates holding the World Market Portfolio. Ahearne, Griever and Warnock (2001) buttress this by arguing that when global stock market capitalisation is considered, foreign assets comprise a disproportionately minute fraction of fund portfolios. The phenomenon, where investors hold too little foreign assets relative to the World Market Portfolio, and portfolio theory propositions is referred to as home bias. With its puzzling implications and conflicting views on the extent and likely effects on portfolio efficiency, many forms of home bias have been researched extensively across different markets. However, because of data constraints, and the need for a model optimiser to correctly review home equity bias, this chapter is not investigating home or equity bias per se but the extreme cross sectional allocation of assets within the home and equity markets, by UK pension funds.

The first set of studies, Evans and Archer (1968), Fielitz (1974), Wagner and Lau (1971) and Statman (1987), support the excessive allocation of assets in the home market, indicating that, beyond a certain diversification level, the marginal benefit of unsystematic risk reduction is subsumed by incremental transaction costs. While Statman (1987) demonstrates that diversification, with as few as 20 US stocks, accomplishes the desired risk reduction benefits (90% effective as those achieved by the S&P 500) Evans and Archer

(1968), Fielitz (1974) and Wagner and Lau (1971) indicate that an 8-10 stocks portfolio offers "adequate" diversification comparable to any index. Further supportive evidence originates from Cooper and Kaplanis (1995) who indicate that high levels of market integration (correlation coefficient of 0.55) justifies home bias. The second set of studies, Lombard, Roulet and Solnik (1999) and Diermeier and Solnik (2001), argues that market integration accelerates diversification because returns are strongly influenced by the extent of a stock's global activities. While Herston and Rouwenhorst (1994) indicate that country effects are more important than industry effects to explain cross-sectional return differences, Elton and Gruber (1992) find that the correlation between country indices is weaker. Despite the above and further evidence in favour of diversification, Grubel (1968), Levy and Sarnat (1970) and Solnik (1974), investors still exhibit extreme home bias 30-years after the publication of the first results indicative of substantial foreign asset gains. Several wide ranging, and at times conflicting explanations continue to be proffered for this puzzle. Black (1974) and Stulz (1981b) attribute it to institutional constraints and transaction costs; Gehrig (1993) and Brennan and Cao (1997) cite information asymmetry; French and Porteba (1991) heterogeneous beliefs; Lin, Engle and Ito (1994) bear markets correlation, and Stulz (1981a), Adler and Dumas (1983) and Cooper and Kaplanis (1994) hedging purchasing power. Thus far, no consensus has emerged on the existence of a single factor, or a combination thereof, to provide a satisfactory explanation. The thematic motive of this chapter is to correct this by analysing UK fund cross sectional asset allocation.

The important position of the UK pension funds is clear and well entrenched. Walter (1999) indicates that by 1994, of the $30 trillion managed assets, funds captured 27.3%, offshore

private clients 25%, insurance companies 21.3%, mutual funds 17.7% and the other category 8.7%. Further evidence, Blake (1995), indicates that funds directly held 34% of the quoted UK equity in 1993. The author further shows that the UK funds have become equity biased over the years as more cash has been allocated to equity. While fund portfolios were composed of 55% bonds and 25% equity in the 1950's, they have hovered around 15% bonds and 62% equity respectively in the 1990s. Walter (1999), further indicates that the UK funds have the second largest assets (US$775 billion) in the world after the US (US$3,760 billion). As a percentage of the GDP, the UK comes only second (at 76%) after Switzerland (116%), compared with the US (56%). WM (1994) reports that at the close of 1994, funds held £420 billion worth of assets and had grown to £800 billion at the end of 1999. This magnitude of assets, and the prevalence of funded pensions, is one of the most unique attributes of the UK economy, as epitomised by **Figure 3, Chapter 2**. Despite this phenomenal growth, no concise in-depth study has employed adequate resources to evaluate the UK funds' cross-sectional and time-series portfolio trends, leading to a suspect appreciation of their influence in the capital markets. The majority of studies consider small panels of data and short time-series. Indeed, in recent studies, Blake et al (1998 and 1999), employ two panels of 306 (247) large UK funds for 1986-94 (1991-97) respectively. While not directly addressing the question, further studies provide important insights into the aggregate flow of funds between countries. Bohn and Tesar (1996) analyse data on US transactions in foreign equity, while Tesar and Werner (1995) and Brennan and Cao (1997) consider data on portfolio flows between the US and foreigners. Still, such studies lack data on individual portfolio constituents and are restricted to assumption-based-conclusions that investors either hold indices or single asset (equity) portfolios.

Furthermore, the suggested home bias explanations result in flawed conclusions as they entangle the two effects of equity and home asset bias, and report it without probing funds for home bias at individual portfolio constituent level. Although focussing on a global perspective, Griffin (1998) is the only study closest to the isolation of fund equity and home asset allocation evaluation, but its credibility is somewhat compromised by its 1-year (1998) sample period. Fundamentally, to present a clearer and valid distinction between equity and home bias, it is important that the two effects are disentangled and an examination of each asset class and market weighting carried out in isolation over a longer time series. Because no previous study presents clear evidence to the justification and validity of these separable effects, this chapter exploits this gap, untangles the two hypotheses and documents more robust results by examining a larger sample of UK funds over a longer period.

Since there is no better disaggregated, formatted data generating an articulate analysis satisfactory to hypotheses requirements, this study constructs a sample of 1056 funds by hand over a 7-year period. To investigate excessive home asset class allocation, fund portfolios are split into the common 6 assets classes of; equity, bonds, index-linked gilts, real estate, cash and the "other" class. To investigate asset class bias (by market origin and extreme home equity allocation), the asset constituents are decomposed by their geographical origins into 10 portfolio constituents: UK and foreign equities, UK and foreign bonds, UK index-linked gilts, UK cash, UK and foreign property, trusts and managed funds. To investigate fund size bias, the portfolios are split and analysed by size rankings. The empirical results indicate extreme equity investment (at 72.2% of the

portfolio) coupled with a strong home asset allocation (at 77.7% of the portfolio) dominated by home equity (at 53.1% of the aggregate portfolio). Extreme home asset allocation is prevalent across fund sizes but is more pronounced among the smallest (below £10 million) with 81% in home and 19% foreign assets, while the largest funds (above £1 billion) allocate 76.5% in home and 23.5% in foreign assets. No previous study has deliberated on fund asset allocation employing such a large panel of individual portfolios in the UK context, in such an elaborate and innovative approach.

Because asset allocation represents an average of decisions from a diverse group of portfolios, it is difficult for research to draw precise scientific conclusions in a bid to rationalise its disparate patterns. Through literature review Section A recognises this phenomenon and presents a comparative analysis of the asset allocation trends. To obtain clarity on the implications of extreme market and asset class allocation, the discussion initially focuses on the equities, bonds, real estate, cash, and trusts etc between the home and foreign assets and large and small funds. The chapter establishes three inequitable scenarios that can result from excessive home and equity allocation. First, skewed excess development and deepening of the UK at the expense of foreign markets. Second, is the biased growth of home equity at the expense of other assets (in this scenario, the UK financial markets become more liquid and overpriced with equity trading at a premium). The final section presents the data, tests the hypothesis and presents the results.

SECTION ONE

3.1. **Literature Review**

This section reviews literature on the justification for asset class bias. While there is abundant diversification evidence, Evans and Archer (1968), Wagner and Lau (1971), Solnik (1974), Statman (1987), and Odier and Solnik (1993), there is also widespread bias literature, Ambchtsheer (1987), Thaler and Williamson (1995), Tutt and Tutt (1986) and Froot (1995) especially equity bias. Literature review focuses on the extent to which institutional portfolios are concentrated, both at portfolio level (domestic versus foreign) and asset class level (home equity versus foreign equity etc). The analysis examines portfolio trends in major markets, where evidence displays anomalous bias to the extent that, even during periods of domestic and equity markets under-performance, the switch into foreign and other assets is surprisingly inconsequential. The section concludes by presenting a tentative rationalisation of this puzzling phenomenon.

3.1.1. **Home Asset and Equity Bias**

One of the most striking features of asset allocation is the extent of home equity bias. Walter (1999) investigates the structure of the EMU and US asset management industries, for 1994, and indicates that of 9 countries, the UK exhibits the strongest equity bias with 82% of assets in equity (of which 56% is domestic, compared with the US's 48% and Ireland's 25%). From the *MPT* perspective, Griffin (1997) analyses fund and insurance company portfolio suitability from two standpoints. The first measures risk (standard deviation) and the second presents their economic situation (measured by the tracking error between the riskiness of fund assets and liabilities, proxied by an arbitrarily chosen

domestic 10-year bond as a risk free asset). The data used is the sum of allocations to 1-, 2-, 3-, 5-, 10-, and 30-year domestic bond, with foreign equities and bonds, inclusive of both hedged and un-hedged currency overlays, proxied by size-weighted indices of the G7 capital markets. The author indicates that fund portfolios are characterised by strong equity and bond home bias, throughout the sample period. While home and foreign bonds have almost a 50-50 allocation at higher risk, foreign equity actually falls between 20%-30% of total equity, and at different risk levels, the foreign bond and equity portfolios are very similar. With the second approach, bonds in the efficient portfolios are exclusively domestic. The author argues that relative to the domestic 10-year bond, foreign bonds carry considerable risk without sufficient additional return to merit large positions. While there is a stronger equity bias, with remarkable period-dependent relative historical performance, foreign equities only account for between 10%-12% of equity. In conformity with Jorion's (1989) study, using historical returns easily shifts the optimal equity portfolio between 100% domestic and 100% foreign.

Folger (1971) uses a standard mean-variance model to compute portfolio constituents consisting of treasury bills, bonds, equities and real estate. Ranking portfolios by risk, the safest portfolio (0.8% standard deviation) is 12% real estate, 16% equities, 6% bonds and 66% treasury bills. Each subsequent portfolio has higher risk and return. For example, portfolio 3 has a 9.4% return, 1.6% standard deviation, and is about 50% treasury bills and bonds and about 33.3% in equities. By contrast, portfolio 8, with 13% returns, a 4% standard deviation, is 100% equity. The author then compares these results with an index with 10.1% returns, a 2.3% standard deviation is 27% treasury bills, 21% bonds and 52%

equities and argues that this makes a strong case for a 20% real estate minimum commitment, even where equity dominates. Folger (1971) goes further and compares real estate returns with inflation, as measured by the CPI since 1915. The author identifies six inflationary periods at a rate greater than 5%, 1915-19, 1941-42, 1945-47, 1950-51, 1968-70 and 1972-78 and indicates that equity and real estate returns rise steadily throughout this period. While during deflationary periods of 1921 and 1930-32, bonds outperform, as interest rates drop and equity under-performs, during stability real estate and equity returns correlate and outperform bonds. While further tests by Fama and French (1977) and Scholes and Williams (1977) confirm that real estate hedges inflation, Blake (1992) and Grissom, Kuhle and Walther (1987) concur and propose real estate bias in fund portfolios. Froot (1995) supports the above rationale and contends that matching inflationary sensitive liabilities with inflationary sensitive assets should be the main objective of the fund (with a bias for real assets, which like commodity futures, provides some real yield). Focussing on Japan, Kang and Stulz (1997), investigate home equity ownership by non-Japanese investors for the period 1975-91. They document a consistent and strong large-caps home bias with an inclination for manufacturing and strong performance, low unsystematic risk and leverage. Controlling for size, small-caps that export more, with greater turnover, and *ADRS* stocks enjoy greater foreign ownership.

Blake (1995) investigates UK fund home and equity bias for the period 1979-89, using data from the WM and PFTAD data series. Funds exhibit significant portfolio differences due to exchange control abolition, which encourage unrestricted foreign investment from 1979 (when foreign assets comprise only 6% of the portfolio). While foreign assets peak at 21%

in 1986 by 1990 they comprise 17% (15% equity and 1% apiece in bonds and real estate) and home assets 83% (of which 48% is equity). The most significant changes on the domestic scene are the decline in bonds (22% to 10%) and real estate (23% to 9%) and the unrelenting equity bias which increases from 50% to 68% (of which home equity accounts for between 44% and 53% respectively). PDFM (2000) presents a more concise study of a comparison of the US, Japan, Netherlands and Australia for the period 1990-99, and the UK for 1962-99. The study obtains pension fund data from the Federal Reserve Board Flow of Funds (US), Japanese Ministry of Health & Welfare (Japan), APRA, Australian Bureau of Statistics (Australia), CBS- Statistics Netherlands (Netherlands) and the Office of National Statistics and WM (UK). The research splits portfolios by assets and market origin to generate 6-categories; home and foreign equity, bonds, cash and real estate for the US, Japan and Netherlands. For Australia and the UK the decomposition generates 7-categories. The study reports remarkable home bias at 91.8% of the US fund portfolios, Australia 84.6%, Japan 84.2%, the Netherlands 76.3% and the UK 75.4%[13]. While foreign equity remains at modest levels, aggregate equity actually experiences a gradual increase for the sample period from 38% to 65%, placing the US funds among the most equity-oriented (which is not surprising given the vast size and heterogeneity of US equity and bond markets).

For Japan, the period 1997-99 experiences a reduction in home bonds, mostly in favour of equity and, particularly in 1999, in favour of home equity (partly reflective of the strong

[13] To facilitate cross-country comparison, some Government statistics do not split real estate and other investments on domestic and foreign market categories, leading the study to take aggregate values and therefore a lower-than-normal

recovery of the home equity market in 1999 which returns 47% in yen terms). Previously asset allocation had been heavily influenced by Government regulation through the 5:3:3:2 rule. This imposed a minimum of 50% domestic bonds, a maximum 30% apiece in home equity and foreign assets and 20% in real estate. The abolition of this rule may account for the significant shift from home bonds to foreign equities. Without any major restrictions apart from a home-equity-favourable-tax system, Australian funds have a high proportion of foreign assets, accompanied by a gradual decrease in real estate, an increase in equity, (particularly domestic) and uncharacteristically high cash weightings. Netherlands exhibits a dramatic increase in foreign bonds and equity (both home and foreign) and a 67.7% decrease in home bonds, while cash and real estate remain relatively stable, particularly for 1995-1999, (a scenario attributable to annulment of restrictions that feature within the fund industry at the beginning of the sample period).

The UK exhibits a long-term rise in equity (both home and foreign) reflective of equity markets growth. Also vibrant diversification, ascribed to scheme maturity, a reappraisal of the merits of bonds and general increased foreign investment (originating from strong UK equity performance and the 1979 abolition of the exchange controls). Equity increases from under 50% in 1962 to over 80% in 1993, with a transitory dip to less than 40% during the 1974 bear market. Domestic bonds decline from 51% in 1962 to 4% in 1993. This is partly due to substitution with index-linked gilts (first issued in 1981) the attractive foreign bond market and the fall in the gilt market size relative to the equity market. For example, in 1970 the UK bond and equity markets were each capitalised at £20 billion, but by 1999, the

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figure for domestic assets.

equity market overshoots £1,700 billion, versus £255 billion for bonds. There has been a reversal recently, with bonds and index-linked gilts investment being positive, reflective of scheme maturity and a desire for closer tracking of liabilities. Real estate popularity increased in the 1970s as funds hedged inflation, peaking at 18% in 1981 (compared with less than 5% in the mid-1960s) with a reversal to below 5%, by 1999, after a dismal performance. Griffin (1998) offers another global comparison of funds from 12 major economies, (Australia, Canada, France, Germany, Netherlands, Ireland, Italy, Japan, Sweden, Switzerland, the UK and the US) plus South Africa, using data from InterSec Research Corporation and Greenwich Associates for the period 1986-95. The author decomposes the portfolios along 8 lines of analysis; equities versus bonds, home versus foreign equity, home versus foreign bonds, equity versus equity market share, equity-bond diversification versus import and export activity, home equity versus home equity out-performance and equity diversification versus home market volatility. The author indicates home bias on an aggregate portfolio basis; with a sample mean of 86.5% of the portfolio in the home market. On market origin analysis South African funds are 100% domestic, Italy 99.3%, Germany 96.9%, France 93.4%, Sweden 90.5%, Switzerland 88.8%, the US 87.7%, Japan 86.6%, Australia 83.4%, Canada 82.1%, Netherlands 79.5%, the UK 74.8% and Ireland 61.8%.

Griffin (1998) evaluates the equity-bond hypothesis and indicates that while a high home equity content is correlated with the immediate historical performance (when either equity-bond or aggregate foreign-home equity returns are stretched 5-years prior), they generate inconclusive evidence. A phenomenon Griffin attributes in some countries to restrictions.

To rationalise the equity-bond split differentials, the author analyses the UK and the Netherlands funds (countries without any restrictions). He indicates that the home equity out-performance over home bonds is similar in the two countries; the UK (4.4%) and the Netherlands (4.1%). However, despite these similarities, the portfolios are different, UK equity is at 76% and Netherlands 26%, while bonds for the UK and 11% and the Netherlands 63%. Griffin (1998) also tests the hypothesis that high home equity volatility countries have a larger foreign equity component, since they stand to gain the most from the reduced foreign volatility. However, the results indicate a slight discernible trend towards home bias. Another hypothesis examined by Griffin (1998), is that foreign equity diversification is a function of fund size, with funds beginning to diversify when their size puts pressure on the home market. By this rationale, funds in countries with greater foreign diversification indicate higher home equity bias. For this hypothesis, the author dictates a slight correlation between fund size and foreign equity diversification. Griffin (1998) compares the fund (home and foreign) bond components and whether the openness of an economy to foreign trade leads to increased foreign diversification. The author indicates that there is not much correlation between the openness of an economy and foreign diversification and that the foreign bond component is generally low. Aside from the UK, no country has a foreign bond allocation above 20% of total bonds only in Australia (18.2%), Switzerland (12.6%) and Ireland (10.4%) are more than a tenth of bonds non-domestic.

Focussing on the largest UK funds, the WM (1994) provides a concise analysis of asset allocation. Is uses the *WM2000 Universe* (the largest 1364 funds) to compare their

portfolios with the *WM50* (the largest 50 funds) and detects home bias. Using a sub-sample of the largest 306 funds from the *WM2000 Universe* (for the period 1986-94), Blake et al (1998a, 1998b) concur and indicate home bias; with 77.3% of the portfolio in home assets, 73.1% in equity (home plus foreign) and 53.6% in home equity (the highest for developed markets). The *NAPF* (1997, 1998) examines portfolio market origin, asset class and individual shareholding for its 700 member funds, dominated by the largest UK funds and indicates home bias for all assets, with a stronger phenomenon for equity. *PFTA* (1993) examines well over 2000 funds from 1986, by decomposing the portfolios by asset class (equities, bonds, real estate, etc), market origin (home and foreign equities, home and foreign bonds etc) and fund size. Decomposing portfolios by market origin indicates strong home bias, (a mean 81.3% of aggregate portfolio) with a gradual, but significant, fall from 84.3% in 1986 to 77.2% in 1993, with each home asset dominating its foreign counterpart. Evaluation by asset class indicates equity bias at 67.8% of the portfolio. This rises gradually from 59.1% in 1986 to 74.1% in 1993, with strong home equity bias (51.7%). Home equity soars monotonically from 45% in 1986 to a peak of 54.9% in 1993, as do foreign equity, foreign bonds and cash deposits.

In a counterbalance fashion, home bonds fall from 17% to 5.2%, foreign real estate, 1.3% to 0.8%, while index-linked gilts, home real estate and the "other" category are almost steady (save for negligible sporadic deviations). The analysis by size indicates that while the mean home assets stand at 77.4%, small funds (below £25 million) have 81.3% of their assets in the home portfolio while the largest funds (above £1 billion) have 76.3%. Home bias is inversely correlated with fund size, with the smallest size band (below £5 million)

maintaining 83.3% in home assets, while the largest funds (above £10 billion) allocate 75.4%. While the sample period mean foreign component is 22.2%, small funds (below £25 million) have 18.7% in the foreign market, while the largest funds (above £1 billion) invest 23.7%. Foreign assets rise almost monotonically with fund size from 16.7% for the smallest size band (below £5 million) to 24.6% for the largest size band (above £10 billion). Minns (1980) employs the survey methodology to investigate asset allocation by a sample of 250 funds, accounting for 40% of the market value of all UK funds for the period 1972-77. The author indicates home bias, skewed towards large-caps, which hold 67.3% of fund assets. Davies (1995) supplies very imposing evidence that asset allocation is size and age biased, with small funds concentrating on both short-term domestic bonds equity and low proportions of real estate. Motivated by extreme home equity bias in the US (92.2%[14]), Japan (95.7%), the UK (92%), Germany (79%) and France (89.4%), French et al. (1991) employ cross-border equity transactions data, and crude foreign equity estimates for the US, the UK and Japan, and document excessive home bias. The US investors allocate 93.8% to home equity and 6.2% to foreign equity, the UK 82% and 18%[15], and Japan 98.1% and 1.9%, respectively. The authors compute pair-wise correlation, real returns (assuming currency hedging), expected returns (assuming a constant relative-risk-aversion utility function), and employ the MSCI as a benchmark. The authors report that substantial differences in expected returns are needed to rationalise the observed home bias. UK investors expect 500 basis points above the US to explain their 82% home bias; the US 250 above the Japanese, and the Japanese 350 above the US. The authors conclude that this

[14] This is very surprising considering that the US equity market comprises less than 48% of the World Equity Market.
[15] Split almost equally among the US, Continental Europe and Japan.

level of incomplete foreign investment is attributable to choice since it is below the mandated institutional constraints.

Based on this notion, the authors ascribe the second explanation of imperfect diversification and investor bias about markets to the Shiller, Fumiko and Yoshiro (1990) observations. Shiller et al (1990) survey the Japanese and US fund managers' home and foreign equity, optimism-pessimism levels, and document that US investors expect a mean return of -0.3% on the Dow Jones Industrial Average (over the next 12 months) compared with -9.1% on the Nikkei, while the Japanese expect 10.8% and 12.6% respectively. While the Japanese are generally more optimistic than their US counterparts, in concurrence with Tversky and Heath (1991) evidence on unfamiliar gambles, such optimism is biased towards Tokyo. Cooper and Kaplanis (1994) employ data from 8 leading OECD countries, the Survey of Current Business (US), CSO Financial Statistics (UK) and Financial Accounts Statistics (OECD) for Germany, France, Sweden, Japan, Italy and Spain to investigate whether inflation hedging fuels home bias. The authors also use the *LSPD* and various indices like the MCSI (1987), the CAC General (France), Banca Com Ital (Italy), Tokyo SE (Japan), Madrid SE (Spain), Affasrvarlden Gen (Sweden), FTA-All Share (UK), S&P Composite (US) and Commerzbank (Germany). The authors indicate intense home equity bias that is not attributable to either inflation hedging or direct costs of foreign investment.

Tse (1999) investigates the holding of Japanese futures contracts by London Futures Market (LIFFE) investors, and the holding of the LIFFE futures contracts by Japanese

Government Bond futures, and documents home bias even when easy access to similar markets exists. The author argues that since LIFFE and Japanese Government Bond trading times overlap by an hour, investors can rebalance their positions either at LIFFE or at the Japanese Government Bond Futures market. However, the author finds that as the LIFFE opens London investors rush to rebalance portfolios. Furthermore, Tesar and Werner (1995) indicate strong evidence of home bias in 5 OECD countries; Germany, Canada, the UK, the US and Japan, which represent 84% of the world equity market and 78% of the world bond market respectively. They extract data from the Survey of Current Business (US), the International Investment Position, (Canada), Balance of Payments Monthly (Japan), the Statistical Supplements to the Monthly Reports of the Deutsche Bundesbank, (Germany) and the Pink Book: Balance of Payments (UK) for the period 1926-90. The authors find that despite the highest home equity bias, the UK leads in foreign assets in 1990 with 32%, followed by Japan with 11%, Germany 10%, Canada 4% and the US 2%.

Solnik (1974) and Altman (1992) suggest that while home diversification reduces risk due to differential enterprise and sector performance, systematic risk remains because of investing within a single economy. Blommestein (1998a) analyses the implications of rapid fund growth on ageing populations of 11 OECD countries, Belgium, Canada, France, Germany, Italy, Japan, Netherlands, Sweden, Switzerland, the UK and the US for the period 1987-96 and records a shift into riskier, high-yielding assets and foreign markets, with Belgium, the Netherlands and the UK showing significant foreign assets (**See Table 3.1**). Portfolios are less diversified than the world markets portfolio, with funds displaying strong home bias, especially in equity. Broer and Jansen (1998) argue that although the US,

UK and German investors have increased foreign assets over the period 1975-90, home bias still remains remarkably high, with 40% in the home markets.

Table 3.1 **Group-10 Pension Fund Holdings of Foreign Assets (%) 1987-96**

	1987 [%]	1988 [%]	1989 [%]	1990 [%]	1991 [%]	1992 [%]	1993 [%]	1994 [%]	1995 [%]	1996 [%]
Belgium	34.1	37.4	33.4	30.0	29.4	29.2	34.3	33.0	35.8	35.4
Canada	-	5.9	-	7.0	9.0	11.0	12.0	14.0	14.0	-
France	-	-	-	-	-	2.0	2.0	5.0	4.4	-
Germany	-	-	-	4.5	4.5	4.3	4.5	7.0	5.3	7.7
Italy	-	-	-	-	-	4.0	4.0	5.0	-	-
Japan	14.3	14.8	14.3	16.0	14.8	14.4	14.0	10.8	12.5	14.9
Netherlands	12.8	13.3	15.2	15.8	14.9	17.1	19.7	22.0	21.0	30.2
Sweden	-	-	-	-	-	-	-	11.0	9.1	14.8
Switzerland	4.0	4.0	4.0	4.2	6.0	6.0	6.0	13.0	16.0	18.6
UK	14.0	17.0	22.0	20.0	23.0	24.0	27.0	27.0	26.8	29.2
USA	2.5	2.9	3.7	3.5	3.9	4.3	8.1	8.1	9.1	10.4

Source: OECD, 1998

The authors employ a multi-asset dynamic portfolio and data from the US, the world markets portfolio and Germany. Firstly, they examine mean variance restrictions in an asset demand system, with dynamic adjustment and capital controls. Secondly, whether adjustment costs explain lagged shifts to foreign assets. Thirdly, capital controls potential to explain foreign markets under-weighting. The authors report that despite an increase in foreign assets, the German portfolio still displays considerable home bias, as indicated per the Dumas (1994) optimiser, and attribute this to information asymmetry and excessive exuberance on domestic returns. The authors further document that capital outflows are more heavily regulated than inflows, the capital import premium is large (-0.0923), but insignificant in the world markets portfolio, while the capital export premium is small (0.0223) and insignificant for the German return. They conclude that capital controls cannot account for German home bias since foreign asset weighting is below the mandated limit.

Blommestein (1998b) argues that foreign investment benefits are asset type-and-market integration dependent, with bond markets being the most integrated (and hence less beneficial for foreign diversification) while real assets are less liquid, with values dependent on sometimes hard-to-acquire localised information. A second possible reason is that since holding the world markets portfolio is based on market efficiency, optimal diversification is unachievable in inefficient markets, which when added to the preferred strategy of matching home liabilities with home assets, leads to home biased behavioural portfolios. In concurrence, the NAPF Member Funds Database (1997, 1998) shows that investment rules reflect that home assets, especially equity, possess the highest portfolio limit (with foreign assets and property being lowest). Blommestein (1998b) observes that although many countries have relaxed such regulations, direct or indirect residuals are still prevalent, with the first being maximum limits on foreign assets, which, according to Laboul (1998), are lower than those applied to analogous home assets.

Solnik and Noeltzin (1982) evaluate the ex-post-efficient frontier for passive-active strategies for US investors over 1970-80, with short-selling constraints, using the Markowitz optimisation model. The authors indicate that US investors exhibit home bias, despite passive diversification into the Capital International World Stock Index reducing risk from 16% to 14% and generating a return more than 50% higher for a purely 100%-US portfolio. The authors further indicate that the World Stocks-and-Bonds Index posts the same performance as the World Stocks-Only Index but with much less volatility (10% instead of 14%). The same interpretation is observable for optimal strategies, with stocks-only-efficient-portfolios having higher risk (50%-100% more) for the same level of return

than stocks-bonds-efficient portfolios. Tole (1982) indicates that investors concentrate in home assets and attributes this to high costs, illiquid markets, regulatory and tax obstacles to cross border investment. However, the author still indicates that this is anomalous given market deepening through derivatives, combined with a relaxed regulatory environment. Cholerton, Pieraerts and Solnik (1986) examine portfolio activity on the US, the UK, Japan, Germany, Italy, Canada, France, Belgium, Sweden, Denmark, Switzerland, Australia and Holland, by the US investors and report excessive home bias. For example, the authors observe a weak correlation (less than 0.5) between home and Eurobond markets across currencies, which generates abnormal returns. Starting with a 100% US bond portfolio, the authors add non-dollar bonds by 10% increments, equally distributed among the Netherlands, Germany, UK, Switzerland and Japan. The first such substitution increases returns from 6.8% to 7.18% and reduces risk from 8.82% to 8.47%, with the minimum-risk portfolio obtained for a proportion of non-dollar bonds between 30% and 40%.

Focussing on the UK, WM (1994) investigates the portfolios of 700 large funds for 1985-94 by splitting them into UK and foreign assets and documents a sample mean home bias of 78.9%, with concentration in all home assets. Starting with a home portfolio of 84%, in 1984, funds adopt a more foreign posture and close with 74% home bias. Coval and Moskowitz (1996) document strong US local bias for fund-manager-locally-headquartered and highly-levered small-caps producing non-traded goods. The authors investigate US fund manager bias for geographically proximate holdings using the 1996 Nelson's Directory of Investment Managers, Compact Disclosure, US Census Bureau's Gazetter Place and Zip Code Database, for every covered US local-headquartered stock identified by

latitudinal and longitudinal location (City and State). The authors match this data with fund managers and find that they hold stocks 160-184 kilometres (or 9-11%) closer than an average investor. In concurrence, Huberman (1998) reports that investors underweight all unfamiliar stocks, inclusive of distant home stocks, and attributes this to sentiment. The author tests local bias by examining stock ownership records of the 7 Regional Bell Operating Companies *(RBOC)* split up from AT&T in 1984 to become the main phone provider in their locality. The author documents that in all, but Montana State, investors are biased towards their local *RBOC*[16].

3.1.2. **Implicit Economic Determinants of Asset Allocation**

French and Porteba (1991), Cooper and Kaplanis (1994), Brennan and Cao (1997) and Coval and Moskowitz (1996), indicate that although obstacles to foreign assets have substantially subsided, home bias remains unabated. Falkenstein (1996) argues that home equity bias is not totally driven by conventional risk proxies. Research offers various explanations that can be grouped into two categories; explicit (e.g., discriminatory taxes and actuarial assessment) and implicit barriers to capital flows (Gehrig 1993), e.g., political risk), due to regulatory and cultural effects. For example, information asymmetry is an overlooked factor in the home bias debate. For instance, while the existence of national boundaries may amplify information asymmetry and the concern for hedging non-tradable goods, (Coval and Moskowitz 1996), such frictions arise even when only geographic distance separates an investor from potential investments. Statman (1999) argues that information asymmetry, and the behavioural portfolio building process, lead to excessive

[16] Their holdings average US$14,400, while for those investors who do not stick with the local unit, the average is US$8,246.

home bias by US investors that is only matched by the Japanese and the UK. Falkenstein (1996) investigates a cross-section of shareholdings for the 1991-92 sample period and documents that funds avoid stocks with little information (measured by the number of major newspaper articles or the number of months listed). Low (1993) concurs and indicates that information asymmetry influences the destination of portfolio assets, and that less information induces a higher predictive distribution variance and less investment. Merton (1987) argues that investors prefer identifiable stocks, resulting in home equity bias and investors strongly preferring more visible foreign stocks that are known internationally.

Various studies investigate the extent to which investor sophistication affects the performance of different investor groups (individuals, foreign and local institutions) and record contradictory results. Shukla and van Inwegen study the performance differential of US versus UK fund managers investing in the US. Controlling for factors like tax, expenses, fund objectives and currency risk, they conclude that UK fund managers under-perform their US counterparts, and attribute this to information disadvantages faced by UK managers. Using daily data from the Korean Stock Exchange, over a 3-year period stretching 1997-99, Kim (2000) concurs and notes that sophisticated foreign managers out-perform local individuals, but interestingly, under-perform local managers. However, in small-caps, where information asymmetry problem is grave, both foreign and domestic managers under-perform local individuals, perhaps reflective of the fact that foreign managers are less informed about small-caps. Covrig, Lau and Ng (2001) compare stock characteristics preference between foreign and local managers within the UK, Australia, France, Germany, Hong Kong, Italy, Japan, the Nertherlands, Singapore, Sweden and

Switzerland for the year 1999. In addition to size, liquidity, debt, cash flow, earnings and dividends based multiples, turnover and variance, the study employs analysts following a stock, domestic and foreign managers holding a stock to characterise information asymmetry. The results indicate local and cross-border herding behaviour – with home managers following more closely stocks held by other local managers, while foreign managers hold more closely stocks held by their counterparts. Furthermore, foreign managers concentrate in large-cap, high turnover stocks with worldwide visibility, greater investor recognition, wider analyst following, held by a large number of home and foreign managers and forming a constituent of a global market index. Additionally, home managers concentrate more in relatively small-caps, low *BEME,* large dividend yield and high turnover stocks, and prefer small to large-caps they have information on. Otten and Bams (2003) analyse the performance of US versus UK mutual fund managers within the USA market for the decade 1990-2000, employing CRSP as the benchmark, and concludes that after controlling for tax, objectives, style and time variation in betas, UK managers concentrate in small-caps, where they outperform their peers.

Political risk is another factor for consideration when analysing asset allocation, because it lowers expected foreign equity return. It arises when non-resident investors believe that some probability of difficulty in repatriating their holdings might be experienced, or their holdings might be expropriated altogether. However, this can be partly mitigated by investing in assets where immediate re-winding is possible. For example, money markets are liquid and well integrated at short maturity and do not reflect potential political risks, while capital markets may not be as liquid, to effect a quick and inexpensive unwinding

strategy to avoid political risk. French and Porteba (1991) argue that high taxes on foreign equity income lead to home equity bias, since tax-exempt investors, like funds, do not have offsettable credit-claims on dividend withholding taxes. However, French et al (1991) observe that even for funds, tax reduces after-tax returns in foreign markets by only 50 basis points. Tersar and Porteba (1995) argue that while foreign investor withholding tax offsets are imperfect, credit carry forwards are inconsequential to mitigate foreign investment. Adler and Dumas (1983) and Uppal (1993) point out that because investors in different countries consume different bundles of goods, and pay for them in different currencies, this may encourage them to hold portfolios that differ by inflation hedging. Eldor, Pines and Schwartz (1988), and Stockman and Dellas (1989) argue that another explanation attributable to home bias is the existence of non-traded goods. The authors develop equilibrium models in which the desire to hedge non-traded-goods price uncertainty leads to home bias.

Stulz (1981a) states that departures from mean variance optimisation suggest that investors tailor asset holdings to hedge currency purchasing power parity, the spot interest rate or the return to human capital resulting in home bias. Cooper and Kaplanis (1994), argue that while it is tempting to rationalise currency risk as explanatory for home bias, both theory and evidence dispute for observable extreme home bias. Exchange risk can be effectively hedged just by trading foreign assets in the same currencies and investor decisions to hold foreign assets and currencies should be separable so as to avoid sacrificing diversification benefits. Tesar and Werner (1995) indicate that differential transaction costs lower expected net foreign returns and act as barriers to foreign investment. Such costs are classifiable into

fixed and variable costs. Fixed costs take the form of language, institutional and regulatory differences and information access costs. While these costs provide some of the home bias explanation, it seems improbable that the cumulative return on well-diversified portfolios does not exceed the fixed barriers to entry in most markets. Variable costs, such as stamp duty taxes, commissions and higher spreads are difficult to quantify, but may also deter foreign investment by lowering turnover rates. Rowland (1999) employs an inter-temporal portfolio model, incorporating proportional transaction costs, to examine home equity bias and the correlation between home and foreign turnover rates, and concludes that diversification and re-balancing levels decrease with transaction costs. In contrast, French and Porteba (1991) record a positive correlation between cross border equity flows and the likelihood of transaction costs failure to explain home bias. They argue that, for the US, such costs are lower in more liquid markets such as NYSE, which inclines investors towards the most liquid and not home markets.

3.1.3. **Explicit Economic Determinants of Asset Allocation**

Barriers to foreign investment e.g., capital controls, explicit transaction costs (fees and commissions), implicit transaction costs, (illiquidity) and information gathering costs may promote home bias. French and Porteba (1991) indicate that foreign asset limits affect portfolio structures e.g., in France, foreigners cannot hold more than 20% of a stock without the Ministry of Economy and Finance authorisation. Similar restrictions are dictated in Japan, Germany and China, among other countries. In the UK, Woodhouse, Eden and Lippiart (1995) observe that according to the 1988 Tax Act, 1995 Pensions Act and 1990 Social Security Act, the main restrictions are the 5% self-investment, venture capital and stock lending. While Myners (2001) concurs and indicates that over 50% of his

sample view the Minimum Funding Requirement as significantly influencing investment, Griffin (1998) argues that the UK adopts a liberal view, (**See Table 3.2 below**), conducive for equity or home equity bias.

Table 3.2 **Asset Allocation Restrictions**

Country	Portfolio Restriction
Belgium	< 65% in Equity, 15% in Sponsor, 10% in Sight Deposits, Advance Notice, 30-Day Deposit > 15% in Treasury Bonds
Canada	< 20% in Foreign Assets
Denmark	< 40% in Equity
France	< 65% in Equity, 40% in Property, 15% Treasury Deposits, 33% in Venture Capital > 50% in EU Public Bonds
Germany [Pensionskassen]	< 30% in EU Equity, 25% EU Real Estate, 6% in Non-EU Bonds, 20% Foreign Assets 10% Self-investment
Ireland	Prudent Diversification, Declare Self-Investment
Italy	< 20% of Liquid Assets, 20% in Unit Trusts, 50% of Bonds or Equity of OECD Conutries
Japan	< 30% Equity, 30% Foreign Assets, 20% Real Estate, 10% of Single Counter and > 50% in Bonds
Netherlands	< 5% Self-investment, Otherwise Prudent Man Rule
Norway	< 35% in Equity, 30% in Corporate Bonds, 30% in Real Estate
Portugal	< 50% in Real Estate, 15% Self-investment, 40% Foreign Equity and Foreign Bonds > 30% in Treasury Bonds
South Africa	< 10% Foreign Assets, 75% Equity
Spain	< 10% of Assets to Exceed 5% of Issuer, 1% in Cash Deposits > 90% in Listed Securities, Deposits or Real Estate
Sweden	Major Part of Fund in Bonds and Retroverse Loans to Contributors
Switzerland	< 20% in Foreign Assets, 50% in Equity, 25% Foreign Equity
United Kingdom	< 5% Self-investment, Otherwise Prudent Man Rule
United States	Prudent Man Rule

Source: Griffin (1998) and Laboul (1998).

The fund asset-liability structure analysis indicates that home bias is somewhat correlated to fund liabilities and risk. Funds are prone to invest this way to reduce risk. They can do so if they can prospect for assets that match their liabilities by origin; thus matching pound-denominated-liabilities with pound-denominated assets. This investment philosophy does not seek to invalidate foreign diversification benefits. However, foreign assets may increase the risk of default among others, in that transaction consummation and capital recovery may not be immediate because of illiquidity and other factors discussed above. Shalen (1999) investigates the UK fund portfolios, employing the FTSE-100, DJIA, S&P-500 and Euro Stoxx-50 cumulative returns for the period 1994-98. The author indicates that the FTSE-100 trails other indices and that beyond a sporadic trend of increasing correlations, the correlations between the FTSE-100 and other benchmarks are the most volatile.

Furthermore, the author investigates the impact of greater diversification of equity portfolios using 3 portfolios: 15%-DJIA, 70%-FTSE-100 and 15%-Euro Stoxx-50 portfolio, 25%-DJIA, 50%-FTSE-100 and 25%-Euro Stoxx-50 portfolio, and finally, a 45%-DJIA, 10%-FTSE-100 and 15%-Euro Stoxx-50 portfolio. The author indicates that the most efficient portfolio is one with 10%-FTSE-100, with the residual 90% split between the DJIA and the Euro Stoxx-50. However the author agrees that while information costs may be minimal, funds may find it difficult to create liquid enough portfolios that generate earnings mimicking the liability structure. Griffin (1998) observes that while significant portions of fund liabilities are fixed, non-inflation-sensitive and can be matched with home bonds, the residual contains a positive linkage to domestic wage inflation, and when associated with this, foreign diversification is equity biased. Myners (2001) observes that

the actuarial model discounts fund liabilities at the prevailing bond yield, while the rate of return on UK equity used by young funds smoothens liabilities according FTSE-Actuaries All Share Index. While recognising this, Booth and Matsyiak (1995) report two broad implications of the *MFR*, as regards, first the 90% funding level, which implies bias for domestic low volatility bonds, or equities, relative to the *MFR* benchmark, regardless of short term liability matching characteristics. Second, to the extent that both the 1995 Pensions Act and *MFR* discourage and exclude illiquidity, they restrict real estate and foreign assets and avoid potential mismatch.

To understand the equity split difference, an analysis of the UK/Netherlands sheds some light. According to Griffin (1998) the two countries neither possesses any restrictions, have historically indexed benefits, and have had similar home equity out-performance for the past decade: 4.4% and 4.1% respectively. However, despite these similarities, fund portfolios are different, with 76% (26%) equity and 11% (63%) bonds, with actuarial assessment emerging as the main explanatory factor. While the UK, Lee (1986) holds assets at market value, calculates equity by discounting long-term dividends with long-term interest rates, the Netherlands, Griffin (1998) holds bonds and real estate at book values and equity at market value. Also, in the UK, accrued benefit payments are held at *MFR* actuarially assessed value, while in the Netherlands they are discounted at 4%, without any actuarial discretion or market adjustment. This phenomenon becomes clearer when comparisons are made with other Commonwealth countries employing similar standards e.g., Ireland, South Africa, Canada and Australia. According to Griffin (1998) and McGill, Brown, Haley and Schneiber (1996) including the US, these countries represent the top six

in terms of equity bias. Griffin (1998) also observes that a large disparity exists between the equity component of the top 6 (58.5%) and that of the remaining 9 (22.2%).

2. SECTION TWO

3.2. Theoretical Framework

Literature review, Brinson et al (1986, 1991, 1995) and Ibbotson and Kaplan (2000), shows asset allocation as undeniably the strongest determinant of portfolio performance. Markowitz (1953) Elton, Gruber and Padberg (1976) and Ibbotson and Sinquifield (1976) extend the argument and outline diversification benefits. Further empirical evidence, Blake et al. (1998), Timmerman and Blake (1999), Griffin (1998) and Coval and Moskowitz (1998), indicates that asset preference prejudices lead to asset allocation bias. Thus, in equilibrium, given aggregate portfolio P_m, composed of the domestic component (UKA_i), with weight (w_i) and q assets, and the foreign component ($FORA_j$) with aggregate weight (w_j) and p assets, produces equation 1 stated below;

$$P_m = \sum_{i=1}^{q} w_i UKA_i + \sum_{j=1}^{p} w_j FORA_j \qquad \textbf{(1)}$$

Where, P_m is the domestic asset *plus* foreign asset aggregate portfolio.

$w_i\ UKA_i$ is the domestic portfolio component, and

$w_j\ FORA_j$ is the foreign portfolio component.

Due to prejudicial inclinations (sentiment), risk and differential asset class performance, investors tend to overweight one asset class over another, leading to either home or foreign bias. Actually, existing evidence (Cooper and Kaplanis (1995), Griffin (1998), Blake et al (1998) and Coval and Moskowitz (1998)), records home ($w_i\ UKA_i$) bias. Decomposing ($w_i\ UKA_i$) and $w_j\ FORA_j$ produces an asset universe with varying weights in; equity

(*EQ*), bonds (*FIX*) index-linked gilts (*ILG*), real estate (*REAL*), cash (*UKCA*), managed funds (*MF*) and other assets, (*TR*), like investment and unit trusts, derivatives, venture capital and works of art, which produces equation 2, indicating individual weights within the aggregate portfolio components as stated below;

$$P_m = \sum (UKEQ + FOREQ + UKFIX + FORFIX + ILG + UKREAL + FORREAL + UKCA + UKMF + FORMF + TR) \quad 2$$

Where P_m is the aggregate portfolio, *UKEQ* and *FOREQ:* UK and foreign equity, *UKFIX* and *FOREFIX*: UK and foreign bonds, *ILG* are index linked gilts, *UKREAL* and *FORREAL*: UK and foreign real estate, *UKCA*: cash deposits, *UKMF and FORMF* are UK and foreign managed funds, and *TR:* unit-investment trusts, commodities (works of art, gold) inclusive of venture capital and derivatives.

Return optimisation, via the *MPT,* demands the creation of a mean variance efficient portfolio. Since assets possess different risk-return characteristics, and returns are driven by a blend of factors, ranging from asset-specific fundamentals, behavioural elements to economic conditions, portfolio construction necessitates biased weighting to capture the proper weight of economic and psychological effects, as well as company-specific information. In harmony with the Samuelson (1994), PDFM (1997) and Fielitz and Greene (1978) studies (which present irrefutable evidence on return persistence, fuelling both home and foreign equity bias) the emphasis of this study is to isolate home bias from asset class bias and indicate which assets dominate the two biases. Various basic assumptions have been made to explain both home and equity bias, with the most dominant being those of

French and Porteba (1991), Falkenstein (1996), Brennan and Cao (1997), Cooper and Kaplanis (1994), Tesar and Werner (1995) and Kang and Stulz (1997), who argue that, controls aside, investors exhibit bias towards attributes like high visibility and low transaction costs, and are averse to low idiosyncratic volatility. Coval and Moskowitz (1998) argue that investors prefer local area stocks, even in a domestic context. Apart from explanations associated with national boundary existence and geographic proximity bias, the authors attribute this to sentiment, arguing for a "feel good factor" embedded within the closest of home stocks. Judging from the UK funds, once home equity gratification is achieved other home assets follow, then foreign equity before other peripheral foreign assets are considered.

3.2.1. **Hypothesis Tested**

Hypothesis 1: *UK pension fund asset allocation is biased towards the domestic market for all asset classes:*

1. $\sum (P_m w_i D_i) > \sum (P_m w_j F_j)$, *or;*

$$\sum\{(UKEQ + UKFIX + ILG + UKREAL + UKCA + UKMF + TR) > \sum (FOREQ_F + FORFIX + FORREAL + FORMF)\}$$

Hypothesis 2: *The observed UK pension fund domestic asset allocation bias is attributable to equity asset class and excessive home equity bias:*

1 $\Sigma\{(UKEQ + FOREQ) > (ILG + UKREAL + UKCA + UKMF + TR + UKFIX + FORFIX + FORREAL + FORMF)\}$

2. $\Sigma\{(UKEQ) > \Sigma(FOREQ + UKFIX + FORFIX + ILG + UKREAL + FORREAL + UK\,CA + UKMF + FORMF + TR)\}$

Previous studies, examining asset allocation, support the bias hypothesis. Such studies can be grouped into three categories that conclude home bias and yet employ variant portfolio modelling methodologies. The first category, focusing on the US (Coval and Moskowitz (1998), Brennan and Cao (1997)), the UK (Minns (1980), and Japan (Kang and Stulz (1995, 1997)), respectively characterises home bias using equity only. While doing so goes a long way in revealing bias, the studies suffer from the partial portrayal of reality stemming from the exclusion of bonds, real estate, cash and trusts whose incorporation may give a clearer picture. The second category, Tesar and Werner (1995), Griffin (1997) and Timmerman and Blake (1999), while incorporating bonds and equity, suffers from "lumping", by only treating bonds and equity as major assets and condensing other assets into the "other" category. The third group, Griffin (1998), PDFM (1997), WM (1994) and Blake et al (1999), go a step further and give the most articulate results by including indexed-linked gilts, home and foreign real estate. However, the first study suffers from a time-series deficiency (covers only 1-year 1995), has a portfolio of 6 constituents, (cash, home and foreign bonds, home and foreign equity) and lumps real estate, trusts, managed funds, venture capital, commodities and derivatives into the "other" asset. While both PDFM (1997) and WM (1994) elongate the time series and incorporate index-linked gilts, they amalgamate the "other" asset with cash. The Blake et al (1999) study is the closest to our study since it splits UK and foreign real estate, but like previous studies also suffers from "lumping" and a small sample of 306 funds.

In this study, the formulation of the investigation contains not only a large sample (a mean 1056 funds annually) but a reasonable sample period (7-years) too. It is the most innovative

in that, in addition to UK-foreign equity-bond components, it incorporates indexed linked gilts; decomposes real estate into UK and foreign real estate constituents, treats UK cash as an independent asset and splits the "other" asset into trusts, derivatives, venture capital, managed funds and work of art. The methodology is set so that the following hypothesis may be tested:

1. UK pension fund asset allocation is biased towards the domestic market.

(a) On an aggregate portfolio basis, domestic assets predominate fund portfolios, and this dominance is more pronounced in small pension funds.

(b) Individually, all UK asset classes dominate their foreign counterparts.

2. The equity asset class dominates fund portfolios.

(a) The equity asset class dominance is pronounced for both the UK equity and foreign equity and the entire portfolio contexts.

3. While equity and bonds dominate all fund size ranges, real estate and index-linked gilts are more concentrated in large funds, while the "other" asset, dominated by trusts, is concentrated in small funds.

(a) Because of lumpiness, administrative demands and liability indexation abilities respectively, real estate and indexed linked gilts are concentrated in the mature, medium-large funds.

(b) Dominated by trusts, because of its diversification benefits, the "other" asset is more concentrated in small funds.

3.2.2. **Data and Methodology**

The main data requirements for testing the above hypothesis are met by the PFTA Universe intersection, disclosing data annually for the period 1994-2000. This database overcomes

the deficiency of estimating portfolios from indices, as in French and Porteba (1991), Tesar and Werner (1995), Cooper and Kaplanis (1994), and Bekaert and Harvey (2000b)), blamed by Warnock and Mason (2001), Kang et al (1997), Dahlquist and Robertson (2001), and Grinblatt and Keloharju (2001), for erroneous results. S*ince there is no relevant machine-readable secondary database, the above primary data is collected by hand to constructs a sample ranging from 993 funds (in 1996) to 1123 (in 2000) from a total of 7394 total observations over a 7-year time series sample period.* This sample is complete in that it is composed of all funds reporting their portfolios annually generating 10 constituents: UK and foreign equity, UK and foreign bonds, indexed gilts, cash, UK and foreign real estate, trusts-managed funds, derivatives, venture capital and the works of art. By any means and standards, there is no comparable robust data to satisfy our hypothesis. Compared with Griffin (1998) we have more time series observations (7 years to 1 year) and compared with Blake et al (1999) and Timmerman et al (1999), we have a larger mean annual sample (1056 to 301 and 247 funds respectively). Contrasted with Griffin (1999), Falkenstein (1996), Brennan and Cao (1997) French and Porteba (1991), and Blake et al (1999) we have more assets; 10 classes to 1 for Falkenstein 1996, Brennan and Cao 1997 and French and Porteba (1991), 10 to 6 for Griffin (1998) and 10 to 8 for Blake et al 1999.

3.2.2.1. **Unique Sample Characteristics**

There is no uniformity in annual sample size because funds are not consistent in the extent and magnitude of portfolio disclosure (see **Table 3.3** below). While size diversity mitigates bias problems, it may mask systemic disclosure flaws. The database is dominated by large funds sponsored by large-caps, while most small funds are associates or subsidiaries of such sponsors. **Table 3.3** presents the proportion of insured funds and those disclosing their

assets for the period 1994-2000 and it that 60.3% of the funds disclose assets, the smallest (largest) sample occurs in 1996 (1997), when only 55.2% (68.5%) disclose.

Table 3:3 **Proportion of Insured & Funds Disclosing Portfolios Data: 1994 – 2000**

Sample Breakdown	Total Number of Observations	1994	1995	1996	1997	1998	1999	2000	Mean Number of Observations
Funds Disclosing Asset Holdings	7394	995	1039	993	1093	1067	1084	1123	1056
Insured Funds	1702	235	245	238	266	251	191	276	243
Total Sample	**9096**	**1230**	**1284**	**1231**	**1359**	**1318**	**1275**	**1399**	**1299**
Missing Variables*	5980	846	796	998	625	939	975	801	854
Population	**15076**	**2076**	**2080**	**2229**	**1984**	**2257**	**2250**	**2200**	**2154**
Funds Disclosing Asset Holdings As Proportion of Population (%)	60.3	59.2	61.7	55.2	68.5	58.4	56.7	63.6	60.3

*These funds do not disclose asset holdings but only size

Source: Pension Funds & Their Advisers 1994-2000

The robustness of this database is that while size pre-qualification, Minns (1980), Brown et al (1997) and Blake et al (1998a,b, 1999), biases results, the study's asset disclosure precondition ensures a more dynamic database, since all available analytical data is captured, resulting in funds of different sizes populating the sample (**See Table 3.4**) compared to Minns (1980) with a minimum size of £10 million, Brown et al. (1997) and Blake et al (1998a,b and 1999), who utilise the largest 700 *WM Universe* UK funds. The sample mean fund is £534 million, median-£78 million, mean largest- £19.2 billion and mean smallest-£1.2 million. The smallest fund (Waldens Wiltshire Foods Limited) is £637 thousand (December 1997) and the largest (British Telecom) is £24.9 billion (December 2000). As at December 2000, (1994), 49 (112) funds are below £10 million, the smallest fund is £1.7 million and, 453 (451) funds are between £100 million-£1 billion, 125 (55) are above £1 billion, while 12, (4) are above £10 billion.

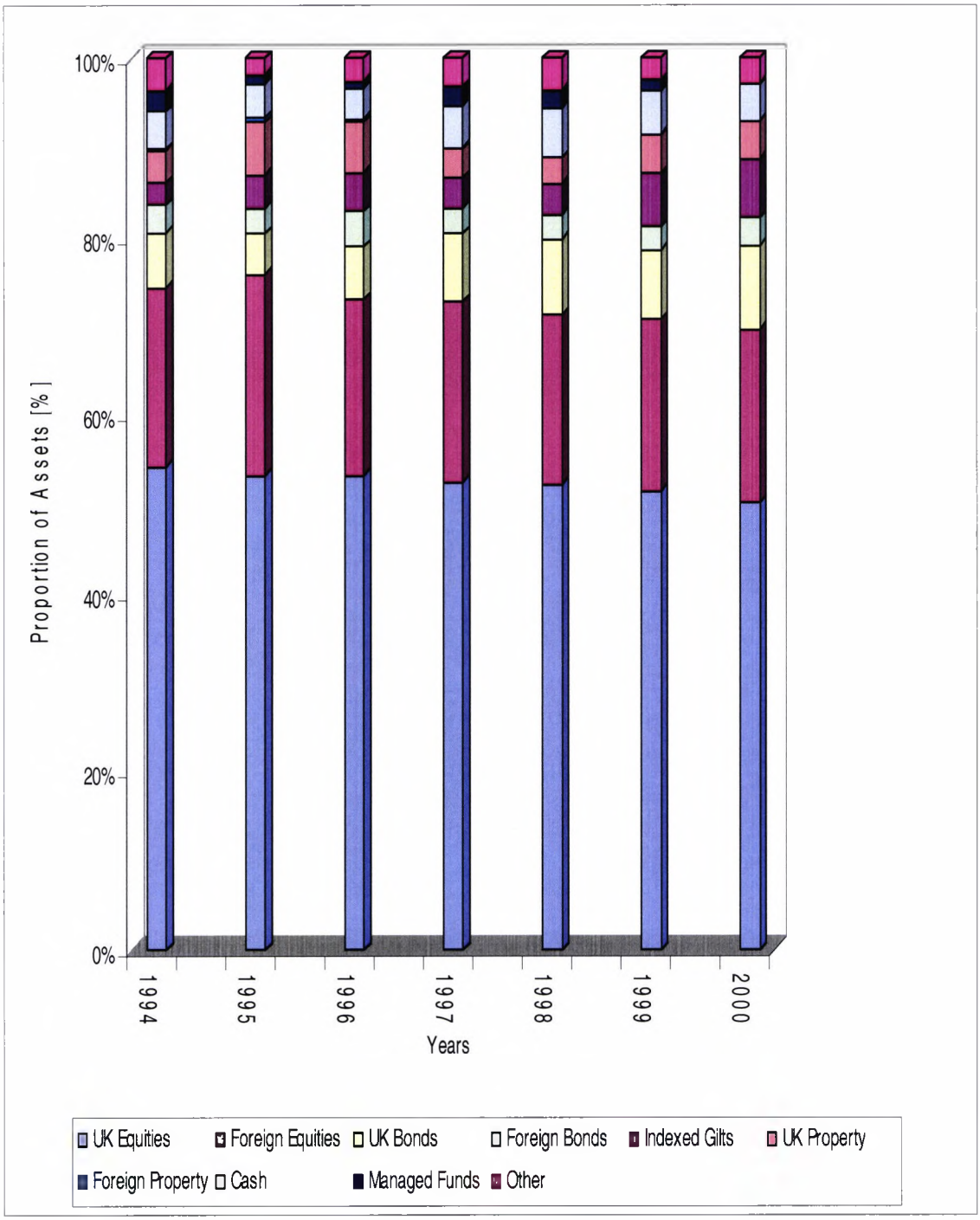
Table 3.4 **Fund Market Value Trends: 1994 – 2000**

Year	Fund Size				Number of Funds				
	Average (£ Millions)	Median (£ Millions)	Largest (£ Millions)	Smallest (£ Millions)	< £10 Million	£10-£20 Million	£100 Million-to-£1 Billion	> £1 Billion	> £10 Billion
1994	323.4	55.0	13,536	1.5	112	137	451	55	4
1995	349.6	61.0	18,058	1.0	88	140	358	66	4
1996	366.6	67.0	16,800	1.1	75	124	355	70	7
1997	377.5	69.3	18,530	0.6	95	122	389	74	7
1998	435.7	81.2	19,879	1.3	81	107	393	92	9
1999	495.0	95.0	22,947	1.3	51	111	427	108	8
2000	573.0	111.0	24,906	1.7	49	92	453	125	12
Sample Mean	**534.0**	**78.0**	**19,237**	**1.2**	**79**	**119**	**404**	**84**	**7**

3.3. **Empirical Results: Domestic Asset and Equity Bias**

The extreme home asset allocation tests split two imbedded sub-hypotheses: extreme home asset and home equity allocation and breaks down the portfolio by asset class and market origin. The study then compares the UK and foreign annual mean asset weights and compares UK and foreign equity and the other assets. This approach seeks to correct the previous studies (that employ aggregated and incomplete portfolios on the assumption that home equity subsumes home bias). The hypothesis tested in this section proffers cross-sectional home bias, as shown in **Figure 3.1,** which presents the market origin asset class split, and clearly indicates disproportionate UK asset bias at individual asset level for the 7-year time series.

Figure 3.1 **Domestic versus Foreign Asset Allocation: 1994 – 2000**



3.3.1 **Domestic Bias: Domestic Versus Foreign Assets**

Comprised of UK equity, bonds, indexed gilts, real estate, cash and trusts, extreme home asset allocation is prominent and dominated by UK equity, accounting for well over 50% of the portfolio. While **Figure 3.1** indicates time series dominance dissipation, with a slight but steady decline from 54.5% to 53.7%, there are compensatory but trivial gains into UK bonds from 6.3% to 9.4% and indexed gilts from 2.6% to 6.6%. Thus, as in Griffin (1998), asset re-allocation following a reduction in UK equity investment, does not benefit foreign[17], but UK, assets through bonds and indexed gilts. Extending from **Figure 3.1**, I split the portfolio by market origin and examine individual asset class contributions to their combined weights in the portfolio, and generate **Table 3.5** below.

Table 3.5: **Home Bias: Aggregate Portfolio Holdings: 1994 – 2000**

Market	Equity Asset	Bond Asset	Index Linked Gilts	Real Estate Asset	Cash Deposits	Other Asset	Aggregate Portfolio
Home	53.1	7.8	3.5	3.3	4.8	5.2	**77.7**
Foreign	19.1	3.2	-	0.1	-	-	**22.3**
Weighting	72.2	11.0	3.5	3.4	4.8	5.2	**100.0**
UK Equity As A Proportion of Domestic Assets	68.3	10.0	4.5	4.2	6.2*	6.7*	-
Foreign Equity As A Proportion of Domestic Assets	85.7	14.3	-	0.0	-	-	-
Relevant Home Asset Class As A Proportion of The Relevant Asset Class	73.5	70.9	100**	97.1	100**	100**	-
Relevant Foreign Asset Class As A Proportion of The Relevant Asset Class	26.5	29.1	-	2.9	-	-	-

* As per previous research practice, these assets are included in the domestic portfolio.

** While Index Linked Gitls are only a UK phenomenon, as per previous research practice, these assets are included in the domestic portfolio component.

[17] On extreme case-point, this is epitomized by the Boots Pension Fund which moves its entire £3.0 billion fund into

This categorization indicates that while extreme UK investment is prevalent at 77.7%, it is fuelled by UK equity, which at 53.1% of the aggregate portfolio accounts for almost 70% (68.3%) of the UK assets and 73.5% of equity, while the residual is split invariably among UK bonds, indexed gilts, UK property, cash and trusts. With a caveat for trusts and cash, at individual asset level, indexed gilts, trusts and cash display the most disproportionate domestic investment (with 100% weights in the UK market), followed by UK property (97.1%) and UK bonds (70.9%). Trusts, indexed gilts and cash dominance can be rationalised in four different ways. First, easy and direct UK liability indexation can only be achieved with UK index linked assets. Second, transitory contributions, returns and a cushion to cover fees are kept in the £-currency for easy market timing and transaction execution purposes. Third, it is an Inland Revenue requirement that funds must maintain about 5% liquidity. Fourth, funds can only diversify into some sectors, e.g., mid-and-small-caps, through trusts and managed funds. While at only 22.3% of the portfolio, foreign assets are dominated by foreign equity at 19.1% accounting for 85.7% of foreign assets, followed by 14.3% foreign bonds, while foreign property constitutes a paltry 0.4%.

3.3.2. **Fund Size and Time Series Analysis of Home versus Foreign Equity Investment**

Table 3.6 Panels A & B below indicate acute domestic equity dominance within the equity sub-portfolio. **Panel A** time series analysis indicates that equity experiences a gradual but significant decline from 75% in 1994 to 67.1% in 2000. While this can be attributed to the tandem and substantial fall both in UK and foreign equity, it is more explained by the slight, but significant, fall in foreign equity, benefiting UK equity, which rises, though insignificantly, from 71.7% (1995) to 74.8% (1999). **Panel B,** fund size analysis, indicates

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bonds, Financial Times, 31 December 2001, pp. 14.

that disproportionate equity investment cuts across size, the smallest funds (**D10**) garner almost 70% (67.9%), the largest (**D1**) about 75% (73.%).

Table 3.6 **Panel A**: **Domestic Equity versus Foreign Equity**

Panel A: The Equity Asset Analysed By Sample Period

Year	Percentage of Total Assets Invested In:			Percentage of Equity Invested In:	
	Equity Asset (%)	Domestic Equity (%)	Foreign Equity (%)	Domestic Equity (%)	Foreign Equity (%)
1994	75.0	55.0	19.9	73.8	26.2
1995	75.9	54.4	21.5	71.7	28.3
1996	72.2	52.8	19.3	73.2	26.8
1997	73.3	53.0	20.3	72.3	27.7
1998	72.5	53.2	19.3	73.4	26.6
1999	68.6	51.3	17.3	74.8	25.2
2000	67.1	50.1	16.9	74.1	24.1
7-Year Mean	**72.2**	**53.1**	**19.1**	**73.5**	**26.5**
T-Statstics	(6.965*)	(6.876*)	(5.647*)	(-0.631)	(2.867*)

T-Statistics for 1994 & 2000 Difference Significance. (*), (**) (***). Significant at 1%, 5%, 10% level and insignificant respectively.

Table 3.6 **Panel B**: **Domestic Equity versus Foreign Equity**

Panel B: The Equity Asset Analysed By Fund Size

Deciles	Percentage of Total Assets Invested In:			Percentage of Equity Invested In:	
	Equity Asset (%)	Domestic Equity (%)	Foreign Equity (%)	Domestic Equity (%)	Foreign Equity (%)
Largest					
D1	73.0	52.3	20.7	71.9	28.1
D2	73.2	53.6	19.6	73.2	26.8
D3	71.9	52.5	19.4	73.0	27.0
D4	72.1	52.8	19.3	73.3	26.7
D5	72.0	53.4	18.6	74.1	25.9
D6	72.9	53.1	19.8	72.9	27.1
D7	71.8	53.1	18.7	73.9	26.1
D8	72.2	53.2	19.0	73.7	26.3
D9	71.8	53.2	18.6	74.1	25.9
D10	67.9	51.2	16.7	75.1	24.9
Smallest					
7-Year Mean	**72.2**	**53.1**	**19.1**	**73.5**	**26.5**
T-Statstics	(4.597*)	(1.658)	(6.317*)	(-5.220*)	(7.611*)

T-Statistics for D1 & D10 Difference Significance. (*), (**) (***). Significant at 1%, 5%, 10% level and insignificant respectively.

While the difference between the two deciles is significant, intermediate deciles all cluster around 72%. This is explained by both UK and foreign equity. The UK equity dominates at 53.1% of the portfolio, and ranges from about 50% (51.2%) (**D1**) to about 55% (53.6%), (**D9**), and exhibits a negligible cross-decile mean difference. On the other hand, UK equity indicates negative correlation with fund size rising almost monotonously from about 70% (71.9%) (**D1**) to over 75% (75.1%) (**D10**) with a significant mean difference between **D1** and **D10**. Otherwise static across deciles, foreign equity (19.1% of the aggregate portfolio) only indicates a significant difference between **D1** and **D10** at about 15% (16.7%) and 20% (20.7%) respectively. Foreign equity stands at 26.5% as a percentage of equity and indicates positive correlation with fund size and its proportion in the equity asset, which exhibits significant mean differences from about 30% (28.1%) for **D1** to 25% (24.9%) for **D10**. Linking this with the time series analysis indicates a rise in UK equity, while there is a decline in both foreign and overall equity. Furthermore, this is symptomatic of excessive home equity investment being fuelled more by small funds (**D10**), while extreme equity allocation is stimulated by large funds (**D1**) foreign equity concentration.

3.3.2.1. **Explanation**

Large fund extreme equity investment can be justified by their risk assumption capabilities. They are likely to be more mature funds, which invest significantly into equity, and still diversify their portfolios. Because of their huge diversification capacities, they can allocate larger amounts into foreign equity compared to small funds. On the other hand, small funds are likely to be young funds with liability returns due in the distant future and can invest significantly through equity. However, because of limited diversification scope, they allocate exceptionally huge amounts into UK equity or equity based trusts.

3.3.3. **Domestic versus Foreign Assets and Domestic Equity Bias by Fund Size**

Griffin (1999) argues that funds diversify when size pressurises the home market. By this logic, large and small funds should display significantly different portfolios. Testing for extreme home asset investment by examining portfolios by size and asset class generates **Table 3.7 Panels A & B**. **Panel A** indicates that 77.7% of the portfolio is invested in UK assets. There is almost monotonous excessive inverse UK asset investment from **D10** to **D1**, which falls from 80.5% (**D10**) to 75.1% (**D1**) with a significant mean difference. On the other hand, bias is almost uniform across funds for UK equity, peaks for mid-small funds in cash, is more intense in large funds *(***D1-D4***)* for UK property and indexed gilts, with more UK bonds and "other" assets for small funds. UK equity does not exhibit any significant difference between the deciles, but unique uniformity at 53%, while **D10** stands at 51.2%, which somewhat nullifies the notion that equity is only a large funds territory.

Table 3.7 **Asset and Equity Home Bias, (1994-2000): Domestic Assets**

Panel A: Domestic Assets Analysed By Fund Size

Deciles	Percentage of Total Assets Invested In:						
	Domestic Assets (%)	Domestic Equity (%)	Domestic Bonds (%)	Index Linked Gilts (%)	Real Estate (%)	Cash (%)	"Other" Assets (%)
Largest							
D1	75.1	52.3	5.4	4.9	5.3	3.8	4.5
D2	77.6	53.6	6.9	4.4	4.6	4.6	4.3
D3	77.2	52.5	7.3	4.3	3.9	4.7	5.5
D4	76.8	53.1	7.6	3.6	3.6	4.8	5.8
D5	77.1	53.6	7.7	3.4	2.8	5.3	5.9
D6	77.2	53.4	7.9	3.1	2.5	5.5	4.7
D7	78.3	53.4	8.1	3.5	2.4	4.9	6.3
D8	78.8	53.8	8.8	2.9	2.3	4.8	5.3
D9	78.8	53.6	8.9	3.1	2.6	4.6	5.9
D10	80.5	51.2	10.6	1.9	3.6	5.3	12.6
Smallest							
7-Year Mean	**77.7**	**53.1**	**7.8**	**3.5**	**3.3**	**4.8**	**5.2**
T-Statstics	(-8.404*)	(1.658)	(-11..258*)	(8.588*)	(5.222*)	(1.044*)	(-9.907*)

T-Statistics for D1 & D10 Difference Significance. (*), (**) (***). Significant at 1%, 5%, 10% level and insignificant respectively.

While almost homogeneous, UK bonds exhibit a slight inverse correlation with fund size, rising from 5.4% for **D1** to 10.6% for **D10**, with significant differences between the smallest and largest deciles, indexed gilts indicate a positive correlation with fund size and almost treble from 1.9% (**D10**) to 4.9% (**D1**), with a significant difference between large and small funds. Though starting high for small funds, property falls for medium funds before picking up momentum again, with a significant difference between **D1** and **D10**. While cash exhibits an almost consistent trend across fund size, it is indicative of a significant difference between **D1** and **D10**. Apart from cash being a transient asset, up to 5% is kept in high interest accounts for Inland Revenue regulatory purposes, as a cover for the management fee, periodical withdrawals and to prevent incurring transaction costs through asset disposals when the need for cash arises. Also almost consistent, the "other" asset is used by all funds almost indistinguishably to diversify into small-caps.

Cross-sectionally, **Panel B** indicates funds shying away from foreign markets at only 22.3%. There is an almost a positive recurrent decline in foreign assets, with the smallest funds (**D10**) possessing the least foreign assets at 18.7%, with significant differences between **D1** and **D10,** and dominant foreign equity. Thus, foreign diversification is achieved, to a much greater degree, through cross-decile equity concentration, while at lower levels, foreign bonds (3.2%) and property (0.1%) funds also reveal the same trends. The most noticeable anomaly is the presence of foreign property in smaller funds. The main explanation may be that small funds with foreign property exposure are subsidiaries of multinational companies, like BP Amoco, HSBC, Vodafone Air-touch, GlaxoSmithKline

and Barclays, with a global presence, which in a bid to free capital, offload foreign office networks into the subsidiary-company funds from which they rent.

Table 3.7 **Asset and Equity Home Bias, (1994-2000): Foreign Assets**

Panel B: Foreign Assets Analysed By Fund Size

Deciles	Percentage of Total Assets Invested In:			
	Foreign Assets (%)	Foreign Equity (%)	Foreign Bonds (%)	Foreign Real Estate (%)
Largest				
D 1	24.9	20.7	2.9	1.30
D 2	22.4	19.6	2.4	0.20
D 3	22.8	19.4	3.5	0.08
D 4	23.2	19.3	3.3	0.60
D 5	22.9	18.6	3.0	1.30
D 6	22.8	19.8	3.4	0.0
D 7	21.7	18.7	2.4	0.60
D 8	21.2	19.0	2.1	0.10
D 9	21.2	18.6	2.0	0.10
D 10	18.7	16.7	3.0	0.01
Smallest				
7-Year Mean	**22.3**	**19.1**	**3.2**	**0.1**
T-Statstics	(9.076*)	(6.317*)	(-0.201)	(6.297*)

T-Stats for D 1 & D 10 Difference Significance. (*), (**) (***). Significant at 1%, 5%, 10% levels and insignificant respectively

The next test focuses on the "other" asset (unit trusts, investment trusts, venture capital, derivatives, managed funds and works of art), which permits the broadest diversification compared with composite assets. Testing which of the "other" asset dominates, **Table 3.8** indicates that at 3.3% of the portfolio and 67.3% of the "other" asset, unit trusts dominate and exhibit almost decile-wide uniformity save for the smallest funds. The largest and smallest funds (**D1** and **D10**) exhibit significant differences. Managed funds follow at 1.5% of the portfolio and 30.7% of the "other" asset category, and exhibit the same trends. Viewed as risky and speculative, venture capital, derivatives and the works of art comprise insignificant proportions but with a positive correlation with fund size and insignificant

differences between all deciles. The works of art only emerges in the largest funds **(D1),** and a closer examination indicates that it is held only by the Railway Pension Scheme[18].

Table 3.8 **The Collective Assets Bias, Analysed by Fund Size**

The Collective Assets: Analysed By Fund Size

Percentage of Total Assets Invested In:					
Deciles	Unit Trusts (%)	Managed Funds (%)	Venture Capital (%)	Futures & Options (%)	Works of Art (%)
Largest					
D1	2.6	2.5	0.2	0.02	0.01
D2	2.7	1.0	0.1	0.01	0.0
D3	2.2	1.3	0.01	0.01	0.0
D4	2.3	1.2	0.0	0.01	0.0
D5	2.6	1.4	0.1	0.00	0.0
D6	2.8	1.2	0.0	0.00	0.0
D7	2.7	1.4	0.09	0.01	0.0
D8	2.5	1.6	0.1	0.0	0.0
D9	2.9	1.2	0.01	0.00	0.00
D10	9.9	6.5	0.00	0.00	0.00
Smallest					
7-Year Mean	**3.3**	**1.5**	**0.07**	**0.01**	**0.001**
T-Statstics	(-13.655*)	(-5.959*)	(4.72*)	(3.915*)	(2.001*)

T-Statistics for D1 & D10 Difference Significance. (*), (**) (***). Significant at 1%, 5%, 10% level and insignificant respectively

3.3.3.1. **Explanation**

This may suggest that whilst generally extreme UK asset investment cuts through the size threshold, small funds also possess significant amounts of foreign assets, contrary to the long-held assertion that they do not venture into overseas markets. On the other hand, while large funds invest less in bonds and more in indexed gilts, there is no fundamental difference across fund size when the two assets are combined. This may be attributable to the fact that while it is the mature funds that are likely to be more apt to duration-match their liabilities, and therefore possess large doses of indexed gilts, it is also the same funds that dominate the medium-large bands. In the same vein, property is considered lumpy,

[18] The works of art has actually fallen from the initial £40 million bought in the market slump in the 1970's, to £24

poses unwinding problems for small funds and entails involving administration, (Shepherd 1987), is not an efficient diversifier for small funds, which results in inverse correlation with fund size.

3.4. **Multivariate Analysis: Correlation Between Variables**

As a backdrop to **Figure 2** and the ensuing **Tables 3.5–3.9** in this section, I use correlation coefficients to check for multi-collinearity between the natural log of fund size (UK and foreign assets). **Table 3.9** presents the results, indicative of a negative but significant correlation between fund size and intense UK investment and significant and positive correlation between fund size and foreign assets. This indicates that while intense UK investment cuts across fund size, large funds hold higher proportions of foreign assets. While on the other hand, in confirmation of **Table 3.7**, UK investment intensification is inversely correlated with fund size.

Table 3.9 **Correlation Coefficients Between The Variables**

Pearson Correlation Coefficients Between The Fund Size and Asset Components Comprising of Domestic Assets, Foreign Assets, Domestic Equity, Foreign Equity, Domestic Bonds, Foreign Bonds, Foreign Bonds, Indexed Linked Gilts, Domestic Real Estate, Foreign Real Estate, Cash Deposits and Trusts

Fund Size & Assets	*[A]*	*[B]*	*[C]*	*[D]*	*[E]*	*[F]*	*[G]*	*[H]*	*[I]*	*[J]*	*[K]*	*[L]*
Fund Size: A	1											
Domestic Assets: B	-0.11	1										
Foreign Assets: C	0.11	-1	1									
Domestic Equity: D	0.02	-0.14	0.14	1								
Foreign Equity: E	0.09	-0.91	0.91	0.17	1							
Domestic Bonds: F	-0.09	0.32	-0.32	-0.32	-0.27	1						
Foreign Bonds: G	0.06	-0.40	0.40	-0.05	0.00	-0.18	1					
Indexed Linked Gilts: H	0.14	0.17	-0.17	-0.27	-0.14	-0.04	-0.10	1				
Domestic Real Estate: I	0.10	0.08	-0.08	-0.11	-0.06	-0.06	-0.07	-0.03	1			
Foreign Real Estate: J	0.06	-0.07	0.07	-0.03	-0.01	0.00	0.00	-0.02	0.05	1		
Cash Deposits: K	-0.06	0.13	-0.13	-0.20	-0.17	-0.03	0.07	-0.01	-0.01	0.01	1	
Trusts & Other: L	-0.10	0.46	-0.46	-0.57	-0.47	-0.11	-0.07	-0.08	-0.08	-0.03	-0.05	1

million in 1998 due to periodical disposal.

Furthermore, matrix indicates that individual assets (save for UK equity, foreign bonds, foreign property and cash) are significantly correlated with fund size, foreign equity, indexed gilts and UK property are positively so, while UK bonds and trusts are negative. This implies that fund size increases do not affect UK equity, foreign bonds, foreign property and cash allocation, but result in an increase in foreign equity, indexed gilts, UK property and a reduction in UK bonds and trusts. Puzzlingly, these results indicate a cross-sectional neglect for UK equity (especially among large funds), equal caution for foreign bonds and property, and slight declines in liquidity needs for large funds. The cash coefficient is unique because large liquidity positions are likely to be maintained by mostly mature funds, with large benefit out-go obligations. The only rationalisation for large cash positions by small funds, is that it is held until adequate to execute orders. On the other hand, while foreign property, indexed gilts and UK property indicate concentration with fund size, large funds that can afford to assume more risky positions through foreign equity, are inclined to increase indexed gilts content so as to duration-match their liabilities. Large UK property positions are likely to be indicative of sponsor company property that has been introduced into the fund portfolio from which it is rented.

UK bonds and trusts are inversely correlated with size for different reasons. Bonds are viewed as less risky and obviously more likely to be held in larger quantities by smaller funds, while trusts are viewed as the most efficient diversifier. From the above empirical evidence, we can generally conclude that as fund size increases, equity benefits through foreign equity, bonds and trusts suffer, real estate through UK property and indexed gilts benefit, while there is no noticeable change in liquidity. It is also a feature of the correlation

matrix that save for foreign property, all assets are significantly correlated with extreme UK investment intensification; positive for UK bonds, indexed gilts, UK property, cash and trusts and negative for UK and foreign equity and foreign bonds. This implies that home bias does not influence foreign property, but results from an increase in UK bonds, indexed gilts, UK property, cash and trusts, but a decrease in UK and foreign equity and foreign bonds. While other scenarios are nothing other than the norm, and confirm **Tables 3.6** and **3.7**, the UK equity result is puzzling since it implies that UK equity allocation negates home bias, in confirmation of **Table 3.6**. Actually columns C and D, which indicate a positive significant correlation between foreign assets and UK equity; and UK equity and foreign equity, imply that equity asset allocation is treated in a blanket manner and significantly benefits in tandem with foreign assets.

3.4.1. **Domestic Asset & Equity Bias and Bonds and Trusts Trends**

Motivated by the results in earlier sub-sections (and recent theoretical developments in home bias literature, Griffin (1997, 1998)), this section explores the possible UK bias determinants, extreme UK equity investment, UK bonds and trusts allocation trends. Our specific intention is to investigate whether UK asset allocation is entirely unconnected to foreign assets, and to gauge whether different assets are substitutes, or compliments of each other, and whether fund size and time play any roles on fund investment. Based on evidence from **Tables 3.7–3.9**, I construct 8 ordinary least squares regressions and employ home assets, for the dependent variable in regressions 1 & 2 (**R1** & **R2**); UK equity (**R3** & **R4**); UK bonds (**R5** & **R6**) and trusts (**R7** & **R8**) to evaluate the robustness of our conclusions about extreme UK investment bias, excessive UK equity, bonds and trusts

allocation. As indicated above, **R1** ascertains the determinants of the fund proportion invested in UK assets, and is more formally represented by:

a. %UK Assets = $(\alpha + \beta_1 \ln(\text{Fund Size}) + \beta_2 \%\text{Foreign Assets} + \text{Error Term})$, which becomes

b. %UKA = $(\alpha + \beta_1 \ln(FSZ) + \beta_2 \text{Foreign Assets} + \varepsilon)$, more formally split into 2 regressions as

c1. %UKA = $(\alpha + \beta_1 \%\ln(FSZ) + \beta_2 FOREQ + \varepsilon)$ **1,**

c2. %UKA = $(\alpha + \beta_3 FORFIX + \beta_4 FORREAL + \varepsilon)$ **2,**

Where *%UKA* are home assets, α is constant, *ln(FSZ)* is the natural log of fund size, *FOREQ* is foreign equity, *FORFIX* are foreign bonds, *FORREAL* is foreign real estate and ε is the error term. To circumvent singular matrix problem and multi-collinearity generating large standard errors, I regress UK assets against fund size and foreign equity, bonds and real estate successively, therefore yielding two cross-sectional models. It is noted that while such models do not significantly affect the explanatory power of the 3 foreign asset classes plus fund size, in reality, all "independent variables" are proportions of the aggregate fund, and are therefore not "independent". However, the size of the adjusted R^2 gives an impression of the influence of fund size. A dummy for the year time series trends is included, and the results are presented in **Table 3.10** below, divided into UK assets, UK equity, UK bonds and trusts. Focussing on **Table 3.10** columns **R1** and **R2** record home bias analysis estimated on fund size and foreign equity, foreign bonds and foreign property. While the time dummy coefficients are positive and significant, fund size, foreign bonds, foreign property and foreign equity coefficients are negative and significant. Thus, as in Griffin (1998), while fund size increases and foreign asset allocations result in significant slackening of UK investment, it actually significantly intensifies between 1994 and 2000.

Table 3.10: **Domestic Asset, Equity Bias, Bonds and Trusts Trends**

Multivariate Regression : Domestic Asset Bias

Regressions 1 & The Dependent Variable is UK Assets

Regressions 3 & The Dependent Variable is Domestic Equity.

Regressions 5 & The Dependent Variable is Domestic Bonds.

Regressions 7 & The Dependent Variable is Trusts & Other Assets.

The UK assets are calculated as UK equity, UK bonds, UK real estate, gilts, cash and trusts, where trusts are calculated by summing up derivatives, venture capital, managed funds and works of art. UK bonds are taken as UK bonds exclusive of Index Linked Gilts. The regressions are run on Independent Varibales across time to gauge their time-series influence on (1). Home Bias, (2). Home Equity Bias (3). UK Bonds and (4). Trusts trends. Coefficient estimates in Fund Size, Foreign Equity, Index Linked Gilts, Foreign Bonds, Foreign Real Estate, Cash Deposits, UK Real Estate, Trusts, and the Year Dummy variables are reported, along with t-statistics in parenthisis. (*), (**), (***) significant at 1%, 5% and 10% level and insignificant respectively.

Dependent Vari	Domestic Assets		Domestic Equity		Domestic Bonds		Trusts	
Variable	Regression		Regression		Regression		Regression	
	1	2	3	4	5	6	7	8
Intercept	98.32	84.87	49.6	71.73	16.65	52.19	26.89	74.71
	(295.77*)	(118.01*)	(46.99*)	(116.59*)	(22.77*)	(61.09*)	(26.34*)	(80.68*)
Ln(FSZ)	-0.17	-0.55	0.09	-0.36	-0.42	-0.64	-0.39	-0.69
	(-6.24*)	(-8.96*)	(1.02)	(-6.93*)	(-6.79*)	(-12.32*)	(-4.56*)	(-10.93*)
FOREQ	-0.99	-	0.24	-	-0.27	-	-0.73	-
	(-189.85*)		(14.19*)		(-23.09*)		(-45.80*)	
FORFIX	-	-0.97	-0.15	-	-0.41	-	-0.26	-
		(-37.12*)	(-4.11*)		(-15.81*)		(-7.31*)	
FORREAL	-	-0.82	-0.55	-	0.01	-	-0.50	-
		(-5.81*)	(-2.73*)		(0.08)		(-2.58*)	
UKEQ	-	-	-	-	-	-0.60	-	-0.94
						(-64.11*)		(-101.51*)
UKFIX	-	-	-	-0.59	-	-	-	-0.63
				(-64.11*)				(-52.49*)
ILG	-	-	-	-0.66	-	-0.44	-	-0.68
				(-52.35*)		(-31.55*)		(-42.08*)
UKREAL	-	-	-	-0.61	-	-0.44	-	-0.69
				(-30.14*)		(-20.68*)		(-27.33*)
UKCA	-	-	-	-0.68	-	-0.49	-	-0.72
				(-39.91*)		(-27.21*)		(-33.25*)
TR	-	-	-	-0.62	-	-0.43	-	-
				(-101.51*]		(-52.49*)		
Time Dummy	0.07	0.52	-0.35	0.20	0.61	-0.64	-0.54	0.21
	(3.06*)	(10.17*)	(-4.69*)	(4.62*)	(12.01*)	(-14.85*)	(-7.64*)	(3.97*)
Adj R2 [%]	83.4	18.2	3.4	68.5	12.7	39.4	23.3	59.9
F	12411.5	412.8	53.8	2306.1	217.1	688.2	450.8	1578.6
P-Value of F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Focussing on the exceptional dominance of UK equity I ascertain the determinants of UK equity investment. Employing UK equity as a dependent variable, I run two regressions

(R3 and **R4)** as above with the time dummy, fund size and foreign assets as independent variables in **R3**, and the time dummy, fund size and other UK assets as independent variables in **R4**. **R3** generates a negative but significant time dummy, foreign bonds and property coefficients, while it is positive and insignificant for fund size. Inexplicably, the foreign equity coefficient is positive and significant. Thus, from the aggregate portfolio perspective, there is a sample period decrease in UK equity, with fund size increase resulting in insignificant and less than proportionate UK equity allocation, while foreign bonds and property result in home equity waning. Strangely, and in confirmation of **Table 3.9**, foreign equity allocation results in a significant, though less than proportionate UK equity investment. This confirms that foreign equity is not a surrogate, but a supplement, of UK equity within the equity sub-portfolio. Focussing on the UK perspective, **Regression 4** generates negative and significant coefficients for every independent variable save for the time dummy, which is positive and significant. This suggests that while there is significant sample period UK equity allocation intensification within the UK asset context, fund size increases result in more diversification resulting in a significant UK equity decline, as UK assets are treated as substitutes to UK equity. I indicated, in **R3,** that fund size and foreign equity generated perplexing coefficients. However, these are easily explained by interpreting them with the fund size coefficients in **R4**. Unifying these regressions indicates that the equity decision is a single decision, with funds deciding on equity allocation (foreign and UK assets then splitting equity into UK and foreign equity) which further explains why in the foreign asset perspective, foreign bonds and property induce UK equity reduction, while foreign equity results in an increase.

In models above, we estimated that home bias actually intensifies across the sample period and that while extreme UK equity investment increase within the UK asset perspective, UK equity actually declines within the portfolio context. Armed with the knowledge that UK equity is the largest single contributor to extreme UK investment (motivated by the above results and the fact that UK bonds are the second largest home asset component) I test whether the reduction in UK equity from the aggregate portfolio context benefits UK bonds, which generate **R5** and **R6** respectively. **R5** returns negative and significant coefficients for fund size, foreign bonds and equity, while positive and significant for the time dummy coefficient and positive and insignificant for foreign property. This implies that in the foreign asset context, there is a time-series concentration in UK bonds, while foreign bonds and equity allocation reduces UK bonds and foreign property this results in an insignificant UK bonds increase. Put in another way, while UK bonds induce a substitution effect on foreign bonds and foreign equity, the larger the fund, the less the likelihood of UK bond investment. **R6** returns negative and significant coefficients for all variables. This implies a sample period reduction in UK bonds, within the home asset context, with the larger the fund the more likelihood of such a reduction, thus bonds possess a substitution effect on all UK asset classes. The evidence entails that the UK equity bias dissipation does not benefit UK bonds, because it does not gain from the UK equity context.

Similarly motivated by the same results, we check the determinants of trusts allocation and whether they benefit from the decline in UK equity, generating **R7** and **R8** respectively. Focussing on foreign assets, **R7** generates negative and significant coefficients for all

independent variables, which implies a sample period and individual asset context reduction in trusts. **R8** returns a positive and significant time dummy coefficient and negative and significant coefficients for individual UK assets. This implies a time-series increase in trusts in the UK asset context, but a reduction in trusts, resulting from an increase in fund size and allocation into individual UK assets. These results confirm **Table 3.8,** which records trusts concentration among small funds, trusts gains over the sample period, with a further indication that trusts substitute all assets. The explanation behind this phenomenon may be that trusts are considered as the most effective diversifier, either domestically or internationally. Whenever funds find themselves without preferable stocks in desirable sectors (e.g., small-caps) they utilise trusts to diversify. The same extends into foreign forays, but with more caution on individual stocks and more utilisation of trusts.

3.5. **Conclusions**

Unlike Cooper and Kaplanis (1995) and Suh (1999), this study has not sought to test inflation hedging, dead weight costs, information asymmetry and stock proximity as drivers of extreme domestic investment, but evaluates UK fund portfolio-level asset allocation. Two broad empirical tests have been carried out to detect any extreme domestic and intense equity allocation, and further establish which of the composite stocks drives home bias. First, the data is tested for extreme equity allocation. Funds show a high penchant for equity, with a 7-year mean of 72.5% in equity, of which 53.1% comprises the UK equity. While UK equity decreases monotonically from a sample-period high of 55% (1994) to an all-time low of 50.1% (1998), results indicate that funds pursue foreign diversification through equity, and intensify domestic investment through UK bonds and trusts, with trusts benefiting more from this phenomenon. Second, data is evaluated for extreme domestic investment. Funds exhibit a high predilection for UK assets, which stand at 77.7% of the portfolio. By size, domestic assets start at 75.1% for **D1**, stabilise around 77% for **D2-D6**, rises precipitously to around 78% for **D6-D9**, and ends high at 80.5% for the smallest funds (**D10**). While small funds, (**D7-D10**) posses a 7-year mean of around 79% in home assets, largest funds (**D1-D3**) allocate only 77%. UK equity prevails over extreme UK investment and the acute individual UK asset investment predominates, with equity bias being more profound. Furthermore, tests somewhat confirm the above and indicate sample period intensification of extreme UK investment, UK equity and trusts allocation from the home perspective, and UK bonds from the foreign perspective. Finally, UK and foreign equity decisions are imbedded on each other, with splitting undertaken when allocating into each respective market.

CHAPTER FOUR

MANAGEMENT STRUCTURE DYNAMICS & PORTFOLIO BIAS

CHAPTER 4: MANAGEMENT STYLES AND PORTFOLIO BIAS

4. **Introduction: Theoretical Background**

Walter (1999) indicates that the worldwide resolution of fund pressures has resulted in fund management becoming one of the largest components of global finance. Prais (1976) and Rifkin and Barber (1978) argue that fund assets are exploited to advance financial institutions interests, while Minns (1980), Lambert (1998) and Myners (2001) argue that fund management structures lead to a concentration of financial control. This leads to the development of a labyrinthine of interrelationships, with financial and industrial capital merging and fund manager influence on asset allocation decisions being entrenched. While previous studies, PDFM (1997), Hager and Lever (1987), Myners (2001), WM (1998) and Shepherd (1989), have illuminated the fund management scene, they have limited their analysis to either in-house/external, or balanced/specialist structures and are not sufficiently exhaustive. PDFM (1997) and Myners (2001) employ small samples of the largest UK funds, resulting in biased conclusions. In view of this, this chapter evaluates the UK fund industry for management structure influence on asset allocation, and generates more structures (see **Appendix 1**). However, due to data limitations, investment style analysis (small-large cap, value-growth, passive/active strategies and market timing or *TAA*) is excluded from our analysis. While Section 1 reviews literature on structure-mandate influences on portfolio construction, Section 2 presents the hypothesis, discusses the data, the methodology and presents the results and conclusions.

SECTION ONE

This section reviews the literature on management structures and indicates management structures influence on asset allocation and portfolio performance.

4.1. **Literature Review: Principal Asset Management Structures**

Coakley and Harris (1983) observe that a few large managers, mainly investment banks, have a strangle hold over fund assets through a diverse portfolio of their financial services. During the management process, strong interrelationships develop. Managers influence the sponsor to restructure service providers in preference of firms they are comfortable dealing with. For example, a fund management subsidiary of a retail bank may be introduced to a fund by its actuary or tax advisors, who also offer accounting or legal services respectively. By implication, because of the different sources of advice the fund utilises, and the strong web of inter-linkages between the service providers, the only logical result is massive concentration in the managers. Schuller (1986), Lambert (1988) and Myners (2001) suggest that by 1984 the UK had between 80% of assets concentrated within the largest top 5 managers (Mercury Asset Management, PDFM, Gartmore, Morgan Grenfell and Schroder). Global Investment (1996) surveys more than 2000 fund managers and indicates that the top 20 fund managers account for 40% of assets. They attribute this to technological advances and competition and argue that it leads to market polarization resulting in few mega-firms (assets over US$100 billion) and small specialist boutiques. Christman (1985a, 1985b) and Goldman (1985a) concur and argue that small managers are not hired by large funds until they have at least 1 large fund. NAPF (1990), Brown et al (1994) and Frost and Hager (1986) observe a positive correlation between diversification and fund size.

Haight (1980) explores in-house-external structure trends in the US and employs fund data from Money Market Directories, Greenwich Research Associates and 50 public funds for the period 1973-79. The author indicates that 28% of funds are in-house, 34% are external, and 48% are part-internal-part-external and managed by large institutions. While small funds (below $300 million) resort to external management for the active style, large funds employ single, active in-house manager. Furthermore, while 60% of public funds are in-house (with 22% equity and 59% bonds) 85% of corporate funds are external (with 50% equity and 29% bonds), while only 6% of corporate funds are more than 80% in-house. Scott (1980) argues that in-house is the preserve of large funds, which split assets between in-house and external at substantially less cost. Paustian (1985) concurs and reports a high incidence of asset internalisation, with in-house registering a 10.5% asset increase from $239 billion (1984) to $264 billion (1983), which he attributes to lower costs, more direct control, improved performance and hedging the transitional period, in case a manager is dismissed. Clowes (1979) surveys a cross section of 91 funds and indicates that of 25 in-house funds, 7 are financial institution subsidiaries, 5 are above £1 billion, 8 are below $100 million, and 1 is below $50 million [19]. The author indicates that of the 19 part-internal-part-external funds, 13 plan to internalise more assets. By asset class, 27 funds manage both equity and bonds in-house, 6 equity only, 4 bonds only, 3 also real estate, while 1 includes venture capital. By style, 8 of the in-house funds also adopt the active style for equity, while 8 are passive. Among those with bonds in-house, 20 are actively managed and generate 8% mean return, in-house funds out-perform the S&P 500 Index by a 2.4%

[19] This fund is a subsidiary of a financial institution.

mean return for equity, with the smallest fund being 100% in-house and generating the highest annual return (15%), for the sample period.

While Bloommenstein (1998) indicates that fees depend on the competitive structure of the asset management industry, Davies (1995) observes their wide variation across OECD countries; they are lower for Anglo-Saxon countries. However, Spurdon (1998) disagrees and indicates that because of competition in the UK, fees are negotiable compared to the US and are near 0.065% of the portfolio compared to US's 0.075%. Harger et al (1989) argue that the cost differential tightens as fund size increases, while Blake et al (1998), attribute this to size-based fee methods, employed by fund managers and the fact that other management costs are not as size-related as fee scales imply (**See Appendix 2: 1st & 2nd Panels**) but are inclusive of performance levels. In a recent survey of 800 corporate and 250 public US funds, the Institutional Investor (1996) concludes that in-house *DB* funds outperform both external funds and the S&P 500, and attributes this to the fact that the sponsor bears the ultimate risk in such schemes. Williamson (1979) employs the mean annual return, Sharpe and Treynor Indices, to investigate 100 US funds for style-performance correlation between in-house and external for the 1974-77 period and records negative correlation between performance and the external structure for all measures (and ascribes this to consistent mandates and lower equity for in-house). Clowes (1979) compares structure performance by examining 125 funds, and indicates that all but 2 of in-house funds out-perform external funds. However, the author indicates that while external management can supply much greater depth and breadth of managerial resources (and can

afford specialists for each asset area) where performance and control are keynote, in-house remains the desired route because cost differences are larger than performance variation.

Clowes (1979) and Haight (1980) indicate that effective control over the investment process is the most important aspect of in-house management. Superior trustee control and influence ensure that more time is spent on monitoring than in external. The independence of in-house managers means that their actions are free from any potential conflicts of interest found in financial conglomerates offering services to a wide range of clients of varying importance. Williamson (1979) investigates the extent of external manager discretion and indicates that of 71 responses, 41 funds give full discretion, while 21 give partial discretion, and the remainder changes either way during the sample period. Furthermore, tests for correlation between performance and the level of discretion indicate that full discretion is synonymous with equity bias and portfolio under-performance.

4.1.1. **Variant Asset Management Structures**

While empirical evidence acknowledges that managers do not possess expertise in all areas of investment, and is convergent on the existence and popularity of multi-manager structures, it is divergent on the rationale for its appeal. Lewis (1979) observes an increasing trend for specialist multi-manager structures, and attributes this to style diversification. Hager et al (1989) indicate that the decision to split management could be on a transitional basis to evaluate the new manager, and to permanently drop the initial manager if performance does not improve at a later stage. When trustees switch management, the natural concern remains that the replacement will replicate poor performance and it becomes fairly unlikely that funds will decide between the managers

and revert to the single structure. Williams (1985) and Shepherd (1987) indicate that fund size has an influence in multi-manager structures, but differ on its rationale. In the first validation, Williams (1985) argues that small funds do not have access to large managers, because the latter insists on huge minimum requirements. The author indicates that this leads to several small funds combining assets to obtain structure diversification from large managers. For example, Frank Russell's $1 billion commingled fund, for the $1-$10 million fund size band, which pools assets into $20 million commingled diversified sub-portfolios.

Haight (1980) indicates that while large public funds dominate in-house and prefer bond specialist multi-manager structures, corporate funds prefer equity and specialist single manager structures. Baker (1984) examines the Maryland, California, Illinois, and Mississippi State public funds, and indicates an upsurge of diversified teams of larger, external, fully discretionary and active bond specialist multi-manager structures. While the authors attribute this to the greater willingness to pay competitive fees, and the need for diversification, Darby (1985) ascribes it to enhanced fund manager sophistication, the high cost of multi-manager structures, performance clustering and increased passive bond management. Schuller (1986) indicates that former in-house large funds are resorting to balanced multi-manager structures, especially for their bond-equity portfolios. In variance, Gallo and Lockwood (1997) differ, and attribute multi-manager structures to specialist mandates, and indicate that funds employ multiple large/small-cap growth (value equity or bond) managers, because of the distinct return generation capabilities of each style. Focussing on the UK, WM (1998) surveys 1500 funds (worth £400 billion at the end of

1996) for multi-manager structures, and indicates that there are 225 multi-manager structure funds valued at £180 billion, leaving £220 billion on single structures. This is then split into 4 groupings: balanced (95 funds at £54.5 billion), specialist (62 funds at £49.8 billion) a mix of part-balanced-part-specialist (at £46.6 billion), while the remainder is specialist. Clarke et al (1990) assert that the benefits of multi-manager structures are similar to those of diversification and introduce an element of competition between managers. However, this is debatable because competition may already exist through league tables, and indeed, merely concentrating more effort on a portfolio may result in churning, while competition by management (on the verge of being sacked) increases risk levels as it tries to boost returns. Multi-manager structures also increase the chances of average performance for amalgamated portfolios, as individual managers follow different, and at times, contradictory styles resulting in relatively good and bad results being made less extreme (on average).

Pension Forum (1978) investigates structure trends in the US and indicates that the balanced structure takes more than 50% of funds' assets, with 86.4% corporate and 13.6% public funds. While this is concentrated in mid-sized funds ($100-$500 million), split 50%-50% on whether they will renew their mandates, balanced managers are the largest in the market. PDFM (1997) investigates balanced, specialist or in-house structures for the largest 100 UK funds for the period 1995-97 it indicates that balanced managers accounts for 75% of the funds, specialist for 16%, while the remaining 9% is in-house, and over the same period there is a slight increase for balanced, accompanied by a compensatory fall in specialist, while in-house is stagnant. PDFM (1997) also sort funds into 6 size bands and

records an increase in balanced structures among larger schemes (£500 million and above), which rise from 53% to 67%, while smaller schemes (£200 million and below) experience a fall. While Shuller (1986) buttresses the Shepherd (1987) philosophy, Institutional Investors (1978), presents conflicting evidence and indicate that while balanced management still predominates (with 50% of the sample being handled by few such large institutions) it is waning as fewer than 50% of the funds plan to hire balanced managers. The study indicates a large fund size-biased assumption of the balanced multi-manager structure. In contrast, Frost and Hager (1986) observe that large funds employ 1 balanced manager and, that while the structure is widespread, trustees are increasingly considering other alternatives, and attribute this to equity bias and extensive predilection for overseas pooled investment vehicles.

Further empirical evidence, Lewis (1979) focussing on the US, , investigates management structure trends, and argues that whilst there is an increase in either specialist bond or equity managers, difficulties in bond-equity integration philosophies have led to a recent upsurge in balanced structures. The author ascribes this to consistency, flexibility, improved communication and simplified administration requirements. Furthermore, while sponsors may not want to bet on a single projection of interest rates, diversification can be carried too far when major portions of the portfolio are positioned for opposite economic forecasts. Flexibility is the cornerstone a single manager structure, since the manager in control can act appropriately and immediately when an economic effect takes effect. When the responsibility is divided among various managers portfolio re-balancing becomes less efficient and costly.

SECTION 2

4.2. **Theoretical Framework**

The main objective of UK fund management structure investigation is to examine asset control in more detail. In particular, the section explores the established financial institutions' role and influence in asset allocation. The section presents the theoretical framework underpinning different management structures, presents the data, hypotheses tested, methodology employed and concludes with the results. Empirical evidence, Haight (1980), Paustain (1985), Clowes (1979), Hager et al (1987) and Williams (1985), indicates remarkable management structure influence on asset allocation. Minns (1980) extends the argument and reports the existence of significant pressures superimposed on the fund manager to bias asset allocation. While Minns (1980) pinpoints manager size as the source of the pressure, this study proposes the fund. Rifkin and Barber (1978) and Herman (1975) argue that professionals (e.g., custodians, actuaries, advisers, etc), vouch for service providers through whom they optimise the exploitation of their interests. For example, a bank may recommend a fund manager which invests in client firms to support or thwart corporate activity, threatening a beneficial relationship (whose fund they manage) even if this is not entirely in the fund's interests[20]. Thus, asset managers do not subordinate their interests, but exert an influence on asset allocation, resulting in biased asset allocation. Furthermore, Clowes (1979), Haight (1980), Williams (1979) and Hager and Lever (1987) report management structures are indicative of investment styles which dictate portfolio content, since they focus on unique sectors, or subsets, of the stock and/or bond markets.

[20]A more dramatic example is the Marcorni debacle and its syndicated loan from Barclays Capital, LloydsTSB and HSBC. Barclays Stockbrokers, the Group investment arm bought the Marconi shares at £8-00 in early 1999, for its 984

An example of this is a given structure may be dominated by value (growth) managers, specialising in UK (foreign) stocks. Furthermore, funds can either be managed in-house, external, insured, split part-in-house-part-external, part-insured-part-managed, part-balanced-part-specialist, by specialists focussing on certain markets, sectors of the economy and stocks, or balanced. This, in equilibrium, creates portfolio P_m, composed of internal (INH_{wi}), and external (EXT_{wi}) weights, which produces equation 1 below;

$$P_m = (\sum_{i=1}^{q} INH_{wi} + EXT_{wi})$$

Where, (1). P_m, is the portfolio of all management structures.

(2). INH_{wi} is the in-house structure.

(3). EXT_{wi} is the external structure.

Analysing the INH_{wi} and EXT_{wi} structures further generates 3 additional structures of; part-internal-part-external-managed ($PIPE_{wi}$), insured (INS_{wi}) and part-insured-part-managed ($PIPM_{wi}$). While the external structure can further be decomposed by the number of managers; multi-managed (MUM_w) or single managed (SIN_w), the insured route can either be self-insured ($SINS_w$) or external insured ($EINS_w$). By fund mandate structures can be balanced, specialist or part-balanced-part-specialist. While the balanced structure is a medium risk strategy (seeking a near 50-50 equity-bond split) specialist structure epitomises either growth or income, while part-balanced-part-specialist is a mixture of the two. The next concept, arising from empirical evidence, is that while funds can be managed

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fund clients. These shares rose to £12-00 in early 2000, only to slowly slide to £0-51 by early September 2001, when they were sold.

by either large or small managers there is a bias for the former, generating equation 5 below;

$$P_m = \sum_{i=1}^{q} (P_{LFi} + P_{SFi}) = \sum_{i=1}^{q} (LF_{wi} + SF_{wi})$$

Where (1). P_m is the aggregate portfolio of assets.

(2). P_{LFi} or LF_{wi} are assets managed by large managers.

(3). P_{SFi} or SF_{wi} are assets managed by small managers.

The emphasis in this study is to demonstrate management structure influence on home bias, and insured structure dominance. Various theories have been made to explain structure-driven bias, the most dominant of which are Williams (1985), Shepherd (1987), Haight (1980), Scott (1980), Darby (1985) and Schuller (1986), who argue that bias and performance are size, cost, investment mandate and structure-driven (where structure subsumes size). They further argue that while large funds are more likely to experience structure variation, dominate multi-manager and specialist structures and that whereas in-house is large funds dominant, small funds also populate the structure. Apart from factors correlated with control, structure and performance, the authors attribute this to fund type (corporate or public), and argue that public funds are conservative, prefer external-single-balanced mandates (with bond bias being mainstream), while large corporate funds prefer in-house, and externalise assets through external-multi-manager-specialists, with growth extremes and equity bias.

4.2.1. **Hypothesis Tested**

Hypothesis I: *While the external structure dominates, in-house is the preserve of large funds and has a higher proportion of foreign assets.*

$$\sum_{i=1}^{q} (INH_{wi\ foreign}) > \sum_{i=1}^{q} (EXT_{wi\ foreign}) \text{ or}$$

$$\sum_{i=1}^{q} \{(INH_{wi\ foreign}) > (EXT_{wi\ foreign}) + (PIPE_{wi\ foreign}) + (INS_{wi\ foreign}) + (PIPM_{wi\ foreign})\}$$

Hypothesis 2: *The multi-manager structure dominates the single-manager structure and has a higher foreign asset content.*

$$\sum_{i=1}^{q} \{(MUM_{wi\ foreign}) > (SIN_{wi\ foreign}) + (SINS_{wi\ foreign}) + (EINS_{wi\ foreign})\} \text{ or}$$

$$\sum_{i=1}^{q} \{(MUM_{wi\ foreign}) + (PIPE_{wi}(MUM_{wi\ foreign}) > (SIN_{wi\ foreign}) + (PIPE_{wi}(SIN_{wi\ foreign}) +$$

$$(SINS_{wi\ foreign}) + (EINS_{wi\ foreign}) + PIPM_{wi\ foreign})\}$$

Hypothesis 3: *While the balanced structure dominates, it is concentrated in the home assets while the specialist is foreign asset biased.*

$$\sum_{i=1}^{q} \{(BAL_{wi\ domestic}) > ((SPE_{wi\ domestic}) + (PBPS_{wi\ domestic})\} \text{or}$$

$$\sum_{i=1}^{q} \{(INH_{wi\ BAL}) + (EXT_{wi\ BAL}) + (PIPE_{wi\ BAL}) + (INS_{wi\ BAL}) + (PIPM_{wi\ BAL})\}$$

Hypothesis 4: *Fund assets are concentrated in a few large fund managers.*

$$\sum_{i=1}^{q} \{(P_{LFi}) > (P_{SFi})\} \text{ or } \sum_{i=1}^{q} (LF_{wi} > SF_{wi})\}$$

Haight (1980), Shepherd (1987), Clowes (1979), and PDFM (1997) support the structure-influence hypothesis and record external and balanced structure prevalence, while

recognising large fund bias for in-house and specialist structures. While doing so goes a long way to symbolize structure bias, these studies do not directly test for structure influence on asset allocation. Thus, apart from an observable dearth of comprehensive research in the area, studies omit the part-internal-part-external, part-balanced-part-specialist, insured and part-insured-part-specialist structures or employ small/large fund biased sample sizes and short time series biases. This study contains a relatively large sample of both small and large managers and a 7-year sample period. It incorporates structures to recognise split management. The methodology is set such that the following hypothesis may be tested:

1. The external structure is the most dominant structure.

(a) While the external structure dominates, in-house is the preserve of large funds and boasts the highest foreign asset component.

(b) The insured structure is the least preferred and is dominated by the smallest funds.

2. The multi-manager structure dominates the single structure.

(a) Reflective of split management benefits funds prefer the multi-manager-structure.

3. The balanced-structure dominates the specialist structure.

(a) Reflective of split management benefits funds prefer multi-skilled managers.

4. Funds are biased towards large fund managers.

(a) While funds concentrate in a few large managers, they do not overwhelm them.

(b) Small managers have their assets dominated by fund assets.

4.2.2. **Data and Methodology**

The *PFTA-Universe* fulfils the main data requirements for management structure analysis. This section describes sample construction for a mean of 1007 funds (disclosing portfolios

annually from the *PFTA-Universe)* generating a sub-sample of 63 managers for the period 1994-2000. Unlike other studies, that use ready-machined data, this one collects data by hand (**See Table 4.1** below). It is complete since it contains all funds disclosing management structures although no disclosure is made of assets controlled by each manager. Despite this drawback, compared with PDFM (1997) and Clowes (1979), we have more funds (1007 to 360 and 1007 to 91) and a longer time series (7-years-to-1-year), respectively. Compared with Paustian (1985) and Haight (1980) we have more time series (7 years-to-1 year and 7-to-2 years) and funds (1007 to 200 and 1007 to 50) respectively.

Table 4.1 presents the proportional distribution of funds disclosing management structures analysed by the number and fund size for the period 1994-2000 (with the inclusion pre-condition of portfolio disclosure). Annual sample size varies because funds do not consistently disclose portfolios and above all, structures vary. While the smallest sample occurs in 1996, when there is a 42.2% disclosure rate, the largest sample occurs in 2000, when it is 49.9%. Structure analysis indicates that as in PDFM (1997), external is the most dominant with a 7-year mean of 74.0% of funds, followed by part-insured-part-managed (9.1%), in-house (9.0%), insured (4.4%) and part-internal-part-external (3.5%). Of the insured-related funds, part-insured-part-managed dominates at 68%, externally insured (28%), and then self-insured (4.4%). Of the managed, the multi-manager structure dominates at 51%, while the single manager structure follows at 49%. Furthermore, part-balanced-part-specialist (62%) dominates the balanced (30%) and specialist (8%). Parameter specification incorporates all funds disclosing data regardless of size and mitigates size bias. Consequently, there is no loss of meaningful data and funds of different

sizes populate the sample. The largest fund is BT (£24.9 billion in 2000), with a part-internal-part-external, multi-manager and part-balanced-part-specialist structure.

Table 4:1.**Funds Disclosing Their Portfolios & Management Structure: 1994 – 2000**

	Fund Size By Management Structure				Years							Number of Funds	
Structures	**Average Fund** (£Millions) (1)	**Median Fund Size** (£Millions) (2)	**Mean Smallest** (£Millions) (3)	**Mean Largest** (£Millions) (4)	**1994** (5)	**1995** (6)	**1996** (7)	**1997** (8)	**1998** (9)	**1999** (10)	**2000** (11)	**Sample Mean** (Number) (12)	(%) (13)
In-house	1417.0	259.0	7.0	16015.2	100	104	86	97	101	81	68	**91**	9
External	1007.0	307.0	10.0	8949.3	715	746	713	734	755	764	789	**745**	74
Insured	299.0	74.0	19.0	2533.0	45	47	52	59	67	16	23	**44**	4.4
Part-internal-part-exter	2491.0	695.0	26.0	15763.0 {24907}	27	34	33	35	41	44	31	**35**	3.5
Part-insured-part-mana	101.1	29.1	2.4 {0.6}	3866.8	35	40	56	77	72	175	186	**92**	9.1
Total Sample	-	-	-	-	**922**	**971**	**940**	**1002**	**1036**	**1080**	**1097**	**1007**	**100**
Missing Variables*	-	-	-	-	1154	1109	1289	982	1221	1170	1103	**1147**	-
Population	-	-	-	-	**2076**	**2080**	**2229**	**1984**	**2257**	**2250**	**2200**	**2154**	-
Disclosure Rate (%)**	-	-	-	-	44.4%	46.7%	42.2%	50.5%	45.9%	48.0%	49.9%	**46.8%**	-
External Managed	**1007**	**307**	**10**	**8949**	**715**	**746**	**713**	**734**	**755**	**764**	**789**	**745**	-
Of Which:													
Multi-Managed	419	189	4	6628	360	377	370	376	385	443	475	**398**	-
Single-Managed	111	37	2	4457	355	369	343	358	370	321	314	**347**	-
Insured Structure	**299**	**74**	**19**	**2533**	**45**	**47**	**52**	**59**	**67**	**16**	**23**	**44**	-
Of Which:													
Self-Insured	695	160	52	2764	5	5	4	4	6	8	10	**6**	-
Externally-Insured	100	34	3	969	40	42	48	55	61	8	13	**38**	-
Managed Structure	**644**	**185**	**2**	**8910**	**1053**	**1030**	**1050**	**1059**	**1092**	**1341**	**1419**	**1149**	-
Of Which:													
Balanced	459	120	3	6943	338	284	329	311	325	404	427	**345**	-
Specialist	1086	339	3	4282	95	103	99	103	98	69	80	**92**	-
Part-Balanced-Part Specialist	386	95	2	15505 {24907}	620	643	622	645	669	868	912	**711**	-

[1]. Missing Variables* = Funds not disclosing their complete portfolios

[2]. Disclosure Rate** = Funds dicslosing complete portfolios as proportion of population

The smallest is Waldens Wiltshire Foods (£641 thousand) and is part-insured-part-managed by Sun Life Group and Scottish Widows with 78% in trusts and 22% cash. While the mean largest fund (£16 billion) is in-house, the mean smallest (£1.6 million) is single manager part-balanced-part-specialist managed. Whilst the insured structure is dominated by the smallest funds (mean £299 million), the largest (£696) of these populate the self-insured structure. On the other hand, of the managed funds, part-internal-part-external is dominated by the largest funds (mean £2.5 billion). Since the experiment also investigates portfolio bias, manager data is extracted with disclosure pre-conditions for manager portfolio, fund assets and of UK funds managed. **Table 4.2**, Columns 1-4 presents the mean, median, smallest and largest managers by structure. Columns 5-7 report the number of funds, mean assets and asset proportion per manager portfolio. Columns 8-11 report the proportion of managers meeting disclosure requirements for 1997-2000. Part-balanced-part-specialist is populated by the largest managers (mean £43 billion and largest £291.0 billion), enjoys a high concentration of assets per fund (£324 million), fund asset proportion per manager, (31.9%) and number of funds per manager (mean 213).

While the specialist structure is dominated by small managers (mean £13.5 billion, median £3.9 billion and largest £56.5 billion) and number of funds per manager (mean 21), at 8 it has the fewest managers per structure. Balanced has the smallest fund, (£355 million), the smallest mean assets per fund (£51 million) and smallest fund asset proportion per manager (24.3%). Overall sample mean (median) manager is £24.8 billion (£10.9 billion), mean largest (mean smallest) manager is £148.3 billion, (£733 million).

Table 4.2. **Managers Disclosing Size, Assets and Fund Managed: 1997 – 2000**

Structure Type	Fund Manager Size (£ Millions)				Fund Assets & Number of Funds			Number of Fund Managers				
	Average Manager Size	Median Manager Size	Smallest Manager Size	Largest Manager Size	Average Assets Per Manager (£ M)	Number of Funds Per Manager	Funds Assets (%) Per Manager	1997	1998	1999	2000	Sample Mean
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(a). Part-Balanced-Part Specialist Structure	43	22	1.1	291	32	21	31.9	36	32	33	40	35
(b). Balanced Structure	17	6.1	0.40	112.00	51	99	24.3	21	19	22	13	19
(c). Specialist Structure	13	3.9	0.80	56.00	15	21	31.6	8	7	10	8	8
Mean	**24**	**10**	**0.70**	**148.00**	**17.00**	**11**	**29.3**	**22**	**19**	**22**	**20**	**21**
Sample	-	-	-	-	-	-	-	65	58	65	61	62
Missing Variable	-	-	-	-	-	-	-	11	14	12	11	12
Population	-	-	-	-	-	-	-	17	19	19	17	18
Disclosure Rate	-	-	-	-	-	-	-	59	71	66	66	66

The sample smallest (largest) manager is Richard Grenville at £50 million (£291 billion at HSBC Asset Managers) in December 2000. While as of December 2000 (1997), 35 (49) managers are below £25 billion, 7 (2) have £100 billion of assets, while 19 (14) range between £25 and £100 billion. By number, while by December 2000 (1997) there are 38 (26) managers with less than 50 funds each, 1 manager has 1 (2) fund(s), Legal & General, (Mercury Asset Management) is the most concentrated at 1524 (1218) funds.

4.3. **Results: Management Structure Influence on Asset Allocation**

The hypothesis tested here proposes that fund assets are concentrated within a few managers, and that management structure biases asset allocation. Firstly, to investigate management structure influence we split portfolios and create 12 structures (as in **Appendix 1**) from which mean asset values, fund assets per manager portfolio, number of funds managed, assets per fund and fund portfolio rankings by manager size are computed. As in PDFM (1997), **Table 4.3** indicates that the proportion of externally managed funds is

high, with a sample period mean of 74.3% of all funds and, a steady but slight fall from 77.5% (1994) to 72.9% (2000), particularly amongst the smallest schemes (£25 million and below) **See Appendix 3**, which fall to 19.2% (2000) from 29.9% (1994). This is accompanied by a slight fall in in-house from 10.8% (1994) to 3.2% (2000), concentrated among small funds (below £100 million) which falls from 41% (1994) to 26.5% (2000).

Tables 4.3 **Principal Management Structure–: 1994-2000**

Structures	Mean Fund Size [£ Millions] (1)	Median Fund Size [£ Millions] (2)	Mean Number [%] (3)	1994 [%] (4)	1995 [%] (5)	1996 [%] (6)	1997 [%] (7)	1998 [%] (8)	1999 [%] (9)	2000 [%] (10)
[a]. Inhouse	1403.7	249.0	8.7	10.8	10.7	9.2	9.7	9.7	7.5	3.2
[b]. External	1426.9	77.9	74.3	77.5	76.8	75.9	73.3	72.9	70.8	72.9
[c]. Insured	211.1	49.5	4.5	4.9	4.8	5.5	5.9	6.5	1.4	2.8
[d]. Part-internal-part-external	2492.9	659.0	3.5	2.9	3.5	3.5	3.5	4.0	4.1	3.0
[e]. Part-insured-part-managed	127.4	32.7	9.0	3.8	4.1	6.0	7.7	6.9	16.2	18.1

However, contrary to popular belief that in-house is the realm of large funds, it is in fact concentrated in medium funds, (£101-£750 million) accounting for 38.7% of funds, and emerges in small funds (below £100 million) which account for 29.5%, and which may be independent managers or subsidiaries of financial houses. Over the same period, there is a steady equilibrium in part-internal-part-external, which is concentrated in large funds (above £750 million) that almost trebles from 25.9% (1994) to 70.9% (2000). Actually columns 1 and 2 in **Table 4.3** give the largest mean (median) fund of £2,492.9 billion (£659 million) respectively, indicative of large funds bias, nullifying the assertion that large funds are in-house. Furthermore, compared with in-house, there are virtually no funds below £10 million in this structure. This is plausible because they find themselves without the expertise in-house offers for their massive assets, principally for specialised areas like real estate. On the other hand, small funds cannot diversify efficiently without compromising

performance and rely on insured-managed funds. Columns 1-2 for the insured give a median (mean) of £49.5 millions (£211.1 millions), symptomatic of small-funds dominance, fluctuating from 4.9% (1994) to 6.5% (1998). All the activity on insured management is concentrated in the smallest funds (below £100 million) which account for 70.1% of the structure. The consistent rise in part-insured-part-managed is accompanied by falls in in-house, external, insured and part-internal-part-external structures. With a mean (median) of £127.4 million (£32.7 million) respectively, part-insured-part-managed is dominated by the smallest funds (87.8% of the structure). It rises from 3.8% (1994) to 18.1% (2000). Focussing on the above structures **Table 4.4**, when read with **Appendix 4.3,** presents the results of fund portfolios. Ranked by management structure it indicates that domestic assets dominate at a staggering 78% of the portfolio, driven by small funds, especially so for in-house and external (79.3%), while the insured structure is least home biased (74.2%). While this is driven by UK equity (52.8%), UK bonds (8.4%), cash (4.4%) and indexed gilts and trusts (5.4%), the apparent equity bias leaves funds with large under-funding risks as experienced in the UK within the last two years.

Table 4.4 **Management Structure Portfolios: 1994–2000**

Structures	UK Assets [%]	Foreign Assets [%]	Equity [%]	UK Equity [%]	Foreign Equity [%]	Real Estate [%]	Cash [%]	UK Bonds [%]	Foreign Bonds [%]	Indexed Gilts [%]	Other Assets [%]
[a]. Inhouse	79.3	20.7	75.8	57.1	18.6	4.4	4.0	7.3	1.7	3.3	3.3
[b]. External	79.3	20.7	69.4	52.0	17.4	2.4	5.2	11.1	3.2	4.5	4.2
[c]. Insured	76.3	23.7	73.7	51.7	22.0	4.0	3.6	8.5	2.7	1.2	7.9
[d]. Part-internal-part-external	77.5	22.5	70.6	51.6	18.9	3.1	4.0	7.2	3.1	4.5	7.2
[e]. Part-insured-part-managed	77.8	22.2	71.1	51.5	19.7	3.3	5.1	8.1	2.5	5.6	4.3
Mean	**78.0**	**22.0**	**72.1**	**52.8**	**19.3**	**3.5**	**4.4**	**8.4**	**2.7**	**3.8**	**5.4**

While in-house and external equally dominate in UK assets, in-house dominates in UK equity concentrated in small funds, UK property fuelled by large funds and equity fuelled by home equity in medium funds. Both structures have the least foreign exposure (20.7%), driven by small funds, while part-internal-part-external invests in the works of art. The external structure UK asset bias dominance is attributable to a high UK bond content in small funds, cash in medium and large funds, and a low foreign equity content for small funds. Generally, largest funds dominate (23%) in foreign assets, by management structure insured is the most dominant (23.7%) driven by medium funds investment in foreign equity and as expected, insured also dominates in the "other" assets. Furthermore, **Appendix 3** indicates that derivatives appear only in part-internal-part-external, while works of art, though trivial, appears in both in-house and part-internal-part-external largest funds. While we have observed external dominance, we do not know whether this is through single or multi-manager structures**. Table 4.5** presents the results of this analysis and indicates multi-manager structure dominance (53.3% of funds) records a 10% gain, is large funds biased (above £501 million), which more than doubles from 14.7% to 32.4%.

Table 4.5 **Principal Management Structures: 1994 - 2000**

Structures	**Mean**	**Median**	**Mean**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
	Fund Size		Number							
	(£ Millions)		(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
	1	2	3	4	5	6	7	8	9	10
1. Managed										
(a). Single-Manager	113.5	249.0	46.8	49.7	49.5	48.1	48.8	49.0	42.0	40.4
(b). Multi-Manager	413.5	77.9	53.2	50.3	50.5	51.9	51.2	51.0	58.0	59.6
2. Insured										
(d). Self-Insured	823.3	49.5	14.3	10.0	9.6	7.1	6.3	8.2	33.3	25.6
(e). Externally-Insured	213.7	659.0	85.7	90.0	90.4	92.9	93.7	91.8	66.7	74.4

The single-manager structure is small-funds biased with a mean (median) of £113.5 million (£249.0 million) and records a 9.2% decline, with the smallest funds (below £25 million) recording a near 50% fall from 48.4% to 27.9%, while immediate size-bands (above £25.1 million) record major increases. The externally insured dominates the insured portfolio (85.7% of such funds) and is dominated by small funds with a sample mean (median) of £213.7 million (£65.9 million). The structure records the highest sample period decline of 27%, it initially rises from 90.0% (1994) to 93.2% (1997) only to tumble thereafter. The fall is concentrated in small funds (below £100 million), while medium-to-large funds record a significant increase. Absent, within both the largest and smallest funds, with a mean (median) of £823.3 million (£49.5 million) and some very few large funds respectively, self insured is dominated by small-to-medium funds (£51-£750 million), and records an initial decline before suddenly rising. Focussing on the above structures, **Table 4.6** presents the results of the single, multi-manager, self-insured and external insured structure influence on asset allocation. It indicates UK asset dominance (78.1%) through small self-insured funds (83.8%). This is driven by UK equity, (53.7%) and UK bonds (9.9%), again driven by self-insured funds (83.8%). Foreign assets (21.9%) concentrate in externally insured. This is attributable to high foreign equity in large funds.

Table 4.6. **Management Structures Portfolios-: 1994-2000**

	UK Assets [%]	Foreign Assets [%]	Equity [%]	UK Equity [%]	Foreign Equity [%]	Real Estate [%]	Cash [%]	UK Bonds [%]	Foreign Bonds [%]	Indexed Gilts [%]	Other Assets [%]
(a). Multi-Managed	76.9	23.1	72.1	52.7	19.3	3.2	4.7	7.6	3.4	3.5	5.2
(b). Single-Managed	76.4	23.6	73.0	53.5	19.6	2.7	5.1	7.6	3.7	3.6	4.1
(c). Self-Insured	83.8	16.2	77.4	56.9	20.5	4.4	4.1	14.8	2.6	1.9	1.7
(d). Externally-Insured	75.3	24.7	73.5	51.8	21.7	2.5	3.9	9.7	2.8	2.7	4.9
Mean	**78.1**	**21.9**	**74.0**	**53.7**	**20.3**	**3.2**	**4.4**	**9.9**	**3.1**	**2.9**	**4.0**

The self-insured structure has the lowest foreign assets, especially for small funds, lowest foreign bonds for medium funds and lowest cash and trusts for large funds. On the other hand, single-manager structure has the largest cash for small funds, foreign bonds concentrated in medium funds, and indexed gilts, smallest UK bonds, property and managed funds concentrated in large funds. The multi-manager structure boasts the lowest indexed gilts and foreign equity in small funds, highest managed funds, the "other" assets fuelled by trusts in small funds, highest indexed gilts and only the presence, though insignificant, of derivatives and works of art in largest funds. Further analysis splits funds into balanced, specialist and part-balanced-part-specialist structures, generating **Table 4.7,** which records part-balanced-part-specialist dominance at 58.7% of funds. While populated by large funds, mean (median) £8,734.8 (£158.1 million), part-balanced-part-specialist is concentrated in small funds, which record a 5.4% increase.

Table 4.7 **Principal Management Structures: 1994-2000**

Structures	**Mean**	**Median**	**Mean**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
	Fund Size		Number							
	(£ Millions)		(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
	1	2	3	4	5	6	7	8	9	10
(a). Balanced	460.4	104.1	32.6	32.1	27.6	31.3	29.4	29.8	30.1	48.1
(b). Specialist	954.8	276.2	8.7	9.0	10.0	9.4	9.7	9.0	5.1	8.6
(c). Part-Balanced Part-Specialist	8734.8	158.1	58.7	58.8	62.4	59.2	60.9	61.3	64.7	43.3

Next follows balanced management, which accounts for 32.6% of these funds. It records a slight decrease, is particularly dominant among small funds (below £200 million), although slowly gaining popularity among medium funds, mean (median) £460.4 million (£104.1 million) respectively. While the fall is prevalent in the small-medium funds (below £500 million), large funds experience an increase. On the other hand, the specialist structure is

medium funds biased, with a mean (median) £954.8 million (£276.2 million) respectively, and as in PDFM (1998), has the lowest proportion of funds (8.7%), is concentrated among medium funds, slightly falls within small funds and rises notably amongst large funds. While the specialist increases are concentrated in large funds, balanced and part-balanced-part-specialist are concentrated in small funds. Because of their limited assets, small-medium funds cannot afford lumpy and specialist areas like real estate. But they are popular with balanced, and as they grow, split between balanced and specialist as a stepping-stone, and when they become large they become in-house and with portions in specialist. Part-balanced-part-specialist is more prevalent among medium funds (£100-£500 million), peaks within large schemes (at the expense of in-house, balanced and specialist) indicating that schemes converting from in-house to external first experiment with part-internal-part-external, as dipping a toe in water. However, as funds subsequently adopt an external posture, part-balanced-part-specialist mandates are preferred briefs. **Table 4.8** presents the results of above structures' influence on asset allocation and indicates the slackening of extreme UK asset allocation (though still unchallenged at 77.1% of the portfolio) with 54.4% in UK equity and 72.2% in the equity asset.

Table 4.8 **Management Structure Portfolios: 1994-2000**

Structures	UK Assets [%]	Foreign Assets [%]	Equity [%]	UK Equity [%]	Foreign Equity [%]	Real Estate [%]	Cash [%]	UK Bonds [%]	Foreign Bonds [%]	Indexed Gilts [%]	Other Assets [%]
(a). Balanced	77.2	22.8	73.3	52.7	19.6	2.6	4.7	7.6	3.4	3.5	5.2
(b). Part-Balanced Part-Specialist	77.5	22.5	72.5	53.5	19.1	2.4	5.1	7.6	3.7	3.6	4.1
(c). Specialist	76.5	23.5	71.0	56.9	19.1	3.5	4.1	14.8	2.6	1.9	1.7
Mean	**77.1**	**22.9**	**72.2**	**54.4**	**19.2**	**2.9**	**4.6**	**10.0**	**3.2**	**3.0**	**3.7**

UK asset dominance explains itself clearly in small funds, especially part-balanced-part-specialist, with 77.5% of UK assets but the lowest bias for UK assets in large funds. It has the highest foreign assets (23.5%) and lowest equity (71%) within large funds. It also has; the lowest cash, UK bonds, trusts, foreign equity and UK equity, among the largest funds, the lowest indexed gilts among smallest funds, largest UK property and managed funds among small funds and the largest foreign assets, foreign equity, indexed gilts among largest funds, and has a presence in derivatives and works of art. While specialist has the largest UK assets and cash mostly in the smallest funds, it has the lowest weight in foreign assets, foreign bonds and UK property. It has no cash for smallest funds, largest trusts and managed funds among the largest funds, while medium funds dominate in foreign bonds, are the lowest in trusts and "other" assets. On the other hand, balanced dominates in equity (73.3%), the "other" asset, particularly for largest funds, is lowest UK equity.

4.4. **Fund Manager Concentration and Management Structure Preference**

In line with Shuller (1986), Lambert (1998) and Myners (2001), the hypotheses here postulate that asset concentration within a few large managers and manager choice are indicative of structure bias. With the data at hand, 3 structures (part-balanced-part-specialist, balanced and specialist) are testable. While large manager portfolios are well diversified, small-manager portfolios are fund assets concentrated. **Table 4.9** presents the results of manager portfolio rankings, by assets, and indicates that while managing 55.9% of funds, the top 25% largest managers control 70.1% of fund assets. These only account for 23.6% of their portfolios, and boast a mean of £60 million assets per fund managed. On the other hand, small manager portfolios are comprised of 76.4% fund assets. This indicates that while fund assets are concentrated in the largest managers, more so by large funds,

large manager portfolios are well diversified portfolios, with other lines of business, while the residual fund assets poured into small managers matter more to them.

Table 4.9. **Manager Bias As Indicated by the Top Managers -: 1997-2000**

	Pension Fund Assets [%]	Number of Pension Funds [%]	Pension Fund Assets As Manager Portfolio Proportion [%]	Proportional Assets Per Pension Fund [£ Millions]
Top 25%	70.1	55.9	23.6	60.0
Others	29.9	44.1	76.4	40.0

Table 4.10 Panels A & 4.11 B & C below analyse structure by fund and manager portfolios. **Panel A (ii)** presents the part-balanced-part-specialist results and indicates a large manager dominance with a mean (median) size of £42.9 billion (£22.8 billion), with fund assets comprising a mean (median) of £14.8 billion (£4.3 billion) respectively of each manager.

Table 4.10 **Panels A: Manager Bias by Part-Balanced-Part-Specialist Structure**

Panel A

PBPS [i]	Proportion of Managers	Fund Assets Portfolio	Funds Per Manager	Fund Proportion in Portfolio	Assets Per Fund
£0 - £100	0.0	0.0	0.0	0.0	0.0
£101 - £500	0.0	0.0	0.0	0.0	0.0
£501 - £1 bn	2.1	0.1	0.2	4.4	0.5
£1.1 bn - £5 bn	11.9	1.5	3.1	14.5	2.2
£5.1 bn - £10 bn	11.6	1.4	1.9	7.0	1.9
£10.1 - £25 bn	29.0	10.4	14.6	24.5	7.1
£25.1 bn - £50 bn	21.2	28.2	23.4	28.6	81.5
£50.1bn - £100 bn	12.1	23.9	27.3	10.9	3.5
£100.1 and - £250 bn	10.4	28.6	27.2	9.2	2.5
£250 bn and Above	2.2	5.7	2.3	0.8	0.8
[ii]	**Manager Size [£ Millions]**	**Fund Assets Portfolio**	**Funds Per Manager [Number]**	**Fund Proportion in Portfolio [%]**	**Assets Per Fund [£ Millions]**
Mean	42860.2	14843.9	257.9	32.0	332.7
Median	22775.0	4287.5	59.3	24.6	62.7

There are 258 funds per manager, each with a mean size of £332.7 million. **Panel A (i)** indicates that fund assets comprise 32% of each manager portfolio and, that while there are no funds in the £0-£500 million size-bands, part-balanced-part-specialist managers are concentrated in the largest size bands (£10-£250 billion) accounting for 72.7% of the managers in this structure. The fund portfolio, number of funds managed and fund assets as a proportion of manager portfolio, indicate the same trend, but with higher concentration levels. **Panel B (iv)** presents balanced structure results and indicates its dominance in the medium size managers with a mean (median) size of £17.7 billion (£6.1 billion), while fund assets comprise £2.6 billion (£1.3 billion) respectively of each manager portfolio. There are 99 funds per manager, each with a mean size of £50.7 million. **Panel B (iii)** indicates that fund assets comprise 24.5% of the manager portfolio and that, while there are no managers in above the £100 billion size-band, balanced managers concentrate in the £0.5-£50 billion bands, accounting for 71.8% of the managers. The fund portfolio, number of funds managed and fund assets as a proportion of manager portfolio show the same trend, but higher levels of concentration within these size bands.

Panel C (v) presents the results of specialist and indicates dominance within small managers, with a mean (median) size of £13.5 billion (£3.9 billion), while fund assets comprise £2.2 billion (£0.9 billion) respectively of each manager portfolio. There are 21 funds per manager, each with £153.4 million in assets, which comprise 31.6% of the manager portfolio. While there are no funds in the £0-to-£100 million size band and above £250 billion, specialist managers concentrate in the £0.1-£5 billion bands, accounting for 75% of the managers within this structure.

Table 4.11 **Panels B and C Manager Bias by Balanced and Specialist Structures**

Panel B

BAL [iii]	Proportion of Managers	Fund Assets Portfolio	Funds Per Manager	Fund Proportion in Portfolio	Assets Per Fund
£0 - £100	11.7	0.0	0.6	4.2	0.1
£101 - £500	11.3	0.1	4.9	5.4	0.1
£501 - £1 bn	21.1	0.8	1.8	9.3	1.1
£1.1 bn - £5 bn	14.7	9.3	28.8	36.3	15.4
£5.1 bn - £10 bn	20.3	5.3	18.8	8.2	3.4
£10.1 - £25 bn	9.0	36.5	23.4	26.4	36.3
£25.1 bn - £50 bn	6.4	24.3	16.1	7.1	19.0
£50.1bn - £100 bn	0.6	17.0	4.4	2.6	19.5
£100.1 and - £250 bn	0.0	6.6	1.3	0.5	5.0
£250 bn and Above	0.0	0.0	0.0	0.0	0.0
[iv]	Manager Size [£ Millions]	Fund Assets Portfolio	Funds Per Manager [Number]	Fund Proportion in Portfolio [%]	Assets Per Fund [£ Millions]
Mean	17745.8	2621.1	98.6	24.5	50.7
Median	6100.0	1250.0	54.1	17.8	18.5

Panel C

SPE [v]	Proportion of Managers	Fund Assets Portfolio	Funds Per Manager	Fund Proportion in Portfolio	Assets Per Fund
£0 - £100	0.0	0.0	0.0	0.0	0.0
£101 - £500	3.1	0.1	1.1	1.9	0.1
£501 - £1 bn	12.3	3.8	11.6	21.9	6.0
£1.1 bn - £5 bn	59.6	41.8	46.9	58.6	56.5
£5.1 bn - £10 bn	0.0	0.0	0.0	0.0	0.0
£10.1 - £25 bn	13.8	24.5	28.1	11.4	10.5
£25.1 bn - £50 bn	0.0	0.0	0.0	0.0	0.0
£50.1bn - £100 bn	8.1	24.8	6.4	5.2	23.7
£100.1 and - £250 bn	3.1	5.0	5.9	1.0	3.2
£250 bn and Above	0.0	0.0	0.0	0.0	0.0
[vi]	Manager Size [£ Millions]	Fund Assets Portfolio	Funds Per Manager [Number]	Fund Proportion in Portfolio [%]	Assets Per Fund [£ Millions]
Mean	13532.2	2237.9	21.3	31.6	153.4
Median	3925.0	943.1	15.5	25.2	87.1

Fund portfolios, number of funds and fund assets as a proportion of manager assets indicate the same trend, but higher levels of bias. This evidence indicates that while balanced managers are relatively larger than specialist boutique managers, they are smaller than the part-balanced-part-specialist managers. Furthermore, while most funds are concentrated

amongst large managers, fund assets comprise a small proportion of their portfolios and are dominated by relatively smaller funds (compared with specialist managers).

4.5. **Results: Multivariate Analysis: In-house, External, Insured and Split Structures**

In this section we test for the robustness of the univariate results in the preceding section, through correlation and regression tests between the natural log of fund size, UK, foreign and individual assets as recorded in **Table 4.12**. **Table 4.12** presents the coefficient results, indicating negative and significant correlation between fund size and UK assets, UK bonds and trusts; positive and significant for foreign assets, indexed gilts and UK property while insignificant for UK equity, cash and individual foreign assets.

Table 4.12: **Structure Matrix Pearson Correlation Coefficients Between Variables**

Pearson Correlation Coefficients Between the Fund Size and Asset Components Comprising of Domestic Assets, Foreign Assets, Domestic Equity, Foreign Equity, Domestic Bonds, Foreign Bonds, Index Linked Gilts, Domestic Real Estate, Foreign Real Estate, Cash Deposits and Trusts

Fund Size & Assets	*A*	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*K*	*L*
FSZ(Ln): A	1											
UKA: B	-0.08	1										
FORA: C	0.08	-1.00	1									
UKEQ: D	-0.003	-0.13	0.13	1								
FOREQ: E	0.07	-0.91	0.91	0.17	1							
UKFIX: F	-0.08	0.33	-0.32	-0.34	-0.28	1						
FORFIX: G	0.04	-0.40	0.40	-0.05	-0.01	-0.18	1					
ILG: H	0.16	0.16	-0.16	-0.26	-0.13	-0.03	-0.10	1				
UKREAL: I	0.15	0.07	-0.07	-0.10	-0.04	-0.06	-0.07	-0.03	1			
FORREAL: J	0.02	-0.11	0.11	-0.06	0.02	0.00	0.01	-0.02	0.04	1		
UKCA: K	-0.06	0.13	-0.13	-0.20	-0.17	-0.03	0.07	0.00	-0.01	0.001	1	
TR: L	-0.09	0.46	-0.46	-0.56	-0.47	-0.10	-0.07	-0.09	-0.09	-0.02	-0.05	1

Furthermore, UK and foreign assets are negative and significantly correlated, while negative and significant for UK equity, foreign equity, foreign bonds and foreign property, and positive and significant for UK bonds, indexed gilts, cash and trusts, and insignificant for UK property. Furthermore, foreign assets return positive and significant coefficients for UK equity, foreign equity, foreign bonds and foreign property, while negative and

significant for UK bonds, cash, indexed gilts and trusts, and insignificant for UK property. While UK and foreign equity coefficients are negative and significant on UK bonds, cash, indexed gilts and trusts, while insignificant for others, UK equity is positive and significant for foreign equity and negative and significant on UK property. UK bonds are negative and significant on foreign equity and trusts; foreign bonds are negative and significant on indexed gilts and UK property, while indexed gilts are negative and significant for trusts. Although puzzling, these results corroborate **Tables 4.3 – 4.10**. Fund-size growth results in a significant reduction in extreme UK asset allocation, UK bonds and trusts. It increases foreign assets, indexed gilts and cash, and results in an insignificant impact on other assets. While it is large funds that are expected to intensify foreign diversification, UK property and indexed gilts, UK bonds and cash coefficients are somewhat unique because large funds are expected to be mature, facing major benefit out-go obligations and tilted towards bond and liquidity assets (e.g. with increased indexed gilts so as to duration-match their liabilities). On the other hand, large funds are also likely to have widely diversified portfolios, and afford high UK property proportions. UK bonds and trusts are inversely correlated with size for variant reasons. Bonds are viewed as less risky and more likely to be held in larger quantities by smaller funds, while trusts are the most extensive diversifier for small funds. Furthermore, domestic investment results in a compensatory reduction in individual foreign assets surprisingly so for UK equity, while increasing other UK assets. While this is somewhat expected, the UK equity coefficient is baffling, because it suggests that UK bias intensification results in reduced UK equity and an increase in UK bonds, indexed gilts, cash and trusts. From the international perspective, there is a significant increase in individual foreign assets and, surprisingly, UK equity, accompanied by a

reduction in other UK assets. This requires that the equity allocation is a single decision combining both UK and foreign equity (which are treated as complimentary) while other home assets are substitutes.

Motivated by the above results, we explore the possible determinants of extreme UK investment trends (within each structure respectively) with the specific aim of testing whether this is structure driven and, whether as substitutes or compliments, different assets impact UK bias similarly. Furthermore, we analyse whether fund size plays an important role on each dependent variable, from both the UK and foreign perspectives. Based on evidence inferred from **Tables 3.3 –3.12**, we construct 10 ordinary least squares regressions and employ home bias as the dependent variable, generating regressions **R1**-**R2** for home bias within in-house, **R3-R4** (external), **R5-R6** (insured), **R7-R8** (part-internal-part-external) and **R9-R10** (part-insured-part-managed). As indicated above, **R1** ascertains the determinants of UK assets in-house, and is more formally represented by:

a. UK Assets $_{INH}$ = (Fund Size$_{INH}$ + Foreign Assets $_{INH}$ + INH + Error Term), generating

b. $UKA - INH_W = f(\sum_{j-1}^{(q)}(wj(LnFSZ) + FOREQ_{jinh} + FORREAL_{jinh} + INH + \varepsilon))$ and

c. $UKA - INH_W = f(\sum_{j-1}^{(q)}(FORFIX_{jinh} + INH + \varepsilon))$

Where $UKA - INH_W$, $FOREQ_{jinh}$, $FORFIX_{jinh}$, $FORREAL_{jinh}$ symbolize UK assets, foreign equity, bonds and property within the in-house structure respectively, $LnFSZ$ is the natural log of fund size, while ε is the error term. We generate regressions **b** and **c** because including foreign bonds with foreign equity and foreign property regressed on UK

assets, leads to a unitary solution with large standard errors since the "independent variables" are proportions of the fund size. Therefore, *Ln(FSZ),* which reflects the form of the independent variable is included to prevent a singular matrix phenomenon. The robustness of the regressions is further strengthened by the size of R^2 that gives an idea about fund size influence. A cross-sectional structure and time series dummy are included to test structure bias and time effects, generating **Table 4.13** below.

Table 4.13: **Structure Series Domestic Asset Bias**

Multivariate Regression : Cross-Sectional Structure-Time Series Domestic Asset Bias

Regressions 1-10 The Dependent Variable is UK Assets

The UK Assets are calculated as UK Equity, UK Bonds, UK Real Estate, Index-Linked Gilts, Cash and Trusts, where Trusts are calculated by Summing up Derivatives, Venture Capital, Managed Funds and Works of Art. UK Bonds are taken as UK Bonds excluding Index Linked Gilts. The Regressions are run on the Natural Long of Fund Size, Foreign Equity, Foreign Bonds, Foreign Real Estate and Structure-Series Across Time as a Dummy to Gauge the Structure-Time Series Influence on Home Bias. Coefficient estimates on Natural Log of Fund Size, Foreign Equity, Foreign Bonds, Foreign Real Estate, and Management Structure are reported, along with t-statistics in Parenthisis, [*], [**], [***] & [—], Significant at 1%, 5%, 10% Level and insignificant respectively.

Structure Type:	**Inhouse**		**External**		**Insured**		**PIPE**		**PIPM**	
Independent	**Regression**		**Regression**		**Regression**		**Regression**		**Regression**	
Variable	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Intercept	98.1	78.4	98.6	79.0	97.5	78.6	78.6	97.7	97.6	78.6
	(286.64*)	(299.7*)	(277.94*)	(254.49*)	(283.06*)	(305.25*)	(307.73*)	(280.05*)	(279.53*)	(308.40*)
Fund Size (Ln)	-0.2	-	-0.1	-	-1.0	-	-	-0.1	-	-0.1
	(-6.41*)		(-4.59*)		(-3.66*)			(-4.05*)		(-3.66*)
Foreign Equity	-0.99	-	-0.99	-	-0.99	-	-	-0.99	-0.99	-
	(-185.85*)		(-185.847*)		(-185.18*)			(-185.01*)	(-184.99*)	
Foreign Bonds	-	-0.96	-	-.97	-	-0.97	-0.97		-	-0.97
		(-35.75*)		(-35.87*)		(-36.31*)	(36.64*)			(-36.29*)
Foreign Real Estate	-1.05	-	-1.05	-	*-1.04*		-	-1.03	-1.03	-
	(-19.07*)		(-19.00*)		(-18.70*)			(-18.58*)	(-18.57*)	
Domestic Equity	-	-	-	-	-0.60	-	-0.94	-	-0.94	-
					(-64.11*)		(-101.51*)		(-101.51*)	
Structure	1.94	1.01	-0.52	-0.25	0.26	-	-0.32	-	-	0.18
	(11.53*)	(2.69*)	(-9.81*)	(-2.10*)	(3.47*)	(—)	(-2.26*)	(—)	(—)	(2.42*)
Time Dummy	0.1	0.49	.07	.47	.07	0.47	0.48	0.08	0.07	0.45
	(4.40*)	(9.31*)	(2.85*)	(9.03*)	(3.31*)	(9.09*)	(9.14*)	(3.20*)	(2.95*)	(8.58*)
Adj R2 [%]	83.8	16.9	83.7	16.9	83.5	16.9	16.9	83.5	83.5	16.9
F	7287.6	477.9	7243.1	476.8	7140.9	475.0	477.1	7127.6	7127.3	477.4
P-Value of F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

This indicates positive and significant structure and time dummy coefficients for in-house, insured-**R5** and part-insured-part-managed-**R10.** Negative and significant for external and part-internal-part-external-**R7**, while insignificant for part-internal-part-external-**R8** and part-insured-part-managed-**R9** and insured-**R6**. Fund size and individual assets return negative and significant coefficients. This implies a significant time and structure series extreme UK bias upsurge. In-house, insured-**R5** and part-insured-part-managed-**R10**, are the most intensely UK biased. External and part-internal-part-external-**R7** result in less than average UK bias, and insured-**R6**, part-internal-part-external-**R8** and part-insured-part-managed-**R9** have an insignificant effect. Additionally, in all instances fund size growth and individual foreign assets induce a fall in UK bias. Thus, in-house funds are the most UK biased and external funds are the least. As a follow on to the above results, we repeat the tests with UK equity as the dependent variable and generate 10 ordinary least squares regressions; **R1-R2** for extreme UK equity allocation in the in-house structure, **R3-R4** (external), **R5-R6,** (insured); **R7-R8**, (part-internal-part-external) and **R9-R10** (part-insured-part-managed). **R1** ascertains the determinants of UK equity in-house and is more formally represented by:

a. UK Equity_{INH} = (Fund Size + Foreign Assets_{INH} + INH + Error Term), for foreign assets which generates

b.

$$UKEQI_{INH\,W} = f\left(\sum_{j-1}^{(q)} (wj(LnFSZ) + FOREQ_{jinh} + FORFIX_{jinh} + FOREAL_{jinh} + INH + \varepsilon)\right) \&$$

c. UK Equity_{INH} = (Fund Size_{INH} + Domestic Assets_{INH} + INH + Error Term), for UK assets, which generates

d. $$UKEQI_{NH}{}_{W} = f\left(\sum_{j-1}^{(q)}(wj(LnFSZ) + UKFIX_{jinh} + ILG_{jinh} + UKREAL_{jinh} + UKCA_{jinh} + TR_{jinh} + INH + \varepsilon)\right)$$

Where $UKEQ - INH_{W}$, $UKFIX_{jinh}$, $UKREAL_{jinh}$, $UKCA_{jinh}$, TR_{jinh}, indicate UK equity, UK bonds, UK property, cash and trusts within in-house, $LnFSZ$ is the natural log of fund size, while ε is the error term. A cross-sectional structure and time dummy series are included to analyse structure bias and time effects. **Table 4.14**, presents the results indicative of negative and significant time dummy coefficients for foreign assets, positive and significant for UK assets, positive and significant structure coefficients for in-house, while either negative and significant or insignificant for other structures. Fund size also generates a cross sectional structure negative and either significant or insignificant coefficients. Additionally, while foreign property, foreign bonds, UK bonds, indexed gilts, UK property, cash and trusts all generate structure negative and significant coefficients, foreign equity returns positive and significant coefficients. This implies that in an aggregate portfolio context, there is a time-structure series UK equity decline, while domestically UK equity allocation intensifies across time. By structure, in-house enjoys the most intense UK equity exposure, while external, insured-**R5** and part-internal-part-external-**R7,** are significantly below average, insured-**R6,** part-internal-part-external-**R8,** part-insured-part-managed-**R9** and part-insured-part-managed- **R10** indicate insignificant effects. Further to this, individual asset allocation, save for foreign equity, results in a significant decline in UK equity. While puzzling, this confirms the complementary effect between foreign and UK equity.

Table 4.14: **Time & Structure Series Domestic Equity Cross-Sectional Bias**

Multivariate Regression : Cross-Sectional Structure-Time Series Domestic Equity Bias

Regressions 1-10 The Dependent Variable is UK Equity

Trusts are calculated by Summing up Derivatives, Venture Capital, Managed Funds and Works of Art. UK Bonds are taken as UK Bonds excluding Index Linked Gilts. The Regressions are run on the Natural Long of Fund Size, Foreign Equity, Foreign Bonds, Foreign Real Estate, UK Bonds, UK Real Estate, Indexed Gilts, UK Cash, Trusts and Style Series Across Time as a Dummy to Gauge the Structure-Time Influence on Home Bias. Coefficient estimates on Natural Long of Fund Size, Foreign Equity, Foreign Bonds, Foreign Real Estate, UK Bonds, UK Real Estate, Indexed Gilts, UK Cash, Trusts, and Management Structure are reported, along with t-statistics in Parenthisis, [*], [**], [***] & [—], Significant at 1%, 5%, 10% Level and insignificant respectively.

Structure Type:	Inhouse		External		Insured		PIPE		PIPM	
Independent	Regression		Regression		Regression		Regression		Regression	
Variable	1	2	3	4	5	6	7	8	9	10
Intercept	52.2	72.2	51.9	72.4	51.5	71.3	50.81	71.06	51.4	71.2
	(48.04*)	(114.1*)	(46.11*)	(110.0*)	(47.3*)	(112.07*)	(46.11*)	(110.43*)	(46.6*)	(110.41*)
Fund Size (Ln)	-0.2	-0.45	-0.06	-0.34	—	-0.33	—	-0.304	—	-0.32
	(-2.20*)	(-8.29*)	(-0.68*)	(-6.35*)	(—)	(-6.13*)	(—)	(-5.58*)	(—)	(-5.34*)
Foreign Equity	0.24	-	0.24	-	0.24	-	0.24	-	0.24	-
	(14.35*)		(13.97*)		(13.93*)		(13.92*)		(13.89*)	
Foreign Bonds	-0.13	-	-0.16	-	*-0.17*	-	-0.17	-	-0.17	-
	(-3.51*)		(-4.26*)		(-4.63*)		(-4.57*)		(-4.55*)	
Foreign Real Estate	-0.96	-	-0.95	-	*-0.92*	-	-0.94	-	-0.94	-
	(-5.59*)		(5.43*)		(-5.29*)		(-5.36*)		(-5.37*)	
Domestic Bonds	-	-0.6		-0.6	-	-0.60	-	-0.60	-	-0.60
		(-64.86*)		(-64.11*)		(-64.02*)		(-64.1*)		(64.07*)
Indexed Gilts	-	-0.65	-	-0.65	-	-0.65	-	-0.65	-	-0.65
		(-48.80*)		(-48.78*)		(-48.66*)		(-48.62*)		(-48.64*)
Domestic Real Estate	-	-0.62	-	-0.61	-	-	-	-0.60	-	-0.32
		(-27.44*)		(-26.75*)				(-26.1*)		(-5.84*)
Cash	-	-0.67	-	-067	-	-0.68	-	-0.68	-	-0.68
		(-37.29*)		(-26.75*)		(-37.34*)		(-37.36*)		(-37.31*)
Trusts	-	-0.62	-	-0.62	-	-0.62	-	-0.62	-	-0.62
		(-97.56*)		(-97.14*)		(-96.81*)		(-96.80*)		(-96.83*)
Style	3.97	3.55	-0.36	-0.61	-0.52	-0.16	-0.46	-0.19	—	0.02
	(7.37*)	(11.52*)	(-2.13*)	(-6.19*)	(-2.18*)	(—)	(-2.25*)	(-1.60***)	(—)	(0.40*)
Time Dummy	-0.25	0.25	-0.32	0.20	-0.32	0.21	-0.32	0.21	-0.3	0.21
	(-3.44*)	(5.82*)	(-4.33*)	(4.52*)	(-4.34*)	(4.79*)	(-4.30*)	(4.81*)	(-4.04*)	(4.66*)
Adj R2 [%]	4.4	68.5	3.8	68.0	3.8	67.9	3.8	67.9	3.7	67.9
F	55.5	1909.5	46.9	1872.7	46.9	1858.4	47.0	1858.8	46.0	1857.9
P-Value of F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Additionally, in all the instances fund size growth induces a reduction in UK equity. Thus, while in-house exacerbates UK equity allocation, other structures possess a moderating effect. Motivated by the recorded gradual shift into UK bonds in Chapter 3, UK asset bias

and extreme UK equity results above, we examine the possible determinants of UK bond trends across time within each structure by repeating the above tests generating **Table 4.15**.

Table 4.15: **Structure & Time Series Cross-Sectional UK Bond Shift**

Multivariate Regression : Cross-Sectional Structure-Time Series Domestic Bonds Bias

Regressions 1-10 The Dependent Variable is UK Bonds

Trusts are calculated by Summing up Derivatives, Venture Capital, Managed Funds and Works of Art. UK Bonds are taken as UK Bonds excluding Index Linked Gilts. The Regressions are run on the Natural Long of Fund Size, Foreign Equity, Foreign Bonds, Foreign Real Estate, UK Equity, UK Real Estate, Indexed Gilts, UK Cash, Trusts and Style Series Across Time as a Dummy to Gauge the Structure-Time Influence on Home Bias. Coefficient estimates on Natural Long of Fund Size, Foreign Equity, Foreign Bonds, Foreign Real Estate, UK Equity, UK Real Estate, Indexed Gilts, UK Cash, Trusts, and Management Structure are reported, along with t-statistics in Parenthisis, [*], [**], [***] & [---], Significant at 1%, 5%, 10% Level and insignificant respectively.

Structure Type:	**Inhouse**		**External**		**Insured**		**PIPE**		**PIPM**	
Independent	**Regression**		**Regression**		**Regression**		**Regression**		**Regression**	
Variable	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Intercept	16.56	53.18	16.72	53.22	16.53	51.9	16.7	51.9	16.68	51.9
	(21.44*)	(59.99*)	(20.96*)	(59.05*)	(21.42*)	(58.78*)	(21.39*)	(58.6*)	(21.34*)	(58.5*)
Fund Size (Ln)	-0.39	-0.66	-0.41	-0.58	-0.4	-0.56	-0.41	-0.56	-0.41	-0.56
	(-5.93*)	(-12.05*)	(-6.48*)	(-10.86*)	(-6.32*)	(-10.48*)	(-6.30*)	(-10.16*)	(-6.31*)	(-10.18
Foreign Equity	-0.28	-	-0.28	-	-0.28	-	-0.27	-	-0.28	-
	(-23.19*)		(-23.11*)		(-23.11*)		(-23.12*)		(-23.12*)	
Foreign Bonds	-0.41	-	-0.41	-	*-0.40*	-	-0.41	-	-0.41	-
	(-15.32*)		(-15.16*)		(-15.13*)		(-15.22*)		(-15.22*)	
Foreign Real Estate	---	-	---	-	---	-	---	-	---	-
	(---)		(---)		(---)		(---)		(---)	
Domestic Equity	-	-0.62	-	-0.62	-	-0.62	-	-0.62	-	-0.62
		(-64.86*)		(-64.41*)		(-64.02*)		(-64.08*)		(-64.07*
Indexed Gilts	-	-0.45	-	-0.45	-	-0.44	-	-0.44	-	-0.45
		(-30.24*)		(-30.14*)		(-29.94*)		(-29.98*)		(-30.00*
Domestic Real Estate	-	-0.46	-	-0.45	-	-0.43	-	-0.43	-	-0.43
		(-30.24*)		(-18.84*)		(-18.23*)		(-18.20*)		(-18.23*
Cash	-	-0.5	-	-0.50	-	-0.50	-	-0.50	-	-0.50
		(-26.05*)		(-25.78*)		(-25.92*)		(-25.96*)		(-25.92*
Trusts	-	-0.43	-	-0.43	-	-0.43	-	-0.43	-	-0.43
		(-51.63*)		(-51.31*)		(-51.03*)		(-51.04*)		(-51.04
Style	-0.66	2.56	---	-0.57	0.36	---	-0.02	---	---	---
	(1.72*)	(8.12*)	(---)	(-5.8*)	(2.12*)	(---)	(-0.11*)	(---)	(---)	(-
Time Dummy	0.63	0.68	0.64	0.64	0.64	0.66	0.64	0.66	0.64	0.65
	(11.95*)	(15.66*)	(12.21*)	(14.68*)	(12.29*)	(15.05*)	(12.21*)	(15.01*)	(11.94*)	(14.56
Adj R2 [%]	13	40.9	13.0	40.6	13.0	40.4	13	40.4	13	40.4
F	176.5	609.9	176.0	603.2	176.8	596.4	176.0	596.3	176.0	596.2
P-Value of F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

This indicates positive and significant time dummy coefficients, negative and significant coefficients for in-house-**R1** and external-**R4**, positive and significant for insured-**R5,** while insignificant for external-**R3**, part-internal-part-external and insured-**R6** and part-internal-part-external. Fund size returns negative and significant coefficients, indicating that fund size growth induces a fall in UK bonds. This may be baffling, because on the one hand large funds are generally mature funds, and should seek liability duration matching through fixed income assets. However, further analysis indicates that they obtain better duration-matching diversification from indexed gilts. Foreign bonds, foreign equity, UK bonds, indexed gilts, UK property, cash and trusts all generate structure negative and significant coefficients, while foreign property is insignificant. This implies a substantial structure and time series UK bond intensification. In-house-**R2** and insured-**R5** indicate significant UK bond allocation, whereas insured-**R6,** part-insured-part-managed, external-**R3** and part-internal-part-external are insignificant, while in-house-**R1** and external-**R4** are negative and significant. This implies that UK bond gradual shift is concentrated within the in-house and insured structures, while external and part-internal-part-external either reduce UK bonds, or do not possess an effect. Individual assets all return negative and significant coefficients save for foreign property which is insignificant. This implies that an allocation into foreign equity, foreign bonds, UK equity, indexed gilts, trusts, cash and UK property results in a reduction in UK bonds, while foreign property has an insignificant effect.

Motivated by the fact that small and risk-averse funds obtain extensive diversification through trusts, and armed with the evidence recorded above, we repeat the same tests on trust allocation, generating **Table 4.16** which records negative and significant foreign asset

time series dummy coefficients, while the domestic are positive and significant. Thus, by structure, foreign asset allocation induces a significant time series reduction in trusts, maybe due to a substitution effect for foreign asset diversification.

Table 4.16: **Structure & Time Series Cross-Sectional Trusts Trends**

Multivariate Regression : Cross-Sectional Structure-Time Series Trust Asset Bias

Regressions 1-10 The Dependent Variable is Trusts

Trusts are calculated by Summing up Derivatives, Venture Capital, Managed Funds and Works of Art. UK Bonds are taken as UK Bonds excluding Index Linked Gilts. The Regressions are run on the Natural Long of Fund Size, Foreign Equity, Foreign Bonds, Foreign Real Estate, UK Equity, UK Real Estate, Indexed Gilts, UK Cash, UK Bonds and Style Series Across Time as a Dummy to Gauge the Structure-Time Influence on Home Bias. Coefficient estimates on Natural Long of Fund Size, Foreign Equity, Foreign Bonds, Foreign Real Estate, UK Equity, UK Real Estate, Indexed Gilts, UK Cash, Uk Bonds, and Management Structure are reported, along with t-statistics in Parenthisis, [*], [**], [***] & [---], Significant at 1%, 5%, 10% Level and insignificant respectively.

Structure Type:	**Inhouse**		**External**		**Insured**		**PIPE**		**PIPM**	
Independent	**Regression**		**Regression**		**Regression**		**Regression**		**Regression**	
Variable	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Intercept	26.49		26.43		30		27.56		27.33	
	(25.34*)	(59.99*)	(24.44*)	(59.05*)	(25.79*)	(58.78*)	(26.04*)	(58.6*)	(21.34*)	(58.5*)
Fund Size (Ln)	-0.27		-0.37		-0.37		-0.42		-0.4	
	(-3.06*)	(-12.05*)	(-4.25*)	(-10.86*)	(-4.33*)	(-10.48*)	(-4.79*)	(-10.16*)	(-4.52*)	(-10.18*)
Foreign Equity	-0.75	-	-0.74	-	-0.74	-	-0.74	-	-0.74	-
	(-46.01*)		(-45.75*)		(-45.69*)		(-45.70*)		(-45.68*)	
Foreign Bonds	-0.29	-	-0.28	-	-0.26	-	-0.26	-	-0.26	.0.41
	(-15.32*)		(-15.16*)		(-15.13*)		(-15.22*)		(-7.34*)	(-15.22*)
Foreign Real Estate	—	-	—	-	—	-	—	-	—	-
	(—)		(—)		(—)		(—)		(—)	
Domestic Equity	-	-0.62	-	-0.62	-	-0.62	-	-0.62	-	-0.62
		(-64.86*)		(-64.41*)		(-64.02*)		(-64.08*)		(-64.07*)
Indexed Gilts	-	-0.45	-	-0.45	-	-0.44	-	-0.44	-	-0.45
		(-30.24*)		(-30.14*)		(-29.94*)		(-29.98*)		(-30.00*)
Domestic Real Estate	-	-0.46	-	-0.45	-	-0.43	-	-0.43	-	-0.43
		(-30.24*)		(-18.84*)		(-18.23*)		(-18.20*)		(-18.23*)
Cash	-	-0.5	-	-0.50	-	-0.50	-	-0.50	-	-0.50
		(-26.05*)		(-25.78*)		(-25.92*)		(-25.96*)		(-25.92*)
Trusts	-	-0.43	-	-0.43	-	-0.43	-	-0.43	-	-0.43
		(-51.63*)		(-51.31*)		(-51.03*)		(-51.04*)		(-51.04*)
Structure	-2.87		0.4		0.32		0.4	—	—	—
	(5.54*)	(8.12*)	(2.47*)		(1.42*)	(—)	(2.03*)	(—)	(—)	(—)
Time Dummy	-0.63		-0.58		-0.58		-0.58		-0.58	
	(-8.86*)	(15.66*)	(-8.21*)	(14.68*)	(-8.22*)	(15.05*)	(-8.25*)	(15.01*)	(-7.97*)	(14.56*)
Adj R2 [%]	24.3		24.0		24.0		24		23.9	
F	376.7		371.3		370.4		370.9		370.2	596.2
P-Value of F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Domestically, a reverse effect is noted. Furthermore, and expectedly, fund size returns negative and significant coefficients, since fund growth means that funds can afford to diversify directly into composite assets. Structure coefficients are negative and significant for in-house-**R1** and external-**R4**, insignificant for insured, part-internal-part-external-**R8,** and part-insured-part-managed. They are positive and significant for in-house-**R2**, external-**R3** and part-internal-partexternal-**R7.** The mixed results indicate that while trusts are both structure and market driven, the two variables induce different effects. Individually, all assets return negative and significant coefficients, save for foreign property which is insignificant. This means that while foreign assets and property induce a negligible effect on trusts, other assets result in a reduction.

4.6. **Single-Manager, Multi-Manager, Self-Insured & Externally Insured Structures**

As a backdrop to evidence presented in **Tables 4.2–4.11**, this section checks for multi-collinearity between the natural log of fund size, UK asset bias, foreign assets and individual assets, using the correlation coefficients for single-manager, multi-manager, self-insured and externally insured structures. This generates **Table 4.17**, which records an insignificant correlation between fund growth and UK bias, UK bonds, foreign property, cash and trusts; positive and significant for foreign assets, indexed gilts and UK property while insignificant for UK and foreign equity and foreign bonds. Furthermore, there is negative and significant correlation between home bias and foreign assets, foreign equity, bonds and property, insignificant for UK equity and property, while positive and significant for UK bonds, indexed gilts, cash and trusts. Additionally, foreign assets are positive and significantly correlated with UK and foreign equity, foreign bonds and property, while negative and significantly correlated with UK bonds, cash, indexed gilts and trusts.

Table 4.17: **Structure Series Correlation Coefficients Between The Variables**

Pearson Correlation Coefficients Between the Fund Size and Asset Components Comprising of Domestic Assets, Foreign Assets, Domestic Equity, Foreign Equity, Domestic Bonds, Foreign Bonds, Index Linked Gilts, Domestic Real Estate, Foreign Real Estate, Cash Deposits and Trusts

Fund Size & Assets	*A*	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*K*	*L*
FSZ(Ln): *A*	1											
UKA: *B*	-0.01	1										
FORA: *C*	0.08	-0.82	1									
UKEQ: *D*	0.02	-0.04	0.21	1								
FOREQ: *E*	0.06	-0.74	0.91	0.23	1							
UKFIX: *F*	-0.07	0.31	-0.33	-0.34	-0.27	1						
FORFIX: *G*	0.07	-0.33	0.40	0.00	-0.001	-0.19	1					
ILG: *H*	0.15	0.16	-0.16	-0.26	-0.13	-0.02	-0.10	1				
UKREAL: *I*	0.10	0.07	-0.03	-0.07	-0.02	-0.06	-0.05	-0.02	1			
FORREAL: *J*	-0.01	-0.09	0.11	-0.05	0.02	-0.01	0.01	-0.02	0	1		
UKCA: *K*	-0.03	0.13	-0.12	-0.19	-0.16	-0.03	0.05	0.01	-0.02	0.01	1	
TR: *L*	-0.07	0.46	-0.47	-0.52	-0.48	-0.10	-0.08	-0.09	-0.08	-0.02	-0.06	1

While individually, UK and foreign equity generate negative and significant coefficients for UK bonds, indexed gilts, cash and trusts, UK equity returns positive and significant coefficients for foreign equity. For their part, UK bonds generate negative and significant for foreign bonds and trusts; foreign bonds are negative and significant for indexed gilts and UK property, while individually, indexed gilts and UK property are negative and significant on trusts. These results confirm that fund growth is synonymous with insignificant trusts reduction, and significant diversification into foreign assets, indexed gilts and UK property while having a negligible impact on UK and foreign equity and bonds. While, on one hand, it is large funds that are expected to diversify widely, the cash coefficient is unique because they are likely to be mature, facing large benefit out-go obligations with large bond and liquidity positions. While foreign assets, indexed gilts and UK property indicate bias with fund size, it is large funds that can assume more risky positions, are inclined to increase indexed gilts content (so as to duration-match their liabilities) and can load high proportions of UK property. UK bonds and trusts are inversely

correlated with size, because the former are viewed as less risky and obviously more likely to be held in larger quantities by smaller funds, while the latter are the most efficient diversifier for small funds.

Also, as expected, extreme UK bias results in a significant reduction in foreign assets while considerably increasing UK bonds, indexed gilts, cash and trusts. While the other results are somewhat expected, the UK equity coefficient is puzzling, since it indicates that UK bias intensification results in reduced UK equity, though insignificantly so. This means that UK bias surprisingly intensifies through UK bonds, indexed gilts, cash and trusts. From the foreign viewpoint, there is a significant increase in individual foreign assets, accompanied by a reduction in UK bonds, indexed gilts, cash and trusts and unexpectedly, UK equity benefits, confirming that other UK assets are substitutes. Explained from the risk perspective, it may mean that as funds diversify within the UK sub-portfolio, they minimise risk by shying away from equity. This is more so because of the recent rampant fall in global equity markets, resulting in gaping holes in fund portfolios.

Motivated by the results above, this section tests for possible UK bias determinants across time and structure (single, multi-manager, self-insured and externally insured). The same regression analysis as above is repeated, but with UK assets as the dependent variable, generating **Table 4.18,** which indicates negative and significant time dummy and single-structure coefficients, positive and significant for multi-manager structure and externally insured-**R7**, while other structures are insignificant. Fund growth returns positive and significant coefficients for the insured, insignificant for single and multi-manger structures,

whereas individually assets return negative and significant coefficients. This implies a significant time series home bias upsurge. Furthermore, single structures are the most diversified, multi-managed and externally-insured-**R7**, are the most intensely home biased, while other structures do not impact asset allocation. Additionally, fund growth results in UK bias intensification for insured structures, has an immaterial effect on single and multi-managed structures, while, as expected, individual assets result in diversification.

Table 4.18: **Structure & Time Series Cross-sectional Domestic Asset Bias**

Multivariate Regression : Cross-Sectional Structure-Time Series Domestic Asset Bias

Regressions 1-8 The Dependent Variable is UK Assets

The UK Assets are calculated as UK Equity, UK Bonds, UK Real Estate, Index-Linked Gilts, Cash and Trusts, where Trusts are calculated by Summing up Derivatives, Venture Capital, Managed Funds and Works of Art. UK Bonds are taken as UK Bonds excluding Index Linked Gilts. The Regressions are run on the Natural Long of Fund Size, Foreign Equity, Foreign Bonds, Foreign Real Estate and Structure-Series Across Time as a Dummy to Gauge the Structure-Time Series Influence on Home Bias. Coefficient estimates on Natural Log of Fund Size, Foreign Equity, Foreign Bonds, Foreign Real Estate, and Management Structure are reported, along with t-statistics in Parenthisis, [*], [**], [***] & [---], Significant at 1%, 5%, 10% Level and insignificant respectively.

Structure Type:	**Single Manager**		**Multi-Managed**		**Self-Insured**		**Externally-Insured**	
Independent	**Regression**		**Regression**		**Regression**		**Regression**	
Variable	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Intercept	97.6	80.8	94.7	79.3	92.3	79.9	91.8	79.9
	(119.3*)	(234.6*)	(125.7*)	(232.4*)	(129*)	(247.9*)	(127.9*)	(244.6*)
Fund Size (Ln)	-0.02	-	-0.09	-	0.4	-	0.4	-
	(-0.27)		-1.3	-	(6.4*)	-	(6.9*)	-
Foreign Equity	-0.9	-	-0.90	-	-0.90	-	-0.9	-0.99
	(-87.2*)		(-86.6*)	-	(-86.0*)	-	(-86.3*)	(-185.0*)
Foreign Bonds	-	-0.9	-	-0.91	-	-0.9	-	-0.9
		(-26.6*)	-	(-26.7*)	-	(-26.7*)	-	(-26.5*)
Foreign Real Estate	-0.9	-	-0.9	-	-0.9		-0.9	-
	(-8.7*)		(-8.9*)		(-8.3*)		(-8.5*)	-
Structure	-2.6	-1.9	1.0	0.8	0.32	0.79	0.6	0.21
	(12.8*)	(-7.0*)	(9.7*)	(6.0*)	(0.92)	(1.55)	(5.7*)	(1.49)
Time Dummy	0.7	-0.2	-0.8	-0.2	-0.8	-0.2	-0.8	-0.2
	(-16.0*)	(-3.4*)	(-16.1*)	(3.5*)	(-16.1*)	(-3.1*)	(-16.0*)	(-3.0*)
Adj R2 [%]	58.6	12.1	58.0	11.9	57.4	11.3	57.6	11.3
F	1577.0	256.4	1543.9	251.4	1500.6	238.0	1515.5	238.7
P-Value of F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

The same analysis as above is repeated here but with a focus on UK equity allocation trends respectively, generating **Table 4.19.**

Table 4.19: **Structure -Time Series Cross-sectional Domestic Equity Bias**

Multivariate Regression : Cross-Sectional Structure-Time Series Domestic Equity Bias

Regressions 1-8 The Dependent Variable is UK Equity

Trusts are calculated by Summing up Derivatives, Venture Capital, Managed Funds and Works of Art. UK Bonds are taken as UK Bonds excluding Index Linked Gilts. The Regressions are run on the Natural Long of Fund Size, Foreign Equity, Foreign Bonds, Foreign Real Estate, UK Bonds, UK Real Estate, Indexed Gilts, UK Cash, Trusts and Style Series Across Time as a Dummy to Gauge the Structure-Time Influence on Home Bias. Coefficient estimates on Natural Long of Fund Size, Foreign Equity, Foreign Bonds, Foreign Real Estate, UK Bonds, UK Real Estate, Indexed Gilts, UK Cash, Trusts, and Management Structure are reported, along with t-statistics in Parenthisis, [*], [**], [***] & [---], Significant at 1%, 5%, 10% Level and insignificant respectively.

Structure Type:	**Single-Managed**		**Multi-Managed**		**Self-Insured**		**Externally-Insured**	
Independent	**Regression**		**Regression**		**Regression**		**Regression**	
Variable	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Intercept	45.9	68.7	46.4	67.4	46.9	66.1	47	65.9
	(31.2*)	(71.9*)	(34.4*)	(76.7*)	(37.0*)	(80.2*)	(36.8*)	(79.5*)
Fund Size (Ln)	0.3	0.01	0.3	0.03	0.3	0.2	0.3	0.2
	(2.8*)	-0.09	(2.7*)	0.40	(2.4*)	(2.7*)	(2.3*)	(2.8*)
Foreign Equity	0.3	-	0.30	-	0.3	-	0.3	-
	(16.4*)		(16.4*)		(16.4*)		(16.4*)	
Foreign Bonds	-0.03	-	-0.03	-	-0.03	-	-0.03	-
	(-0.74*)		(-0.69)		(-0.65)		(-0.69)	
Foreign Real Estate	-0.8	-	-0.8	-	*-0.8*	-	-0.8	-
	(-4.2*)		(-4.2*)		(-4.2*)		(-4.2*)	
Domestic Equity	-	-	-	-	-	-	-	-
Domestic Bonds	-	-0.6		-0.6	-	-0.6	-	-0.6
		(-50.1*)		(-49.9*)		(-49.8*)		(-49.8*)
Indexed Gilts	-	-0.6	-	-0.6	-	-0.6	-	-0.6
		(-37.7*)		(-37.7*)		(-37.7*)		(-37.7*)
Domestic Real Estate	-	-0.62	-	-0.6	-	-0.6	-	-0.6
		(-19.2*)		(-19.1*)		(-19.0*)		(-19.0*)
Cash	-	-0.6	-	-0.7	-	-0.6	-	-0.6
		(-26.8*)		(-26.8*)		(-26.7*)		(-26.7*)
Trusts	-	-0.6	-	-0.6	-	-0.6	-	-0.6
		(-73.0*)		(-72.9*)		(-72.6*)		(-72.7*)
Structure	0.5	-1.3	-0.21	0.5	0.8	-0.6	-0.17	0.18
	-1.38	(-5.4*)	(-1.14)	(4.3*)	(1.29)	(-1.49)	(-0.97*)	-1.56
Time Dummy	-0.8	-0.5	-0.8	-0.5	-0.8	-0.5	-0.79	-0.5
	(-9.6*)	(-9.0*)	(-9.5*)	(-9.0*)	(-9.5*)	(-9.2*)	(-9.53*)	(-9.1*)
Adj R2 [%]	7.3	61.6	7.3	61.5	7.3	61.4.9	7.3	61.4
F	73.9	1117.5	73.8	1114.1	73.8	1108.8	73.7	1108.9
P-Value of F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

This indicates negative and significant time dummy and single-structure-**R2** coefficients, positive and significant for multi-manager structure-**R4,** while other structures are

insignificant. Fund size generates positive and significant coefficients for single-**R2,** multi-**R3** and insured structures, while individually assets generate negative and significant coefficients for UK bonds, indexed gilts, UK property, cash, trusts and foreign property, while insignificant for foreign bonds and positive and significant for foreign equity. This implies a time series reduction in UK equity. Furthermore, while other structures do not affect UK equity, the UK sub-portfolios of single-structure-**R2** and multi-manager structure-**R4**, indicate a significant decrease and increase respectively, while for other structures, fund size indicates a UK equity bias intensification effect. The UK bonds, indexed gilts, UK property, cash, trusts and foreign property result in a decrease in UK equity, while foreign bonds do not have an impact, whereas foreign equity acts as a compliment. The same analysis as above is repeated UK bonds, generating **Table 4.20**, below.

This indicates negative and significant time dummy, and single-manager-**R2** coefficients, positive and significant coefficients for self-insured, externally insured and multi-manager structure-**R4**, while other structures are insignificant. Fund size generates negative and significant coefficients, while individually, assets generate negative and significant coefficients for UK equity, indexed gilts, UK property, cash, trusts and foreign bonds, foreign equity, while insignificant for foreign property. This implies a time series increase in UK bonds. Furthermore, while the insured and the multi-managed-**R4** possess significantly higher than average UK bonds, other structures are not significantly different from an average portfolio. Fund size indicates a decrease in UK bonds, whereas

individually, foreign bonds, foreign equity, UK equity, indexed gilts, UK property, cash and trusts result in UK bonds reduction

Table 4.20: **Structure Series Cross-sectional Bond Shift**

Multivariate Regression : Cross-Sectional Structure-Time Series Domestic Bonds Bias

Regressions 1-8 The Dependent Variable is UK Bonds

Trusts are calculated by Summing up Derivatives, Venture Capital, Managed Funds and Works of Art. UK Bonds are taken as UK Bonds excluding Index Linked Gilts. The Regressions are run on the Natural Long of Fund Size, Foreign Equity, Foreign Bonds, Foreign Real Estate, UK Equity, UK Real Estate, Indexed Gilts, UK Cash, Trusts and Style Series Across Time as a Dummy to Gauge the Structure-Time Influence on Home Bias. Coefficient estimates on Natural Long of Fund Size, Foreign Equity, Foreign Bonds, Foreign Real Estate, UK Equity, UK Real Estate, Indexed Gilts, UK Cash, Trusts, and Management Structure are reported, along with t-statistics in Parenthisis, [*], [**], [***] & [---], Significant at 1%, 5%, 10% Level and insignificant respectively.

Structure Type:	**Single-Managed**		**Multi-Managed**		**Self-Insured**		**Externally-Insured**	
Independent	**Regression**		**Regression**		**Regression**		**Regression**	
Variable	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Intercept	17.5	48.2	16.5	46.2	16.7	45.2	16.3	44.8
	(16.1*)	(41.8*)	(16.6*)	(42.6*)	(17.9*)	(43.7*)	(17.4*)	(43.2*)
Fund Size (Ln)	-0.4	-0.5	-0.3	-0.4	-0.4	-0.3	-0.3	-0.3
	(-4.7*)	(-6.3*)	(-3.7*)	(-5.2*)	(-4.6*)	(-4.3*)	(-4.30*)	(-3.9*)
Foreign Equity	-0.3	-	-0.30	-	-0.3	-	-0.3	-
	(-19.9*)		(-19.9*)		(-19.9*)		(-20.0*)	
Foreign Bonds	-0.4	-	-0.40	-	-0.40	-	-0.4	-
	(-14.1*)		(-14.2*)		(-14.3*)		(-14.1*)	
Foreign Real Estate	-0.05	-	-0.04	-	-0.04	-	-0.06	-
	(-0.33)		(-0.29)		(-0.27)		(-0.40)	
Domestic Equity	-	-0.6	-	-0.6	-	-0.6	-	-0.6
		(-64.9*)		(-64.4*)		(-64.0*)		(-64.1*)
Indexed Gilts	-	-0.4	-	-0.4	-	-0.4	-	-0.4
		(-21.4*)		(-21.4*)		(-21.3*)		(-21.4*)
Domestic Real Estate	-	-0.4	-	-0.4	-	-0.4	-	-0.4
		(-14.0*)		(-13.8*)		(-13.7*)		(-13.8*)
Cash	-	-0.4	-	-0.40	-	-0.40	-	-0.40
		(-17.8*)		(-17.8*)		(-17.6*)		(-17.6*)
Trusts	-	-0.4	-	-0.4	-	-0.4	-	-0.4
		(-38.6*)		(-38.3*)		(-38.0*)		(-38.2*)
Structure	-0.41	-1.4	-0.07	0.4	1.7	1.43	-0.03	0.41
	(-1.55)	(-5.9*)	(-0.53)	(3.3*)	(3.7*)	(3.6*)	(-2.6*)	(3.6*)
Time Dummy	0.5	0.3	0.5	0.3	0.5	0.3	0.5	0.3
	(8.5*)	(5.0*)	(8.4*)	(4.9*)	(8.4*)	(4.8*)	(8.5*)	(5.0*)
Adj R2 [%]	12.2	34.4	12.2	34.1	12.4	34.1	12.3	34.1
F	130.9	366.1	130.5	361.6	133.1	362.1	131.8	362.1
P-Value of F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

The same tests are repeated, with trusts as the dependent variable, generating **Table 4.21.** This indicates negative and significant time dummy, single-manager and self-insured-**R5** coefficients, positive and significant for multi-manager and externally insured-**R8**, while insignificant for insured-**R6** and externally-insured-**R7**.

Table 4.21 **Time & Structure Series Cross-sectional Trusts Bias**

Multivariate Regression : Cross-Sectional Structure-Time Series Trust Asset Bias

Regressions 1-8 The Dependent Variable is Trusts

Trusts are calculated by Summing up Derivatives, Venture Capital, Managed Funds and Works of Art. UK Bonds are taken as UK Bonds excluding Index Linked Gilts. The Regressions are run on the Natural Long of Fund Size, Foreign Equity, Foreign Bonds, Foreign Real Estate, UK Equity, UK Real Estate, Indexed Gilts, UK Cash, UK Bonds and Style Series Across Time as a Dummy to Gauge the Structure-Time Influence on Home Bias. Coefficient estimates on Natural Long of Fund Size, Foreign Equity, Foreign Bonds, Foreign Real Estate, UK Equity, UK Real Estate, Indexed Gilts, UK Cash, Uk Bonds, and Management Structure are reported, along with t-statistics in Parenthisis, [*], [**], [***] & [---], Significant at 1%, 5%, 10% Level and insignificant respectively.

Structure Type:	**Single-Managed**		**Multi-Managed**		**Self-Insured**		**Externally-Insured**	
Independent	**Regression**		**Regression**		**Regression**		**Regression**	
Variable	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Intercept	30.9	68.2	28.8	65.7	25.8	63	25.7	62.8
	(22.1*)	(52.0*)	(22.5*)	(53.5*)	(21.3*)	(53.1*)	(21.1*)	(52.8*)
Fund Size (Ln)	-0.5	-0.5	-0.5	-0.5	-0.16	-0.11	-0.15	-0.09
	(-4.5*)	(-5.0*)	(-4.6*)	(-4.6*)	(-1.53)	(-1.23)	(-1.49)	(-1.05)
Foreign Equity	-0.8	-	-0.80	-	-0.8	-	-0.8	-
	(-42.4*)		(-42.4*)		(-42.3*)		(-42.3*)	
Foreign Bonds	-0.3	-	-0.30	-	-0.3	-	-0.3	-
	(-7.1*)		(-7.4*)		(-7.6*)		(-7.6*)	
Foreign Real Estate	-0.18	-	-0.15	-	-0.14	-	-0.15	-
	(-0.96)		(-0.82)		(-0.78)		(-0.82)	
Domestic Equity	-	-0.8	-	-0.8	-	-0.8	-	-0.8
		(-73.0*)		(-72.9*)		(-72.6*)		(-72.7*)
Domestic Bonds	-	0.6	-	-0.6	-	-0.6	-	-0.6
		(-38.6*)		(38.3*)		(-38.0*)		(-38.2*)
Indexed Gilts	-	-0.6	-	-0.6	-	-0.60	-	-0.60
		(-29.4*)		(-29.5*)		(-29.6*)		(-29.5*)
Domestic Real Estate	-	-0.67	-	-0.66	-	-0.66	-	-0.66
		(-17.9*)		(-17.6*)		(-17.4*)		(-17.5*)
Cash	-	-0.59	-	-0.59	-	-0.59	-	-0.59
		(-21.7*)		(-21.7*)		(-21.6*)		(-21.6*)
Structure	-2.87	-2.49	1.2	1.1	-1.3	0.05	0.24	0.3
	(7.0*)	(-8.9*)	(6.8*)	(-7.7*)	(-2.1*)	(0.09)	(1.40)	(2.3*)
Time Dummy	-0.8	-0.4	-0.8	-0.4	-0.8	-0.43	-0.8	-0.4
	(-9.6*)	(-6.4*)	(-9.7*)	(-6.5*)	(-9.7*)	(-6.6*)	(-9.7*)	(-6.5*)
Adj R2 [%]	25.9	51	25.8	50.8	25.3	50.3	25.2	50.4
F	325.4	726.7	324.0	721.9	315.4	706.8	314.8	708.1
P-Value of F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Fund size indicates negative and significant coefficients for single and multi-manager structures, while insignificant for others. Individually, all assets return negative but significant coefficients, save for foreign property which is insignificant. This implies a time series reduction in trusts, driven by the single-manager and self-insured-**R5**, while the multi-manager and externally insured-**R8** are intensely biased, and self-insured-**R6** and externally insured-**R7** have immaterial effects. Individually, investment into any asset results in a reduction in trusts, while foreign property has an insignificant effect. As a follow on to preceding evidence, we check for multi-collinearity between the natural log of fund size, UK and foreign assets and individual asset variables for balanced, specialist and part-balanced-part-specialist structures using the correlation coefficients and report results in **Table 4.22**.

Table 4.22: **Structure Series Correlation Coefficients Between Variables**

Pearson Correlation Coefficients Between the Fund Size and Asset Components Comprising of Domestic Assets, Foreign Assets Domestic Equity, Foreign Equity, Domestic Bonds, Foreign Bonds, Index Linked Gilts, Domestic Real Estate, Foreign Real Estate Cash Deposits and Trusts

Fund Size & Assets	*A*	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*K*	*L*
FSZ(Ln): *A*	1											
UKA: *B*	0.01	1										
FORA: *C*	0.01	-1.00	1									
UKEQ: *D*	-0.04	-0.13	0.13	1								
FOREQ: *E*	-0.02	-0.90	0.90	0.16	1							
UKFIX: *F*	-0.02	0.33	-0.33	-0.36	-0.27	1						
FORFIX: *G*	0.01	-0.39	0.39	-0.05	-0.040	-0.17	1					
ILG: *H*	0.13	0.18	-0.18	-0.30	-0.14	-0.02	-0.12	1				
UKREAL: *I*	0.08	0.04	-0.04	-0.12	-0.03	-0.08	-0.04	-0.03	1			
FORREAL: *J*	0.05	-0.05	0.05	-0.02	-0.01	-0.02	0.00	0.00	0.06	1		
UKCA: *K*	0.01	0.13	-0.13	-0.19	-0.19	-0.05	0.09	-0.03	-0.02	0.02	1	
TR: *L*	-0.04	0.46	-0.46	-0.53	-0.47	-0.09	-0.07	-0.09	-0.07	-0.02	-0.04	1

Table 4.22 presents the correlation coefficient results, which indicate positive and significant correlation between fund size and indexed gilts and UK property, insignificant for UK assets, bonds, foreign property, cash, trusts, equity, foreign equity and foreign bonds. Furthermore, the correlation between UK and foreign assets, foreign equity, bond

and property and, surprisingly, UK equity is negative and significant, while positive and significant for UK bonds, indexed gilts, cash and trusts, while insignificant for others. Additionally, foreign assets return positive and significant coefficients on foreign equity and bonds and, surprisingly, UK equity, negative and significant for UK bonds, cash, indexed gilts and trusts, while insignificant for others. While individually, UK and foreign equity generate negative and significant coefficients for UK bonds, indexed gilts, cash and trusts, UK equity also returns negative and significant coefficients for UK property and positive and significant coefficients for foreign equity. UK bonds generate negative and significant for foreign bonds, UK property and trusts; foreign bonds are negative and significant for indexed gilts, and positive and significant on cash and indexed gilts, negative and significant on trusts, while others are insignificant.

These results indicate that fund growth is synonymous with increasing indexed gilts and UK property, while having an insignificant impact on other assets. While it is not wholly surprising that large and mature funds, with large pension benefit out-go obligations, increase indexed linked gilts, foreign assets, UK equity, UK property and cash coefficients are unique because larger funds are likely to be mature, eager to diversify across the foreign markets and maintain large bond and liquidity positions. In the process, they should sacrifice UK property and UK equity. While foreign assets, indexed gilts and UK property indicate bias with fund size, it is large funds that can assume more risk, are inclined to increase indexed gilts (so as to duration-match their liabilities) and can afford illiquidity.

Furthermore, as expected, UK bias results in a significant reduction in foreign assets, while having a positive impact on UK bonds, indexed gilts, cash and trusts. The UK equity coefficient is puzzling, because it suggests that as home bias intensifies, UK equity is reduced to the benefit, rather, surprisingly, of UK bonds, indexed gilts, cash and trusts. When interpreted from the foreign asset perspective, there is a significant increase in UK equity, foreign bonds and equity and a compensatory reduction in UK bonds, indexed gilts, cash and trusts, with foreign diversification. This confirms earlier observations indicating that UK and foreign equity are complimentary while other UK assets are substitutes. Finally, an allocation into UK bonds results in a significant reduction in foreign bonds, UK property and trusts, while foreign bonds benefits indexed gilts and sacrifices cash. Indexed gilts allocation compromises trusts, and other assets have an insignificant effect on each other. This means that while cash can be maintained in indexed gilts form, trusts strongly move with home bias intensity.

To determine the cross-sectional structure and time series influence on UK bias, we repeat the preceding tests on balanced, specialist and part-balanced-part-specialist structures, with UK assets as the dependent variable. This generates **Table 4.23**, which records positive and significant time dummy, specialist-**R3** and part-balanced-part-specialist-**R6** coefficients, while other structures return insignificant coefficients, while balanced-**R2** and part-balanced-part-specialist-**R5** are negative and significant. Fund size and individual assets generate negative and significant coefficient for specialist-**R3**, other structures are insignificant. This implies a time series excessive UK bias, which significantly soars through the specialist-**R3** and part-balanced-part-specialist-**R6**, but is reduced by balanced-

R2 and part-balanced-part-specialist-**R5**, while others have an insignificant effect. Fund size reduces UK bias for specialist-**R3**, while it does not possess an effect on others and individual assets significantly reduce UK bias.

Table 4.23: **Structure Series Domestic Asset Cross-sectional Bias**

Multivariate Regression : Cross-Sectional Structure-Time Series Domestic Asset Bias

Regressions 1-6 The Dependent Variable is UK Assets

The UK Assets are calculated as UK Equity, UK Bonds, UK Real Estate, Index-Linked Gilts, Cash and Trusts, where Trusts are calculated by Summing up Derivatives, Venture Capital, Managed Funds and Works of Art. UK Bonds are taken as UK Bonds excluding Index Linked Gilts. The Regressions are run on the Natural Long of Fund Size, Foreign Equity, Foreign Bonds, Foreign Real Estate and Structure-Series Across Time as a Dummy to Gauge the Structure-Time Series Influence on Home Bias. Coefficient estimates on Natural Log of Fund Size, Foreign Equity, Foreign Bonds, Foreign Real Estate, and Management Structure are reported, along with t-statistics in Parenthisis, [*], [**], [***] & [---], Significant at 1%, 5%, 10% Level and insignificant respectively.

Structure Type	**Balanced Manager**		**Specialist Managert**		**Part-Balanced-Part-Specialist**	
Independent	**Regression**		**Regression**		**Regression**	
Variable	**1**	**2**	**3**	**4**	**5**	**6**
Intercept	96.0	78.0	96.1	77.9	96.2	77.5
	(344.27*)	(330.0*)	(352.8*)	(330.5*)	(351.4*)	(291.8*)
Fund Size (Ln)	-0.03	-	-0.04	-	0.0	-
	(-1.30)		-1.8	-	(-.099)	-
Foreign Equity	-0.98	-	-0.98	-	-0.98	-
	(-190.1*)		(-190.4*)	-	(-190.3*)	-
Foreign Bonds	-	-0.98	-	-0.90	-	-0.91
		(-39.1*)	-	(-39.1*)	-	(-39.2*)
Foreign Real Estate	-0.96	-	-0.96	-	-0.96	
	(-13.4*)		(-13.4*)		(-13.4*)	
Structure	0.13	-0.46	0.33	-0.25	-0.12	0.19
	-1.36	(-2.3*)	(4.3*)	(-1.54)	(-3.8*)	(3.1*)
Time Dummy	0.1	0.56	0.11	0.55	0.10	0.56
	(4.8*)	(12.8*)	(5.23*)	(12.5*)	(4.5*)	(12.8*)
Adj R2 [%]	81.6	17.1	81.6	17.1	81.6	17.2
F	7445.2	581.2	7463.4	580.1	7459.1	582.9
P-Value of F	0.000	0.000	0.000	0.000	0.000	0.000

The same analysis on UK equity, generating **Table 4.24**, which indicates negative and significant time dummy coefficients for balanced-**R1**, specialsit-**R3** and part-balanced-part-specialist-**R5**, positive and significant coefficients for balanced-**R2**, specialist-**R4** and part-balanced-part-specialist-**R6**. By structure, coefficients are negative and significant for specialist-**R3** while other structures are insignificant. Fund size generates negative and

significant coefficients, while individually assets generate negative and significant coefficients for UK bonds, indexed gilts, UK property, cash, trusts and foreign property, while positive and significant for foreign equity.

Table 4.24: **Structure Series Domestic Equity Cross-Sectional Bias**

Multivariate Regression : Cross-Sectional Structure-Time Series Domestic Equity Bias

Regressions 1-6 The Dependent Variable is UK Equity

Trusts are calculated by Summing up Derivatives, Venture Capital, Managed Funds and Works of Art. UK Bonds are taken as UK Bonds excluding Index Linked Gilts. The Regressions are run on the Natural Long of Fund Size, Foreign Equity, Foreign Bonds, Foreign Real Estate, UK Bonds, UK Real Estate, Indexed Gilts, UK Cash, Trusts and Style Series Across Time as a Dummy to Gauge the Structure-Time Influence on Home Bias. Coefficient estimates on Natural Long of Fund Size, Foreign Equity, Foreign Bonds, Foreign Real Estate, UK Bonds, UK Real Estate, Indexed Gilts, UK Cash, Trusts, and Management Structure are reported, along with t-statistics in Parenthisis, [*], [**], [***] & [---], Significant at 1%, 5%, 10% Level and insignificant respectively.

Structure Type:	**Balanced Manager**		**Specialist Manager**		**Part-Balanced-Part-Specialist**	
Independent	**Regression**		**Regression**		**Regression**	
Variable	**1**	**2**	**3**	**4**	**5**	**6**
Intercept	51.7	68.1	51.8	68	51.7	67.9
	(61.3*)	(148.2*)	(63.0*)	(152.6*)	(62.5*)	(152.0*)
Fund Size (Ln)	-0.11	-0.07	-0.11	-0.06	-0.12	-0.08
	(-1.67)	(-1.97*)	(-1.7*)	(-1.8*)	(-1.9*)	(2.0*)
Foreign Equity	0.21	-	0.22	-	0.22	-
	(14.1*)		(14.2*)		(14.2*)	
Foreign Bonds	-0.14	-	-0.15	-	-0.15	-
	(-4.4*)		(-4.5*)		(-4.5)	
Foreign Real Estate	-0.36	-	-0.36	-	-0.37	-
	(-1.7*)		(-1.7*)		(-1.7*)	
Domestic Bonds	-	-0.61		-0.61	-	-0.61
		(-72.5*)		(-72.5*)		(-72.5*)
Indexed Gilts	-	-0.67	-	-0.67	-	-0.67
		(-60.1*)		(-60.1*)		(-60.0*)
Domestic Real Estate	-	-0.69	-	-0.69	-	-0.69
		(-33.8*)		(-33.7*)		(-33.7*)
Cash	-	-0.66	-	-0.66	-	-0.66
		(-40.6*)		(-40.6*)		(-40.6*)
Trusts	-	-0.6	-	-0.6	-	-0.6
		(-100.1*)		(-100.1*)		(-100.1*)
Structure	0.12	-0.14	-0.60	-0.11	0.10	-0.07
	0.43	(-0.85)	(-2.0*)	(-0.85)	(1.05)	-1.3
Time Dummy	-0.28	0.27	-0.23	0.27	-0.27	0.27
	(-4.4*)	(7.1*)	(-4.4*)	(7.0*)	(-4.2*)	(7.2*)
Adj R2 [%]	3.1	67.8	3.2	67.8	3.1	67.8
F	46.2	2216.2	47.2	2216.2	46.3	2216.6
P-Value of F	0.000	0.000	0.000	0.000	0.000	0.000

This implies a time series reduction in UK equity resulting from foreign investment, while UK asset allocation results in an increase in UK equity across time. Furthermore, while other styles do not have an effect on UK equity, above that on an average portfolio, the foreign sub-portfolio of specialist-**R3** actually indicates a significant decrease, with structure respectively. For all structures, fund size growth and individual assets result in UK equity reduction, save for foreign equity which acts as a compliment.

The same analysis is repeated on UK bonds, generating **Table 4.25**. This indicates positive and significant time dummy coefficients for the specialist structure, while insignificant for others. By structure, coefficients are positive and significant for balanced, negative and significant for part-balanced-part-specialist, and insignificant for specialist. Fund size generates negative and significant coefficients, while individually assets are negative and significant, save for foreign and UK equity and foreign property. By and large, this implies time series UK bond intensification for specialist, while other structures have an insignificant effect. The balanced structure has more UK bonds, part-balanced-part-specialist is below average, and specialist is not significantly different from average. Fund size growth and individual assets have a UK bonds reduction effect, save for foreign and UK equity, and foreign property which have an insignificant effect.

Table 4.25: **Structure Series Domestic Bond Shift**

Multivariate Regression : Cross-Sectional Structure-Time Series Domestic Bonds Bias

Regressions 1-6 The Dependent Variable is UK Bonds

Trusts are calculated by Summing up Derivatives, Venture Capital, Managed Funds and Works of Art. UK Bonds are taken as UK Bonds excluding Index Linked Gilts. The Regressions are run on the Natural Long of Fund Size, Foreign Equity, Foreign Bonds, Foreign Real Estate, UK Equity, UK Real Estate, Indexed Gilts, UK Cash, Trusts and Style Series Across Time as a Dummy to Gauge the Structure-Time Influence on Home Bias. Coefficient estimates on Natural Long of Fund Size, Foreign Equity, Foreign Bonds, Foreign Real Estate, UK Equity, UK Real Estate, Indexed Gilts, UK Cash, Trusts, and Management Structure are reported, along with t-statistics in Parenthisis, [*], [**], [***] & [---], Significant at 1%, 5%, 10% Level and insignificant respectively.

Structure Type	**Balanced Manager**		**Specialist Manager**		**Part-Balanced-Part-Specialist**	
Independent	**Regression**		**Regression**		**Regression**	
Variable	**1**	**2**	**3**	**4**	**5**	**6**
Intercept	9.4	11.5	10.6	12.7	11	13.2
	(14.5*)	(15.2*)	(16.6*)	(17.0*)	(17.2*)	(17.6*)
Fund Size (Ln)	-0.2	-0.17	-0.28	-0.26	-0.22	-0.2
	(-4.1*)	(-3.6*)	(-5.7*)	(-5.3*)	(-4.5*)	(-4.1*)
Foreign Equity	0.01	-	0.01	-	0.01	-
	(-0.86)		(-1.12)		(-0.85)	
Foreign Bonds	0.07	-	0.06	-	0.07	-
	(2.6*)		(2.4*)		(2.7*)	
Foreign Real Estate	-0.15	-	-0.16	-	-0.15	-
	(-0.91)		(-0.95)		(-0.92)	
Domestic Equity	-	-0.01	-	-0.01	-	-0.01
		(-0.81)		(-0.7*)		(-0.69*)
Indexed Gilts	-	-0.1	-	-0.05	-	-0.05
		(-3.5*)		(-3.1*)		(-3.4*)
Domestic Real Estate	-	-0.22	-	-0.22	-	-0.22
		(-8.4*)		(-8.3*)		(-8.3*)
Cash	-	-0.12	-	-0.11	-	-0.12
		(-5.6*)		(-5.0*)		(-5.6*)
Trusts	-	-0.08	-	-0.07	-	-0.08
		(-9.6*)		(-9.4*)		(-9.6*)
Structure	1.84	1.96	-0.28	-0.27	-0.48	-0.52
	(8.3*)	(8.9*)	(-1.57)	(-1.52*)	(-6.9*)	(7.5*)
Time Dummy	-0.04	0.05	0.10	0.10	0.07	0.07
	(-0.88)	-0.91	(2.2*)	(2.3*)	(1.32)	-1.38
Adj R2 [%]	1.2	3.2	0.4	2.3	1.0	2.9
F	18.4	35.9	7.3	26.0	14.8	32.9
P-Value of F	0.000	0.000	0.000	0.000	0.000	0.000

The same analysis is repeated on trusts, generating **Table 4.26**, indicative of negative and significant time dummy, individual assets and part-balanced-part-specialist coefficients.

4.26: **Structure Series Trusts Shift**

Multivariate Regression : Cross-Sectional Structure-Time Series Trust Asset Bias

Regressions 1-6 The Dependent Variable is Trusts

Trusts are calculated by Summing up Derivatives, Venture Capital, Managed Funds and Works of Art. UK Bonds are taken as UK Bonds excluding Index Linked Gilts. The Regressions are run on the Natural Long of Fund Size, Foreign Equity, Foreign Bonds, Foreign Real Estate, UK Equity, UK Real Estate, Indexed Gilts, UK Cash, UK Bonds and Style Series Across Time as a Dummy to Gauge the Structure-Time Influence on Home Bias. Coefficient estimates on Natural Long of Fund Size, Foreign Equity, Foreign Bonds, Foreign Real Estate, UK Equity, UK Real Estate, Indexed Gilts, UK Cash, Uk Bonds, and Management Structure are reported, along with t-statistics in Parenthisis, [*], [**], [***] & [---], Significant at 1%, 5%, 10% Level and insignificant respectively.

Structure Type:	**Balanced Manager**		**Specialist Manager**		**Part-Balanced-Part-Specialist**	
Independent	**Regression**		**Regression**		**Regression**	
Variable	**1**	**2**	**3**	**4**	**5**	**6**
Intercept	0.85	4.27	1.15	4.7	1.35	5.1
	-0.96	(4.1*)	-1.34	(4.6*)	-1.55	(4.9*)
Fund Size (Ln)	0.37	0.3	0.35	0.3	0.37	-0.33
	(5.5*)	(5.0*)	(5.3*)	(4.5*)	(5.5*)	(5.0*)
Foreign Equity	0.02	-	0.02	-	0.02	-
	-1.27		-1.31		-1.24	
Foreign Bonds	-0.02	-	-0.02	-	-0.02	-
	(-0.71)		(-0.7)		(-0.65)	
Foreign Real Estate	-0.01	-	-0.01	-	-0.01	-
	(-0.03)		(-0.05)		(-0.03)	
Domestic Equity	-	0.01	-	0.01	-	0.01
		-0.41		-0.46		-0.45
Domestic Bonds	-	-0.14	-	-0.14	-	-0.14
		(-9.6*)		(-9.4*)		(-9.6*)
Indexed Gilts	-	-0.18	-	-0.18	-	-0.18
		(-9.0*)		(-8.9*)		(-9.0*)
Domestic Real Estate	-	-0.27	-	-0.27	-	-0.27
		(-7.4*)		(-7.4*)		(-7.4*)
Cash	-	-0.14	-	-0.13	-	-0.14
		(-4.7*)		(-4.5*)		(-4.8*)
Structure	0.52	-0.94	0.16	0.15	-0.19	-0.31
	(1.7*)	(3.1*)	(0.68)	(0.63)	(-2.0*)	(-3.3*)
Time Dummy	-0.16	-0.12	-0.14	-0.09	-0.16	-0.12
	(-2.4*)	(-1.8*)	(-2.1*)	(-1.33)	(-2.4*)	(-1.8*)
Adj R2 [%]	0.3	2.9	0.3	2.8	0.3	2.9
F	5.7	32.1	5.3	30.9	5.9	32.3
P-Value of F	0.000	0.000	0.000	0.000	0.000	0.000

Furthermore, the coefficients are positive and significant for balanced, while insignificant for the specialist structure. Fund size coefficients are positive and significant, save for UK equity and all foreign assets. This implies a time series trust reduction, while by structure,

balanced is more trusts intensified, part-balanced-part-specialist is below average, while specialist is not significantly different from average. For all structures, fund size growth indicates trust bias intensification, while individually all assets result in a reduction, save for UK equity and all foreign assets, which have an insignificant effect. This means that, contrary to long-held beliefs, that small funds diversify through trusts, it is the large funds that indicate an increase, and trusts are treated as a substitute for all UK assets, save for UK equity, which has an insignificant effect.

4.7. **Summary and Conclusion**

An attempt has been made in this chapter to examine the influence of management structure and manager size on UK bias. The study generates 8 management structures in addition to the popularly known 4 (of in-house, external, balanced and specialist) and carries out two broad empirical tests to investigate structure influence. Firstly, the data on fund portfolios is tested for trends in management structures. The external dominance cannot be over emphasised, especially among small funds. Furthermore, contrary to the long-held belief that in-house is the preserve of large funds, the largest funds are concentrated in the part-internal-part-external structure, while small funds involved in management are found in in-house. Funds further exhibit multi-manager structure bias for the managed structure, while the externally insured dominates the insured route. While the multi-manager structure possesses large funds, it is the self-insured funds that exhibit dominance of large funds. Secondly, management structure influence on asset allocation is examined. Generally, UK assets dominate fund portfolios, with in-house management dominating UK asset and real estate bias, while the part-internal-part-external structure dominates in foreign assets and the insured dominates in equity, UK equity and bonds. Thirdly, fund concentration is considered. Evidence indicates that while funds concentrate their assets in the large fund managers and the part-balanced-part-specialist fund managers, their proportions of the entire portfolios is lower than fund portfolio components in the smaller fund managers.

CHAPTER 5

FUND PORTFOLIOS AND STOCK FINANCIAL CHARATERISTICS

CHAPTER 5: FUND PORTFOLIOS & STOCK FINANCIAL CHARATERISTICS

1. **Introduction**

Pension funds are vital financial markets participants because of the desirable effects their investment activity generates. However, despite this importance, little is known about their investment trends as literature provides a microscopic insight into stock characteristics essential for their portfolios. This is further compounded by conflicting empirical evidence from the few relevant studies. While Arbel and Strebel (1983) record the wide disparity in institutional shareholding intensity, Hessel and Norman (1992) and Arbel et al (1983b) conclude that size is the major determining variable for this (which raises the question whether shareholding intensity is synonymous with out-performance). While, according to Minns (1980), funds are large-cap biased because they need to "park" assets within manageable portfolios of few stocks, Barclays Capital (2001) attributes this to fund mandate bidding, which is based on short-term performance. This eliminates small-caps that are viewed as taking relatively long to generate profits. This chapter seeks to plug these gaps by investigating the financial characteristics of stocks, in which funds invest and those they do not disclosing investing in. While Bushan (1988) uses analyst following, Falkenstein (1996) employs press coverage, and Arbel et al (1983b) use shareholding intensity to characterise stock bias. These studies employ very small large-cap biased samples over short time series.

To correct this, we employ actual shareholding for stocks, in which funds invest over a much longer period (with both large and small-caps) and evaluate both financial variables

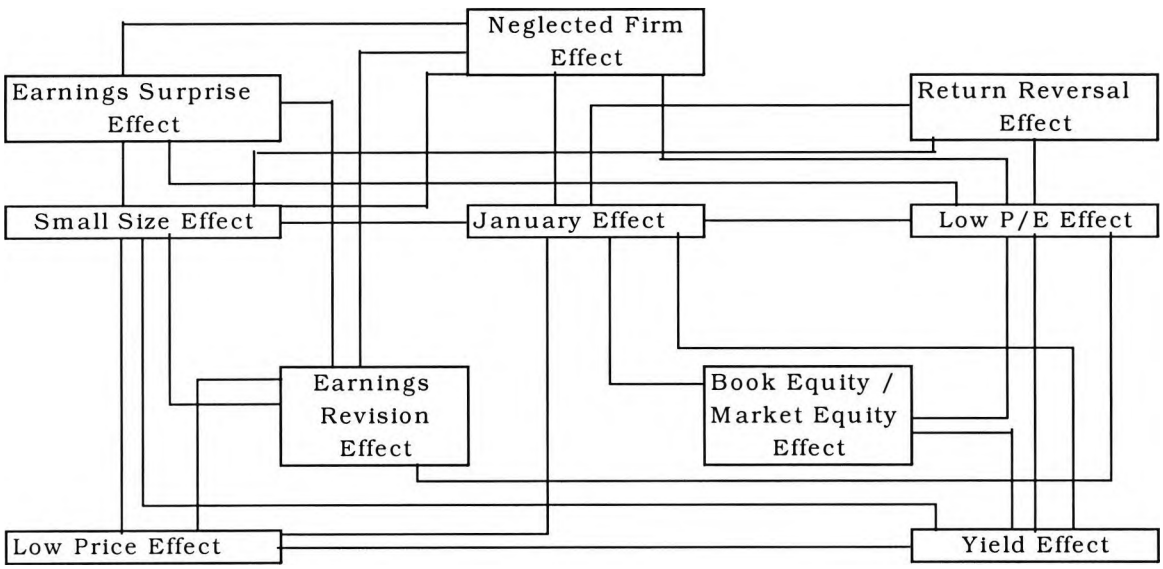
and long term performance. This approach does not only test for differences between the financial status of fund invested stocks, and those they do not disclose as their investments, but presents a unique, more relevant and robust measure that tests fund bias' interaction with equity attributes. This is because evidence is suggestive of underperformance by intensely held stocks, does not link large-cap bias and the quality of financial variables to be imbedded on size to fuel stock bias. For funds, the size-and-neglect effects are more puzzling because their demographic profiles dictate diversified portfolios, as indicated by liability duration, i.e., young funds should invest in risky assets (small-and-neglected stocks), while mature funds should be biased towards low risk. The chapter is structured so that the first section reviews literature on the financial characteristics of the institutionally invested and neglected stocks. Posited mainly as varying from size, information asymmetry, liquidity, inefficient pricing, dividend policy, debt, cash flow and performance among others, evidence on the causal effect is diverse. This chapter advocates some form of size-biased factor operational on the fund-invested portfolio. It further infers that equity attributes are not mere proxies for value, but possess a strong explanatory power, and it is the actual desire, to hold more or less of these, that fuels either bias or neglect. The second section presents data, methodology, tests the hypothesis and presents the results.

SECTION 1

5.1. **Literature: Financial Characteristics of Institutional Portfolio Stocks**

The neglect and size effect issues are two of a myriad of interrelated effects, known within the investment community, as displayed in **Figure 5.1** below.

Figure 5.1 **A Web of Some Interrelated Return Effects**



Jacobs and Levy (1988) report various interrelated effects. For example, the small-cap and January effects are related, as it is claimed that much of the small-cap out-performance occurs in January. The small-cap and low-*PE* effects are also related. Along the same line of argument, Hessel and Norman (1992) investigate the importance of these effects in efficient asset allocation. The authors examine the equity attributes of neglected and institutionally held stocks using two samples; an analytical sample of 119 firms and a classification sample of 81 firms, from 50 industries and 3 size variables, and 32 financial ratios including measures of risk, asset turnover, research development, profitability and dividend pay out. The authors report large-cap bias for stocks with long-term high R&D

ratios, return on equity (*ROE*), return on assets (*ROTA*) and dividend pay out ratios (*DPR*), low risk and a sacrifice for liquidity. This is consistent with two related hypotheses. Firstly, institutions prefer the stability of high *DPR* and secondly, management (desiring to keep institutions happy) maintain high *DPR*. An important question is how size influences stock selection. According to Hessel and Norman (1992) size can either be a threshold (with firms below a certain size being rejected) or a continuously important variable, with investor bias for the larger of two firms with the same attributes.

Falkenstein (1996) investigates equity attribute bias using Morningstar mutual funds with excess of 50% of portfolios in equity by analysing 7 variables (variance, β, price, age, news flow, liquidity and size), 20 investment objectives and CRSP returns and indicates that while the top 6 mandates represent 75% of shareholding, only two (growth and income) account for 60%. The author further indicates that shareholding is positively correlated with price, liquidity, stock listing periods and news flow, but susceptible to transaction costs. Bhushan (1988) investigates analyst attention by examining 5 variables, (size, ownership structure, β, lines of business and the correlation between firm and market return), using the Nelson's Directory of Wall Street Research, with a sample of 1409 firms. The author indicates that institutions are biased towards large-caps with more lines of business, lower β, while small-caps are closely-held by insiders. Arbel et al (1983b) investigate shareholding by using the S&P-500 for the period 1970-79, and various variables including the number of analysts following a stock and proportion of shareholding and report either larger-cap or neglect out-performance persistence.

Arbel et al (1983a) confirm this trend using a sample of 510 NYSE, AMEX and OTC stocks over the 1970-79 period and report neglect stocks out performance. While returns decline with shareholding intensity as intense holding (while raising turnover, liquidity levels and prices) depresses returns. Profitable opportunities exist for trading levels of confidence for higher returns, since, if the market is efficient, the implied cost of lower confidence levels is fully offset by the discount implicit in the lower price (higher return). If not, there are opportunities for abnormal returns on such stocks, based on gathering of higher quality information. Merton (1987) and Low (1993) indicate that investors invest smaller amounts in a stock they are less informed about, because the variance of their predictive distribution is higher. But, should familiarity and sentiment override all attributes, including performance? If so why? If not, what does size proxy for to warrant such bias? Gentler and Gilchrist (1994), indicate that size is imbedded with innumerable economic phenomena. Similarly, diverse phenomena in corporate finance; debt-to-equity *(DER)* (Harris and Raviv (1990) and Rajan and Zingales (1995)), trade credit used (Petersen and Rajan 1997) executive compensation (Jensen and Murphy 1990) all seem related to size. According to Bhushan (1989) and Kang and Stulz (1997) large-caps are strongly followed because they are mature and liquid, better known and easily researched (since accessing their information is cheaper because of their visibility, through marketing wider product ranges in larger markets and ever ready press publicity). Kumar, Rajan and Zingales (1999) analyse the cross-industrial and country size determinants and indicate that stocks facing large markets tend to be larger.

Though indirectly, fund managers trigger shareholding bias, because the demand for their services is likely to be an increasing function of stock size. A fund manager is likely to find information about large-caps more valuable, based on the premise that its potential profits are likely to be higher. Size and economies of scale will also influence the supply of such services, since they also generate business for themselves and have an incentive to focus on large-caps (because they are more widely held and stimulate the interest of a wider market with more potential transactions business), which implicitly lowers cost through its direct influence on information acquisition. While Bushan (1989) indicates that large-caps are geographically more dispersed and have complex structures (which increases information acquisition cost) Freeman (1987) indicates that they release more information. However, it may also be a substitute for information that a stock is readily accessed, thus necessitating more costly private information. Thus, it is not obvious whether such cost increases or decreases with size, but it is clear that the transaction business effect is dominant. Further, Arbel and Strebel (1983) argue that consumers always pay a premium for product quality or information certainty, e.g. franchised and brands versus independent services and generic products. Consumers discount items with low quality information to compensate for the uncertainty involved or for the cost of acquiring more information to minimise uncertainty. The neglect effect suggests that the same process is at work in the financial markets. Institutional shareholding not only implies a stamp of approval, but also generates superior information about the stock, which raises the price and lowers its return relative to the neglected one, a factor not captured by the usual measures of risk.

Focussing on analyst following, Gadarowski (2001) argues that mis-priced stocks receive more publicity, investor overconfidence in private information reinforces this effect. Furthermore, Hong, Lim and Stein (2000) argue that this contributes to bad news about overvalued stocks to travelling slowly, regardless of whether publicity is causative or indicative, high rather than lower levels of recent publicity is more likely to cause mis-pricing. This suggests that high publicity helps identify over-under-valued stocks, and that only for a limited number of high-valued stocks do marketing concerns for analytical services result in more publicity. Thus, with persistent mis-pricing, high publicity predicts lower returns while negative publicity could be due to investor rationality. Firstly, Barry and Brown (1985) and Coles and Lowenstein (1988) argue that differences in financial news coverage could be associated with differences in risk estimation and report return effects related to information variables consistent with risk estimation theory. If higher publicity increases precision about returns the priced systematic risk could be lowered. Per *CAPM*: e.g. Sharpe (1964) and Lintner (1965a, b), lower systematic risk is associated with lower expected return and, coincidentally, high publicity stocks have lower systematic or risk estimation factor loadings. Secondly, a publicity effect, unrelated to systematic risk, could be due to markets being incomplete with respect to information. For example, Merton (1987) supported by Amihud, Mendelson and Uno (1999) shows that market imperfection results in lower expected returns and higher levels of investor recognition in a manner unrelated to systematic risk. Hence, a negative publicity effect unrelated to systematic risk could be rational if news flow levels are related to investor recognition.

5.1.1. **Market Incompleteness, Risk and Inefficient Pricing**

If prices are materially affected by behavioural biases in a way connected with visibility, the empirical question to address is whether this is related to under-or-overpricing. For example, as in Merton (1987), high publicity is positively correlated with investor recognition resulting in overvaluation and lower expected returns than predicted systematic risk, either because publicity reinforces prior beliefs or because mis-priced stocks get more publicity. Regardless of whether a visibility effect is causative or indicative, high publicity stocks should have lower subsequent returns. Alternately, if investor priors are negatively biased, high publicity stocks will have higher expected returns. In the same context, Skinner and Sloan (1999) indicate that investors are overly optimistic about large-caps, and that high publicity predicts overvaluation and, intense holding but results in lower returns. Since the CAPM assumes complete markets, models that consider incompleteness trigger rational pricing unrelated to systematic risk. If stock publicity is connected with a variable related to market incompleteness, a non-systematic publicity return effect may be due to investors' rational responses to market incompleteness. Gadarowski (2001) investigates the effect of size-adjusted publicity and indicates that higher size-adjusted publicity predicts lower excess returns, and market β captures all of average predictive power of this effect with respect to excess returns. Behavioural pricing, however, suggests that size adjusted publicity complements *BEME* in explaining low returns.

5.1.2. **Information Deficiency, Risk and Investment Bias**

Neglected stocks may offer abnormal returns above the information deficiency premium because of inefficient pricing, an outcome of the information deficiency itself. The very

premium generating deficiency creates momentary inefficient pricing. The factors that make it costly for investors to invest in certain stocks represent a market barrier segmenting the market. If, after adjustment for the information deficiency premium, neglected stocks excess returns are greater than the market barrier, investors step in to exploit and eliminate arbitrage profits. Rationally, in a multi-investor environment, decisions are highly restricted by considerations of self-preservation, leading to neglected segment opportunity avoidance even when potential gains warrant risk assumption. Furthermore, consistent with the Arbel et al (1983) notion that consumers pay a premium for brand names and franchised services, higher prices are charged and are willingly paid for as "known quality" is associated with a higher level of informational confidence. Consequently, neglected stock superior returns might be an information premium attributable to lower confidence levels associated with a lack of information. Under such circumstances, investors discount neglected and "information deficient" stocks relatively to what they stand ready to pay for researched and, "information saturated" stocks. This lack of information is more critical for small-caps, inducing higher perceived risk, which reinforces the neglect effect. Conversely, the risk among large-caps is lower, reducing the value of informational confidence and the premium required in its absence. Thus, investors thus have the choice of discounting neglected stocks and living with the lower level of confidence, or carrying out their own research or, alternatively buying ready-researched stocks at a premium. To the extent that they accept lower confidence levels, or are incapable of performing efficient research, they are better off with otherwise neglected stocks. While Arbel et al (1983b) suggest that investors who can not benefit from the small-firm effect can benefit from the neglect effect

(because the latter subsumes the former), Solveig (1982) argues that investors concerned about high small-cap transaction costs can invest in mid-cap neglected stocks.

5.1.3. **Size, Transaction Costs, Risk and Investment Ceilings**

While Fleisig, (1995) precisely reveals a positive correlation between liquidity and bias, Haugen (1997), indicates that investors are not enthusiastic about illiquid small-caps with a narrow market. The author argues that it is less costly to hold liquid shares but if a share lacks liquidity, informed investors arbitrage such information by timing their trades. In such a setting, the difficulty of high costs, analogous with research for stocks without track records and limits on external investors prevent substantial interest, leading to information-starved investors being large-cap biased. A more categorical rationalisation is that by Stoll et al (1983), Schultz, (1983) and Loeb (1991) who examine the magnitude of transaction costs for different stock size categories and suggest that high small-cap transaction costs erode performance. While Stoll et al (1983) reinforces this point by estimating small-cap risk-adjusted returns, net of transaction costs, and reporting that a quarterly round trip transaction is sufficient to eliminate the size-effect, Schultz (1983) concludes that transaction costs can not explain the high small-caps returns. Hessel et al (1992) argue that institutional investors limit attention to large-caps in order to "park" large sums of money in few stocks. If that is true, size may be a threshold; once a firm attains a certain size, size ceases to be a discriminator between neglect and intensity. The authors investigate this possibility and conclude that size is a continuous variable similar to other variables. Empirical evidence, Minns (1980) on large-cap bias, suggests that fund size is an important factor in the direction of flow of investment. The author argues that once a fund reaches a certain size it becomes increasingly arduous to invest in stocks smaller-than-a-particular-

size, because the maximum percentage of a stock's share capital which the fund treats as minimum shareholding, is reached before the fund's designated upper ceiling.

This operates as follows. Funds invest according to maximum limits of their assets (at most between 2.5% and 5%) to avoid concentrated portfolios. Such limits also include ceilings based on size that funds hold for similar reasons and avoid being "locked in" to any stock, unable to offload it without affecting its price. Limits of this nature force funds to invest in larger stocks where they rarely reach limits before allocating designated amounts. A small (fund with a 2.5% limit on its assets) places its upper ceiling in large-caps more often than large funds, without the attainment of the LSE disclosure requirements. For example, the Vodafone Fund (£100 million in December, 1999), with a 2.5% investable maximum, places £2.5 million in a £100 million stock, which also stands at 2.5% shareholding. In this case, so long as the fund invests in stocks equal-to-or-larger than itself, it can easily diversify when invested in a £1 billion stock, which dilutes to a 0.25% shareholding, allowing the fund to invest more funds. On the other hand, a large fund, say BT (£24.9 billion in December 2000), adopting the 2.5% limit allocates £623 million per stock. Thus, one shareholding is more than 6 times each of the £100 million stocks and requires a large market with the same size stocks, which comes with increased pressure on the number of stocks and tiny penny packets that are cumbersome to monitor. To mitigate this BT is large-cap biased, since it cannot invest £623 million in a stock before achieving its limit, if it is to diversify without breaching the Companies Act 1989 shareholder spread regulations. To simultaneously achieve its desired maximum limit and keep within the regulatory framework it invests in large-caps, of at least £20.8 billion. On the other hand, because it

needs only invest tiny percentages in small-caps before reaching maximum limits, the pressures of large cash flows create the need for large funds to have large blocks of assets invested on a regular basis and compels them to be large-cap biased. Funds also impose limits by maximum shareholding per stock, say 2.5% a classification compelling large-cap bias. Taking the BT Fund, for example, and using a 2.5% threshold, it can allocate and maintain £2.5 million in a £100 million cap stock, but sticking with such stocks means constructing a portfolio of a multitude of components.

5.1.4. **Financial Characteristic Influence on Shareholding**

Rosenberg and Marathe (1975) rationalise the inter-linkage between equity attributes and subsequent returns and argue that attributes may be mis-priced, which manifests itself in anomalous pockets of inefficiency, such as the residual-return-reversal effect, (Jacobs et al 1988), or just like fads, may be psychologically motivated, hence mean-reversion. Barlev et al (1990) and Horrigan and Johnson (1978) argue that because these variables are highly correlated (and in some cases simple mathematical functions of one another). Their interpretations are similar and can be broadly classified as liquidity, solvency and debt coverage, profitability, efficiency and dividend policy, and it is sufficient to select a representative per class. For example, financial leverage *(DER)* affects the risk-return interaction of stocks of every size, but its influence is felt more strongly among marginal stocks. Furthermore, while, Modigliani and Miller (1963) and Ross (1977) posit that returns are positively correlated to *DER,* due to the corporate tax shield effect, Leland and Pyle (1977) and Fama (1985) argue that debt announcements lead to a positive correlation between returns and the expected change in insider ownership, since bankers are privy to private information and do not approve loans if negative news is observed in the lending

process. Tweedy (1996) and Bhandari (1988) observe that undervalued stocks generate more efficient returns, particularly if they have modest *DER* levels, even after controlling for risk and size and *DER* is a credible proxy for risk apart from β. Hence, given two stocks of more or less of the same size belonging to the same industry, one with higher *DER* is an attraction. Presenting contradictory evidence, Foster (1988), indicates that *DER* boosts default risk and forces stocks to forego lucrative long-term projects. Further extensions from Stevens (1973), Simkowitz and Monroe (1971), Kraus and Litzenberger (1972), DeAngelo and Masulis (1980) and Ross (1985) argue that increasing *DER* leads to high leverage-related costs that constrain return growth. The role of *DER* becomes more articulate when stocks are ranked by size, (Huberman, Kandel and Karolyi 1987). The rationalisation is that there are risk differences between small and large-caps, emanating from differences in their responses to time series changes in underlying risk factors with small-caps being more exposed to production risk and changes in the risk premium. However, smallness by itself does not necessarily imply higher risk, and differences in size do not explain why small and large-caps behave differently to economic news. But the reality remains that if information is imperfect, poor performance and high *DER* restrict debt accessibility (especially during tight credit periods) and these are felt more in small-caps, which contain a higher proportion of marginal firms than large-caps. The economic interpretation of why small-caps are riskier is, thus based on variables that cause marginal stocks to react differently from healthy stocks to the same piece of macroeconomic news.

Abukari, Jog and McConomy (2000) set the scene on dividend robustness to explain returns by investigating the explanatory power of *EPS*, book values and dividends for the Toronto Stock Exchange during the period 1989-98. They indicate that the most robust stock attributes are all either book value or earnings-related. Furthermore, the authors indicate that the value relevance of the dividends signal is higher for firms with implied negative growth rates, due to information asymmetry between outsiders and insiders. For stocks experiencing losses, dividends are a costly, but credible, signal used to communicate future profitability. Thus, the profitability hypothesis suggests that the dividend effect is higher for less profitable firms. Miller and Rock (1985) concur and report that dividend policy has information or signalling value, but recognise that its role may be different for stocks in different relative financial position. An alternate prediction is that the dividend effect is stronger when *FCF* is high, which is most likely when current *EPS* are positive, since management is able to use dividend to signal that they do not waste *FCF*. However, consistent with Hand et al (1999), the Abukari et al (2000) study indicates results which are more strongly supportive of the profitability-signalling hypothesis than *FCF* mitigation. Results from the size-based segmentation indicate that the dividend signal is very strong for the smallest and medium size groups, though with much robustness for the small-caps. Shiller (1984) also examines the explanatory power of annual S&P Composite returns and finds that *DY* explains nearly 16% of the variation in the 1946-83 period. The author interprets the relationship between the *DY* and future performance as evidence of noise trading which causes temporary return deviation. According to this theory periods with low *DY* are periods with overvalued stocks, and since prices are likely to decrease under these circumstances, a low *DY* is associated with lower than average future rates of return.

The other tested variable is the return on equity *(ROE)* model, which enables performance evaluation in terms of source and magnitude, relative to selected risk. Lookabill (1976) reports that *ROE* is a comprehensive indicator of firm performance and that in addition to the earnings-to-price *(EP)* and *BEME* models, there is a strong reason to expect earnings changes to correlate with *ROE*, to the extent that *ROE* combines the two models. Wilcox (1984) observes that the *ROE* drop has a two-layered effect on the *BEME* (directly and indirectly) by lowering the expected growth rate in *EPS* and/or the expected *DPR*. Thus, either the retention ratio increases or expected growth falls and by implication, high *ROE* stocks sell for well above book values. Thus, stocks that draw investor attention are those with great mismatches of *BEME* and *ROE*. However, Solomon (1966) and Ohlson (1990), argue that *ROE* does not completely track earnings records, but propose performance characterisation in terms of *ROCE*. Penman (1991) notes that curiously, given *ROCE's* prominence, it has little theoretical analysis, while Solomon (1966) and Livingstone and Salomon (1970) reconcile return on total book assets to the internal rate of return, which under some conditions satisfies the present value criterion for profitability analysis.

Jacob and Pettit (1984), Hessel and Lustgarten (1987) and Ou and Penman (1989) observe that the return on total assets *(ROTA)* reflects the stock's ability to utilise financial and real assets to generate income. They argue that investors seeking performance comparisons (while ignoring differences in equity capital ratios) focus on *ROTA*, which is preferred to other profitability calibrators since it measures efficiency and minimises capital structure-induced differentials. Barber and Lyon (1995) investigate abnormal returns using a variety of statistics, including *ROTA*, and find that it is a powerful explanatory variable. However

the variable is inherent with historic cost, non-operating assets and earnings manipulation drawbacks. Firstly, total assets are recorded at historic cost, while operating income is recorded in current values, secondly, *ROTA* reflects all of the firm's assets, not just operating assets, a phenomenon which may understate the true productivity of operating assets (as operating income is not appropriately matched with the assets used to generate it). Third, operating income is an accrual-based measure that managers could over-or-under-state by increasing or decreasing discretionary accruals. Barlev et al (1989), Barber et al (1996) and Hessel et al (1987, 1992) scale profit-before-interest-and-tax income by sales (*ROSA*) to gauge operational efficiency and find that the explanatory power of this variable is no way different from *ROTA* except that it is more anti-conservative for the top-performance-small-cap cell. This measure has an advantage in that both the numerator and denominator are from a firm's income statement and, consequently, they may be appropriately matched compared with *ROTA*. However, the disadvantage is that it does not directly measure asset productivity, e.g., a stock that increases sales (and operating income) without increasing book assets improves productivity, which should be evident in a well-constructed *ROTA* measure. However, this firm could have no change in *ROSA*, if both sales and operating income increase proportionately. Nonetheless, *ROSA* detects certain types of operating performance changes - for example, reductions in selling, general and administrative expenses, or improvements in production efficiency.

Although screening stocks on the basis of sales multiples as a size measure is incorporated by previous studies, Karnami (1984) and Wernerfelt, (1985), there are still some gaps in empirical evidence, either for or against its use as a style-strategy determinant. In a direct

test of the correlation between sales and returns, Spence (1977, 1979, 1981) explains that early sales growth maximisation, through the irreversibility of investment with a growth constraint, and early capacity maximisation functions as a deterrent to potential entrants. As the company matures, it becomes large and its appetite to retain funds for the exploitation of investment projects increases. Porter (1980), Aggarwal, Rao and Hiraki (1990) and Damodaran (1996) suggest that changes in sales and capital expenditure possess some predictive power on stock returns as they signal the strategic emphasis (e.g., capturing market share and increasing capital versus cost trimming). In a related study, Senchak and Martin (1987) and Jacobs et al (1988a), conclude that a high sales stock outperforms the market. Furthermore, Easton and Zmijewski (1989) and Collins and Kothari (1989) posit a positive correlation between sales and earnings. Lakonishok, Shleifer and Vishny (1997) and Cai (1997), correlate the ability of stocks to generate *EPS* to sales growth and conclude that value stocks have a history of low sales growth, and trade for low multiples of current *FCF,* presumably because of the market's pessimism about future growth.

The seminal work by Fisher (1984) and Barbee (1989) indicate a positive correlation between the *SP* and stock returns. Fisher (1984) indicates that a high (low) *SP* indicates unpopular (popular) stocks, thereby providing buying (selling) opportunities. A high *SP* stock is likely to earn high returns if it implements strategies to boost profits from the relatively higher levels of sales. In contrast, Barbee et al (1996) argue that a low *SP* stock is popular with investors expectant of high earnings growth rates. Paradoxically, they may realise low rates of return because, if sales grows recede the earnings growth rate fails to meet optimistic expectations and the stock price drops. Furthermore, the earnings of the

perceived-to-be-growing stocks may actually decline because of unexpected developments. The *SP* may have greater explanatory power than price-earnings because sales are a more reliable indicator of a stock's long-term profit potential than reported *EPS*. Earnings are unstable and can be more affected by temporary occurrences, e. g, high R&D expenditure, current cyclical industrial conditions etc. Barbee et al (1996) see the *SP* being more reliable than the *BEME,* in that sales are less affected by stock-specific factors (unlike both the *BEME* and the price-earnings), can not be negative and sales are a reflection of a company's relative popularity in the investment community. In such circumstances, the earnings-to-price ratio *(EP)* may be considered. Fama et al (1995, 1998), Joy, Litzenberger and McEnally (1974), Beaver (1975) and Black (1973), argue that high earnings and dividend changes are associated with excess returns. Litzenberger, Joy and Jones (1971) and Breen (1968) report that the *EP* is a good surrogate for expected returns and that high *EP* stocks are under-valued. Rendleman, Jones and Latane (1987), confirmed by Freeman and Tse (1989), document evidence of future abnormal return prediction by the current *EP,* while Ball (1978) posits that the *EP* is a catch-all for omitted risk attributes in expected returns. The author also argues that *EPS* related variables, like *EP*, are proxies for expected returns and that low *EP* stocks outperform high *EP* stocks.

Research, Woolridge (1988) indicates that the cash flow yield *(CFP)* is a more robust alternative to the *EP* ratio. The author finds a correlation between stock returns and *FCF* and argues that the *EPS* reflects industry-wide information (e.g., input price changes) that is captured in returns. The efficacy of *CFP* to generate clearer profitability trends lies in the fact that cash flow, i.e., net *EPS* plus all non-cash charges like depreciation and

extraordinary losses, provide less volatile, more robust and relevant underlying stream compared to earnings. The rationale for the reduced variability in *FCF* is the elimination of the manipulative effect of the different depreciation and depletion methods employed. More importantly, while accounting earnings may be a misleading and biased estimate of the economic earnings, *FCF* per share is less manipulatable, and therefore, possibly a less biased estimate of economically important flows accruing to the stockholders. Kaplan et al (1997) use a combination of both qualitative and quantitative information to rank stocks in terms of their apparent degree of financial constraint. They indicate that stocks with the highest *FCF* exhibit the greatest investment-*FCF* sensitivity. This is puzzling and contradicts a large body of empirical evidence implying the importance of examining the generality of their conclusions because they suggest that managers choose to rely primarily on internal *FCFS*, despite the availability of low cost external funds. Cleary (1999) indicates significant evidence demonstrating investment decisions of stocks with high credit worthiness being significantly more sensitive to high required rate of return. This is consistent with the conclusion of Bernanke and Gentler (1990) that both the quantity of investment spending and its expected return will be sensitive to the creditworthiness of the stocks (as reflected in their net worth positions). Jensen (1986) argues that the financial structure of the destination stock is very relevant to investment decisions. Furthermore, while Whited (1992) and Bernarke et al (1990) corroborate this line of thought and conclude that investment levels and expected return are sensitive to *FCFS*, Gilchrest and Himmelberg (1994) conclude that investment is more sensitive for small-caps with less *FCFS*. Fazzari, Hubbard and Petersen (1988) test for investment trends in stocks with different characteristics. The authors employ the *NITA* model and rank their stocks on the

basis of the *DPR*. They find that low *FCF* and *DPR* stocks are populated by small-caps with high *NITA* ratios. Cleary (1999) proffers that internal financing is the most dominant source of financing and that investment decisions are directly linked with the financial status of companies where investment is placed. For a stock to show that it is committed to and, confident about the future, it must invest significant sums of internal funds and by implication, investors follow stocks that are committed to future growth.

SECTION 2

5.2. **Theoretical Framework**

Arbel et al (1983b) indicate that while some stocks are intensely held, others are ignored. To investigate this, Hessel and Norman (1992) and Cleary (1999) evaluate the financial characteristics of such stocks and pinpoint size as the driving force. This, as per Falkenstein (1996) and Bhushan (1989), is not totally driven by conventional proxies for risk alone, but other variables like sentiment. Thus, in equilibrium, given portfolio P_m, composed of large-caps (L_c) with weight (w_l) and q number of stocks and small-caps stocks (S_c) with weight (w_s) and p number of stocks, produces equation 1 below;

$$Pm = \sum_{l=1}^{q} (w_l L_c) + \sum_{s=1}^{p} (w_s S)_c \qquad 1$$

Where P_m is the aggregate asset portfolio of both large and small-caps.

$w_l\ L_c$ is the weight of the large-cap component, and

$w_s\ S_c$ is the weight of the small-cap component.

The bias, or neglect of certain financial variables, compels investors to overweight certain stocks creating large-or-small-cap bias. Actually, existing evidence, Lakonishok et al (1994), Kothari et al (1995), Hessel and Norman (1992), Falkenstein (1996), Merton (1997), Coval and Moskowitz (2001) and Breen and Korajczyk 1993), indicates bias for older, large ($w_l\ Lc$) and previously "successful and less risky" stocks and neglect for younger, small ($w_l\ S_c$) and previously "risky and loss-making" stocks. Decomposing ($w_l\ Lc$) and ($w_l\ S_c$) produces a portfolio composed of a multitude of stocks with different

weightings by size and economic sector. For example, an investor can be either large-or-small-caps biased in Mining, General Retail, Consumer Goods, Services, Utilities and Financials. Since different stocks are imbedded with different risk-return traits and investors suffer selective bias, this raises the question whether shareholding intensity is synonymous with excess returns, and if not, why are certain stocks intensely followed? And, most importantly, what are the practical implications for the financial markets? The main aim of this study is to show that, as in Hessel and Norman (1992), the bias concept applies across size classes, and that the performance of fund invested, and that of stocks in which investors do not disclose investing, is not considerably dissimilar. While various assumptions (risk perception, sentiment and size bias) have been made to explain this phenomenon, their significance and directional trends have not been tested.

5.2.1. **Hypothesis Tested**

Hypothesis 1*: The UK fund stock selection is biased towards large-cap stocks.*

(1). Stocks in which funds disclose shareholdings are larger than those they do not invest in. $\sum(w_l L_c) > \sum(w_s S_c)$

Hypothesis 2: *Fund invested stocks out-perform those they do not invest in.*

(1). Stocks in which funds disclose shareholdings generate higher accounting returns: ROE, ROCE, ROSA and ROTA.

Hypothesis 3: *Fund invested stocks exhibit higher cash flows, investment, growth and dividend pay out ratios than those they do not invest in.*

(1). Stocks in which funds disclose shareholdings generate higher cash flows as shown by free cash flows, cash flow yield and EPS.

(2). Stocks in which funds disclose shareholdings experience higher growth and invest more as indicated by sales growth and NITA.

(3). Stocks in which funds disclose shareholdings pay out higher proportions of their earnings as dividends.

Hypothesis 4: *Fund invested stocks have lower debt than those they do not invest in.*

(1). Stocks in which funds disclose shareholdings have small long-and-short-term and thus lower DER.

Previous empirical evidence supports these hypotheses and is grouped into two categories that employ different sample assembly methods. The first, Arbel and Strebel (1983) and Bhushan (1989), characterises large-cap bias using analyst research concentration. While this goes a long way in exemplifying selection bias, the studies suffer from the deficiency of equating analyst research with direct shareholding. The second, Arbel et al (1983b), Hessel and Norman (1992) and Falkenstein (1996), goes a step further and employs actual shareholding. However, Arbel et al (1983b) employs the S&P500 (the largest 500 US stocks) and, while exhibiting unparalleled size bias, only focuses on the risk-return relationship. Hessel and Norman (1992), while employing a comprehensive set of variables, suffers from both large-cap and sample size bias. Falkenstein (1996) focuses only on those mutual funds with 50% or greater in equity holdings. Although these investigations are indicative of bias, sample construction methods sacrifice clarity. The formulation of this study is designed to fill this gap and contains not only a larger sample but, in similarity to Falkenstein (1996) covers a longer sample period (without size bias and characterises bias with a large sample). The approach is such that the following hypothesis may be tested:

1. UK fund stock selection is biased towards large-caps.

(a). Large-caps (mostly FTSE-100 members) dominate fund portfolios.

2. Stocks which funds disclose investing in out-perform those they do not.

(a). Stocks which funds disclose investing in are more profitable than those they do not.

3. Stocks in which funds invest generate high cash flows, and have high pay out ratios.

(a). Despite higher cash-flows, stocks in which funds invest face limited growth opportunities, and embark on short-termism to keep institutional investors happy.

4. Stocks in which funds invest have low debt and can satisfy their restricted investment needs with internal funding.

(a). Stocks in which funds invest have low gearing ratios because of their huge cash pile cushion and restricted investment opportunities.

5.2.2. **Data and Methodology**

We create a portfolio of stocks in which funds disclose shareholdings from the intersection of Company Analysis Financial Data-1997-98 *NAPF-Member List*-PFTA Universe. Company Analysis financial data is extracted if a stock are appears on both the *PFTA* Universe and *NAPF-Member List,* where individual shareholding is disclosed. This generates 403 qualifying funds, 250 of them disclosing their shareholdings in 515 (1997) 866 (1998) stocks respectively. However, due to data constraints we are unable to extend the NAPF-Member List beyond the 2-year period, since data is collected by hand. After deletions, for missing or inconsistent data and incorporating de-listings and corporate activity effects the combined portfolio for the 2-year period comprises 826 stocks from 38 sub-economic sectors. The size of this sub-sample is by any standards robust and competitive for the nature of the study for three basic reasons. Firstly, the *NAPF Member List* is itself small, comprised of the largest 700 UK funds. Secondly, the *NAPF Member*

List is large-cap biased. This transcends shareholding, resulting in significant cross holding[21]. Thirdly, funds systematically report their top 25-30 individual holdings (only Forth Ports reports over 90% of its entire shareholding). Apart from overcoming the data flaws of previous studies, this design boasts of all disclosed holdings regardless of size and overcomes the upwards of the mandatory *LSE* 3% bias reported by the Extel Financial, the Official Stock Exchange Yearbook and the Company Guide (IRG). After screening the 2315 LSE-listed stocks researched by Extel Financial Company Analysis, we obtain 1449 stocks that do not appear on the fund-invested portfolio. Ranking these stocks for data compliance, missing or inconsistent variables, corporate activity and de-listings effects generates a portfolio of 933 stocks in which funds do not disclose investing. Since the goal of the analysis is to identify consistently significant discriminating variables between fund invested stocks and those they do not disclose investments in, from which to infer the attributes that make a stock attractive to funds, we then compare the stock variables of the two sub-samples. In all circumstances stocks must have positive values for sales, total book assets, book and market values of equity and to avoid survivorship bias (the sample includes extinct stocks) as long as they once had fund holdings and all relevant data. **Appendix 5** documents the proportion of stocks satisfying classification within each attribute.

In line with Mensah (1983), Francis (1986), Jacob and Lyon (1984), Horrigan (1965) and Pinches, Eubank, Mingo and Carruthers (1975) rationalisations, we then select the variables

[21]BT Fund holds 2.2% of BP Amoco, 1.9% of GlaxoSmithKline, 1.7% of Shell, 1.7% of HSBC and 1.2% of LlyodsTSB. For its part BP Amoco holds 1.5% of BT, 2% of Glaxo Wellcome, 3% of Shell, 1.5% of LlyodsTSB and 1.8% of HSBC.

the hypothesis is to be tested on and generate 5 panels of 14 financial ratios and 3 size attributes as presented in **Table 5.1**.

Table.5.1: **Financial Attributes, Rationale and Hypothesis Investigated**

Table 5.1. Stock Financial Attributes, Rationale and Hypothesis Investigated
This Table Presents The Variables That Proxy For Desirable Information About Stocks. Diveded Into Five Panels, The 1st Focuses on Profitability and Covers ROA, ROE, ROCE and ROSA. The 2nd Focuses on Leverage and Covers DER, The 3rd Focuses on Dividend Pay-Out and Covers DPR; The 4th Focuses on Free Cash Flow and Covers BEME, EP, CFP, NITA, SG, SP, DY and EPS, while the 5th Analyses Size and Covers ME, SA and TA

Variable	Definition	Hypothesis	Author Reference
Panel 1	**Profitability**		
1. ROA	Profit Before Interest and Tax Divided by Total Book Assets	Attitude towards potential stock performance	Kang and Stulz (1997), Hessel and Norman (1992), Ou and Penman (1989) Barber and Lyon (1996),
2. ROE	Earnings per Share Divided by Shareholders' Equity		Lev (1989), Beaver (1972), Freeman, Ohlson and Penman (1982), Hessel and Norman (1992), Penman (1991)
3. ROCE	Profit Before Interest and Tax Divided by Shareholders' Equity Equity plus Long-Term Debt		Vatter (1966), Hessel and Norman (1992), Ohlson (1990) Penman (1991)
4. ROSA	Profit Before Interest and Tax Divided by Turnover		Barlev and Livnat (1989), Hessel and Lustgarten (1987) Hessel and Norman (1992), Barber and Lyon (1996)
Panel 2	**Leverage Ratios**		
5. DER	Long-Term plus Short-Term Debt Divided by Shareholders' Funds	Attitude Towards Solvenvy and Debt Coverage	Hessel and Norman (1992), Ou and Penman (1989a, 1989b) Lang, Ofek and Stulz (1996), Bhandari (1988), Cleary (1999) Hoshi, Kashyap and Scharfstein (1991)
Panel 3 Pay-Out Ratios			
6. DPR	Dividends per Share Divided by Earnings per Share	Attitude Towards Dividends	Hessel and Norman (1992), Ou and Penman (1986a, 1986b), Shefrin and Statman (1984), Lemke and Page (1991)

Panel 4	**Free Cash Flow and Growth Opportunities**	Attitude Towards Growth Opportunities	
7. BEME	Book Value of Equity Divided by Market Value of Equity		Penman (1991), Ou and Penman, (1987) Rosenberg, Reid and Lanstein (1985) Fama anf French (1992, 1995, 1998) Barber and Lyon (1997)
8. EP	Earnings per Share Divided by Share Price		Reinganum (1980), Zarowini (1990) Healy and Palepu (1988), Jaffe, Keim and Westerfield (1989) Fama and French (1992, 1998) Beaver and Morse (1978)
9. EPS	Earnings per Share		Reinganum (1980), Zarowini (1990) Healy and Palepu (1988), Jaffe, Keim and Westerfield (1989) Fama and French (1992, 1998) Beaver and Morse (1978)
10. CFP	Earnings per Share Add (Less) Extraordinary Losses (Profits) Divided by Share Price		Cai (1997), Barber and Lyon, (1996), Fazzari, Hubbard and Petersen (1988) Hoshi, Kashyap and Scharfstein (1991) Whited (1990)
11. NITA	Average Investments Divided by Total Book Assets		Bernake and Gertler (1990), Cleary (1999), Whited (1990) Lehman and Poulsen (1989), Kaplan and Zingales (1997) Schaller (1993),
12. SG	Turnover in Year-t Less Turnover 1-Year Prior Divided by Turnover 1-Year Prior		Spence (1977, 1979, 1981), Karnami (1984), Wernerfelt (1985) Hoshi, Kashyap and Scharfstein (1991), Whited (1990)
13. SP	Sales per Share Divided by Price per Share		Hawawini and Keim (1997), Cai, (199), Damodaran (1996) Abukari, Jog and McConomy (2000)
14. DY	Dividend per Share Divided by Price per Share		Abukari, Jog and McConomy (2000) Ohlson (1995), Penman and Sougiannis (1998) Fama and French (1992, 1998)
Panel 5	**Size Variables**		
15. TA	Natural Logarithm of Total Book Assets	Size Effect	Hessel and Norman (1992), Whited (1990)
16. SA	Natural Logarithm of Total Turnover		Hawawini and Keim (1997), Aggarwal, Rao and Hiraki (1990) Hessel and Norman (1992), Senchanke and Martin (1987)
17. ME	Natural Logarithm of Market Value of Equity		Reinganum (1981, 1983) Fama and French (1992, 1995, 1998), Basu (1983), Cai (1997), Donald, Keim and Westerfield (1989)

Although not exhaustive, this list is sufficiently broad to test for size bias. To investigate size bias between fund-invested stocks and those they do not disclose investments in, we rank the portfolios according to the means of the natural log of the market value of equity, total book assets, and sales and test for the significance of mean differences through t-statistics. We then divide the portfolios into three categories of small, medium and large with the bottom 33.3% being small-cap, the second 33.3% medium and the top 33.3% large-cap. This is because a crude split into large-small caps is flawed. Firstly, will stocks just below and just above average be fairly classified, and what is to be done about them? What about mid-cap stocks? However, we are aware that our classification has problems of whether mid-cap stocks are either large-caps that are shrinking or small-caps that are growing. Still, if funds are large-cap biased, we expect the means of the three size proxies, (market value of equity, sales and total book sales) to be larger for the fund invested portfolio.

To characterise performance, we analyse the time series and cross-sectional accounting return 1984-98 and the sub-period 1994-98 for 6 measures, (*ROE, ROCE, ROSA, ROTA* and returns) as in previous research by Barber and Lyon (1996), Damodaran (1996), Hessel and Norman (1992) and Hawawini and Keim (1995). We expect the chosen indicators to be higher for the fund-invested sub-sample. The same assumption is adopted for free cash flow and attitude towards growth hypothesis (*EP, CFP, SP,* sales growth, *BEME* and *NITA*) with the last ratio expected to measure the stock's willingness to exploit new projects, with a caveat that asset cost replacement is constant. This is not a strong assumption in the sense that there is no a priori raison d'être to believe that asset replacement cost varies across the

two samples. If funds prefer growth stocks, we expect the fund-invested portfolio to be dominated by stocks with a higher level of earnings yield, *NITA*, sales growth, cash flow yield and lower *BEME* and sales yield. For solvency and leverage, we employ the *DER*. If funds are risk averse they will invest in low *DER* stocks. Financial leverage affects the risk-return matrix of stocks of every size, but its influence is likely to be felt more strongly among marginal stocks. For example, financial leverage can compound the problems of a marginal stock making it difficult for it to access finance.

To measure the attitude towards dividends, we compute *DPR* as net dividends over net income. If funds have a penchant for dividends, they should invest in high *DPR* stocks. It is well known (Chan et al (1991) that stocks are reluctant to cut dividends, and those that cut them drastically are likely to have done poorly, face an uncertain future and will be discarded by dividend-hungry investors. Furthermore, such cuts can also signal management expectation of lower future cash flows or mounting difficulties in relying on external finance. To proxy for risk, we compute the standard deviation of the means of the sub-samples and in all cases we average annual values across all portfolio formation years. To eliminate the outlier influence and in line with previous research, Cleary (2000), variables exceeding cut-offs are "winsorized", according to the following rules:

(i). Assign a maximum value of 100% (-100%) if sales growth, *ROE, ROCE, ROSA, ROTA, DER* and *NITA* is greater (less) than 100% (-100%);

(ii). Assign a value of 100% if *DPR* is greater than 100% and delete all negative values. This does not only eliminate extreme values but is the most logical way of dealing with negative dividend payment figures since there are no dividends due from the shareholders.

(iii). For *DER, EP, CFP, BEME* and sales yield, we set observations below the 1st and above the 99th percentiles of the distribution to those at the 1st and 99th percentiles, (see Barber et al (1996)). For the *BEME, EP*, sales yield and the *CFP*, the explanatory prowess is strong for positive *EPS*, sales and *FCF*, thus negative values are eliminated since they do not proxy for performance. While sales are always positive, for financial stocks they are not considered since their revenue is not classified as sales. This reduces the impact of mean, median and standard deviation skewing by extreme observations, and permits the use of a larger number of observations than would be possible if they are deleted.

5.3. **Empirical Results: Shareholding Bias and Fund Performance**

In this section we carry out long-term performance, investment and dividend policy comparative analysis between the two sub-samples. Firstly, we test for likely differences and changes in cross-sectional and time series performance using 4 ratios: *ROE, ROCE, ROSA* and *ROTA* for the whole sample period, and analyse whether performance is correlated to either *DPR* or *NITA*. We perform a robust test for the 1994-98 sub-period, the choice of which is driven by two interrelated factors. First, this is the period during which funds exhibit extreme home bias. Additionally, while we need a sufficiently long time-horizon, we need to counterbalance that with the period in which funds simultaneously maintain shareholdings and exhibit bias. Secondly, since data is collected by hand, we face critical data availability problems, especially regarding the period during which funds disclose shareholdings. Because of this, and the impracticality of making credible conclusions based on the 2-year period, we introduce a caveat and extend our sample backwards to 1984, with the assumption that funds have been investing in such stocks since then. **Table 5.2**, **Panel A** shows the distribution of fund assets in the fund invested stocks.

Table 5.2: **Statistics On the Number of Funds and Shareholding Bias: 1997-98**

The Table Summarises Data on Pension Fund Shareholdings, Defined as Proportional Shareholdings of the Outstanding Ordinary Share Capital

Panel A: Distribution of the Number of Pension Fund Assets											
	Number of Pension Funds	Largest Proportion of Assets Invested	Smallest Proportion of Assets Invested	Mean Proportion of Assets Invested	Median Proportion of Assets Invested	Pension Funds (%) Disclosing Asset Base: Proportion Invested (%) In The Range of:					
						1-10	10-20	20-30	30-40	40-50	Above 50
1997	241	79.3	1.3	24.0	23.8	9	42	152	30	1	5
1998	243	91.9	6.2	23.9	22.9	3	76	119	30	13	2

Panel B: Distribution of the Number of Pension Fund Shareholdings per Company											
	Number of Companies (Database)	Number of Companies With at Least One Shareholding	Proportion In Which Funds Invest (2)/(1)%	Distribution & Number of Companies With Individual Pension Fund Shareholdings							
				1-5	6 - 10	11 - 20	21 - 50	51 - 100	101 - 200	Above 200	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	
1997	2315	514	22.2	390	40	42	26	7	10	-	
1998	2205	866	39.3	633	103	72	38	13	7	1	

In entirety, there are 241 (243) pension funds in 1997 (1998), with a mean 24.0% (23.9%) of their assets invested in disclosed stocks, while a mean of 9 (3) funds report between 1%-10%, 52 (119) between 20%-30%, 1 (13) between 30%-40%, while 5 (2) report above 50% (with Forth Ports reporting the largest at 91.9% in 1998 and the Dyson Fund the smallest at 1.3% in 1997). In 267 stocks (38.7%) funds hold more than 3% of equity, while in 181 (26.2%) they hold more than 5%. In 47 stocks, (6.8%) they also hold between 10%-20%, while only in 28 (4.1%) they hold above 20% of the capital. **Table 5.2, Panel B** reports the

distribution of fund shareholdings per stock. Of the 2315 Extel Financial Company Analysis stocks, 22.2% (39.3%) have their shares held at least by 1 fund in 1997 (1998). While 514 (866) stocks have at least 1 fund holding in 1997 (1998), as much as 390 (633) stocks have below 5 fund holdings, 40 (103) below 10, and the number of stocks falls monotonically with an increase in funds maintaining shareholding until BP Amoco has 209 fund positions in 1998. **Table 5.3** displays the number, FTSE sector distribution, proportion and number of shareholdings for 826 fund invested stocks and indicates shareholding intensity falling monotonically with stock size.

Table 5.3: **FTSE Sector Representation and Shareholding Intensity: 1997-98**

The Table Summarises FTSE Sector Presentation

Sector	**Stocks per FTSE Sector**	**Sector Proportion**	**Capitalisation Per Stock**	**Proportional Share Capital Owned**			**Individual Fund Holdings**	
	(Number)	(%)	Mean (£ Millions)	Median (£ Millions)	Mean (%)	Median (%)	Mean Number	Median (Number)
FTSE 100	100	12.1	5281.8	5696.9	8.7	7.1	19	12
FTSE-250	125	15.1	1081.6	897.9	4.9	3.6	12	5
FTSE Small-Cap	219	26.5	288.7	155.4	3.6	1.7	5	2
FTSE Fledgling	261	31.6	162.7	29.9	3.3	1.4	6	2
AIM	121	14.7	294.5	70.8	2.5	1.2	6	2
Total	**826**	**100**	**1421.9**	**1370.2**	**4.6**	**3.0**	**9**	**4**

Column 2 records the percentile proportion of stocks by sector. Firstly, while the FTSE-100 comprise the smallest proportion by number (12.1%) of the sample, funds invest in all these stocks, representative of 8.7% of shares owned by funds, with on average, each FTSE-100 stock held by 19 funds. Secondly, the FTSE-250 comprises 15.1% of the sample and

accounts for 4.9% equity on average, each FTSE-250 stock is held by 12 funds. Thirdly, AIM is moderately held. It comprises 14.7% of the sample, accounts for 2.5% of fund held stocks, with each stock held by 6 funds. Thus, holding intensity falls with size both by proportion and number of funds per stock. The study also finds that, on average, each of the 334 stocks (40.4% of the sub-sample) is held by 1 fund, 23 (2.8%) by 5; 22 by over 50 while 15 boast of over 100 funds. The largest individual shareholding is 11.2% by the Railway Fund on Life Opportunities, followed by the same fund on Faupel Trading at 10.4%. The study further investigates the concentration of fund assets by 4 variables; number of stocks per sector, size, proportional and number of shareholdings per stock as presented in **Table 5.4**. Ranked by number of stocks per sector, each of the top 10 sectors has a mean of 45 stocks. The most concentrated is the Investment Trusts (with 145 stocks) followed by Engineering (55), Media (37), Real Estate (32), Support Services and Distributors (32 each), Building and Construction (30), Building Materials and Merchants (30), General Retail (27), and Leisure and Hotels (27). Ranked by the number of funds per sector, the above sectors have the least mean number of shareholdings with each stock on average, being held by 2 funds (accounting for 3.0% of equity per stock). Ranking by size, each of the top 10 sectors contains 8 stocks and is capitalised at £11,817.3 million. This category is comprised of Oil Integrated (£38805.4 million), Telecomms (£17,600.9), Retail Banks (£14,289.9), Pharmaceuticals (£10,213.2), Gas Distribution (£9,370.2), Alcoholic Beverages (£8,655.2), Tobacco (£6,190.5), Life Insurance (£4,228.0), Electricity (£3,291.3) and Food Retail (£2,8161.1). These sectors have the highest mean number of shareholdings at 17 funds per stock, accounting for 4.9% of equity per stock. Sorted by shareholding, each stock within the top 10 intensely held sectors has 7.4% of its capital held by funds.

Table 5.4: **Economic Sector, Size and Shareholding Bias**

Economic Sector	Number of Stocks	Capitalisation [£ Million]	Proportional Shareholding [%]	Number of Shareholdings
Oil Intergrated	5	38805.4	5.1	40
Tobacco	2	6190.5	11.1	26
Telecommunications	6	17600.9	4.9	23
Retail Banks	14	14289.9	7.3	21
Alcoholic Beverages	3	8655.2	3.9	18
Gas Distribution	2	9370.2	4.6	16
Pharmaceuticals	15	10213.2	3.0	12
Merchant banks	5	756.5	14.9	10
Life Insurance	17	4228.0	3.1	6
Extractive Industries & Mining	7	1271.7	3.0	5
Diversified Industrials	17	2711.8	2.8	5
Transport	17	2049.8	3.3	5
General Retail	27	2243.0	2.9	4
Electricity	10	3291.3	4.0	4
Breweries	12	1988.0	3.6	4
Food Retail	13	2816.1	2.3	3
Media	37	1841.2	2.7	3
Investments	145	195.1	9.1	3
Water	11	1782.2	3.4	3
Other Financial	20	504.5	8.7	3
Food Producers	22	1313.0	4.1	2
Chemicals	16	986.7	2.0	2
Leisure & Hotels	27	919.1	1.8	2
Property	32	622.7	3.1	2
Vehicle Engineering	10	939.5	1.6	2
Oil Exploration	9	569.7	3.2	2
Engineering	55	737.5	2.3	2
Other Services	11	123.3	1.4	2
Building Materials & Merchants	30	638.2	2.3	2
Insurance [Composite]	2	1229.4	1.7	2
Support Services	32	1049.8	1.9	1
Distributors	32	243.9	1.7	1
Health Care	12	328.1	2.6	1
Building & Construction	30	218.8	2.5	1
Paper. Packaging & Printing	19	425.8	1.9	1
Electronic & Electrical Equipment	23	218.3	1.5	1
Household Goods	15	378.9	1.4	1
Textile & Apparel	23	153.3	1.4	1
	20	**3735.6**	**3.7**	**6**

This ranking comprises Merchant Banks (14.9%), Tobacco, (11.1%), Investment Trusts, (9.1%), Other Financial (8.7%), Retail Banks (7.3%), Oil Integrated (5.1%), Telecomms (4.9%), Gas Distribution (4.6%), Food Producers (4.1%) and Electricity (4.0%).

Furthermore, the top 10 intensely held sectors have the highest mean number of shareholdings per stock, with 15 funds each accounting for 23 stocks per sector. Sorting by the number of shareholdings per sector, indicates that each stock within the top 10 intensely held sectors has 18 funds. Oil Integrated is the most intensely held (40), then Tobacco (26), Telecomms (23), Retail Banks (21), Alcoholic Beverages (18), Gas Distribution (16), Pharmaceuticals (12), Merchant Banks (10), Life Insurance (6) and Extractive Industries & Mining (5). These sectors command the second highest mean market equity per stock (at £11,138.2 million) with 6.1% of their equity held by funds. It is evident from this that size plays a vital role in fund investment. While the largest stocks also appear in the most represented sectors, and among the most intensely held by shareholding, they also emerge amongst the most intensely followed by number of funds. This is no coincidence, the sectors have the largest UK stocks, 41 of which feature prominently among the Global 500 largest stocks (FT, FT500, 10 May 2002) with HSBC, Royal Bank of Scotland, LloydsTSB, Barclays, GlaxoSmithKline, Astrazeneca, Vodafone, BPAmoco and Shell visible within the top 10 of their respective sectors.

5.4. **Performance Illusion and Size Bias**

While we can conclude the prevalence of certain attributes with nominal values, their information content is of limited value since it prevents us from concluding absolutely in proportionate terms, that stocks display certain trends in specific multiples. Sub-divided into 4 panels, **Table 5.5** presents fundamental statistics, in nominal and multiple terms, for both sub-samples for the period 1984-98. For the fund invested stocks, **Panel A** reports fund interests and indicates stock bias, through the proportion of capital held and the number of funds following per stock. **Panel B** records the £-size denominated stock

attributes encompassing market capitalisation, total book assets and sales. **Panel C** presents the financial ratios focussing on profitability, attitude to dividends and growth, while **Panel D** presents the sample mean, large-mid-and-small-cap returns. For each attribute we compute the mean, median and t-statistics for significance of differences, standard deviations, and minimum and maximum shareholding, and stock following levels. The proportion of equity held indicates that each fund holds a mean of 3.7% per stock, while the most (least) intensely held stock has 60.7% (0.004%) of equity held. Classified by the number of funds, there are 8 funds following a stock at any one time, out of 242 funds, and the most followed stock, BPAmoco (the largest) has 209 funds on its trail.

The absolute £-size denominated attributes in **Panel B** indicate that the fund invested portfolio is dominated by large-caps (£751.5 v £87.8 million), high total book assets (£1,496.4 v £174.9 million) and sales (£820.9 v £80.0 million). The smallest stock, by sales (market value of equity), is found in the fund-invested stocks (stocks in which funds do not disclose shareholding), the largest by market value of equity (sales) in the fund-invested stocks (stocks in which funds do not disclose shareholding), with mean differences all significant at 1%. Thus, funds are significantly large-cap biased and prefer stocks with large sales. **Panel C** analyses growth and profitability factors, the objective being to dictate whether funds are overly exuberant about large-caps that have done well in the past. We know that from Gordon's formula low cash flow yield and *EP* ratios reflect high-expected growth rates, holding the discount rate and *DPR* constant. On the other hand, if funds are overly pessimistic about stocks they do not disclose investing in, because of their past, then cash flow yield and *EP* should be high, reflecting low expected future growth rates. **Panel**

C indicates significantly lower *DPR, NITA,* sales growth, and *DY*, flat *EP* and *BEME*, while *ROE* and sales yield variables are significantly higher for fund-invested stocks. The large and significant differences suggest that funds expect growth differences to persist, or that the *DPR* is lower, or the required rate of return is much higher for fund invested stocks. *DPR* is lower for fund-invested stocks and growth is actually higher for stocks they do not disclose investment in, maybe funds prefer a guaranteed, rather than a high but unstable, dividend. **Panel D** indicates that sample-wide (for large, mid and small-caps) fund-invested stocks outperform those they do not disclose investment in, and significantly so at the 1%. This implies that funds prefer high return large-caps, with low pay out ratios. We further test for the robustness of the above evidence by focussing on the 1994-98 sub-period, and **Table 5.6**. **Panel A** results confirm large-cap bias by indicating high £-denominated absolute size variables for fund-invested stocks. In **Panel B**, *ROE* and sales yield are significantly high at 10% and 1% respectively, while *DPR, NITA,* sales growth and *DY* are significantly low at 1%, *EP* is flat, while *BEME* is slightly lower. While this is in line with Hessel and Norman (1992), that institutions prefer high return on equity, contrary to the above and consistent with the *static clientele models* of Porteba and Summers (1984), evidence indicates a clear bias for low *DPR* stocks, with significantly low levels of growth and investment. **Panel C** indicates insignificantly higher sample-wide and mid-cap sub-portfolio returns, while lower for the large and small-caps. Thus, while overall the fund-invested outperforms (though insignificantly) this is fuelled by mid and small-caps.

Table 5.5: **Panels A & B: Financial Attributes of Fund Invested and Non-Invested Stocks: 1984-98**

Comparison of Stock Attributes and Financial Ratios between the Neglected [Without Fund Holdings] and the Strongly Held Stocks [With Fund Holdings] Tests are run to compare means between the two sub-smaples for 1984-98.[*], [**], [***] significant at 1%, 5% and 10% respectively. Min indicates minimum while Max is maximum value within classification. There are 826 observations for the pension fund invested portfolio while the neglected has 933. PropCap denotes the proportion of capital held per stock; NumFunds - number of funds folowing a stock; while mean NumFunds denotes the average number of funds with fund holdings

	Pension Fund Invested Stocks					**Neglected Stocks (Without Pension Fund Holdings)**					
Variable	**Panel A: Pension Fund Interests**										
	Number of Stocks	**Mean**	**Median**	**Min**	**Max**	**Number of Stocks**	**Mean**	**Median**	**Min**	**Max**	**T-Stas For Differences in Means**
Sample	826	-	-	-	-	933	-	-	-	-	-
PropCap (%)	-	3.7%	2.2%	0.004%	60.73%	-	-	-	-	-	-
NumFunds	-	8	2	1	209	-	-	-	-	-	-
Mean NumFunds		(242)	-	-	-	-	-	-	-	-	-
Panel B: Various Size Proxies (Millions £-Denominated)											
[£-Millions]	**Mean Stock**	**Median Stock**	**Smallest Stock**	**Largest Stock**		**Mean Stock**	**Median Stock**	**Smallest Stock**	**Largest Stock**		
Market Capitalisation	751.5	192.6	2.0	144,104.0		87.8	63.7	0.1	14,113.9		7.00*
Total Book Assets	1496.4	254	0.2	29,154.0		174.9	34.4	0.2	14,457.4		4.75*
Turnover	820.9	330.8	0.1	128,963.9		80.0	58.0	0.2	144,430.0		5.86*

Table 5.5. **Panels C & D: Financial Attributes of Fund Invested and Non-Invested Stocks –: 1984-98**

Comparison of Stock Attributes and Financial Ratios between the Neglected [Without Fund Holdings] and the Strongly Held Stocks [With Fund Holdings] Tests are run to compare means between the two sub-smaples for 1984-98.[*], [**], [***] significant at 1%, 5% and 10% respectively. There are 826 observations for the pension fund invested portfolio while the neglected has 933. ROE denotes return on equity as in Table 5.1; DPR- dividend pay out ratio; NITA - average investments divided by total book assets; EP - earnings yieild; SG - sales growth; BEME - book equity divided by market equity; SP - sales yield, while DY denotes dividend yield

[%]	**Panel C: Financial Ratios As Indicators of Stock Financial Attributes Between The Two Sub-Portfolios**									
	Mean	**Median**	**SD**			**Mean**	**Median**	**SD**			
ROE	11.21	10.22	12.55			8.98	8.89	10.84			3.96*
DPR	47.71	47.71	13.17			54.38	54.38	9.48			-12.05*
NITA	10.59	9.61	5.68			12.89	12.23	6.14			-8.14*
EP	0.08	0.08	0.03			0.08	0.08	0.02			3.52*
SG	13.22	13.22	8.22			18.72	18.72	6.96			-15.04*
BEME	0.77	0.73	0.37			0.8	0.78	0.23			-2.39*
SP	2.29	2.2	1.64			1.98	1.97	0.86			4.87*
DY	3.44	3.43	0.01			3.96	3.96	0.01			-8.94*
[%]	**Panel D: Stock Returns As Indicators of Stock Financial Attributes Between The Two Sub-Portfolios**									
Sample Mean Returns	0.89	0.98	0.71			0.61	0.66	0.62			8.75*
Large-Cap Returns	1.28	1.28	0.6			0.9	0.86	0.55			7.96*
Medium-Cap Returns	0.92	1.00	0.59			0.64	0.68	0.53			5.95*
Small-Cap Returns	0.48	0.56	0.71			0.29	0.46	0.62			3.35*

Table 5.6: **Financial Attributes of Strongly-Held and Non-Invested Stocks: 1994-98**

Comparison of Stock Attributes and Financial Ratios between the Neglected [Without Fund Holdings] and the Strongly Held Stocks [With Fund Holdings] Tests are run to compare means between the two sub-smaples for 1994-98.[*], [**], [***] significant at 1%, 5% and 10% respectively. Min indicates minimum while Max is maximum value within classification. There are 826 observations for the pension fund invested portfolio while the neglected has 933. PropCap denotes the proportion of capital held per stock; NumFunds - number of funds folowing a stock; Mean NumFunds - average number of funds with fund holdings; ROE - return on equity as in Table 5.1; DPR- dividend pay out ratio; NITA - average investments dividend by total book assets; EP - earnings yield; SG - sales growth; BEME - book equity/market equity; SP - sales yield and DY - dividend yield.

Variable	**Pension Fund Invested Stocks**				**Neglected Stocks (Without Pension Fund Holdings)**				
	Panel A: Various Size Proxies (Millions £-Denominated)								
[£-Millions]	**Mean Stock**	**Median Stock**	**Smallest Stock**	**Largest Stock**	**Mean Stock**	**Median Stock**	**Smallest Stock**	**Largest Stock**	**T-Stats For Mean Differences**
Market Capitalisation	1,051.0	149.7	2.0	144,104.0	118.0	62.0	0.1	14,113.9	
Total Book Assets	2,466.0	254.0	0.2	29,154.0	428.7	50.6	0.2	14,457.4	3.84*
Turnover	1,078.1	330.8	0.1	128,963.9	118.9	63.2	0.2	144,430.0	5.70*
[%]	**Panel B: Financial Ratios As Indicators of Stock Financial Attributes Between The Two Sub-Portfolios**								
	Mean	**Median**	**SD**		**Mean**	**Median**	**SD**		
ROE	10.33	9.45	21.00		8.21	8.08	24.30		1.97*
DPR	50.90	18.30	18.30		57.30	57.30	15.01		-8.03*
NITA	10.85	9.21	7.79		14.26	12.50	9.60		-8.23*
EP	0.07	0.07	0.04		0.07	0.07	0.03		3.11*
SG	11.52	11.52	13.90		22.22	22.22	16.60		-14.69*
BEME	0.74	0.65	0.45		0.74	0.71	0.34		0.06
SP	2.17	1.96	1.93		1.69	1.69	1.22		6.22*
DY	0.03	0.03	0.02		0.04	0.04	0.03		-5.51
[%]	**Panel C: Stock Returns As Indicators of Stock Financial Attributes Between The Two Sub-Portfolios**								
Sample Mean Returns	0.18	0.26	1.41		0.15	0.24	1.37		0.42
Large-Cap Returns	0.79	0.71	1.31		0.81	0.71	1.22		-0.18
Medium-Cap Returns	0.26	0.33	1.22		0.21	0.28	1.14		0.50
Small-Cap Returns	-0.50	-0.45	1.40		-0.56	-0.20	1.38		0.49

Motivated by this evidence indicating fund invested portfolio dominance in profitability and size variables, and the fact that the high returns within the fund-invested stocks (for the 1994-98 sub-period) are actually driven by mid-and-small-caps, we further test for the robustness of this evidence. We simulate the above proxies by employing variant financial variables for long-term debt, net investment, earnings-per-share, dividends and free cash flow and ratios; *ROCE, ROSA, ROTA, DER* and cash flow yield, for the two sub-periods. The results are presented in **Tables 5.7** and **5.8.** Focussing on the 1984-98 sample-period, **Tables 5.7. Panel A** indicates significantly high £-denominated absolute long-term debt, net investment, *EPS,* dividends and free cash flows for the fund invested portfolio, significant at 1%, save for *EPS* which is at 10%. This indicates that funds prefer stocks with high earnings, high free cash flows and dividends, and this is manifests itself in an economically important way. In **Panel B** *ROCE, ROTA, ROSA* and cash flow yield are high for the fund-invested sub-portfolio, and significantly so at 1%, save for *ROCE* and *ROSA* at 5%, while *DER* is significantly low at 1%. The return ratios indicate the importance funds attach to profitability, while *DER* shows fund interest dissipation with the probability of default or risk, and this is discernible in an economically important way. Focussing on the 1994-98 sub-period, **Tables 5.8 Panel A** indicates the same results, but with *ROCE* being insignificant while *ROSA* is significant at 1%. Thus, within the 1994-98 sub-period, *ROCE* appears, at best, marginally important to account for large-cap bias, while funds continue not only being large-cap biased, but search for profitable stocks with high earnings multiples, free cash flow and low debt.

Table 5.7: **Financial Attributes of Fund Invested and Non-Invested Stocks: Robustness Checks**

Comparison of Stock Attributes and Financial Ratios between the Neglected [Without Fund Holdings] and the Strongly Held Stocks [With Fund Holdings] Tests are run to compare means between the two sub-smaples for 1984-98.[*], [**], [***], significant at 1%, 5% and 10% respectively. There are 826 observinvested portfolio while the neglected has 933. L-T-D denotes Long-Term-Debt; Net Investment - average funds invested; EPS - earnings per share, DIV - dividend per share, FCFS - free cash flow per share; ROCE - return on capital employed, ROSA - return o sales, ROTA - return on total book assets; DER - debt equity ratio while CFP - free cash flow yield

Variable	Pension Fund Invested Stocks			Neglected Stocks (Without Pension Fund Holdings)			
	Panel A: Various Financial Proxies (Millions £-Denominated)						
	Mean	Median	SD	Mean Stock	Median Stock	SD	T-Statistics For Differences in Means
L-T-D (£-Millions)	170.3	83.0	-	35.20	26.00	-	7.89*
Net Investment (£-Millions)	104.9	31.8	-	16.40	8.10	-	5.69*
EPS	0.91	0.22	-	0.16	0.08	-	1.95***
DIV	0.11	0.08	-	0.07	0.06	-	4.05*
FCFS	1.44	0.82	-	0.30	0.26	-	2.72*
Panel B: Financial Ratios As Indicators of Stock Financial Attributes Between The Two Sub-Portfolios							
[%]	Mean	Median		Mean	Median		
ROCE	17.25	15.82	12.78	16.03	15.29	11.40	2.11**
ROSA	7.79	7.79	9.17	6.76	6.76	8.65	2.41**
ROTA	8.43	8.27	6.83	7.44	7.51	6.93	3.04*
DER	30.72	47.71	13.17	33.67	33.67	10.21	-5.01*
CFP	0.32	0.27	0.21	0.24	0.23	0.13	9.73*

Table 5.8: **Financial Attributes of Fund Invested and Non-Invested Stocks: Robustness Checks**

Comparison of Stock Attributes and Financial Ratios between the Neglected [Without Fund Holdings] and the Strongly Held Stocks [With Fund Holdings] Tests are run to compare means between the two sub-smaples for 1994-98.[*], [**], [***], significant at 1%, 5% and 10% respectively. There are 826 observinvested portfolio while the neglected has 933. L-T-D denotes Long-Term-Debt; Net Investment - average funds invested; EPS - earnings per share, DIV - dividend per share, FCFS - free cash flow per share; ROCE - return on capital employed, ROSA - return o sales, ROTA - return on total book assets; DER - debt equity ratio while CFP - free cash flow yield

Variable	Pension Fund Invested Stocks			Neglected Stocks (Without Pension Fund Holdings)			
	Panel A: Various Financial Proxies (Millions £-Denominated)						
[£-Millions]	Mean	Median	SD	Mean Stock	Median Stock	SD	T-Statistics For Mean Differences
L-T-D (£-Millions)	263.80	83.00	-	67.90	41.30	-	6.42*
Net Investment (£-Millions)	108.00	18.20	-	20.00	6.90	-	5.70*
EPS	0.41	0.12	-	0.09	0.08	-	1.94**
DIV	0.14	0.08	-	0.07	0.07	-	4.05*
FCFS	0.98	0.42	-	0.29	0.21	-	2.71*
Panel B: Select of Financial Ratios Proxying For Stock Financial Attributes Between The Sub-Portfolios							
[%]	Mean	Median		Mean	Median		
ROCE	13.64	12.32	20.25	12.47	10.91	25.50	1.07
ROSA	6.94	6.94	15.20	2.80	2.80	19.80	4.95*
ROTA	6.50	6.70	11.45	4.77	5.33	15.50	2.69*
DER	35.90	35.70	22.20	40.30	40.30	20.50	-4.32*
CFP	0.32	0.25	0.30	0.22	0.18	0.18	8.96*

5.5. **Results: Multivariate Analysis: Stock Characteristics and Fund Bias**

The above evidence is further confirmed by **Table 5.9**, which presents the correlation coefficients for 10 variables, size, debt, free cash flows, dividends, average investments, *EPS,* total assets, sales, the proportion of capital and number of funds per stock.

Table 5.9: **Correlation Between Financial Attributes of Strongly-Held Stocks: 1984-98**

The correlations are based on 826 stocks in which pension funds invest. PropCap is the proportion of capital owned per stock; NumFunds is the number of funds following a stock; ME is market capitalisation, L-T-D is Long-Term-Debt; DIV - dividends per share; Average Investment - average funds invested annually; EPS - earnings per share; TA - total book assets; FCF - free cash flow; while SA is turnover. For ease of computation, all figures are expressed per individual stock.

Correlation Coefficients of a Selection of Major Variables Used											
Variables		***A***	***B***	***C***	***D***	***E***	***F***	***G***	***H***	***I***	***J***
ME:	A	1									
L-T-D:	B	0.80	1								
FCF:	C	0.03	0.03	1							
DIV:	D	0.05	0.02	0.00	1						
Average Investment:	E	0.83	0.85	0.04	0.02	1					
EPS:	F	0.00	0.00	1.00	-0.01	0.00	1				
TA:	G	0.62	0.74	0.02	0.02	0.69	0.00	1			
SA:	H	0.80	0.67	0.05	0.01	0.88	0.01	0.46	1		
PropCap:	I	0.10	0.12	0.004	-0.01	0.09	0.01	0.12	0.09	1	
NumFunds:	J	0.86	0.65	0.02	0.04	0.64	0.00	0.63	0.55	0.28	1

Market equity and long-term debt (*L-T-D*) record significant coefficients for long-term debt, average investments, total assets, sales, proportion of capital and number of funds per stock, while insignificant for earnings based variables like free cash flow, dividends and *EPS;* free cash flow is significant on *EPS,* dividends and *EPS* is insignificant on all; average investments significant on total assets, sales, proportion of capital and number of funds per stock; total book assets – on sales, proportion of capital and number of funds per stock; sales on proportion of capital and number of funds per stock. As in Cooper and Kaplanis (1994, 1997), Coval and Moskowitz (1998) and Kang and Stulz (1997) this

indicates an economically significant correlation between size and investment bias. The proportion of capital held, and number of funds per stock, is significantly size biased whether expressed by equity capital, total book assets or sales. Fund following is also significantly correlated with long-term commitment to investment, and does not substitute, but compliments debt as shown by significant and positive coefficients, while earnings, free cash flow generation and dividend payment capabilities play no part at all.

5.5.1. **Debt, Free Cash Flows and Growth Opportunities.**

Earlier evidence indicates that each fund invested stock, in absolute £-terms, holds more long-term debt, (£170.3 v £35.2 and £263.8 v £67.9million) than stocks in which funds do not invest. Because of significant debt funding capacity, fund-invested stocks can optimise capital structure. However, because of the fund capital-debt substitution effect, and the fact that nominal £-values may not be reflective of the proportional content, this may not be the case. **Panels C** in **Table 5.5** and **Panel B** in **5.6** record the mean *DER,* median, standard deviation and t-statistics for the period 1984-98, and indicate that actually *DER* is higher for stocks in which funds do not disclose investments, with the difference in means significant at 1%. This is in line with Hessel and Norman (1992) and Hackel et al (1994), that investors prefer stocks with little debt and low risk of immediate default. Consistent with Jacobs and Levy (1989), stocks in which funds do not disclose investing are highly levered, maybe to fund the myriad of growth opportunities they face since they can not substitute debt for fund investment, or exploit growth opportunities through cash generated from operations without significantly affecting pay out levels.

The most desired position for a firm is large free cash flows, significant and consistent dividend payment with simultaneous exploitation of organic growth opportunities. High levels of free cash flow are important because they ensure significant dividend pay out without any effect to the market value of the firm (beyond free cash flow decrease). Free cash flows can also be used to repay debt or exploit new opportunities, which may yield additional free cash flow in the future and increase shareholder value. **Tables 5.5 Panels B** and **Tables 5.6 Panel A** typify the £-denominated mean, median and t-statistics for significance in differences of free cash flow, *EPS*, dividends and average investments for both sub-samples for the period 1984-98. For the whole sample period, evidence indicates that in nominal terms, the fund invested portfolio generates high free cash flows (£1.44 v £0.30), high *EPS* (£0.91 v £0.09), large dividends (£0.105 v £0.066) and invests large amounts (£104.9 v £16.4 million). The mean differences are significant at the 1% level for free cash flows, dividends and average investments, while 10% for *EPS*. **Panel C** in **Table 5.5** and **Panel B** in **5.6** record the financial ratios and indicates higher *NITA, DPR, DY* and sales growth ratios for stocks in which funds do not disclose investing, while higher cash flow yield, sales yield and *BEME* for fund invested stocks, with differences between the means being significant at 1% for *NITA, EP*, cash flow yield, sales growth and sales yield and 5% for *BEME,* while earnings yield is the same. The same phenomenon is recorded for the 1994-98 sub-period, which confirms the above evidence, but with more robust significance levels of 1% for mean differences. *NITA* and sales growth are higher, cash flow yield and sales yield lower for the stocks in which funds do not disclose investing, while *EP* and *BEME* are the same, with mean differences significant at 1% for cash flow yield, *EP,* sales growth, *NITA* and sales yield, while *BEME* is insignificant.

The high *NITA* and sales growth suggest that while the portfolio in which funds do not disclose investing undertakes lower levels of absolute £-denominated average investments, and generate lower sales revenues, it actually invests higher proportions of its free cash flow and experiences higher sales growth rates. This may suggest that because stocks in which funds do not disclose investing have higher growth prospects, they invest more but lack cash, which results in high *DER* for those with access to external finance. The high *DPR* also indicates that because of their inability to negotiate better financing deals, they keep investors happy by maintaining a high *DPR*, further overstretching themselves. On the other hand, fund invested stocks are more profitable, generate stable and high free cash flow, they are in more mature industries with limited growth opportunities, thus affording lower *DPR* with constant pay outs, lower *NITA* but the security of guaranteed returns. Management relies primarily on internal cash for exploiting growth, despite the stocks' apparently high creditworthiness and accessibility to low cost additional external funds. Therefore, it is reasonable to expect a lesser dividend for guaranteed, future constant pay out. On the surface, the *DPR* and *DY* results are striking, given that funds presence should ensure high *DPR* to optimise tax credits. The high *DPR* should also lead to lower *NITA*, but this seems to be the opposite. However, these results are consistent with previous ex-day studies and static clientele models suggesting that low tax-payers and tax exempt investors do not necessarily invest in high *DY* stocks.

5.5.2. **Performance, Stock Size and Fund Bias.**

Panels C in **Table 5.5** and **Panel B** in **5.6** present *ROE, ROCE, ROSA* and *ROTA* ratios and indicate fund invested portfolio out-performance, with differences significant at 10% for *ROCE* and *ROSA,* and at 1% for *ROE* and *ROTA.* **Panel D** in **Table 5.5** and **Panel C** in **5.6**

record the annual cumulative returns measure and indicate out-performance by fund-invested stocks, but at higher risk. Splitting the portfolio into large, medium and small-caps sub-portfolios indicates the same correlation, with mean differences significant at 1%. Focussing on the 1994-98 sub-sample period, fund-invested portfolio out performance is persistent. However, the *ROTA* and *ROSA* differences are significant at 1%, *ROE* at 1% while *ROCE* is insignificant. Furthermore, on average, fund-invested stocks generate higher returns at higher risk, while large-caps in which funds do not disclose investments generate high returns at lower risk, with the fund-invested medium and small-caps out-performing their counterparts. However, sample-wise (large, mid and small-cap segments) the differences in means are insignificant.

Additionally, as in Jacobs and Levy (1998 and 2000), we investigate which size segment of the fund invested portfolio out-performs, within which category of holding intensity and by which type of intensity proxy – number of funds or proportion of capital per stock. Such a split recognises that exploiting investment style and size-based portfolio nuances enhances performance, relative to indexing. That is, there are instances when it is better to invest in fund-invested small, mid, large-cap or some component of stocks in which funds do not disclose investing. The necessity of either employing two stock popularity proxies is that shareholding proportion is not a categorical indicator of stock popularity. This is because small-caps (e.g., NatWest Smaller Companies Fund at £84.8 million with 48.2% of capital held by 4 funds in 1997, and Throgmonton Preferred Fund at £51 million with 60.73% of capital held by 6 funds in 1998) can have large proportions of capital held by few funds, while large-caps (e.g., BPAmoco at £144 billion with 6.1% held by 209 funds; Shell at

£60.9 billion with 9.8% held by 169 funds in 1998) can have many funds only accounting for a cumulative minimal proportion of their capital. As such, to generate robust results, we also use the actual number of funds per stock, and moreover, the two different measures check the sensitivity of the results of different aspects of fund attention. **Panels D** in **Table 5.5** and **Panel C** in **5.6** above report the results of this analysis, for 1984-98 and 1994-98 sub-samples, and indicate, overall out-performance by fund-invested stocks, albeit at higher risk. **Panel B** gives a snapshot of the 1994-98 sub-period and confirms the above evidence, except for large-caps, which slightly under-perform by –0.02%. **Table 5.10, Panel A**, presents the size-split (measured by market capitalisation) annual cumulative returns of the two sub-samples for the period 1984-98.

Table 5.10: **Comparative Analysis of Intensely-Held and Non-Invested Stocks Returns**

Comparison of Cumulative Mean Monthly Returns Between the Whole Fund Invested Sample and Neglected Stocks: Standard Deviations in Parenthisis. C1 and C3 are Fund Invested Stock Returns, While C2 and C4 are Neglected Stock Returns. Analaysis is Undertaken for the Sample Period 1984-1998 and Sub-Sample Period 1994-98 For the Sample Mean, Large-Caps, Mid-Caps and Small-Caps Classifications For the Fund Invested and Neglected Stocks. Size Ranking Cut-offs are: Top 33.3% by Market Capitalisation Denotes Large-Caps, Mid-33.3% - Mid-Caps, While Bottom 33.3% Denotes Small-Caps

	Panel A: 1984-98 Period		**Panel B: 1994-98 Sub-Period**	
Variable	**Fund Invested Stocks** (C1)	**Neglected Stocks** (C2)	**Fund Invested Stocks** (C3)	**Neglected Stocks** (C4)
Sample Mean	0.89 (0.71)	0.61 (0.62)	0.18 (1.41)	0.15 (1.37)
Large-Caps	1.28 (0.60)	0.90 (0.55)	0.79 (1.31)	0.81 (1.22)
Medium-Caps	0.92 (0.59)	0.64 (0.53)	0.26 (1.22)	0.21 (1.14)
Small-Caps	0.48 (0.71)	0.29 (0.62)	-0.50 (1.40)	-0.56 (1.38)

While on average, sample-wise, large-caps out-perform all size splits, inclusive of the stocks in which funds do not disclose investment, the latter large and mid-caps out-perform fund-invested small-caps at lower risk. Thus, in hindsight, it would have been more rewarding to be in the large-or-mid-caps of stocks, in which funds do not disclose investment, than in fund invested small-caps. Focussing on the 1994-98 sub-period generates even more enlightening results. Sample-wise, fund-invested stocks outperform those in which funds do not disclose investment and the small-caps of both sub-samples. Thus, with hindsight, while it would have been beneficial to focus on the fund invested portfolio, it would have been more profitable to substitute this with the large and mid cap segments of stocks, in which funds do not disclose investment for the 1994-98 sample period. While this gives an indication, on average, about the comparative performance of the two sub-portfolios, it does not indicate performance levels by holding intensity-size category intersection and sample period. To counteract this problem, we analyse the two sub-portfolios by following, and capital holding intensity using the number of funds and the proportional holding per stock.

5.5.3. **Stock Popularity, Size and Fund Bias.**

In line with Bhushan, (1989), Arbel and Strebel (1983) and Brown et al (1987), in this section we rank stocks by size and following intensity measured by the number of funds, according to 3 shareholding intensity rankings of strongly-held, moderate and weak and 3 size rankings of large, medium and small-caps. Stocks held by between 1-10 funds are weakly held, 11-30 are moderate and 31-and above are strongly-held. As indicated, this should give the clearest picture about size-range performance by intensity ranking compared with the stocks in which funds do not disclose investment. **Table 5.11, Panel A,**

presents the annual cumulative returns of the two sub-samples expressed by the number of funds following a stock for the period 1984-98, split by size and following intensity. Sample-wise, fund invested stocks (0.89) outperform stocks in which funds do not disclose investment (0.61). Furthermore, fund invested strongly-held large-caps out-perform all segments at lower risk, while those in which funds do not disclose investment (0.61) and the mid-caps within this split, outperform fund invested small-caps and small-caps weakly-held at lower risk.

Table 5.11: **Size, Number of Funds Concentration and Intensely-Held Stocks**

Comparison of Cumulative Mean Monthly Returns Between the Whole Fund Invested Sample and Neglected Stocks: Fund Invested Stocks are Ranked by Size and Fund Following Intensity as Expressed by the Number of Funds Per Stock; Standard Deviations in Parenthisis. C1, C2, C3 & C4 are 1984-98 Sample Returns For The Small-Caps, Mid-Caps, Large-Caps and Sample Mean Returns, While C5, C6, C7 & C8 are 1994-98 Sample Means For The Small-Caps, Mid-Caps, Large-Caps and Sample Mean Returns, Analaysis is Undertaken for The Sample Mean, Strongly, Moderate, Weakly and Neglected Stocks. Following Intensity Cut-offs are 1-10 Funds Following Denotes Weakly Followed Stocks, 11-30 - Moderate, while 31-above is Strongly Followed. Size Ranking are: Top 33.3% by Market Capitalisation Denotes Large-Caps, Mid-33.3% - Mid-Caps, While Bottom 33.3% Denotes Small-Caps

	Panel A: 1984-98 Sample Period				**Panel B: 1994-98 Sub-Sample Period**			
Variable	**Small Caps** (C1)	**Medium Caps** (C2)	**Large Caps** (C3)	**Sample Mean** (C4)	**Small Caps** (C5)	**Medium Caps** (C6)	**Large Caps** (C7)	**Sample Mean** (C8)
Sample Mean	0.48 [0.71]	0.92 [0.59]	1.28 [0.60]	0.89 [0.71]	-0.50 [1.40]	0.26 [1.22]	0.79 [1.31]	0.18 [1.41]
Strongly-Held	1.17 [1.0]	1.29 [0.93]	1.77 [0.38]	1.41 [0.81]	0.28 [1.32]	1.61 [0.92]	1.97 [0.61]	1.29 [1.20]
Moderate	0.69 [0.61]	1.04 [0.53]	1.42 [0.50]	1.05 [0.62]	-0.17 [1.29]	0.48 [1.18]	0.99 [1.14]	0.43 [1.29]
Weak	0.39 [0.73]	0.74 [0.68]	1.13 [0.63]	0.75 [0.75]	-0.66 [1.52]	-0.09 [1.21]	0.62 [1.39]	-0.05 [1.47]
Neglected Stocks	0.29 [0.62]	0.64 [0.53]	0.90 [0.55]	0.61 [0.62]	-0.56 [1.38]	0.21 [1.14]	0.81 [1.22]	0.15 [1.37]

This means that while it is beneficial to invest in fund invested stocks, especially through large-caps, it is actually more rewarding to substitute fund invested small-caps, especially the moderate and weak categories with large and mid-cap segments of stocks (in which funds do not disclose investment for the sample period). More interestingly, large-caps within stocks, in which funds do not disclose investment, outperform the sample-wise fund invested stocks, due to underperformance by small-caps, small-cap moderate and weakly-held, mid-cap weakly held and sample-wise weakly held sectors. Thus, in hindsight, it is more rewarding to switch into the large-caps in which funds do not disclose investment. Focussing on the 1994-98 sub-period generates even more enlightening results. Sample-wise, fund invested stocks (0.18) outperform stocks in which funds do not disclose investment (0.15), fund invested large-caps (0.79) outperform all size ranges, fund invested large-caps strongly-held outperform all segments at lower risk, while large-caps in which funds do not disclose investment outperform fund invested weakly and moderately-held, save for large-caps, small-caps strongly-held and the individual sample-wise means for all size sectors of fund invested stocks. On the other hand, mid-caps in which funds do not disclose investment outperform the weakly-held sample mean, small and mid-cap weakly held, small-cap moderately held and the sample-wise small-caps.

Additionally, in line with, Falkenstein (1996), Hessel and Norman (1992) and Arbel et al (1983b), ranking stocks by size and following intensity, measured by the proportion of capital according to 3 intensity rankings of strong, moderate and weakly held, and 3 size rankings of large, mid small-caps. Stocks with between 0-15% of share capital held are weakly held, 16-29%-moderate and 30%-and above strongly held. The 30% shareholding

cut-off for the intensely held is used since it is an obligatory threshold in the UK for an investor to institute a merger-takeover. **Table 5.12, Panels A and B**, presents the monthly cumulative returns of stocks in which funds do not disclose investment, and fund invested stocks as expressed by proportion of capital for the period 1984-98, and sub-period 1994-98, split by size and shareholding intensity. **Table 5.12 Panel A** presents the results for the 1984-98 sample period. Sample-wise, fund invested stocks outperform (0.89) stocks in which funds do not disclose investment.

Table 5.12: **Stock Size, Shareholding Bias Intensity and Non-Invested Stocks**

Comparison of Cumulative Mean Monthly Returns Between the Whole Fund Invested Sample and Neglected Stocks: Fund Invested Stocks are Ranked by Size and Fund Following Intensity as Expressed by the Proportion of Capital Held Per Stock; Standard Deviations in Parenthisis. C1, C2, C3 & C4 are 1984-98 Sample Returns For The Small-Caps, Mid-Caps, Large-Caps and Sample Mean Returns, While C5, C6, C7 & C8 are 1994-98 Sample Means For The Small-Caps, Mid-Caps, Large-Caps and Sample Mean Returns, Analaysis is Undertaken for the Sample Mean, Strongly, Moderate, Weakly and Neglected Stocks. Holding Intensity Cut-offs are 0-15% Capital Held denotes Weakly Held Stocks, 16%-29% - Moderate, while above 29% is Strongly Held. Size Ranking Cut offs are: Top 33.3% by Market Capitalisation Denotes Large-Caps, Mid-33.3% - Mid-Caps, While Bottom 33.3% Denotes Small-Caps

	Panel A: 1994-98 Sample Period				**Panel B: 1994-98 Sub-Sample Period**			
Variable	**Small Caps** (C1)	**Medium Caps** (C2)	**Large Caps** (C3)	**Sample Mean** (C4)	**Small Caps** (C5)	**Medium Caps** (C6)	**Large Caps** (C7)	**Sample Mean** (C8)
Sample Mean	0.88 [0.73]	0.98 [0.49]	0.95 [0.52]	0.89 [0.71]	-0.50 [1.40]	0.26 [1.22]	0.79 [1.31]	0.18 [1.41]
Strongly-Held	0.60 [0.54]	1.06 [0.38]	1.24 [0.44]	0.95 [0.52]	-0.39 [1.25]	0.33 [1.04]	0.98 [0.82]	0.28 [1.16]
Moderate	0.82 [0.43]	0.96 [0.31]	1.18 [0.63]	0.98 [0.49]	0.01 [1.08]	0.37 [0.71]	0.57 [1.17]	0.32 [1.02]
Weak	0.46 [0.70]	0.91 [0.64]	1.28 [0.61]	0.88 [0.73]	-0.52 [1.43]	0.21 [1.26]	0.81 [1.33]	0.17 [1.45]
Neglected Stocks	0.29 [0.62]	0.64 [0.53]	0.90 [0.55]	0.61 [0.62]	-0.56 [1.38]	0.21 [1.14]	0.81 [1.22]	0.15 [1.37]

Sample-wise fund invested mid-caps by far out-perform other segments at the lowest risk, mid-caps weakly-held do exceptionally well, large-caps stocks in which funds do not disclose investment outperform the entire fund invested small-caps, sample-wise weakly-held and stocks in which funds do not disclose investment, and sample-wise fund invested stocks. **Panel B** presents the results of the annual cumulative returns analysed by size and intensity of holding for the 1994-98 sub-period. Sample-wide, fund invested stocks out-perform, especially so for mid-caps. However, when categorised by intensity of holding, while large-caps strongly held outperform all segments, mid-caps in which funds do not disclose investment and the sample-wide sector itself outperform fund invested small-caps, while large-caps outperform the small-caps, weak, moderately held, mid-caps and the large-caps sample wide fund invested stocks.

5.5.4. **Fund Bias: Robust Checks**

We carry out further robust checks within the fund-invested sub-sample, using fund following intensity, size and performance correlation, with the proportion of capital and number of funds as popularity intensity proxies. To characterise size we employ market capitalisation, for performance we use *ROCE, ROE* and returns, while for free cash flow, growth, dividends preference and related effects we use free cash flows, *EPS,* dividends, *DPR, DER, NITA* and sales growth, variables that have a significant explanatory power (Arbel et al (1983a, b), Bhushan (1989), Cooper and Kaplanis (1995), Falkenstein (1996), Barbee et al (1996), Barber and Lyon (1997), Hessel and Norman (1992) and Lang and Litzenberger (1989)) in stock popularity. To check for multi-collinearity, we use correlation coefficients, the results of which are reported in **Table 5.13**.

Table 5.13: **Correlation Coeffecients Between Variables and Holding Intensity**

The correlations are based on 826 stocks in which pension funds invest. PropCap is the proportion of capital owned per stock; NumFunds is the number of funds following a stock; ME is market capitalisation, DER - Debt-Equity-Ratio; DPR - dividend-payout-ratio; NITA - average funds divided by total book assets; FCF - free cash flow; SG - sales growth; ROE - return on equity while Ret are stock returns. For ease of computation, all figures are expressed per individual stock.

Correlation Coefficients of a Selection of Major Variables Used										
Variables Correlated	***A***	***B***	***C***	***D***	***E***	***F***	***G***	***H***	***I***	***J***
ME: A	1									
NumFunds: B	0.43	1								
PropCap: C	0.28	0.28	1							
FCF: D	0.05	0.02	0.004	1						
DPR: E	0.11	0.02	0.23	-0.11	1					
NITA: F	0.02	-0.09	0.01	-0.03	-0.12	1				
DER: G	0.41	0.11	0.04	0.01	0.01	0.09	1			
SG: H	-0.04	-0.05	-0.03	-0.04	-0.17	0.33	0.05	1		
ROE: I	0.13	0.15	-0.01	0.01	-0.19	0.07	0.05	0.24	1	
RET: J	0.21	0.19	0.10	-0.02	-0.08	0.02	0.00	0.19	0.49	1

There is a significant correlation between size and number of funds per stock, proportion of capital held per stock, *DPR, DER, ROCE* and returns. It is also apparent that the number of funds per stock is significantly and positively correlated with *DER,* the proportion of capital held, *ROE,* returns and negatively so with *NITA;* while the proportion of capital held per stock is significantly correlated with *DPR* and returns; free cash flow is negative and significant with *DPR*; while *DPR* is positive and significant with sales growth, *ROE* and returns, while negative and significant with *NITA.* On the other hand, *NITA* generates positive and significant coefficients for *DER* and sales growth, while sales growth is positive and significant on *ROE* and returns and returns are positive and significant on number of funds per stock, proportion of capital held, ROE, sales growth and stock size. This indicates fund preference for large-caps. Size is significantly correlated with *DPR,*

DER, ROE and returns. While *DPR, ROE* and returns implications can be understood, *DER* appears to be an anomaly. The number of funds variable indicates that of the strongly followed large-caps, funds prefer those with high *DER, ROE* and returns, and shun those investing large amounts, maybe trading future growth for current dividends. On the other hand, the proportion of capital held variable indicates bias for high *DPR* and return stocks.

Furthermore, **Table 5.14** below reports the results of the various cross sectional regressions for size, performance and stock popularity. Regression 1 **(R1)** typifies fund following proxied by the proportion of capital held per stock run on size, *DER,* free cash flows, *DPR, NITA,* sales growth, *ROE,* returns and number of funds per stock for the sample, while **R2** illustrates stock following proxied by the number of funds per stock run on the above variables (including the proportion of capital held per stock). The next test step divides the fund-invested sample into 6 broad fund concentration rankings **(FCR)** according to following intensity, either by proportion of capital held or number of funds per stock, with **FCR3 & 4** comprised of the most fund intensely held stocks and **FCR7 & 8** the least fund held stocks. While **FCR1, 3, 5** and **7** are the proportion of capital per stock regressions run on the above variables, inclusive of number of funds per stock for high, moderate, and weak fund following intensity expressed by the proportion of capital held per stock shareholding splits, **FCR2, 4, 6** and **8** are the same regressions but for the number of funds per stock. For the fund-invested stocks, classified by the proportion of capital held per stock, **(FCR1),** size, *DPR* and number of funds per stock generate positive and significant coefficients at 1%, while return is positive and significant at 10%. On the other hand, *DER*

is negative and significant at 10%, while free cash flows, *NITA*, sales growth and *ROE* are insignificant.

Table 5.14: **Shareholding Bias, Fund Following and Stock Performance**

Cross-Sectional Regression of Proportional Fund Holding Per Stock [FRC1, FRC3, FRC5 & FCR7] and Number of Funds Per Stock [FRC2, FRC4, FRC6 & FRC8] by Intensity of Following & Shareholding High, Moderate and Weak for The Intensely Held Stocks All Stocks are Included. t-values are in Parenthesis Below the Coefficients: Significant at 1%, [*], 5%, [**] and 10%, [***]

Variables	Whole Sample		High Intensity		Moderate Intensity		Weak Intensity	
	Proportion of Capital	Funds Per Stock	Proportion of Capital	Funds Per Stock	Proportion of Capital	Funds Per Stock	Proportion of Capital	Funds Per Stock
	[FRC1]	[FRC2]	[FRC3]	[FRC4]	[FRC5]	[FRC6]	[FRC7]	[FRC8]
Intercept	-18.26	-89.76	238.04	-317.16	8.25	-2.85	-6.12	-3.01
	[-5.39*]	[-9.55*]	[2.70*]	[-2.41**]	[0.42]	[-0.26]	[-5.31*]	[-2.47**]
ME	0.93	5.74	-17.54	17.54	0.70	0.98	0.39	0.27
	[4.64*]	[10.52*]	[-2.69*]	[2.38**]	[0.62]	[1.67***]	[5.83*]	[3.75*]
DER	-0.03	-0.07	1.77	-1.25	-0.15	-0.08	0.002	-0.004
	[-1.86***]	[-1.50]	[2.79*]	[-2.46**]	[-2.39**]	[-1.96**]	[0.41]	[-0.59]
FCF	0.01	-0.02	-4.54	3.64	-1.29	0.40	0.01	0.003
	[0.57]	[-0.36*]	[-0.66]	[1.10]	[-0.62]	[0.62]	[1.22]	[0.48]
DPR	0.10	-0.10	0.11	0.87	-0.01	0.03	0.01	-0.002
	[6.16*]	[-2.02**]	[0.92]	[1.49]	[-0.27]	[1.01]	[1.70***]	[-0.32]
NITA	0.06	-0.32	0.03	-1.78	0.05	-0.01	-0.002	0.01
	[1.52]	[-2.87*]	[0.08]	[-1.10]	[0.37]	[-0.10]	[-0.13]	[0.79]
SG	0.01	-0.10	5.41	0.84	0.17	-0.16	-0.01	0.002
	[0.29]	[-1.19]	[2.93*]	[0.58]	[0.55]	[-2.28**]	[-0.74]	[0.22]
ROE	-0.03	0.12	-1.28	2.14	0.21	0.19	-0.004	0.008
	[-1.60]	[2.21**]	[-1.60]	[2.74*]	[1.30]	[3.21*]	[-0.55]	[1.26]
RET	0.61	1.66	-0.84	-4.61	-3.09	-0.51	0.46	0.24
	[1.77***]	[1.69***]	[-0.19]	[-0.29]	[-1.88***]	[-0.49]	[3.96*]	[2.04**]
Proprtion of Capital Held	-	0.56	-	0.88	-	0.05	-	0.25
	-	[5.72*]	-	[0.79]	-	[1.16]	-	[16.18*]
Number of Fund per Stock	0.07	-	0.41	-	-0.01	-	0.04	-
	[5.72*]	-	[2.18*]	-	[-0.41]	-	[9.79*]	-
Adj R^2 [%]	16.10	23.30	25.20	27.70	9.40	14.80	27.40	32.30
F	17.40	28.85	1.90	2.96	1.64	2.40	32.20	38.2
P-Value of F	0.000	0.000	0.130	0.010	0.130	0.000	0.000	0.000

This implies that using the shareholding intensity as a measure of stock popularity mirrors the number of funds per stock, and is biased towards large-caps with high stock returns and high pay out ratio (while shunning risky stocks with high leverage) and this manifests in an economically significant way. However, free cash flow, *NITA,* sales growth and *ROE* are, at best, marginally important in explaining this bias. For the most intensely followed, classified by number of funds per stock, **(FCR2),** size and the proportion of capital held per stock are positive and significant coefficients at 1%, while *ROE* and returns are 5% and 10% respectively. On the other hand, *DPR* and *NITA* are negative and significant at 5% and 1% respectively, while *DER,* free cash flow and sales growth are insignificant. This confirms that the number of funds per stock mirrors shareholding intensity, and is biased towards large-caps with high stock returns and high *ROE*, while shunning high dividend pay out and high investment levels. However, *DER,* free cash flow and sales growth are, at best, marginally important in explaining fund stock bias. Thus, either classification indicates that funds prefer large-caps and high pay out ratio stocks with high returns. The number of funds per stock proxy exhibits itself in a high proportion of capital held per stock, and shuns illiquid stocks with high debt levels. Furthermore, the number of funds per stock indicates that, in addition to large-cap bias, funds also prefer high *ROE*, while spurning high *DPR* and *NITA* stocks.

For the most intensely followed segment, classified by the proportion of capital held per stock (**FRC3)** size is negative and significant at 1%, *DER* and sales growth are positive and significant at 1%, while the number of funds per stock is at 5% and other variables are insignificant. This means that funds hold high capital proportions of mid-and-small-caps,

with large sales oriented growth capital-starved stocks with high leverage ratios but shun large-caps. However, on one hand, at the outset, with the underlying principle about the conjuncture between size and the proportion of capital held per stock, it appears that shareholding intensity stands out clearly in small-caps, which are submerged by fund investment, rather than this explaining popularity. Small-cap financial stocks involved in fund management dominate this sub-sample leading to the observed bias. For the most intensely followed classified by number of funds per stock, **FRC4** size and *ROE* are positive and significant at 5% and 1% respectively, *DER* is negative and significant at 5%, while all other variables are insignificant. This is partially indicative of funds preferring large-caps with high *ROE* and low debt. For the moderately followed classified by the proportion of capital per stock, **FRC5,** *DER* and the number of funds per stock are negative and significant at 5% and 10% respectively, while other variables are insignificant. For the moderately followed classified by number of funds per stock, **FCR6,** size and *ROE* are positive and significant at 10% and 1%, while *DER* and sales growth are negative and significant at 5%, while all other variables are insignificant. This means that in the moderate segment the shareholding intensity falls with the number of funds per stock and *DER,* while by the number of funds per stock it indicates bias with size and *ROE*, falls with debt levels and growth, while other variables have a marginally important effect. For the least followed segment classified by the proportion of capital per stock, **FRC7,** size and returns are positive and significant at 1%, *DPR* at 10%, while all other coefficients are insignificant. This means that within the least followed segment, a large proportion of capital is held for large-caps with high pay out ratios and returns, while other variables have a marginally important effect. For the least followed segment classified by the number of

funds per stock, **FRC8,** size and the proportion of capital per stock are positive and significant at 1%, returns at 5%, while others insignificant. Thus, within the least followed segment, large fund numbers are mirrored by shareholding intensity, and this epitomises itself well for large-caps with high stock returns, while other variables have a marginally important effect. This evidence is partly in line with the Levis (1988) findings in the UK, that the size effect on the LSE is unrelated to institutional acquisitions or dispositions, but that institutional trading follows, rather than leads, market behaviour.

To check the robustness of the above results we run regressions on size as proxied by total book assets, then *ROCE, EPS,* dividends, *ROTA* and either the number of funds or the proportion of capital per stock and report the results in **Table 5.15** below. For fund-invested stocks, classified by the proportion of capital held per stock, **FRC3, FCR1,** total book assets and the number of funds per stock generate positive and significant coefficients at 1%, *ROCE* is negative and significant at 5%, while other variables are insignificant. For the fund-invested stocks, classified by the number of funds per stock, **FCR2** indicates positive and significant coefficients for total book assets, *ROCE* and the proportion of capital held per stock at 1%, while other coefficients are insignificant. This implies that while the proportion of capital and number of funds per stock mirror each other in each classification, using the proportion of capital held per stock as a measure of fund following, indicates that funds hold large stakes in stocks with large total book assets, shun high *ROCE* stocks, while the number of funds significantly increases with the proportion of capital held, total book assets and *ROCE.* While for the most intensely followed, classified by the proportion of capital held per stock, **FRC3,** total book assets and *ROTA* are positive

and significant at 5%, *EPS* negative and significant at 1%, while other variables return insignificant coefficients.

Table 5.15 **Shareholding Bias, Fund Following and Stock Performance: Robustness**

Cross-Sectional Regression of Proportional Fund Holding Per Stock [FRC1, FRC3, FRC5 & FCR7] and Number of Funds Per Stock [FRC2, FRC4, FRC6 & FRC8] by Intensity of Following & Shareholding High, Moderate and Weak for The Intensely Held Stocks All Stocks are Included. t-values are in Parenthesis Below the Coefficients: Significant at 1%, [*], 5%, [**] and 10%, [***]

Variables	Whole Sample		High Intensity		Moderate Intensity		Weak Intensity	
	Proportion of Capital [FRC1]	Funds Per Stock [FRC2]	Proportion of Capital [FRC3]	Funds Per Stock [FRC4]	Proportion of Capital [FRC5]	Funds Per Stock [FRC6]	Proportion of Capital [FRC7]	Funds Per Stock [FRC8]
Intercept	-13.97	-104.76	-75.49	-323.00	37.60	-19.50	-8.14	-6.11
	[-4.77*]	[-14.51*]	[-1.57]	[-3.04*]	[2.77*]	[-2.07**]	[-8.49*]	[-5.82*]
TA	0.95	5.62	5.55	14.81	-1.05	1.47	0.52	0.42
	[6.14*]	[14.73*]	[2.16**]	[3.16*]	[-1.59]	[3.40*]	[10.30*]	[7.51*]
ROCE	-0.08	0.23	-0.58	0.68	0.16	-0.05	-0.020	0.001
	[-2.45**]	[2.65*]	[-1.03]	[0.87]	[0.92]	[-0.59]	[-1.70***]	[0.12]
EPS	-0.002	-0.03	-28.78	-13.63	2.34	-1.22	0.004	0.001
	[-0.13]	[-0.71]	[-3.74*]	[-0.77]	[1.04]	[-0.87]	[0.74]	[0.16]
DIV	-0.45	-0.41	-41.83	191.03	2.30	-0.12	-0.05	0.280
	[-0.57]	[-0.19]	[-1.15]	[2.04**]	[0.19]	[-0.10]	[-0.20]	[0.99]
ROTA	0.06	-0.23	3.62	2.26	-0.52	0.49	0.030	0.02
	[1.04]	[-1.41]	[2.28**]	[1.27]	[-1.20]	[2.36**]	[1.50]	[1.03]
Proprtion of Capital Held	-	0.43	-	0.69	-	0.14	-	0.24
	-	[4.57*]	-	[0.63]	-	[2.77*]	-	[16.04*]
Number of Fund per Stock	0.06	-	0.04	-	-0.01	-	0.04	-
	(4.57*]	-	[0.26]	-	[-0.02]	-	[8.29*]	-
Adj R^2 [%]	12.20	28.50	31.30	27.60	0.00	17.90	30.50	35.70
F	20.15	55.85	2.83	3.92	1.00	3.73	55.23	65.82
P-Value of F	0.000	0.000	0.040	0.004	0.440	0.003	0.000	0.000

For the most intensely followed, classified by number of funds per stock, **FRC4** total book assets and dividends are positive and significant at 5% and 1% respectively, while others

are insignificant. This means that the proportion of capital per stock rises with total book assets and *ROTA*, it decreases with *EPS,* while the number of funds also increases with total book assets, but falls with dividends, while other variables are marginally important. For the moderately followed, classified by the proportion of capital per stock, **FRC5,** all variables are insignificant, while for the most moderately followed classified by number of funds per stock, **FCR6,** total book assets and the number of funds per stock are positive and significant at 1%, while *ROTA* is at 5%, while other variables are insignificant. This indicates that book assets, *ROCE, EPS*, dividends, *ROTA* and number of funds per stock possess a marginally important effect on the proportion of capital held per stock in the moderate segment, while the number of funds per stock rises with book assets, *ROTA* and the proportion of capital per stock. For the least followed segment, classified by the proportion of capital per stock, **FRC7,** total book assets and number of funds per stock are positive and significant at 1%, *ROCE* is negative and significant at 5%, while other variables are insignificant. For the least followed segment, classified by the number of funds per stock, **FRC8,** total book assets, the number of funds per stock and size are positive and significant at 1%, while other variables are insignificant. Thus, while the proportion of capital and number of funds per stock mirror each other, funds invest less of their assets in high *ROCE* stocks.

5.6. **Conclusions**

This chapter has indicated that while fund invested stocks are large-cap biased, there is a presence of mid-and-small-caps as well, especially those involved in financial services. The chapter also indicates growth and return generation capability, variability between the stocks in which funds do not indicate investment and the fund-invested stocks. It also highlights that, while the fund-invested stocks are predominantly large-caps, stocks in which funds do not indicate investment also contain large-caps, though dominated by small-caps. The chapter further indicates that there are significant differences between the financial variables of the two samples, but an absence of sample period higher returns for small-caps, or stocks in which funds do not indicate investment as suggested elsewhere. However, stocks in which funds do not indicate investment do, at times, outperform some levels of intensity of holding and size segments, have higher growth, investment and pay out ratios. While intense following induces premiums and lowers returns, stocks in which funds do not indicate investment are treated with lower confidence, but risk levels between the two are insignificant, or actually higher for the intensely held stocks. In such circumstances, an opportunity exists for funds to benefit from the higher return on stocks in which they do not indicate investment by trading levels of confidence for higher returns. If the market for information is efficient, the implied cost of lower degrees of confidence will be fully offset by the discount implicit in the lower price (higher return). If not, there are opportunities for abnormal returns on gathering higher quality information.

CHAPTER 6

"CONCLUSIONS, IMPLICATIONS AND SUGGESTIONS FOR FURTHER RESEARCH"

CHAPTER 6: CONCLUSIONS, IMPLICATIONS AND SUGGESTIONS FOR FURTHER RESEARCH

6.1. The UK Pension Fund Structure

The UK privately funded pension fund system has grown immensely to one of the largest in the world, mainly because of the favourable tax advantages and contracting-out following the Beveridge Report. Funds are a very important component of the UK equity system, with 70% of their assets invested in equity (of which about 55% is in domestic equity), and by 1993 were holding well over 34% of the UK listed equity, ignoring indirect holdings.

6.2. The Research in This Field

Asset allocation deals with how investors invest their funds. This issue, while at the heart of investment, has not been comprehensively considered for the UK fund experiment, with piecemeal and rather superficial studies by WM (1997), NAPF (1997), PDFM (1997, 1998), Blake et al (1998a,b & 1999) and Minns (1980) bringing illuminating but rather sketchy results. In particular these studies record home asset, equity and large-cap bias, but are limited in scope. The UK fund sector represents a unique contextual scenario to test for the existence of these biases, with a more robust database populated with many funds; large and small and over a longer time series. Furthermore, while we have evidence of home and large-cap bias, we lack evidence on the financial characteristics (Hessel and Norman (1992) and Cleary (2000)) of stocks in which funds invest in the UK. In a bid to address this, I answer the following fundamental questions: In which markets do UK pension funds invest? In which assets do they concentrate? Which asset management structure dominates UK fund investment? In which stocks do they invest? The main findings and fundamental conclusions from the research are summarized as follows.

6.3. **Main Research Findings and Conclusions**

Various fund portfolios are constructed by desegregating portfolios by assets and markets, using a variant of the Blake (1995), Blake et al (1998, 1999), Griffin (1999) and Coval and Moskowitz (1996) asset classification and home bias method. Evidence indicates a statistically significant fund portfolio and management structure bias phenomenon, and sheds light on the debate of the existence of home asset bias, and whether this is subsumed by home equity bias. The UK portfolio component dominates the aggregate portfolio, UK equity dominates all individual assets, and all individual UK assets dominate their foreign counterparts over the sample period. Furthermore, UK bond shift, fund size bias for trusts and large-cap bias are recorded. By management structure, external, multi-asset-manager and part-balanced-part-specialist structures dominate, confirming the latest US studies. By asset allocation self-insured is the most UK biased, followed by in-house and external (79.3%in) and specialist structure (77.5%). In all cases this is driven by UK equity. There are strong intra-style correlations between all UK assets and fund size, except trusts. Time series analysis indicates the slackening of UK asset bias, with a slight but significant shift into UK bonds, while foreign equities also benefit. A challenging research question is why such high levels of UK asset bias, and in what type of stocks do funds concentrate, bearing in mind the proportion of the UK equity market within the World Market Equity portfolio? Is it because of the performance or sentimentality for local stocks? We investigate the financial characteristics of stocks in which funds invest, and those they do not disclose investing in, and test the correlation between size, intensity of holding and performance. Classifying shareholding and following intensity by the proportion of capital held per stock and the number of funds following a stock (Bhushan (1988) and Arbel et al (1983b)), we

find that holding intensity is strongly and positively correlated with size, while it is negatively correlated with dividend, sales growth and *DER,* indicating that funds invest more in large stocks and shun high growth stocks with high levels of debt. Whilst, in line with Minns (1980), our results indicate significant levels of large-cap bias, the intensely held portfolio is also populated by a significant number of small-caps as well, especially within the financial sector, while stocks in which funds do not disclose investing in are also populated by large, medium as well as small-caps.

Additionally, fund invested stocks significantly out-perform stocks in which funds do not disclose investing, although at higher risk levels. Furthermore, consistent with Porteba and Summers (1984), this sub-sample generates high levels of dividend pay out. Stocks in which funds do not disclose investing also record high leverage, investment and sales growth multiples. This indicates a quandary that stocks in which funds do not disclose investing find themselves in, trying to keep shareholders happy through high dividend levels, and optimising the exploitation growth opportunities face with limited capital. To investigate performance levels, we rank stocks, as per Arbel et al (1983b) method, on the proportion of capital held and number of funds per stock. While the fund invested portfolio outperforms, this is concentrated in large-caps, and there are times when funds could optimise returns by holding either the sample-wide stocks, in which funds do not disclose investing, or their large-caps, instead of the small weakly held stocks within the intensely held portfolio. This has important implications in asset allocation strategies. This evidence indicates moments when some size segment of the stocks in which funds do not disclose

investing outperform some segment of the fund invested stocks, indicating that style rotation can be employed to enhance performance.

6.4. **Limitations of the Thesis and Suggestions for Further Research**

Of course this research does not fill all the gaps in asset allocation. Since the main conclusions of this thesis rely on empirical findings, there are some important limitations in the research design and method that need emphasis. Furthermore, the thesis has identified as many research questions, and areas for further research, as it has sought to address. Firstly, since there is no accepted portfolio disentanglement method, we experiment with the ideal of treating managed funds, trusts, cash, derivatives, venture capital and works of art as part of the UK sub-portfolio. Also, classification problems are encountered where some funds lump these under the "Other" asset. While, this is how they are treated elsewhere, a counterargument can be that investors are likely to use funds to gain access into the unfamiliar small-cap or foreign markets. Furthermore, trusts and managed funds are treated as part of the UK portfolio, as their influence to sway results is insignificant. However, a more sophisticated approach, that utilizes a straightjacket model classification of these asset categories, could give a more precise result. The results further indicate the existence of further management structures in line with previous US evidence. However, the evaluation of this is cumbersome and done indirectly, resulting in time loss as the data is collected by hand. This is further complicated by the very nature of the asset management industry, which is fraught with secrecy and confidentiality. It would be helpful only if a standardized method is used to publish these. Chapter 5 examines whether the financial characteristics of stocks in which funds do not disclose investing and fund-invested stocks are significantly and economically different. The analysis done is however,

with the proviso of employing a longer time series of 1984-1998 on the assumption that funds have been investing in stocks identified in the 1997-98 sub-sample since 1984. While this is the most robust way of addressing data availability problems, it could be better if the asset management sector can change its ways and publish some of this non-essential data. Another important issue is related to the impact of the intensity classification method. There is no hard and fast rule to characterize shareholding intensity within the UK experiment. Even US studies, Falkenstein (1996), Arbel and Strebel (1983), Arbel et al (1983), Hessel and Norman (1992) and Bhushan (1988) vary their intensity characterization from proportion of capital held, analyst following to newspaper stories. This study employs the number of funds following a stock and the proportion of capital held. While these methods generate robust results, they are defective. The number of funds following a stock is supposed to indicate the popularity of a stock, and this is supposed to reflect itself in the proportion of capital held. However, because of large-cap bias, the highest number of funds within a stock exists within BPAmoco (the largest stock) but only account for about 9% of capital, while a £51 million Throgmonton Preferred Fund boasts of 61% proportion of capital held by funds. This may result in a slightly distorted interpretation of results. A clear-cut definition of the approach to characterize holding intensity thus needs to be identified.

Furthermore, we indicated that the anomaly results have been found to be conflicting most of the time, due to a failure to disentangle them. Only a joint study of return effects in a unified framework can distinguish between real effects and illusory ones. This is because, while all anomaly measures may be somewhat correlated, they may all have independent

predictive powers. This is because many forces affect stock returns; some of them like the size and neglect may be correlated, so that considering only a few produces highly misleading results. For example, a low-*PE* strategy is by nature biased unintentionally towards certain related attributes, such as higher yield, and show heavy representation in certain industries such as utilities. Quintiling procedures tend to consider only one variable at a time, while assuming that related effects do not matter at all, leading to contamination and naïve returns. Pure returns that arise from disentangling the effects eliminate such proxying problems. The unique insight from modelling return effects individually is that it provides a greater explanatory power. Additionally, pure returns are more predictable than their naïve counterparts, because they are immune to proxying contamination. For example, naïve returns to the low-*PE* effect are buffeted by many extraneous forces, including, oil price shocks, while pure returns are immunised from such incidental forces. Last, but not least, the results might be period specific. It would be interesting to observe how these findings change (if they do) if a longer time series is analysed, all funds within the *PFTA* publish portfolios and *NAPF-Member List* records all the stocks they invest in over a much longer time series. This and all the above issues constitute important directions for further research, and may help us to gain an insight into some aspects of fund management and excessive home asset and equity investment.