IPF Investment Property Forum

INVESTMENT PROPERTY FORUM Educational Trust

Asset Allocation in the Modern World

A report to the Investment Property Forum

A report to the Investment Property Forum

June 2007

ASSET ALLOCATION IN THE MODERN WORLD

Research Findings

June 2007

The IPF Educational Trust and IPF Joint Research Programme

This research was commissioned and funded under the auspices of the IPF Educational Trust and IPF Joint Research Programme.

The three-year programme supports the IPF's wider goals of enhancing the knowledge, understanding and efficiency of property as an investment class. The initiative provides the UK property investment market with the ability to deliver substantial, objective, and high quality analysis on a structured basis. It will enable the whole industry to engage with the other financial markets, wider business community and government on a range of complementary issues.

The programme is funded by a cross-section of 16 businesses, representing key market participants. The IPF Educational Trust and the IPF gratefully acknowledge the contributing organisations:

Capital & Regional • Donaldsons • Grosvenor • GVA Grimley • Investment Property Databank • KPMG • LaSalle Investment Management • Land Securities • Lovells • Morley Fund Management • Nabarro Nathanson • Prudential Property Investment Managers • Quintain Estates & Development • Scottish Widows Investment Partnership • SJ Berwin and Strutt & Parker.

Research Team

Shaun A. Bond, *University of Cambridge, and University of Queensland*
Soosung Hwang, *City University*
Paul Mitchell, *Paul Mitchell Real Estate Consultancy*
Stephen E. Satchell, *University of Cambridge*

The Project Steering Group

The IPF, appointed a project steering group to guide and assist the Research team. They gratefully acknowledges the contribution from:

Nick Tyrrell	*JP Morgan*
Robin Goodchild	*LaSalle Investment Managers*
Peter Pieria Grey	*The Wellcome Trust*
Malcolm Frodsham	*Investment Property Databank*

EXECUTIVE SUMMARY

This report examines the role of alternative assets in an investment portfolio of an institutional investor. It specifically addresses the question of whether the expected shift towards alternative asset classes is likely to come at the expense of funds allocated to commercial real estate. The key findings of the report were derived from interviews with institutional investors and investment consultancies, and a quantitative analysis of historical data series. In terms of the current approach to investing in alternative assets, the survey found the following:

- Overall, institutional exposures to alternatives are low at 2–3% compared to around 10% in property. However, investment in alternatives is not widespread (limited to about two-fifths of pension funds) and funds that do invest typically have exposures of around 4–5%; of those investing, only one in 20 have exposures over 10%.
- Exposure to property is generally higher and more widespread. Sixty per cent of pension funds invest in property, most have exposures over 5% and a third of those invested have allocations of 10% or more. There is no evidence that allocations have been undermined by the shift to alternatives. However, overall exposures to alternatives look set to double over the next few years.
- Traditionally, private equity was the most likely form of alternative investment but is now closely matched by hedge funds. Commodities are of lesser, more selective interest, with overall exposures at negligible levels. Infrastructure has not featured significantly but is now emerging rapidly. High-yield and emerging market bonds, CMBS etc typically are not part of alternative allocations but feature as an optional tactical tool for bond investing.
- Increased institutional exposures to alternatives appear to have been financed from lower allocations to domestic equities. This has also been the case among the more aggressive and long term types investor (eg some charities and endowments) who have accumulated substantial (more than 30%) allocations to alternatives.

When asked why investors are considering a move away from mainstream investment classes, the alternatives were believed to have three key attractions; particularly in comparison to equities.

- First, the potential to identify and tap into relatively high fund manager alpha (excess return lowly correlated with market performance). Investors are particularly bullish about the potential hedge funds offer in this respect.
- Related to this is the existence of a premium return on account of illiquidity. This is one of two characteristics which most of the alternatives are perceived to share with property.
- The third attraction, also characteristic of property, is alternatives' perceived diversifying appeal. However, our empirical analysis found little evidence of this and if it applies at all, it is with commodities.

In terms of future expectations of the investment strategists and consultants, the survey revealed that:

- Property is still perceived by investors and consultants to have attractive diversifying potential and this positions it well in relation to the alternatives and the mainstream asset classes. The rapidly emerging infrastructure sector, however, has some characteristics which align it more with property and which could represent a greater challenge in the future.

From the statistical investigation, it is demonstrated that property is clearly the best hedging instrument among the alternatives considered in the context of institutional investment. The following key points are also noted about historical performance measures and interrelationships among the asset classes:

- The risk-adjusted performance of the asset classes under consideration differed dramatically over the sample period. Private equity and infrastructure had high returns but also high levels of risk. Real estate was shown to have attractive risk and return characteristics for a UK institutional investor.

EXECUTIVE SUMMARY

- An analysis of the correlation coefficients between asset classes showed that UK equities are highly correlated with overseas equities, hedge funds and private equity. Gilts, index-linked bonds, corporate bonds and overseas government bonds also show high levels of correlation. Real estate and commodities have lower correlations with the other asset classes.
- The volatility of our chosen benchmark portfolio (global minimum variance portfolio) can be reduced substantially by including real estate in the asset mix (4.61% compared to 5.50%). Using smoothed IPD index returns could reduce the standard deviation even more but the effect is likely to be a statistical artefact arising because of the valuation smoothing problem.

In terms of the question about whether alternative assets could replace real estate, we investigated whether a similar reduction in risk to that described by adding real estate to a mixed-asset portfolio could be achieved by using alternative assets? It is noted that:

- In no case does adding one of the alternative assets to the core asset mix achieve a significant level of risk reduction.
- If real estate is not already included in the portfolio, the greatest risk reduction occurs when hedge funds are included in the portfolio (though this is small compared to that obtained from including real estate). Including infrastructure or private equity to the core asset group results in no risk reduction.

CONTENTS

CONTENTS

1. INTRODUCTION

This research project, supported by the IPF Education Trust, seeks to help fill a gap in the academic and practitioner literature. It comes at a time when traditional views on asset sectors are increasingly seen as being out of date, yet limited information exists on alternative investment structures. Since the collapse of equity markets at the beginning of the century, asset classes outside the mainstream of equities, bonds and money market instruments have attracted widespread attention. However, many questions remain about the suitability of benchmark indices and, even more importantly, about the measurement of risk and correlation with the traditional asset classes. This report is aimed at helping portfolio managers and investment strategists to deal with the expanded investment opportunity set that is now available, particularly with regard to advice on data sources and index benchmarks.

A key question that underlies this research project is whether real estate will continue to have a place in a mixed-asset portfolio, when institutional investors can select from a range of investments outside the core asset classes of bonds and equities. It is often stated that hedge funds, private equity and commodities all offer the benefit of portfolio diversification due to a low correlation with equities. This diversification potential is often used to argue for the inclusion of real estate in a portfolio, hence, if these benefits can be obtained in another way, with the added benefit of liquidity and lower transaction costs, does it imply that real estate allocations will fall? In this report we investigate in detail the risk and return characteristics of real estate and a selection of alternative assets, the benefits that arise from diversification and role of these assets in an institutional investor's portfolio.

A feature of differentiation of this report is that we examine both the historical (ex post) investment characteristics of the core and alternative asset classes for a UK based institutional investor as well as investment strategists' expectations (ex ante) of performance and risk of these asset classes. Many studies limit their research to either an ex ante or ex post perspective, whereas we are interested in examining both sets of information to gain an understanding of the role of alternative asset classes in the traditional mixed asset portfolios. Hence our methodology consists of both statistical analysis of historical asset returns and interviews with key investment decision makers working with institutional investment groups. This report does not consider the expectations or decision making process of retail investors or small investment groups, as such issues have been dealt with in previous research by the IPF[1].

In this report we refer to core asset classes as the traditional investment sectors favoured by large institutional investors. In this regard we include equities (domestic and foreign), corporate bonds, gilts (including index linked), commercial real estate and UK treasury bills as core asset segments. In addition to this we are interested in the role of alternative asset classes in a mixed-asset portfolio. The term alternative reflects the fact that while many of these assets segments have attracted the attention of some institutional investors for a long time, they have not traditionally been considered as an essential component of the asset mix. For alternative assets we include private equity, hedge funds, infrastructure and commodity funds. We do not consider investment in art, wine, or forestry as we do not believe such collections of assets are under serious consideration by large segments of the institutional investment community, and there are not readily available plausible time series returns that we can use for analysis[2].

[1] See the report *Opening the Door to Property,* jointly published by the IPF, BPF and RICS in September 2004.

[2] This is not to say that some institutional investors do not hold these assets or that they necessarily lack investment merit.

1. INTRODUCTION

A key difficulty with this analysis is obtaining a data set of sufficient integrity and historical coverage to accurately reflect the performance of each asset segment. This is particularly the case for the alternative asset segments. To some extent we have had to make decisions on using data series for which there may not be universal agreement on the appropriateness of that data in representing the performance of a specific asset segment. This is the limitation of any applied research project. However, because we supplement this ex post analysis with interviews to gauge investors' expectations of performance for these asset classes, this is not the limitation that it may at first appear. We do find that there is a degree of compatibility between the historical data analysis and the expectations of market participants which gives confidence in the overall findings of this report.

A second difficulty faced in this report is to what extent an 'optimal portfolio' can be identified for the purposes of this project. Institutional investors will have very different investment objectives, for example, compare the investment objectives of a large life fund with a small occupational pension fund with immature liabilities. Many investors seek to develop an optimal portfolio for a specific set of future liabilities rather than optimise against some measure of risk in a single period setting. Alternatively investors may define risk broadly to include consideration of higher moments (such as skewness or kurtosis) or downside risk measures. As it would be a difficult exercise to consider all possible investment objectives we choose to place the application of the results of the data analysis in this report in the context of a mean-variance approach. In particular, we consider the global minimum portfolio; this has the important and attractive property that it is free from any assumptions about asset class returns. As a result, it is the natural metric to consider when assessing the relative merits of different asset classes as potential diversifiers. This will not represent the portfolio held by the industry. Unsurprisingly, they will differ because of differing beliefs about expected returns.

While necessarily accepting that the mean-variance model may not reflect the approach to investment by all of those reading this report, it does provide a benchmark model which is widely applied both in industry and in academic research. It is generally well understood and the limitations of the model are widely known. We also do not focus extensively on the issue of illiquidity in this report. It is recognised that this may be an important factor in investment decision making and is particularly relevant to asset classes such as commercial real estate. However it is beyond the scope of this report to provide detailed investigation of this topic[3].

The next section of the report provides a literature review on the key academic articles devoted to this topic. Section 3 outlines the data series available on each asset class and provides some discussion of the relative merits of the series chosen for analysis. The results of interviews conducted with investment strategists in the UK are given in Section 4. Historical returns for the assets segments are analysed in Section 5 and use is made of this information to analyse how portfolio risk and return changes as different assets enter a portfolio. A conclusion follows in Section 6.

[3] Those readers interested in this topic are referred to the report published by the IPF on liquidity risk in commercial real estate markets for a more detailed discussion.

2. LITERATURE REVIEW

2.1 Introduction

This section (along with Section 3) provides a selective review of relevant academic literature on the topic of the role of alternative assets in a mixed-asset portfolio. Given the extensive work on optimal portfolio allocation it is surprising that very little of this research considers optimal allocations for the full range of asset classes under consideration by the typical institutional investor. Asset allocation across a broad range of assets is discussed first and then a discussion specifically related to real estate is provided.

2.2 Asset allocation – recent theoretical developments

Extensive research has been conducted on multiperiod allocation between equities and bonds by, inter alia, Brennan, Schwartz and Lagnado (1997), Campbell, Chan and Viceira (2003), Campbell and Viceira (1999, 2002, 2005). In part the focus on a small number of assets by researchers interested in multi-period asset allocation arises because of the numerical complexity of obtaining solutions to these problems when faced with many asset classes. Solutions to such models are also highly dependent on the degree of predictability of asset returns and the level of risk aversion assumed for the representative investor.

Hoevenaars et al (2005) is of particular relevance to this project as it seeks to follow the work of Campbell and Viceira (2002, 2005) and extend it to consider a wider range of asset classes (including hedge funds, commodities and real estate). They also consider an asset-liability matching strategy in addition to focusing on an asset only portfolio. Interestingly optimal asset allocations do not change significantly between the asset-liability portfolio and the asset only portfolio. They find alternative assets (such as commodities and hedge funds) have an important role in the optimal portfolio for investors over both short and long horizons. Real estate seems less important in their optimal models, although their study is limited to only considering investment in listed real estate.

Another study which considers a full range of asset classes from an institutional investor's perspective is by Terhaar, Staub and Singer (2003). This study considers a similar set of assets as the present research project, however, the methodology is based on simulations of asset returns after identifying common factors in the data. The data used is also orientated to a US investor rather than a UK investor as in the present study. These authors recommend a weighting of around 10% to alternative asset (private equity, hedge funds and commodities), 10% in real estate and the remainder in global equities and global bonds (52% and 28% respectively).

2.3 Real estate in a mixed-asset portfolio.

There has been a great deal of interest in the role of commercial real estate in a mixed-asset portfolio in the academic literature. Excellent summaries of this research area are available in Sirmans and Worzala (2003) and Worzala and Sirmans (2003) covering both direct real estate investment and indirect real estate investment in an international context. The findings of these studies tend to be different depending on whether the study has considered direct investment or investment in real estate securities. However, even within these sub-areas the evidence is not clear cut. For instance, in recent work Bond and Glascock (2006) find that European real estate securities do offer some diversification potential when included in a portfolio containing equities, bonds and cash. This research highlights the diversification potential of real estate securities in times when equity markets show low performance levels. Similar findings have also been reached by Knight, Lizieri and Satchell (2005) using a different methodological approach.

Other recent UK studies include Hoesli et al (2002) and Adair et al (2006). The later study includes further discussion of the form of real estate investment vehicle (eg direct, listed or unlisted) and the impact this has on portfolio allocations. They found good diversification potential for low and medium risk investors, though the greatest benefits were for direct property investment. When listed real estate companies were used to gain exposure to the asset class, allocations to real estate tended to fall and were significantly lower than when other real estate investment vehicles had been used. Giliberto et al (1999) provide an interesting example of using regime models to estimate mean and variances for portfolio allocation (including real estate). While their results for the UK are less convincing than for the US market, they argue that in the case of estimating means and variances, regime models may have some benefits for investors.

2.3.1 Treatment of data – the issue of smoothing

One common problem faced by any study on this topic is how to deal with problems inherent in the data series chosen. In addition to some of the concerns outlined in the introduction (and also discussed below in Section 3), a particular issue covered in this paper is the treatment of appraisal-based real estate returns. There are a large number of academic studies dealing with the issue of appraisal smoothing. This work is often motivated by the apparent low historical volatility relative to mean returns on benchmark indices such as NCREIF in the US or the IPD Index in the UK. This smoothness looks particularly evident when the mean return to standard deviation ratio for real estate is compared to other asset classes such as equities or bonds. The academic argument for the presence of smoothing in individual asset returns is based on the work of Quan and Quigley (1991). However, empirical approaches to unsmoothing aggregate or benchmark real estate indices had previously been suggested by Blundell and Ward (1987), Geltner (1989) and Ross and Zissler (1991). Extensive summaries of the smoothing literature can be found in Geltner and Miller (2001) and Geltner, MacGregor and Schwann (2003), to which the interested reader is referred for a detailed background to the smoothing debate.

In this study we use the approach of Bond and Hwang (2003, 2007), and Bond, Hwang and Marcato (2006) to unsmooth the appraisal-based real estate returns. This line of research contends that traditional approaches to unsmoothing real estate data deal only with the persistence in the aggregate performance index (often mistakenly labeled as smoothing) and ignore other potential problems with the time series (nonsynchronous appraisal and aggregation). Using an Autorgressive Fractional Integrated Moving Average (ARFIMA)[4] representation of index returns, Bond, Hwang and Marcato find that the level of smoothing in real estate returns is significantly lower than found in many other studies. However, the high level of persistence at the aggregate level appears to be the result of a highly persistent common factor in the return of individual commercial property assets. It is not applied in this study, but the research of Bond, Hwang and Marcato may also have relevance for the treatment of autocorrelation in some performance indices for hedge funds and venture capital funds.

[4] This approach has the advantage that it allows for different econometric problems associated with valuation-based indices (such as IPD) to be modelled separately. In this case the autoregressive (AR) component will capture any autocorrelation in the common factor that drives real estate returns. The order of fractional integration (also known as the long memory parameter) will capture the average level of smoothing at the individual property level. Finally the moving average (MA) component will model possible nonsychronous valuation effects (the difference between when valuations take place and when the information is recorded).

3. NOTES ON DATA SOURCES

3.1 Introduction

In this chapter, we introduce some of the data sources available on the performance of property and the main alternative asset classes, and discuss the attributes and possible limitations of each series. A table summarising this information is contained in the Appendix and this table also provides information on the frequency of the series and the available sample size.

3.2 Direct commercial property

The IPD Annual, starting from 1971, represents the definite index for UK commercial property. The IPD Monthly Index contains higher frequency data but, while having increased its coverage, it remains relatively small, has shown different performance characteristics and starts only in 1986. The recently launched IPD Quarterly Index is at present insufficiently short for useful analysis.

The recent IPF report *Depreciation in Commercial Property Markets* (Baum et al 2005) indicated the likelihood of survivorship bias in the IPD Annual. Such bias arises from institutional investors selling their worst performing assets to other types of investors not in the index; as a result, the IPD Annual may over-state underlying market returns.

While the IPD Annual Index starts in 1971, it is possible to extend it back further using other sources and thereby allow longer time series analysis with other asset classes. Peter Scott, in his book *The Property Masters* (Scott, 1996), uses the records of two 'large' institutions (accounting for, perhaps, 5–10% of the market at that time) to derive performance for 1956–1970. Jones Lang LaSalle's portfolio-based index starts in 1965 and, in drawing on a larger set of funds than Scott, might represent a better source up to 1970.

3.2.1 Residential property

A brief discussion on residential property is included in this section for completeness. However, we do not provide any additional analysis on residential property in this report. In the pre-war period, UK institutions had substantial exposures to the residential property market, these had been largely liquidated by the early 1970s and hence pre-date modern property performance indices. The market has seen a recent resurgence and with this performance indices have been established (eg IPD). The history, however, is short (starting in the late 1990s) and therefore it represents little value in a study looking at the sector's performance relative to other asset classes. With the private-rented market now liberalised and property owners able to move their assets quickly in and out of the owner-occupied market, performance could reasonably be proxied with reference to the owner-occupied market – for which there are long time series. This could be judged reasonable for capital growth (but see the qualifications below); however, investors also receive an income return. Yields are meaningful (typically greater than 4.0%) and have varied historically (rising above 8% in some years) and therefore would have a corresponding effect on investment performance. Various studies have illustrated historic time series but invariably these are poorly referenced. Such yield estimates also take account of irrecoverable costs (property management and agent fees, maintenance) and voids.

The capital (price) indices for owner-occupied housing collated by the government and mortgage providers, however, do not capture periodic major capital expenditures (eg new roofs) which counter depreciation and enhance values. It is unlikely that such irregular and large expenditures are incorporated into estimates of net yields and as such need to be taken account of. A further factor affecting capital values in the residential investment market is the practice of applying a discount for an incumbent tenant. However, such an impact should only be transient, given contemporary short leases allow owners to realise market values without much impediment.

In summary, satisfactory data on the investment performance does not exist in the UK but it should be possible to develop a proxy, synthetic series representative of the current universe for investors. Alternatively insights could be derived from the US where NCREIF records a long historic time series.

3.3 Hedge funds

There is a considerable literature reviewing data sources for hedge funds and their characteristics. Brooks and Kat (2002) and Kat and Amin (2003) are useful in referring to both data sources and previous studies. These, together with a variety of studies by Fung, Hsieh (2006) and colleagues, emphasise the difficulties involved in collating an authoritative performance series. There is no definitive source for performance data. Hedge funds do not have any obligation to disclose their results but often release performance data for marketing purposes. Invariably it is unaudited and not independently verified. The information is collated by a number of database suppliers and combined into indices of aggregated fund performance. The coverage of the 'universe' and rules differ across suppliers, to the extent that their performances vary widely, even when covering the same type of hedge fund. Most of them start only in the mid-1990s and whereas indices exist prior to then, Kat and Amin describe such data as being "somewhat suspect". Most of the databases equally-weight funds with the notable exception of those generated by CSFB-Tremont, who value-weight. Its indices and those generated by Hedge Fund Research (HFR), are the most widely cited and were also the ones typically used by multi-asset allocators (see Section 4 and Section 5).

Performance is recorded net of fund manager fees and operating costs. Fung and Hsieh (2000) note the tax advantages which favour off-shore funds and thereby induce variations in the indices according to their off-shore: onshore bias.

More fundamental measurement issues relate to:

- 'selection' bias where the funds in the index, because they are self-selecting, are not representative of the universe – something amply illustrated in Kat and Brook's study. Selection bias can lead to returns being under-stated (as a result of the best-performing funds not participating because they have no need to market themselves) as well as exaggerating underlying performance through only those with an attractive track record participating;
- 'instant history/backfill' bias where past returns from a newly-recorded fund are incorporated into the index history; bias can be introduced through such funds being ones with a good track record; and,
- 'survivorship' bias which arises through the indices relating only to those funds which are still operating, with potential bias coming from the exclusion of defunct, unsuccessful funds.

Various studies have made estimates of the impact of survivorship and instant history bias and these are tabulated in Kat and Amin's paper. Estimates of the impact on reported performances vary from 1–3% per annum. All these studies assess the impact by gaining privileged access to the underlying fund data and re-building and re-estimating the indices in a way which avoids bias.

Fung and Hsieh (2000) recognise that such an approach is not feasible for most people and propose an alternative approach of using indices of fund-of-hedge fund performance as a relatively unbiased proxy estimate of the universe. The logic is that: (i) fund-of-hedge fund managers are investors in portfolios of hedge funds and collectively cover a large part of the universe; (ii) their historic performances incorporate the impact of defunct funds and thereby avoid survivorship bias; and, that the fund-of-funds themselves are less exposed to survivorship and selection bias. As fund-of-fund performance is diluted by their own fund management fees, Fung and Hsieh add these back to the fund-of-fund performance indices. Kat and Amin also follow this fund-of-funds approach, but conclude that such indices also incorporate survivorship bias of 0.63%.

3.4 Private equity

Private equity presents similar issues to hedge funds but these are arguably more challenging and in addition there are further issues. There are very few sources of private equity performance: for the UK, these relate to those collated annually from the late 1980s by the BVCA (the industry's trade association) and for the US, from the late 1970s by Venture Economics and also by Cambridge Associates. In the same way as for hedge funds, academic studies (eg Cochrane, 2005; Kaplan and Schoar, 2005) have gained privileged access to the underlying fund data in an attempt to control for the various biases. Unlike hedge funds, there are no formal indices of private equity performance in the UK.

It is notable that the *Myners Report*, published in 2001, recommended that the BVCA should "introduce some degree of independent auditing of reported returns". Ahead of the *Myners Report*, the BVCA commissioned a report by Burgel (2000) which, amongst other things, compared the performance measurement basis of private equity with bonds and equity. Burgel had privileged access to the underlying fund data used by the BVCA.

His report outlined how a definite return of a fund could be provided only when the fund is wound up and that most performance estimates for the intervening years tend to be interim (this probably explains why studies find private equity returns are serially correlated).

Returns – industry practice is to calculate them as IRRs – in the early years of a fund's life tend to be low not only because of start-up costs but because BVCA guidelines recommend that investments are valued at cost in the early years; the overall industry's profile of returns will therefore be affected according to the extent to which funds are being set-up.

Like hedge funds and in contrast to public equity, bonds and direct property, private equity returns are calculated net of fund management fees (including carried interest).

In conclusion, the data for private equity is likely to be the least satisfactory. The option of drawing benchmark performance indices does not exist as there are no such records. While suffering from the same biases, the US private equity market and its performance data is perceived to be more developed. In order to incorporate information on the risk return characteristics of this important section, information on the returns of venture capital trusts in the UK are used to approximate the returns on private equity[5]. These are listed trusts which hold private equity investments. The returns series used are obtained from the Datastream service.

3.5 Commodities

There are a number of commodities indices. The longest standing series is the Commodities Research Bureau's spot price index; however, the most widely recognised for investment market analysis are the Goldman-Sachs Commodity Index and the DJ-AIG. The CRB's comprises a basket of 22 commodities' (unequally weighted) spot prices. The latter two are futures indices incorporating not only the appreciation of the underlying but also the collateral and futures roll yields. These two indices relate to different baskets of commodities with different weighting systems (the GSCI has a higher weighting to oil). The two series can behave differently: having previously been highly (approx 0.9) correlated, they diverged more in 2006.

[5] However, it is noted that such information has not typically been used in previous studies because it may not be representative of the form of private equity investment which institutions undertake.

4. INSTITUTIONAL INVESTORS' AND INVESTMENT CONSULTANTS' ATTITUDES TOWARDS THE ALTERNATIVE ASSET CLASSES

4.1 Introduction

This section presents information on institutional investors' and investment consultants' attitudes towards and their performance assumptions for the alternative asset classes, property and the mainstream markets. It also gives estimates of UK institutional exposures to these asset classes.

Much of the analysis is based on a series of interviews and the first section outlines the methodology in this respect. To set the context for the remainder of the section, this is followed by a brief introduction to investment decision making in the institutional market and after this, a brief discussion of the asset classes which investors and consultants see as distinct.

The rest of the section covers the substantive issues. Institutional investor exposures and trends are detailed. This draws on both the discussions with investors and consultants, information specially provided by the WM Company, and published reports and surveys.

The penultimate section presents investors' and their advisers' characterisation of, and their attitudes towards, the alternatives, property and the mainstream asset classes. This includes their detailed, forward-looking assumptions on prospective returns, volatilities and correlations. These views are also briefly compared with the historic information presented in Section 5. The conclusions are outlined in the final section.

4.2 Methodology

The analysis is primarily based on 13 structured interviews – typically lasting 60–90 minutes and undertaken in summer 2006 – with nine institutional investors (primarily life and pension funds) and four investment consultants. In some cases, the interviews with the life companies were with their internal fund management arms.

The investors in the survey accounted for approximately £300 billion of their own money (and managing, in total, a substantially higher amount), while the consultants advised the majority of the UK's pension funds. With the 2001 government sponsored *Myners Report* observing that few pension funds are involved in the assumptions for asset allocation modeling and that in most cases consultants are the sole source of serious input, it is suggested that the information collected is representative of the larger part of the UK's £2 000 billion institutional investment market.

The questions focused on:

- the markets viewed as distinct asset classes and which of these are considered investable;
- current and prospective asset class allocations;
- the means by which exposures to asset classes are achieved;
- the asset allocation process, including the basis by which the assumptions are derived and (for the alternative asset classes) the indices used in the analysis;
- the perceived characteristics of property and the alternative asset classes;
- the assumptions on prospective performance characteristics used in asset allocation.

4. INSTITUTIONAL INVESTORS' AND INVESTMENT CONSULTANTS' ATTITUDES TOWARDS THE ALTERNATIVE ASSET CLASSES

4.3 Investment decision making and asset allocation

The discussion focused on *Strategic Asset Allocation* (SAA). This relates to the optimal mix of assets held over the long term or under normal investment market conditions; such allocations are based on the (prospective) performance characteristics of asset classes corresponding to these conditions. Under SAA, exposures are typically only reviewed periodically, and there may be constraints placed on how far day-to-day variations in exposures may move from this allocation. All interviewees were involved with SAA, either directly undertaking or responsible for it or providing advice and assumptions.

Strategic asset allocation contrasts with *Tactical Asset Allocation* (TAA) which is more dynamic and opportunistic, having regard for short-term variations in the pricing and prospective performance of markets and where positions may correspondingly vary, in some cases quite frequently. Tactical asset allocation can be undertaken in its own right; among institutional investors, however, it will typically be used as an adjunct to strategic asset allocation, enabling variations in positions around the strategic benchmark.

In being more dynamic and opportunistic and being concerned about relatively marginal variations around strategic allocations, the interviews did not consider TAA.

The interviews highlighted variations in the asset allocation process according to type of institution. Among the life funds, strategic asset allocation was a group head office actuarial decision. They were responsible for the performance assumptions but these had regard, in varying degrees, for analyses from their internal fund management arms.

With respect to pension funds, the *Myners Report* referred to two approaches to investment decision making. The first, said to be on the wane but "still important in pooled pensions … and widely used in local authority schemes", entrusted both strategic and tactical asset allocation to an external fund manager.

The alternative model identified by Myners separated decisions about strategic asset allocation – the responsibility of the pension fund trustees – from the tactical asset allocation and stock selection which were delegated to one or more fund managers. Myners' observation that pension funds' consultants were the main source of the assumptions used by pension funds in asset allocation has already been noted.

These themes from the *Myners Report* were observed during the interviews, and have two implications which are considered later in this section. First, the discretion given to fund managers to invest tactically outside strategic asset classes, second the importance of the advisers and their views in institutional strategic asset allocation.

4.3.1 Distinct asset classes

Interviewees overwhelmingly identified three or four asset classes, in addition to cash, to which they made strategic allocations: global equities, bonds, property, and, in some cases, alternatives.

Informally or formally there was a finer level at which strategic allocations were effectively made:

- UK equities;
- overseas equities (sometimes further broken down into three broad regions);
- index-linked government bonds;

- conventional government bonds;
- corporate bonds; and,
- property.

Institutions citing alternatives treated the specific classes as separate and distinct, notably hedge funds/absolute return and, where investable, commodities and infrastructure. Private equity was also identified in this way; however, among a number of interviewees, it was also (implicitly or explicitly) seen as high beta listed equity and part of the equity asset class.

There were other examples of fuzzy boundaries, for example mezzanine finance (bond or alternative?). Where investable, mortgage-backed securities and collateralised debt obligations were not distinct but seen as part of the bond sector.

Property was generally seen as a single asset class and not subject to further granulation. As already noted, commercial (and residential) mortgage backed securities were unambiguously seen as part of the bond asset class; listed property equity was similarly seen as equity.

This more extensive delineation was the one in which strategic allocations were effectively made by investors. Within these asset classes, some institutions allowed fund managers to invest in a wide range of markets outside the benchmark: examples included non-investment grade bonds and emerging market debt, overseas, residential and listed property against an (overwhelmingly direct commercial property) IPD UK Index. All this means that institutions could find themselves with exposures to alternative asset classes even though a strategic allocation had not been made. The impression, however, was that any such exposure was low.

Finally, it is also worth noting that advisers and consultants tended to parameterise their models more finely for bonds, specifically according to term and credit rating.

4.4 Allocations and trends

4.4.1 Current institutional allocations and exposures

Information was collected on interviewees' exposures to the various asset classes but the bulk of the following analysis is based on industry-wide data.

Reports vary in their estimates of institutional exposures to alternative asset classes. Headlines often point to double-digit exposures but these are misleading as they often include property – an asset class where exposures are 8% in pension funds (and around 15% in with-profits life funds) but which most investors now see as a mainstream rather than as an alternative.

Such headlines also can relate to early adopters, and can be biased according to the characteristics of their sample base – particularly as there are significant divergences in exposure between the largest funds (which are often the base for global surveys) and the myriad smaller funds with less than £1 billion of assets.

The most representative source of UK institutional exposures is the WM Company, which reports the performance of funds and their structure as part of its benchmarking service. Information on pension funds is publicly available;

4. INSTITUTIONAL INVESTORS' AND INVESTMENT CONSULTANTS' ATTITUDES TOWARDS THE ALTERNATIVE ASSET CLASSES

that for life funds, however, is private and only available to contributing life funds. WM have kindly provided more detailed information on pension fund exposures than is generally available; their contribution is gratefully acknowledged in this respect.

For pension funds, exposures to the specific alternative asset classes are not available and in aggregate they are normally incorporated into a cash and other category. WM, however, have made available the overall data for pension funds on 'other investments', relating to asset classes other than listed equity, government and corporate bonds, property and cash.

Table 4.1 shows the latest structure for UK pension funds[6]. The majority of their assets remain in equities. Exposure to 'other' (predominantly the alternatives) is low at just under 3%, with property at almost 8%. The biggest pension funds have higher exposures to property and (by a lesser margin) alternatives, and correspondingly lower exposures to bonds and UK equities.

As already noted, with-profits life fund exposures are not publicly available. The interviews – and publicly available information submitted by the life companies to the FSA – suggest a slightly different structure, in particular:

- a much higher exposure to property, in the region of 15%;
- a higher exposure to conventional and corporate bonds;
- a correspondingly lower exposure to international equities; and,
- a comparable exposure to alternative asset classes.

The impression, therefore, is that higher property allocations tend mainly to be at the expense of equities. Consideration of the asset classes which have lost out from higher exposures to alternative is outlined in the evidence from the interviews below.

[6] A potentially interesting exercise would be to reverse engineer the portfolio weights to determine the underlying expectations of the returns for each asset class. This is not attempted in this report but is left for future research.

4. INSTITUTIONAL INVESTORS' AND INVESTMENT CONSULTANTS' ATTITUDES TOWARDS THE ALTERNATIVE ASSET CLASSES

Table 4.1: UK pension fund exposures, June 2006

	All pension funds (%)	Top 50 (%)	£250m–£1 000m (%)	£50m–£250m
UK equities	33	32	37	37
International equities	31	31	31	29
Bonds (sovereign and corporate)	15	15	16	20
Index-linked	9	9	6	8
Property	8	8	6	3
Other	3	3	1	1
Cash	2	2	3	2
TOTAL	100	100	100	100
% of sample:				
Exposed to property	60	92	63	36
Exposed to other	43	75	39	17
Of those invested, % with				
Property exposure > 5%	82	89	93	52
Other exposure > 5%	16	14	28	20

Source: WM

Exposures to property are also more widespread than alternatives (60% of funds with an exposure to property compared to 43% in other). Almost all large pension funds invest in property as do most mid-sized ones. Only among small pension funds is property investment not common place. Furthermore, those that invest in property tend to have significant exposures (82% had exposures over 5% while a third were over 10%).

By contrast, investment in alternatives tends to be a large fund phenomenon: whereas the bulk of large pension funds invest in alternatives, in the mid-sized and the small ones such exposures are very much the exception rather than the rule.

The WM data also belie headline evidence of large exposures to alternatives – of those investing, only one in 20 had an exposure above 10%, and the vast majority were under 5%.

WM, as noted earlier, does not routinely provide information on the types of alternative asset classes. Its December 2005 report, *Alternative Investments and Private Equity*, suggests the largest part of pension funds' exposure to alternatives was in private equity.

Table 4.2 summarises evidence from various other surveys on exposures to different types of alternative asset class. It emphasises the earlier point about sample bias – for example, Mercer's survey indicates that 6% are investing in private equity whereas JP Morgan's analysis points to 31%. On balance, the evidence suggests that:

- The most likely form of alternative exposure is private equity and at present this accounts for the largest part, in total, of institutional exposures to alternatives;
- Exposure to hedge funds is lower but increasing, and of those investing, allocations are comparable to those investing in private equity;
- The extent and magnitude of exposure to commodities is negligible;

4. INSTITUTIONAL INVESTORS' AND INVESTMENT CONSULTANTS' ATTITUDES TOWARDS THE ALTERNATIVE ASSET CLASSES

- There is also interest – more so than commodities but still to small degrees – in currency and tactical asset allocation overlays; and,
- Interest in high yield and emerging debt markets is low, although (as explained below in the discussion of the interview evidence) funds are giving their fund managers discretion to invest in these from their bond allocations.

Notably, the published survey evidence does not refer at all to infrastructure investment.

Table 4.2: Published survey evidence on exposures to alternative asset classes

	Private equity	Hedge funds	Commodities
Mercer 2006	6% of UK sample (and 22%for those funds over £500m) investing; of these, allocation <3%.	7% of UK sample investing; of these allocation of 6.9%.	'A handful considering investing.'
JP Morgan Nov 2004	31% of UK sample investing; of these, allocation of 2.3%.	12% of UK sample investing; of these, allocation of 5.5%.	
Russell 2005	63% of Europe sample investing. Overall UK sample mean allocation of 5.3%.	35% of Europe sample investing. Overall UK sample mean allocation of 5.3%.	4% of Europe sample using 'active' commodities and 5% 'passive' commodities.

Sources: Mercer – European Institutional Marketplace Overview 2006; JP Morgan – Alternative Investment Strategies survey 2005; Russell – Survey on Alternative Investing 2005-2006.

It is worth noting that forward thinking and risk-tolerant investors outside the UK institutional sector, for example the US foundations (eg the Yale Endowment which has been a leading advocate of significant allocations to alternatives, see Table 4.3 below) and some UK charities, have substantially higher allocations to the alternatives than portrayed above. An interesting observation about Yale's allocations – also reflected in discussions with UK investors – is that exposure to property has remained significant, with increased monies for alternatives coming from domestic equities and, to a lesser extent, bonds. This further emphasises the earlier observation that, in the UK, allocations to alternatives have been mainly at the expense of UK equities.

Table 4.3: Yale Endowment exposures, June 2005

	%
Equities	28
Bonds	5
Real assets*	25
Absolute return/hedge funds	26
Private equity	15
Cash	2
TOTAL	100

Source: Yale Endowment 2005 Annual Report

*Real assets include property, oil and gas, and forestry. Property is understood to represent about half of the allocation to real assets

4. INSTITUTIONAL INVESTORS' AND INVESTMENT CONSULTANTS' ATTITUDES TOWARDS THE ALTERNATIVE ASSET CLASSES

4.4.2 Institutional exposures: evidence from the interviews

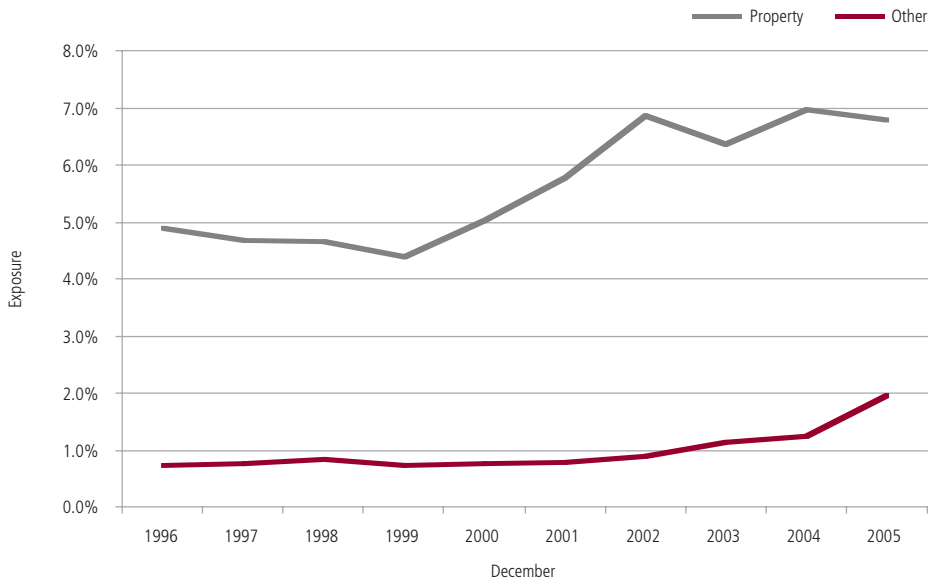
The evidence on exposures from the interviews was mixed. While the information provided was comprehensive in some cases, in others it was difficult to disentangle internal investments from externally managed monies; some interviewees were reluctant to release precise information. Nonetheless it was possible to build-up the following picture:

- Both life and pension fund interviewees typically had much higher exposures to alternatives (on average 4–5%) than the overall institutional universe, echoing the earlier observation that investment in alternatives increases with fund size. Pension fund interviewees also had higher exposures (on average greater than 10%) to property than the average pension fund;
- Private equity had been the earliest form of alternative investing and all investor interviewees had an exposure. Life fund exposures were typically around 1%. Amongst pension fund interviewees, exposures varied but invariably were higher than the life funds;
- Most interviewees invested in hedge funds and these represented their largest alternative asset class; the average exposure amongst those investing was about 4% (including those not invested it was around 2.5%). Most investors were having to build up their exposures slowly, with targeted allocations higher than current investments;
- Commodity investments on the whole were negligible and not widespread, although could be significant in the few cases where invested; and,
- Current investment in infrastructure was negligible but imminent to a meaningful degree in a number of the interviewed funds. Among those planning to invest, the suggestion was that allocations would be of comparable magnitude to their private equity exposures.

4.4.3 Changes in exposures

Figure 4.1 shows the trend in UK pension fund exposures to 'other' (predominantly alternative) and property since 1996 provided by WM. Exposure to alternatives is clearly on an upward trend from a low base, increases in exposure to property seem to have moderated in recent years (although the most recent data for June 2006 reveals a renewed pick-up).

Figure 4.1: Pension fund exposures to 'other' (predominantly alternatives) and property



Source: WM

4. INSTITUTIONAL INVESTORS' AND INVESTMENT CONSULTANTS' ATTITUDES TOWARDS THE ALTERNATIVE ASSET CLASSES

The detailed data provided by WM and presented in Table 4.4 illustrates where these increased monies for alternatives and property have come from. There has been a significant shift out of UK equities which not only has financed increased exposures to alternatives and property but also increased allocations to conventional and index-linked bonds, particularly in the small and mid-sized funds.

The table also shows that the biggest pension funds have increased their exposures to alternatives more than property, but that the mid-sized and small funds have been more active in raising their exposure to property.

Table 4.4: Changes in UK pension fund exposures over the last five years

	All pension funds (%)	Top 50 (%)	£250m–£1 000m (%)	£50m–£250m
UK equities	-14	-11	-14	-15
International equities	6	6	6	3
Bonds (sovereign and corporate)	2	1	3	6
Index-linked	2	1	3	6
Property	2	1	3	1
Other	2	2	1	0
Cash	-1	0	-1	-1

Source: WM

These findings were reflected in the interviews. Most investor interviewees – all large funds – had been focusing on increasing their allocations to alternatives and such shifts had been financed from equities.

Further allocations to alternatives were anticipated by all investors in the survey, specifically into hedge funds as understanding developed and opportunities emerged, and, for some, into infrastructure for the first time. Across the sample, these would add about two percentage points to current allocations. In most cases, it was not clear how such shifts would be financed although there were some tentative suggestions of reductions in property, notably in favour of infrastructure.

Such uplifts in alternatives are in line with Russell's 2005–2006 *Survey on Alternative Investing* which pointed to anticipated increases in exposure to hedge funds of 1.9 percentage points and of 1.4 percentage points into private equity over the next – years. Furthermore, Russell's survey singled out commodities, along with timber and convertible bonds, as being "most lacking in consideration".

Similarly, Mercer's survey anticipated the proportion of UK pension funds investing in hedge funds rising from 7% in 2006 to 10% in 2007, with interest in private equity increasing "but not dramatically so" and only "a handful" (out of the 426 surveyed) considering investing in commodities.

4.5 Characterisation of and attitudes towards the asset classes

4.5.1 General characterisation

During the interviews, three fundamental characteristics were frequently highlighted which distinguished most of the alternative classes and property from mainstream listed equity and bonds.

The first was *alpha* – in particular the potential for excess return from skill. This was most applicable to hedge funds but the ability to get such a return from private equity, infrastructure and also, as a relatively inefficient market, property, was also attractive to investors. Interviewees were well aware of research[7] showing the wide range of returns amongst fund managers in alternative asset classes. The potential to tap into superior returns contrasted with perceived limits on 'true' alpha available from traditional active equity and bond fund managers[8].

Second, *illiquidity* was typically identified as an important characteristic – both with respect to the premium return it offered, and as a factor not to be overly exposed to. Equity, and sovereign and investment grade corporate bond markets were perceived as very liquid. By contrast, property and alternative asset classes – with the exception of commodities – were viewed as illiquid, with the ranking virtually universal as outlined in Table 4.5. Related to this was the extent and speed at which a target exposure could be achieved with quality fund managers – a factor most applicable to hedge funds.

Table 4.5: Investors' and consultants' perceptions of liquidity in the alternative asset classes and property

Most illiquid	Infrastructure		
	Private equity	Property	High yield bonds
Least illiquid	Hedge funds		
Liquid	Commodities		

A third feature – *diversifying potential* – was also attractive but, other than commodities, this was secondary to the excess returns potentially available from alpha[9] and from illiquidity. However, diversification of portfolio risk was commodities' main appeal.

One other observation was mentioned by life companies. This related to the admissibility (ie those assets which can be taken into account when determining if the life company has adequate solvency) of the alternative asset classes. Difficulties in this respect were specifically noted for hedge funds and commodities. This consideration did not feature among or apply to pension funds.

4.5.2 Specific characterisations

4.5.2.1 Hedge funds

The attraction of hedge funds was universally cited to be their alpha – in particular through the opportunity they gave to access skilful fund managers, in contrast to the mainstream asset classes where there were limits in this respect. Interestingly, as outlined later, investors had stronger return expectations for hedge funds than advisers, the former believing they could identify managers who could deliver exceptional alpha, the latter perhaps recognising the overall limits in this respect. This issue is returned to later in this section.

[7] See the Yale Endowment's 2005 Annual Report and David Swensen's *Pioneering Portfolio Management*

[8] Alpha of 25-50bps was said to be reasonable expectation for a good active equity manager.

[9] By definition, such returns are lowly correlated with other markets and hence offer diversification.

There was, however, concern amongst interviewees about beta masquerading as alpha – returns associated with market risk rather than superior skill – and of hedge funds during turbulent market conditions behaving like and being highly correlated with equity (and possibly bond) markets.

Overall, hedge funds were seen to have some equity character to them. Their advantage over equities was their potential to deliver comparable returns, if not higher ones through alpha, with the added prospect of lower volatility and lower correlation with other asset classes. On this basis, they did not represent a threat to property.

4.5.2.2 Private equity

Private equity's perceived illiquidity – possibly more so than property – has already been mentioned. The majority, albeit not universal, view was that it was essentially high beta equity, not unlike small cap stocks, but also incorporating some alpha. Accurate performance information was hard to come by; private equity was the market where interviewees struggled most with analysis and where their analytical methodologies varied most.

Private equity was seen as a (higher returning) alternative to equity – indeed those increasing their exposures had correspondingly reduced their listed equity allocations – with only its illiquidity aligning it with property.

4.5.2.3 Commodities

Commodities were the asset class which investors felt least informed about and, on the whole, least interested in. However, opinion was also polarised. First, there were those who believed commodities should deliver excess returns through a futures roll yield – and that they therefore constituted an investment class. But on the other hand, there were those philosophically believing there should be no systematic roll yield; set against their underlying volatility, commodities had no appeal to this latter group. To them, exposure to commodities could be achieved through oil or mining company stock for example.

4.5.2.4 Infrastructure

This was an asset class where most interviewees saw emerging potential. Most expressed an attraction towards government and related project-finance (government buildings, hospitals or toll roads for example) which promised a quasi-government cashflow with a substantially higher yield than a gilt and where the risk was to a large extent physical (eg wear and tear, unsound building techniques or destruction).

One investor, however, raised concerns about reputational risk when investing in PFI. Interest in ports, utilities and so on was less common place, with interviewees noting that such exposures could be acquired through the listed equity market.

Analogies with property were drawn – obviously with respect to cashflow but also to the shared characteristics between property development and greenfield infrastructure projects. One investor was proposing to introduce a strategic exposure, which would be achieved through equal reductions in exposure to equity and property.

Operationally, investing in infrastructure was sometimes seen to resemble private equity. These investment and operational characteristics are reflected in the two different types of infrastructure fund management model that have emerged – ie property or private equity led.

4. INSTITUTIONAL INVESTORS' AND INVESTMENT CONSULTANTS' ATTITUDES TOWARDS THE ALTERNATIVE ASSET CLASSES

4.6 Investors' and consultants' assumptions on prospective performance

4.6.1 Definitional issues

Interviewees were asked for 'the assumptions which inform their decisions/advice on strategic asset allocation': these were assumptions used to determine their asset allocation and hence no judgement was made on them.

The bases for the assumptions, however, were also requested as a check, and it was apparent there were variations across interviewees which influenced the magnitude of the responses. They related to:

1. The statistical basis for expected returns – practitioners measure and present historic and prospective returns either as an arithmetic mean or a compound, geometric return: the two differ, the arithmetic mean always being higher, particularly so in the most volatile series. Most interviewees offered their prospective return assumptions as an arithmetic average, although in three cases the basis was either geometric or indeterminate – something which will bias the returns down a little.

2. The temporal basis – about half presented their expected return assumptions as a long term equilibrium.

The rest gave assumptions off current market prices: for those markets which are currently perceived to be overpriced, their prospective returns would be below the long run equilibrium and vice-versa. The time horizon of this group's assumptions also varied, ranging from the next five to the next 50 years, but with most looking at the next 10 years. These varying horizons will also generate variations in expected returns, for example leading to a greater dampening in expected returns in overpriced markets the shorter the time horizon.

3. Active vs passive – for most asset classes, the assumptions provided related to the overall market. There was greater variation for the alternative asset classes where the prospective returns (and volatilities) could include the expectation of excess return from active management or of higher returns from investing in the riskier, higher beta areas of the asset class including as a result of gearing. This is likely to explain in part the relatively high hedge fund returns which investors are assuming.

4. Costs – all returns were requested net of asset management costs and fund management fees. These, anyway, are low for equities and bonds. For private equity and hedge funds, fund management costs – including performance related fees – are more substantial but they can be difficult to quantify. Variations in expected returns could have resulted.

5. Transparency – the alternative asset class performance indices, especially for hedge funds, are widely seen to be distorted, being inflated by survivorship and instant history bias. Such poor transparency is likely to have introduced some variability in the assumptions of prospective returns.

6. Hedged vs unhedged – ex-UK prospective returns, standard deviations and cross-correlations were requested on a hedged basis. Hedging dampens prospective volatility by eliminating the element associated with currency movements; in theory, its impact on expected returns is negligible – the positive/negative cost of the hedge matching the prospective gain/loss from the expected currency movement. It is not thought that unintentional departures from the requested hedged basis were significant.

7. Smoothed vs unsmoothed property returns – various studies, most recently the IPF's *Index Smoothing and the Volatility of UK Commercial Property* (Key and Marcato, 2006), have highlighted how the returns observed in direct property performance indices understate the underlying volatility of the asset class, which can be around 50% higher. In most cases the information given was on a de-smoothed basis. The IPF's research into smoothing also indicated that most analysts used de-smoothed assumptions for property in their multi-asset allocation work.

4.6.2 Use and derivation of the assumptions

The assumptions on expected returns, standard deviations and correlations were for use in mean:variance optimisation and for asset-liability modelling in support of asset allocation decisions and advice. Among life funds and some consultants, the assumptions could also be used to support (regulatory) assessments of capital adequacy.

Interviewees' assumptions were never based on an uncritical analysis of historic performance but incorporated, in varying proportions, all of the following three sets of information:

1. Historic performance typically of at least 10 years, with a number of interviewees emphasising the importance of looking back over a much longer period.

Such historic analysis was easily undertaken for the mainstream asset classes (less so corporate bonds) and commodities but more difficult for private equity (poor availability of information) and hedge funds (limited and unrepresentative history, index construction issues). Given the poor information, most interviewees had less confidence in their assumptions for private equity and hedge funds than for the mainstream asset classes.

For private equity, interviewees often relied on proxies – characterising the asset class as high beta equity and analysing emerging market or small cap equities to derive insights. The Credit Suisse/Tremont Hedge Fund Index was widely used, with some interviewees also mentioning Hedge Fund Research's Fund of Funds Composite Index.

Investors and, to some extent the consultants, also relied on their own experience and this gave them a particular advantage in deriving assumptions for the alternatives, especially private equity.

2. Fundamental theory, especially with respect to the natural order of return and risk;

3. Expert opinion, including from the academic and practitioner literature, survey evidence and the consensus. This was said to be particularly helpful in forming views on hedge funds.

4.6.3 Assumptions on prospective performance

The assumptions, averaged across interviewees, for the prospective nominal returns, standard deviations and correlations are shown in Table 4.6. One interviewee explicitly adopted their consultant's assumptions (also interviewed) and their response has been excluded to avoid double-counting. Another gave very limited information; in most cases interviewees did not provide the full set of information, with gaps most likely in the alternative asset classes[10].

[10] Nine interviewees gave information for hedge funds, eight for private equity but only four for commodities. Only two gave precise assumptions for infrastructure, although a number gave broader assessments of the likely returns.

4. INSTITUTIONAL INVESTORS' AND INVESTMENT CONSULTANTS' ATTITUDES TOWARDS THE ALTERNATIVE ASSET CLASSES

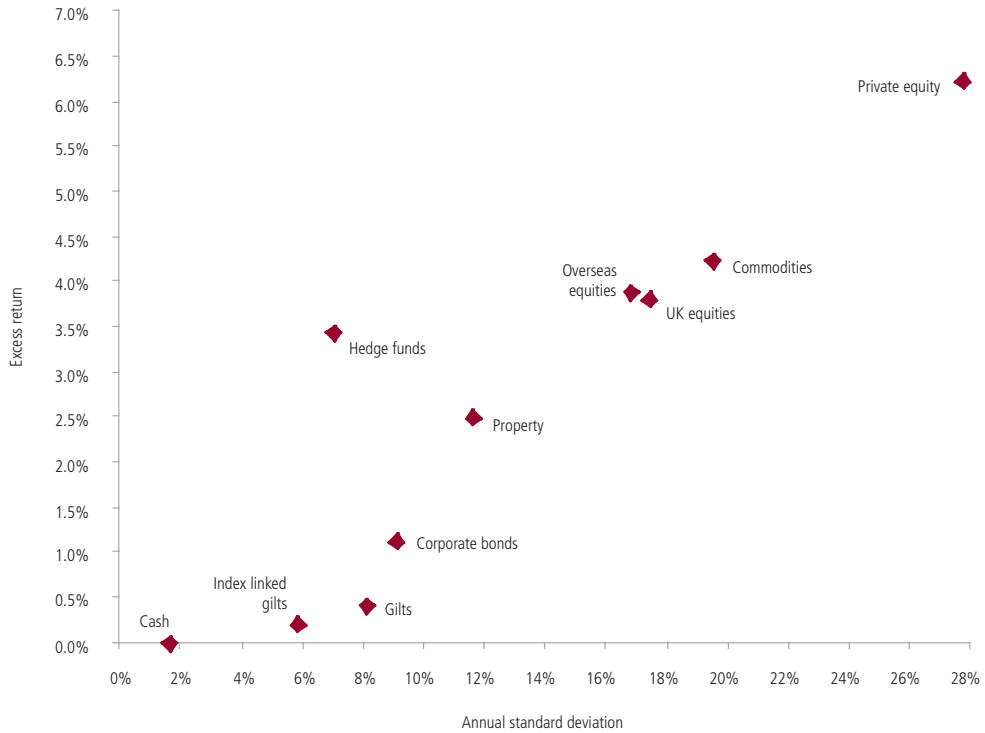
Table 4.6: Assumptions on expected returns, standard deviations and correlations – survey averages

			Correlations								
Nom return %	St dev %		Cash	Gilts	Corps	Prop	UK eq	Ov'sea eq	Priv eq	Hedge funds	Commod
4.5	1.6	Cash	1.0								
4.9	8.1	Gilts	0.0	1.0							
5.6	9.1	Corp bonds	0.0	0.8	1.0						
7.0	11.6	UK property	0.0	0.2	0.2	1.0					
8.3	17.4	UK equities	0.0	0.2	0.3	0.3	1.0				
8.4	16.8	O'seas eq	0.0	0.1	0.2	0.2	0.7	1.0			
10.7	27.7	Priv equity	0.0	0.0	0.1	0.2	0.6	0.6	1.0		
7.9	7.0	Abs return/ hedge funds	0.1	0.0	0.0	0.1	0.4	0.3	0.2	1.0	
8.7	19.5	Commodities	0.1	0.0	0.0	0.1	0.1	0.2	0.1	0.1	1.0
2.6	-	RPI									

These assumptions, by and large portray, a 'natural order' of risk and return as illustrated in Figure 4.2; private equity and commodities, for example, offer the highest expected returns and highest risk, whereas amongst equity type investments, property offers the lowest returns and lowest risk.

Hedge funds depart from this natural order in having relatively expected high risk-adjusted returns (eg comparable expected returns to equities but lower risk and, similarly, having higher returns than property but lower prospective risk).

Figure 4.2: Prospective risk and return by asset class – survey averages



4. INSTITUTIONAL INVESTORS' AND INVESTMENT CONSULTANTS' ATTITUDES TOWARDS THE ALTERNATIVE ASSET CLASSES

Table 4.6 also shows that interviewees expect most asset classes to be lowly correlated with each other, the notable exceptions being:

- Sovereign and corporate bond markets which are expected to be highly correlated;
- UK, overseas and private equity markets which are also expected to be fairly highly correlated with each other; and,
- Hedge funds which are expected to be moderately correlated with listed UK and overseas equities.

Leaving aside cash, commodities by far were expected to be the least correlated asset class. Expected correlations in general were also on the low side for property, gilts and hedge funds. The three main alternatives (hedge funds, private equity and commodities) were also expected to be fairly lowly correlated with each other. All this highlights the perceived diversifying potential of property and, among the alternatives, of hedge funds and commodities.

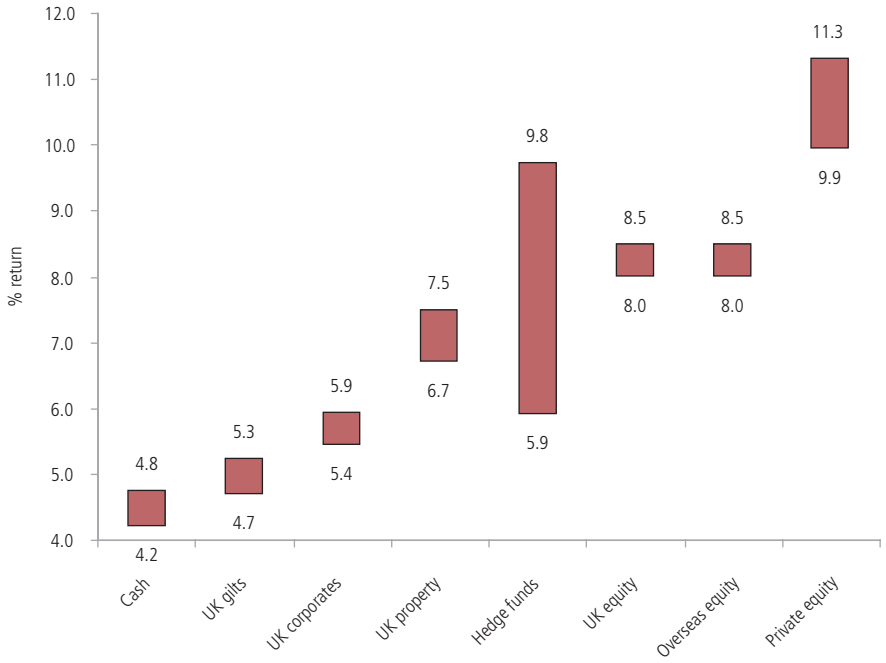
4.6.4 Infrastructure

Most interviewees had not developed definitive assumptions on the prospective performance characteristics of infrastructure, although a number provided broad qualitative views. These suggested an expected return about five percentage points above gilts, thereby putting the asset class among the highest returning and in particular above property, hedge funds and equities. Such returns would include a premium for illiquidity but would also depend on the level of gearing (thereby also affecting risk).

4.6.5 Dispersion of assumptions

For the most part there was a broad consistency of view between interviewees. As Figures 4.3 to 4.5 illustrate, most inter-quartile ranges were fairly narrow, eg around 0.5% for return expectations, 2–3% for standard deviations, and 0.1–0.2 for correlations.

Figure 4.3: Expected returns – inter-quartile ranges



4. INSTITUTIONAL INVESTORS' AND INVESTMENT CONSULTANTS' ATTITUDES TOWARDS THE ALTERNATIVE ASSET CLASSES

Figure 4.4: Expected standard deviations – inter-quartile ranges

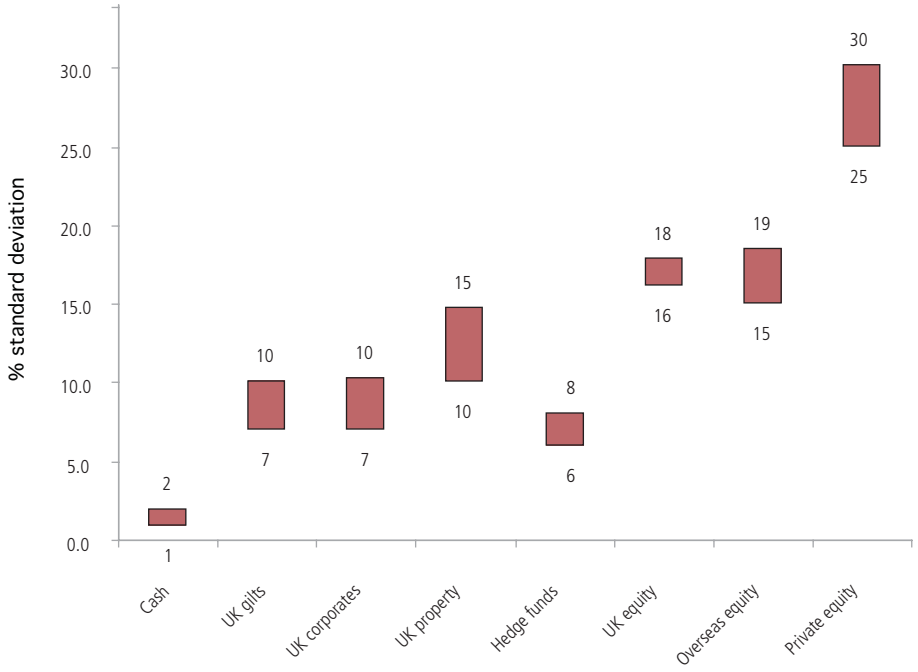
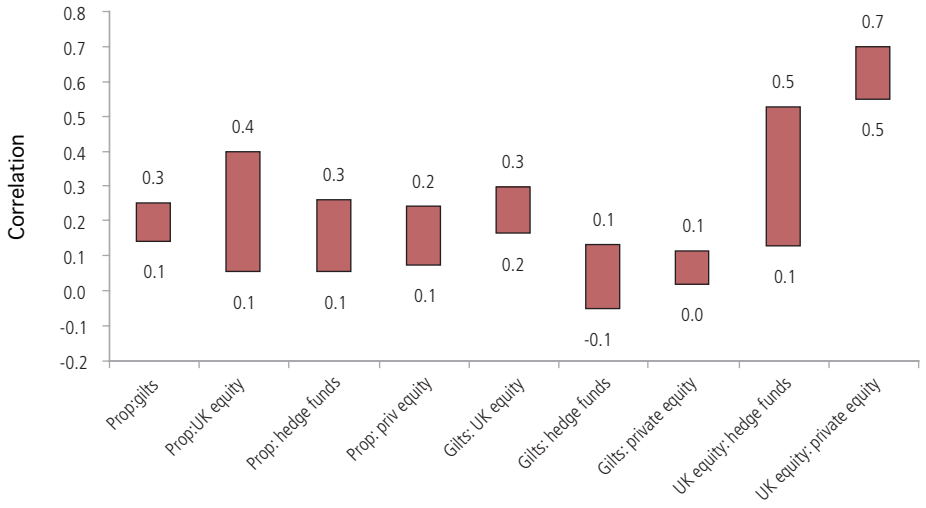


Figure 4.5: Expected cross-correlations for selected asset classes – inter-quartile ranges



The dispersion of views, however, was larger for hedge funds and, to a lesser extent, private equity. These partly reflect the definitional issues outlined earlier but also the debate over the extent to which hedge funds can deliver alpha and truly uncorrelated returns. As Table 4.7 shows, investors are much more bullish in this respect and are factoring much higher returns through fund manager alpha; the advisers, in addition to being less optimistic, are probably capturing the returns deliverable in the industry as a whole.

Table 4.7: Prospective returns and risk for hedge funds: investor vs consultant expectations

	Investors	Consultants	All
Expected return	9.6	5.9	7.9
Prospective standard deviation	6.4	8.0	7.0
Sharpe ratio	0.79	0.19	0.49

4.7 Comparison with empirical estimates

As noted earlier, investors and consultants portray their asset allocation assumptions as ex ante, prospective views and derive them from a combination of economic theory, fundamental judgement, and expert opinion in addition to the historic performance. It is therefore to be expected that the assumptions adopted by investors and consultants differ from those displayed historically.

It is nonetheless interesting to compare their assumptions with the historic record, drawing on the data analysis in Section 5. These are illustrated in Figures 4.6 and 4.7. Note that for property and as discussed in Section 5, the historic standard deviation for property is not derived from our own analysis but is based on the findings from the IPF's recent study *Index Smoothing and the Volatility of UK Commercial Property.*

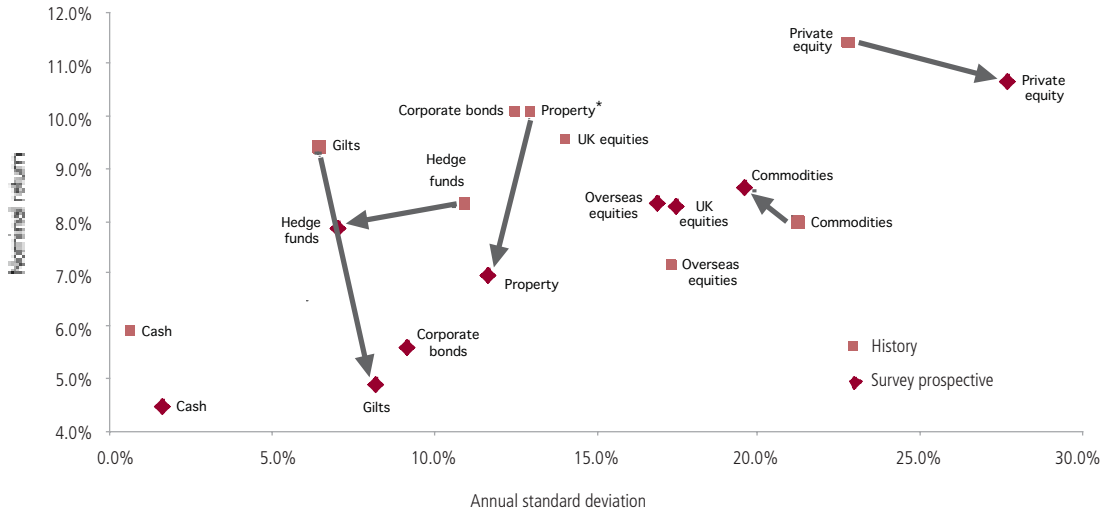
Figure 4.6 shows marked divergences between the historic record and investors' and consultants prospective assumptions for returns and risk. For most asset classes, prospective returns are seen to be lower than delivered over the period August 1990 to July 2006. This is particularly the case for cash and for sovereign and corporate bonds where returns are lower without any corresponding reduction in risk.

Equally as remarkable is the perception of a sharp reduction in expected return – albeit with similar risk – for property compared to the last 15 years. Investors and consultants also anticipate a reduction in returns and an increase in risk for private equity. There are mixed expectations for the other alternatives – a lowering in both risk and return for hedge funds but an increase in returns and a lowering in risk for commodities.

With respect to the correlations, interviewees' assumptions on average were close to history for bonds, equities and private equities. However, as Figure 4.8 shows, they were different for hedge funds and property. Investors and advisers expect property's correlation with other asset classes to be much higher than over the last 15 years, whereas for hedge funds they expect correlations to be lower.

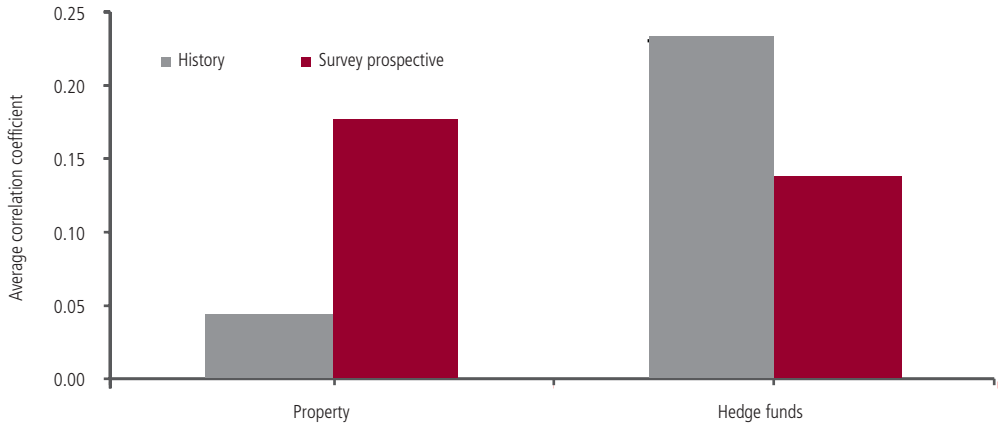
4. INSTITUTIONAL INVESTORS' AND INVESTMENT CONSULTANTS' ATTITUDES TOWARDS THE ALTERNATIVE ASSET CLASSES

Figure 4.7: Risk and return by asset class – survey averages vs August 1990–July 2006 history



*Assumption from IPF report Index Smoothing and the Volatility of UK Commercial Property, not August 1990 – July 2006

Figure 4.8: Average cross-correlations for property and hedge funds – survey averages vs August 1990–July 2006 history



4.8 Allocations implied by investors' and consultants' assumptions

The perceptions of interviewees towards alternative asset classes suggest the following for investment allocations:

- Alternatives' diversifying benefits imply meaningful exposures for all investors;
- Interviewees' overall expectation of very favourable risk-adjusted returns from hedge funds imply substantial exposures for all but the most risk tolerant investors; and,
- Investors willing to tolerate high levels of risk in return for strong performance would have a substantial part of their portfolio in private equity and, to a lesser extent, commodities.

The attraction of hedge funds to interviewees lies in the perceived potential to tap into much higher levels of fund

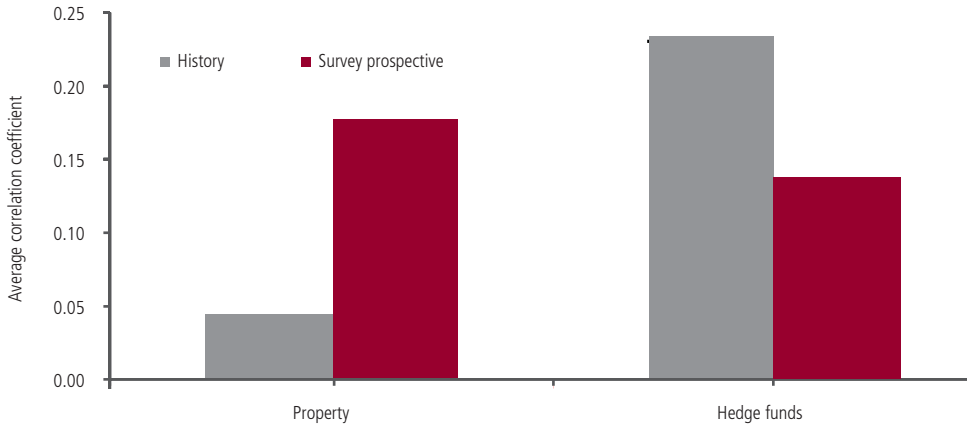
manager alpha than are available in other asset classes. Investors confident of achieving such returns would be expected to have very high allocations to hedge funds. Leaving aside the likelihood of such alpha being delivered to these interviewees, these expectations cannot be representative of the returns from hedge funds as a whole. Furthermore, the lower allocations to hedge funds among the most progressive investors indicates that the bullish assumptions are not entirely influential. The relatively conservative assumptions of the consultants are arguably more applicable to the wider universe of investors.

Figure 4.9 presents the efficient allocations using mean:variance optimisation using the survey assumptions (but with the expected return and standard deviation for hedge funds corresponding to those of the consultants). Cash has been constrained throughout to 2%, reflecting its use primarily for operational liquidity rather than as an investment.

At low levels of portfolio risk where bonds predominate, allocations to hedge funds nonetheless would be significant. Private equity and commodities are the domain of the most risk-loving investors. However, property features significantly for all but the most risk-loving investors; implied allocations quickly reach 10% and rise as high as 32%. By contrast, equity allocations are generally lower.[11]

These findings fit with the earlier observation – hedge funds are becoming the most likely alternative asset class for relatively conservative (in risk terms) UK institutional investors, with private equity and commodities featuring significantly in the portfolios of risk-tolerant investors such as Yale. Equities have been the main losers in both in UK institutional portfolios and amongst the most progressive asset allocators.

Figure 4.9: Efficient allocations on the basis of survey assumptions



[11] Note that the question of portfolio allocations is explored in additional detail in Section 5.

4. INSTITUTIONAL INVESTORS' AND INVESTMENT CONSULTANTS' ATTITUDES TOWARDS THE ALTERNATIVE ASSET CLASSES

4.9 Conclusions

UK institutional investor exposures to alternative asset classes are on average modest at around 3%. Relatively few institutional investors have an exposure to alternatives and those that do have exposures in the region of 5%. Very few have exposures in excess of 10%. Allocations, however, have been rising and further increases are planned, both through those already invested and those entering the market for the first time.

As a result, exposures to alternative asset classes are likely to double over the next three years but (given current attitudes and plans) still remain modest at 5–6%. By contrast, allocations to property are currently much higher at around 10%. This said, forward thinking and risk-tolerant investors outside the UK institutional sector, for example the US foundations and some UK charities, have substantially higher allocations (ie in excess of 30%) to the alternatives.

Investors' desires to boost performance in a low (nominal) return world, to increase portfolio diversification, and for greater certainty in investment performance are behind this shift to alternatives. Hedge funds stand out in this respect, both as a concept and through the potential for investors to identify and then tap into skilled managers capable of delivering much higher alpha than traditional active equity fund managers. The correspondingly high prospective risk-adjusted returns perceived by investors would lead to hedge funds overwhelming mainstream equity-type asset classes (including property) in mean:variance portfolio optimisations.

There is a vigorous academic and practitioner debate underway over the extent to which the best hedge fund managers are able to deliver significant alpha to their investors. The interviewed investors' justify their bullish expectations on the substantial resources they can bring to identifying the best managers.

The historic evidence is that there has been greater potential for fund manager alpha in the hedge fund industry. Fung et al (2006) identify, first, significant differences in the risk-adjusted performance – ie in the generation of alpha – of hedge fund of fund managers, and second, a greater probability of the alpha generators persistently delivering superior risk adjusted returns. In line with this, the Yale Endowment's 2005 Annual Report illustrates a wider range of performance amongst hedge fund managers than the narrow one characteristic of active equity fund managers.

Fung et al, however, also note that the most able managers have witnessed greater capital inflows and that this is associated with a decline in the alpha produced by the hedge fund industry. Regardless of whether or not the interviewed investors' bullish expectations are justifiable, such views cannot be influential for the universe of investors. This said, high allocations to hedge funds – of similar magnitude to property – are still implied on the basis of the more conservative assumptions provided by the investment consultants.

Private equity is largely seen as an extreme – ie high returning, high risk – form of listed equity albeit with the added potential for relatively high alpha and a further premium return on account of illiquidity. However, while universally recognised for their diversifying potential, there are mixed perceptions about commodities – some see them capable of delivering attractive equity-type returns, others fundamentally question their longer term potential to deliver excess returns. This, together with their perceived complexity, may explain why exposures are lower and less widespread than the other alternative asset classes.

4. INSTITUTIONAL INVESTORS' AND INVESTMENT CONSULTANTS' ATTITUDES TOWARDS THE ALTERNATIVE ASSET CLASSES

To date, listed equity has been the loser in the (modest) shift towards alternatives – on the one hand, the hedge funds' lure of relatively high alpha, comparatively stable returns and less correlated performance, on the other the security and liability matching appeal of bonds have all ensured this. By contrast, low allocations, an extra-ordinary benign period of performance and its acknowledged diversifying appeal have helped protect property from this shift. Looking forward, however, investors and their advisers anticipate a more ordinary performance from property.

This said, mean:variance optimisations using investors' and consultants assumptions still imply high allocations to property, and to a greater degree than is the case in practice. In investors' eyes, property retains a strong place in a modern day multi-asset portfolio.

Investors and their advisers are currently in the process of coming to terms with the rapidly emerging infrastructure sector and have yet to parameterise this asset class as precisely as the other markets. They nevertheless see infrastructure as appealing as the other alternatives, with a similar potential to generate competitive returns through alpha and illiquidity. Otherwise, they see it as quite distinct from the other alternative asset classes and the equities which they have usurped – in particular offering yield and cashflow. For this reason, and given the expectation of a more ordinary performance, property could face greater challenge in the future.

5. DATA ANALYSIS

5.1 Introduction

In this section of the report we analyse historical data on the returns of the major core and alternative asset classes to assess the statistical characteristics and the risk-return profile of asset classes considered by institutional investors in the UK. In doing so we address a number of important questions: for instance, how have the asset classes performed in the past; to what extent are the asset classes driven by common factors; what would an optimal portfolio look like; and, could alternative assets match or perhaps replicate the performance of real estate in a mixed-asset portfolio?

To answer the questions raised above we base our analysis on a sample of data covering a number of asset classes over the period from August 1990 to July 2006. This 16 year history covers the late 1990's bull market period as well as the bear market period after 2000. Since quantitative analysis can be sensitive to the market conditions in the time period chosen, as a check for robustness we divide the entire sample into two sub-periods, namely the 'bull period' from August 1990 to December 1999, and 'bear period' from January 2000 to July 2006.[12]

From the information obtained in the interviews conducted for the previous section, 12 different assets classes were identified for detailed analysis. These 12 asset classes are divided into two groups, a set of core assets and a set of alternative assets. The eight assets classes in the core group include:

- UK equities
- Overseas equities
- Conventional gilts
- Index linked gilts
- UK corporate bonds
- Overseas bonds
- Real estate
- Cash

While the remaining assets are included in the alternative asset group, these assets include:

- Hedge funds
- Private equities
- Commodities,
- Infrastructure

[12] All the returns are calculated in nominal terms, reflecting practice. Moreover, taking inflation into consideration does have identical effects on the returns, and is not expected to change our conclusions markedly.

5. DATA ANALYSIS

As discussed in Section 3 above, for each of the asset class there are many potential time series available to us.[13] Considering their characteristics and popularity, we have chosen the following time series for the 12 assets. For the eight core assets, we use

- The FTSE All Share Index
- MSCI World Index excluding UK
- 10–15 years maturity UK government gilts
- Index linked gilts
- Corporate bonds[14]
- Overseas government bonds
- IPD Index
- UK one month Treasury bonds

For the four alternatives, we use

- The Credit Suisse/Tremont Hedge Fund Index
- Macquarie Global Infrastructure Index
- Datastream UK Investment Trusts Private Equity[15]
- Goldman Sachs Commodity Index

Details of these time series as well as other time series we have considered are attached in the Appendix. In particular we have attempted to investigate the relative size of the asset classes. While this has been limited to collating information from published data sources, the details of current market capitalisations of some of the series used can be found in the Appendix.

For the real estate asset class, it is necessary to make a decision about how to deal with the problem of valuation smoothing. As discussed in the literature review and in the previous section, it is widely believed that the historical volatility of the headline IPD index is downward biased, that is, real estate returns are more volatile in reality than is actually shown in the data. If only the unadjusted IPD Index returns are used, it may lead us to overstate the desirability of real estate in a mixed-asset portfolio. To allow for this well known problem, we report two sets of data for the real estate asset class: the original IPD Index returns, and an unsmoothed IPD Index return which has been modified using the methods proposed by Bond and Hwang (2007)[16].

[13] See the Appendix for the details of data we have considered in the study.

[14] We collect the monthly data from Bloomberg from April 2000. From August 1990 to March 2000, We use the quarterly USB Warburg AA over 10 year bonds total return index to generate monthly returns. Within each quarter the dynamics of the created monthly returns follow those of the UK gilts.

[15] We also collect BVCA (annual data) and LPX50 Private Equity (monthly data from November 2003 to July 2006) for the private equities, and find that the DataStream UK Investment Trusts Private Equity is not qualitatively different from these two.

[16] When the method proposed by Bond and Hwang (2007) is applied, the smoothing level of the IPD Index returns is only around 0.4 which is a sharp contrast to those of the previous studies who suggest more than 0.9.

5. DATA ANALYSIS

In a series of studies, Bond and Hwang show that the smoothness of the IPD Index return may not be entirely due to the valuation smoothing problem, but could rather reflect the slowly changing nature of a number of fundamental economic influences on real estate prices[17]. See Section 2 and Bond, Hwang, and Marcato (2006) for further discussion. However, when this method is applied to the monthly data, the resulting standard deviation of the unsmoothed IPD Index is lower than that suggested by many practitioners and in some elements of the academic literature. Therefore we took the approach of increasing the standard deviation of the unsmoothed IPD Index returns, such that the standard deviation of the annual unsmoothed IPD Index returns equaled 13%, which is suggested value in a recent IPF project on this topic[18] (see Key and Marcato 2006).

In this study we use monthly data rather than annual data. Considering the investment horizon and the intervals for measuring performance, annual data would be more appropriate. Indeed, in some cases the annual data sets are more comprehensive than the monthly series (eg the IPD Annual vs Monthly Index). However if annual data had been used the number of observations available for some of the asset series would have been too small for meaningful analysis, ie, less than 16. This would limit the statistical precision of the results. Also, in many cases asset allocation decisions are carried out using monthly observations, hence our focus on monthly data is consistent with industry practice. As a check for robustness we evaluated the results from using monthly returns to see if they were different from those obtained from using annual returns. We found that they were not qualitatively different from each other.[19] We report the results using monthly returns to save space.

5.2 Properties of data

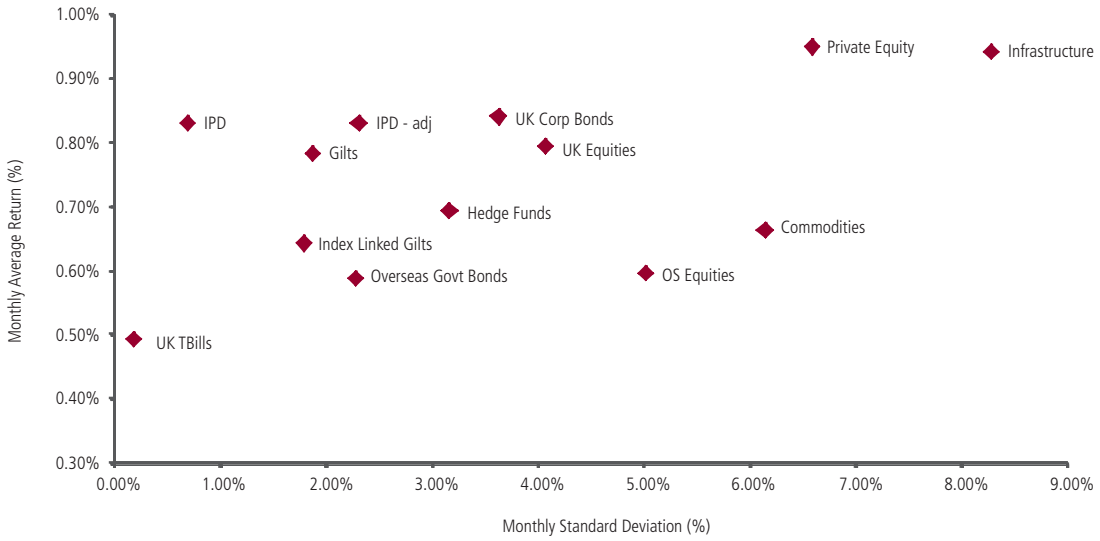
The key statistical properties of the monthly returns series for the 12 asset classes are reported in Table 5.1 (p49). Private equity was the best performing asset class over the entire time period, followed by infrastructure and corporate bonds. The asset groups with the lowest performance were Treasury bills, overseas government bonds and overseas equities. Figure 5.1 displays a plot of the return of each asset class against its standard deviation (a measure of total risk). Looking at the assets in the upper left-hand quadrant, which have the desirable characteristics of higher returns and lower risk compared to the other asset classes, shows that commercial real estate and gilts have appealing risk-return trade-offs. The best performing asset classes (private equity and infrastructure) had slightly higher average returns than real estate but also had very high levels of volatility. The simple Sharpe ratios suggest that real estate has outperformed the others because of its low volatility.

[17] These influences may include factors such as long term interest rates, inflationary expectations or demographic trends.

[18] If the reported standard deviation from the summary statistics is multiplied by the square roots of 12, a number different from 13 will be found. However, the multiplication approach to annualizing a monthly value is not applicable when the series are heavily autocorrelated.

[19] We use three different methods to convert the monthly data into the annual returns; multiplying by 12 the monthly returns, rolling windows of past 12 months (overlapping), and annual returns (non-overlapping). The results are not qualitatively different from each other.

Figure 5.1: Asset class historical performance and risk
mean and standard deviation of monthly total returns
August 1990 to July 2006



As is well known in financial economics, most asset return series are not normally distributed, and this is consistent with the results shown in Table 5.1. Many of the assets show right or left skewness and leptokurtosis, which means than more positive or negative returns are likely to occur, and also more extreme returns, than if the underlying return distributions had been normally distributed. The non-normally is also confirmed by the Jacque-Bera statistics.

The second and third panel in Table 5.1 show the sample characteristics over the two sub-periods from August 1990 to December 1999 and from January 2000 to July 2006. In the first sub-period, private equity and UK equities show the highest returns, reflecting the strong bull-market that in equities that occurred over the 1990s. Infrastructure, commodities and real estate all showed a low level of performance during the bull market period.

However, the situation was reversed in the bear market period, with most core assets showing poor performance during the bear period, except for the IPD Index. Among the alternative asset grouping, infrastructure and commodities show much higher performance in the second sub-period than in the first sub-period, explaining recent interest in these alternative assets.

Generally the asset returns are not serially correlated, with the noticeable exception for the IPD Index (and cash). Even after unsmoothing procedures have been applied to the IPD Index returns, the adjusted data still shows positive significant autocorrelations. However, as explained in Bond, Hwang, and Mercato (2006), this autocorrelation (persistence) can be interpreted as the smoothness of the fundamental economic information driving valuation-based real estate returns rather than the problem of appraisal smoothing.

5. DATA ANALYSIS

5.3 Co-movement and common factors in asset returns

Many investors are concerned not just with the risk and return characteristics of each asset class, but also in the extent to which returns on the assets move together. Asset classes that tend to move in similar ways, at similar times, may add little value in a portfolio context, as the benefits of risk diversification will not be as great. To consider the question of interrelationships among the data, and hence the desirability for inclusion in a mixed-asset portfolio, we present two sets of quantitative results. The first, shown in Panel D, Table 5.1, presents the correlation matrix of asset returns. It shows the correlation pattern over the complete sample period and provides a simple indication of the co-movement between asset returns series.

The second set of results, shown in Table 5.2 (p49), examines the issue of commonality in a more sophisticated manner. It considers the extent to which each set of assets classes (core and alternative assets) are driven by the same underlying risk factors. It could help us to identify whether any assets are redundant, where their performance could be replicated by a combination of the other assets. We do not try to identify what these factors might be, but they could be specific to a certain asset type (eg a risk factor that only affects property), or related to fundamental economic information (eg interest rates, economic activity or employment) or other features of the financial markets (eg liquidity, market capitalisation, style or momentum). The statistical technique used for this part of the analysis is called Principal Components Analysis.

Turning first to the correlation matrix, a number of interesting results are clear from the data. UK equities are highly correlated with overseas equity markets (0.795). In addition, UK equities are also highly correlated with Hedge Funds (0.515) and private equity (0.743). Correlation among fixed-income type asset segments is also high. For example, the correlation coefficient between UK gilts and index-linked gilts is 0.679. Between gilts and corporate bonds, the correlation coefficient is even higher at 0.771. Gilts, index-linked gilts and overseas government bonds also display high correlation.

Real estate, Treasury bills and commodities tend to have lower correlation with the other asset classes in the sample. Real estate in particular is generally characterised by low levels of correlation, and even negative correlation, with the other asset classes. In particular, compared with the alternative asset classes, real estate has a negative correlation with commodities and infrastructure. This is an interesting finding, as it points to the beneficial role real estate might play in mitigating portfolio risk in a mixed-asset portfolio which includes alternative assets. The positive correlation between hedge funds, private equity and equities suggests less beneficial risk reduction from including these alongside the core asset holdings.

In examining the results of the principal components analysis, the assets are first separated into the core and alternative categories. With so many core assets it is of interest to see how many common factors drive the asset series. In the extreme case, if the eight core assets are not correlated with each other, that is, each asset is determined by its own unique dynamic process, then none of the assets could be considered redundant. If this is the case then all of these assets could be used to form the optimal (minimum risk) portfolio. On the other hand, if the correlations between these assets are high, there may be less than eight common factors that drive the dynamics of the core asset group. In this case not all assets would need to be included in the optimal portfolio, as some may be considered redundant.

From Table 5.2, we find that six common factors explain 99% of the variation in the eight core asset returns. The first common factor appears to be a 'stock market factor' related to UK and overseas equity markets that explains around 55% of the variation in core asset returns. A second common factor affecting core asset returns is driven by bond returns (conventional gilts, index linked gilts, and corporate bonds), and explains around 25% of the variation in core asset return. The remaining common factors are difficult to interpret, one appears to be related to an exchange rate factor (7.5%) and another appears related to real estate (1.5% of core asset returns).

When examining the common factors in the alternative asset groupings, we find that it is overwhelmingly infrastructure, private equity and commodities that explain most of the variation in the returns of the four alternative assets. It is interesting to see that hedge funds appear to be a redundant asset. This may be due to the fact that a hedge fund's assets consist of primarily of the assets in the other asset segments. We also conducted the principal component analysis on the entire collection of 12 assets directly, rather than grouping them first. These results are not presented as they fully reflect the results of the earlier correlation analysis and add little to the analysis beyond the discussion that has already taken place.

5.4 Real estate and alternative assets in a portfolio context

At the heart of this research project lies the question of whether commercial real estate still has a role in investment portfolios as alternative asset classes come under greater consideration. In this section we consider the role of real estate in a mixed-asset portfolio and demonstrate the positive risk reduction benefits obtained when real estate is included. It will be shown that these benefits are greater than when alternative asset classes replace real estate in a portfolio.

In general the risk-adjusted performance of the core assets over the full sample period has been better than the four alternatives; that is, core assets show higher returns relative to volatility. Thus if fund managers are limited in how many asset classes they can invest in (because of either mandate conditions or resource costs) or in some other way are required to minimise the number of the asset classes invested in, our results suggest that the eight core assets are the right choice. However if there is no restriction on the number of asset classes included in a portfolio, by adding the alternative assets it is possible to reduce portfolio risk further.

A simple way to evaluate the possible reduction in risk that can be achieved from combining assets in a portfolio is to examine the correlation matrix of asset returns. As discussed above and as shown in Panel D of Table 5.1, real estate is not significantly positively correlated with other core assets, this suggests that including real estate could reduce the risk of the portfolio appreciably. Another interesting result is that hedge funds and private equity are highly correlated with the core assets. This is not surprising since hedge funds consist of the other assets and private equities are also highly sensitive to the equity market movement.

In the following we use seven core assets excluding cash. We exclude cash since including it is likely to result in a huge investment proportion in cash simply because of its small volatility. In fact, holding cash is generally not done for investment purposes, except in periods of expected adversity, but is more likely to prepare for other investment opportunities or payback cash to investors.

5.4.1 Real estate in a mixed-asset portfolio

The investment proportion allocated to real estate has been increasing gradually for the last five years in the UK. An important question is to what extent does including real estate in a portfolio result in reduced portfolio risk. To examine this question, we adopt the following methodology; from the asset return series we construct the global minimum variance portfolio, that is the portfolio with the lowest level of risk among all 'efficient' portfolios. We then examine how its variance is reduced by the addition/deletion of additional assets. This method allows us to assess the hedging impact of an asset class independently of its alpha contribution.

The results of the analysis are shown in Table 5.3 (p50). This table compares the standard deviations of the global minimum variance (GMV) portfolios with and without real estate. It shows the composition of the minimum variance (lowest risk) portfolio under several different assumptions. In each case the table reports the results for a portfolio where the asset weights are constrained to be non-negative. The portfolio is constructed using the full sample of monthly returns. The first column in the table shows the asset weights for the minimum variance portfolio without including real estate in the asset mix. From this column, the portfolio can be seen to contain primarily fixed-income investments with a small allocation to equities. The annualised standard deviation of this portfolio is 5.50%.

The second and third columns of Table 5.3 shows the composition of the minimum variance portfolio if real estate is now included in the selection process. Two sets of data are used for real estate. The first is the original (unadjusted) IPD series, this is labelled 'Smoothed IPD' in the table. A second set of results reports the portfolio weights using the unsmoothed IPD index returns. The reasons for unsmoothing the data and the method used are discussed in the earlier sections of this report. The standard deviation of the minimum variance portfolio returns is shown in the first row of the table. It is clear from the table that the standard deviation of the portfolio can be reduced substantially by including real estate in the asset mix (4.61% compared to 5.50%). Using smoothed IPD index returns could reduce the standard deviation even more, but the further reduction is probably obtained by downward bias in the volatility of real estate returns resulting from the problem of appraisal smoothing. Thus it is likely to be superficial. Therefore throughout the empirical section of this report we only use the unsmoothed IPD Index returns.

An interesting result is that when real estate is not included, bonds dominate the other assets. On the other hand when real estate is included, it dominates the other assets. The results are expected since both bonds and real estate have lower volatility than the other assets (with real estate having the higher return-risk trade-off of the two).

The investment proportions of the global minimum portfolio are different from what is suggested by the interviews reported earlier in this report, where the proportions in equities and bonds are around 60% and 30% respectively. This is not surprising as there is no reason to believe that institutional investors choose the GMV as their preferred portfolio. The reason we consider the global minimum portfolio is that it has the important and attractive property that it is free from any assumptions about asset class returns. As a result, it is the natural metric to consider when assessing the relative merits of different asset classes as potential diversifiers. This will not represent the portfolio held by the industry. Unsurprisingly, the portfolios held by institutional investors will differ because of their differing beliefs about expected returns. We consider allocations that are more consistent with industry practice towards the end of this section.

5.4.2 Can alternative assets replicate the role of real estate in a mixed-asset portfolio?

We now turn to the question of whether a similar reduction in risk to that described by adding real estate to a mixed-asset portfolio could be achieved by other means. That is could any of the alternative asset classes provide a similar or greater level of risk reduction to that provided by real estate? Table 5.4 (p50) shows the results of a similar analysis but this time each of the alternative assets is considered individually along side the core asset group. Note that in this table the results are calculated over the period January 1997 to July 2006, this is due to the fact that the Infrastructure series is not available over the full period. It also explains why the numbers in the first part of the table do not match those in Table 5.3. Panel A of Table 5.4 shows that the four alternative assets play a limited role in reducing portfolio risk in a mixed-asset portfolio. The interpretation of the results in Panel A is similar to that in Table 5.3. The standard deviation of the minimum variance portfolio is shown in the first row of each table. The panel shows the composition of the minimum variance portfolio when either hedge funds, infrastructure, private equity or commodities are added to the core asset mix (excluding real estate); for example the allocation to hedge funds equals 7.4%. In the portfolio for the core asset group, excluding real estate and any alternative assets, the (annual) standard deviation of returns for the minimum variance portfolio is 4.43%. In no case does adding one of the alternative assets to the core asset mix achieve a significant level of risk reduction. The greatest risk reduction occurs when hedge funds are included in the portfolio, including infrastructure or private equity to the core asset group results in no risk reduction.

Panel B of Table 5.4 on the other hand shows that again adding real estate to the asset mix results in a reduction in overall portfolio risk. However, adding the alternative assets to the portfolios with real estate does not contribute to the reduction in risk.

Motivated by the results we now consider all possible asset classes for the minimum variance portfolio (both core and alternative assets) to see what is the maximum possible level of risk reduction. Table 5.5 (p51) shows that the extent of the risk reduction depends on whether or not real estate is included in the portfolio. When real estate is not included, the reduction of volatility is marginal. On the other hand with real estate included, the volatility of the portfolio can be reduced by 15%. Including the four alternative assets does not contribute to the reduction of volatility, and the magnitude of the risk reduction is close to zero. *This analysis clearly shows the importance of real estate as the principal hedging instrument in portfolio formation, and justifies the recent increase in this asset class.*

5.4.3 An application to pension fund asset allocation decisions

In this section our approach to portfolio allocation constraints is more realistic, in the sense that we analyse how much volatility reduction is possible by adding alternative assets to portfolios that might commonly held by institutional investors (for example 'with-profit life funds' and 'pension funds'). In this context, we take the relative weights of the core asset as fixed and based on the evidence in the previous section we include real estate as a core asset. It is assumed that these managers allocate their funds to core assets as follows.

Table 5.2: Indicative institutional allocations to the core asset classes

	With-profits life funds	Pension funds
UK gilts	10.00%	6.25%
Corporates and other non-govt	15.00%	6.25%
UK index-linked	0.00%	10.00%
Overseas bonds	5.00%	2.50%
UK equities	37.50%	32.50%
Overseas equities	12.50%	30.00%
Property	15.00%	7.50%

The sums of the proportions do not add to 100%, reflecting that they hold cash and have the potential to invest in other assets, such as the alternative asset classes under consideration in this study. We take these relative weights as given and calculate the optimal investment allocation to the alternative assets. It is assumed that there is a two stage decision process. Asset managers must decide on how to allocate their assets between the core asset group (as a whole – in the proportions listed above) and the alternative asset. The allocation to the core assets are then split by the allocations above.

To begin, one alternative asset at a time is added to the portfolios (assumed to represent a UK with-profit life funds and a pension fund). Because of the availability of these alternative asset returns, the sample periods (sample sizes) of the four cases are not the same. In order to compare various cases, we use a sample period when all asset return series are available to us; 115 monthly observations from January 1997 to July 2006. We calculate the core asset portfolio's volatility and the volatility we can achieve by adding an alternative asset. Panel A of Table 5.6 (p51) shows that there is little difference in the standard deviation of portfolio returns between the alternative assets. Except for adding hedge funds, the other three cases show that we need to invest more than 80% on the core assets to obtain the minimum variance. In particular adding infrastructure and private equity does not reduce the variance. In the case of hedge funds the investment proportion in the core asset portfolio is 53.4% (pension funds), reflecting the high correlation between the core assets and hedge funds. Even if we add all four alternative assets to the core asset portfolio, Panel B shows that volatility is hardly reduced further (compare the standard deviation of 8.08% to the standard deviation of the portfolio that does not include any alternative asset, which 8.41%)

Assuming that investment managers would be unconstrained in their allocation to alternative assets is however unrealistic. It would be more realistic to assume that the maximum investment proportion in the alternative assets category is 10%. Panel C shows the results with the restriction that the investment proportion in the core asset portfolio must be at least 90% (that is no more than 10% allocation to alternative assets). As expected, the volatility levels of the restricted portfolios are slightly higher that those in panel B, but the alternative assets still do not contribute to any significant reduction in risk.

Finally as a check on the robustness of the results to the sample period chosen, we repeat the same procedure during the bull and bear market periods. Panels D and E suggest that there is little difference in our conclusion; the four alternative assets do not reduce risk significantly. One noticeable difference between the bear and bull markets is that during the bull market of the late 1990s commodities were the preferred alternative asset included in the optimal portfolio, while hedge funds were chosen during the recent bear market period.

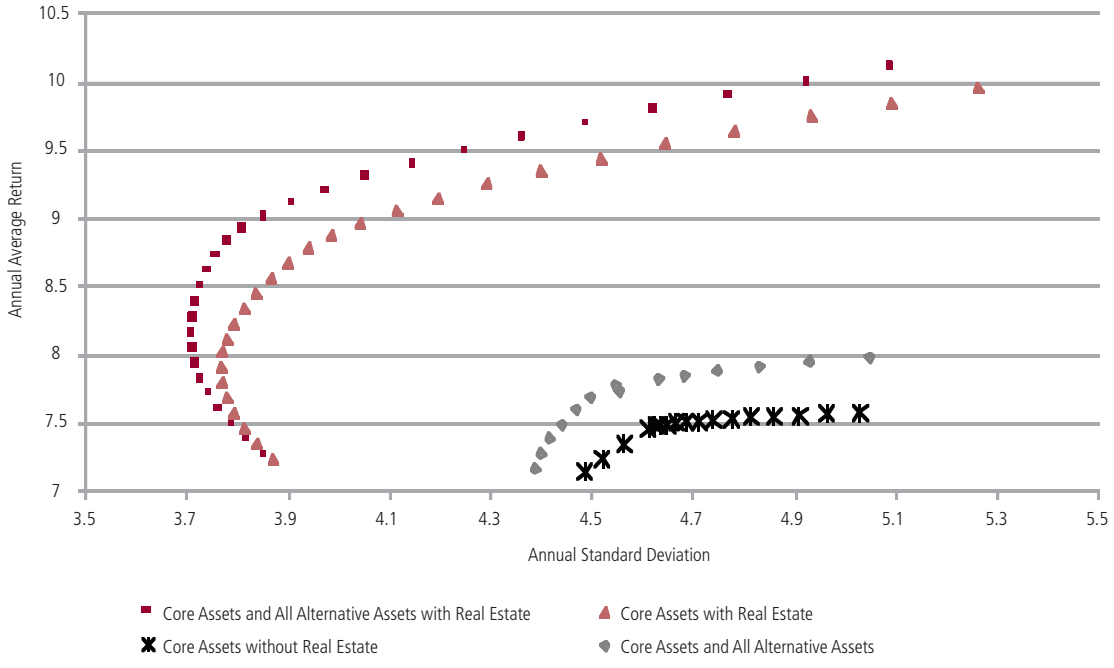
5.4.4 The efficient frontier with real estate and alternative assets

So far the focus of the analytical section of this research has been on the reduction of the volatility (portfolio risk) of the global minimum variance portfolio (GMV). When the variance of the GMV decreases with additional assets, the whole efficient frontier expands outward. Hence a greater range of risk-return possibilities open up to investment managers. We illustrate the impact of adding real estate and the alternative assets to an investment portfolio.

Figure 5.2 below shows four curves that represent the efficient frontier under different assumptions about the assets available for inclusion in an investment portfolio. The efficient frontier obtained without real estate or any of the alternative assets is in the far right bottom corner of the figure (the line marked by Xs). This suggests that there is a large scope to expand the efficient frontier by adding additional assets. For example, when the four alternative assets are added to the portfolio mix (not including real estate), the efficient frontier is shown to expand towards the upper left quadrant (the curve represented by blue diamonds in the chart). However the expansion is limited compared with the results obtained by adding real estate to the core asset mix (shown by the red triangles). When real estate is added to the portfolio, a large outward shift occurs in the efficient frontier. This suggests that investors can now achieve a higher return for the same level of risk they assumed before real estate was added to the portfolio. Alternatively investors may be able to lower portfolio risk for a given level of return. Finally using all possible assets expands the frontier even further (the curve represented by purple squares). However the expansion beyond the previous curve is marginal; the diversification gain is not as large as that obtained by adding real estate to the portfolio.

These results are consistent with the analysis of the minimum variable portfolio discussed in the sections above. Portfolio risk decreases dramatically by including real estate in a mixed-asset portfolio and the inclusion of the four alternative assets into a portfolio plays a somewhat limited role.

Figure 5.2: Efficient frontier (115 monthly returns from January 1997 to July 2006)



5.5 Conclusions

In this section of the report we have investigated the empirical attributes of a set of core assets and a list of alternative asset classes under active consideration by portfolio managers (these are hedge funds, commodities, private equity and infrastructure). The keys findings from this empirical analysis can be described as follows.

- The historical risk-adjusted performance of the asset classes under consideration differed dramatically over the sample period. Private equity and infrastructure had high returns but also high levels of risk. Real estate was shown to have attractive risk and return characteristics for a UK institutional investor.
- Over the bull and bear market periods the relative performance of the asset groups changed dramatically. Equities, private equity and gilts were the best performing assets during the bull market. In the bear market period, real estate and infrastructure have performed strongly.
- An analysis of the correlation coefficients between asset classes showed that UK equities are highly correlated with overseas equities, hedge funds and private equity. Gilts, index-linked bonds, corporate bonds and overseas government bonds also show high levels of correlation. Real estate and commodities have lower correlations with the other asset classes.
- Six common factors explain 99% of the variation in core UK asset returns. One common factor appears to be a stock market factor (55%). A second appears to be a bond related factor (25%). Other possible common factors might be related to the exchange rate and real estate.
- The volatility of our chosen benchmark portfolio (global minimum variance portfolio) can be reduced substantially by including real estate in the asset mix (4.61% compared to 5.50%). Using smoothed IPD Index returns could reduce the standard deviation even more but the effect is likely to be a statistical artefact arising because of the valuation smoothing problem.
- Could a similar reduction in risk to that described by adding real estate to a mixed-asset portfolio could be achieved by using alternative assets? In no case does adding one of the alternative assets to the core asset mix achieve a significant level of risk reduction.
- If real estate is not already included in the portfolio, the greatest risk reduction occurs when hedge funds are included in the portfolio (though this is small compared to that obtained from including real estate). Including infrastructure or private equity to the core asset group results in no risk reduction.
- When core asset holdings are held in a fixed proportion to reflect the portfolio structure of either a UK pension fund or a with-profits life fund, the role for alternative assets in providing portfolio diversification is small. Preference for which alternative asset to hold was found to depend on the state of the market. Commodities provided some diversification benefit during the bull market period and hedge funds were the preferred diversifier during the bear market.

This analysis clearly shows the importance of real estate as the principal hedging instrument in portfolio formation, and justifies the recent increase in this asset class.

6. CONCLUSION

This report has examined the role of alternative assets in an institutional investor's portfolio. In particular, the question of whether investors will shift funds away from real estate towards alternative investment classes has been evaluated using both survey based information and a detailed analysis of historical data on investment returns. While there were some discrepancies between the findings of the survey and the results of the data analysis, the overall conclusions obtained from this report are remarkably consistent between the two sets of results.

Where there was a difference between investors' views on the performance characteristics of the asset classes under consideration from those used in the data analysis, it is because in making their asset allocation decisions, strategists do not rely exclusively on ex-post (historic) performance characteristics but also draw on expert opinion and fundamental beliefs. Overall, their views portray a natural order of risk and return under which risk-adjusted returns are comparable across asset classes.

These assumptions differ from history in two very significant ways. First, the returns expected from property are much lower than delivered over the last 10–15 years; property's correlation with other asset classes is also assumed to be higher. This has the effect of dampening property's risk-adjusted returns and diversifying capability and in turn implied allocations; even so, these allocations remain high absolutely and relative to current institutional exposures.

It is also noteworthy that, under this natural order of risk and return, investors' specific risk appetites become more influential in dictating their asset allocation – with bonds dominating the portfolios of the most risk-adverse investors, and private equity and commodities having higher weightings among the risk-loving.

The second way in which investors' views diverge from the historic analysis relates to the perceived potential to identify and tap into fund manager alpha. This is a very powerful factor behind their strategies towards alternatives, especially hedge funds, and contrasts with the limited potential perceived for equities. It implies higher risk-adjusted returns and lower correlations than the (historic) market statistics indicate, and higher allocations to hedge funds.

While such alpha has been accessible historically, there is a vigorous academic and practitioner debate on how sustainable it might be. However, even when the more conservative assumptions of the advisers are adopted, a high allocation to hedge funds is implied for all but the most risk-loving investors. Consistent with the pattern observed amongst institutional investors, such allocations are at the expense of equities.

Encouragingly for investors, there is strong support from the historical evidence to underlie the current trend towards the high and increasing allocations towards real estate. On a risk-adjusted basis, real estate has been one of the best performing asset classes over the sample period studied and it is noted that real estate has a significantly better risk hedging characteristic than any of the other asset classes. On the question of whether these benefits could have been derived from substituting members of the alternative asset group in place of real estate in a portfolio, the emphatic answer was that no other asset class could deliver the same level of portfolio hedging benefits as real estate.

The evidence from the quantitative analysis and survey expectations is that allocations to real estate will remain high. The risk-hedging benefits and the observed allocations to property, even among the most enthusiastic investors in alternative asset classes, emphasise the place of property in a modern world multi-asset portfolio.

7. DATA APPENDIX

Table A1: Asset Classes

Core Assets

Asset Classes	Data	Sources	Frequency	Period	Available	Notes
Domestic Equity	FTSE All Share	Datastream	M	1985M12~2006M05	*	The FTSE All-Share Index is a capitalisation-weighted index, comprised of comp traded on the London Stock Exchange. It aims to represent at least 98% of the ful value of all UK companies, which qualify as eligible for inclusion.
Overseas Equity	MSCI ex UK	MSCI website; Datastream	M	1969M12~2006M05	*	The MSCI World Index is a free float-adjusted market capitalization index that is designed to measure global developed market equity performance. As of June 20(MSCI World Index ex UK consisted of the 22 developed market country indices v the UK market is excluded.
UK Bonds	UK Index-Linked Gilts	Datastream	M	1986M01~2006M06	*	UK index-linked gilts were started to issue in 1981. The price index data is availa from datastream since 1986, which is an arithmetically weighted index on the gro dirty prices, and weighted by the nominal amount outstanding; however, the total index is available since 1998. Both are published in the Financial Time
	UK Gilts	Datastream	M	1985M12~2006M07	*	10-15 years maturity total return index.
	Investment Grade	Bloomberg	M	2000M04-2006M07	*	We use a user defined index containing four series of NAV for investment funds v invest UK investment grade corporate bonds only.
Real Estate	IPD	IPD	M	1987M01~2006M05	*	

Alternatives

Hedge Funds	CSFB/Tremont Index	Datastream; CSFB/Tremont: www.hedgeindex.com	M	1994M01~2006M05	*	Credit Suisse/Tremont Hedge Fund Index is an asset-weighted hedge fund index and includes only funds, as opposed to separate accounts. The Index uses the Credit Suisse/Tremont database, which track over 4500 funds, and consists only of funds with a minimum of US$50 million under management, a 12-month track record, and audited financial statements. It is calculated and rebalanced on a monthly basis, and shown net of all performance fees and expenses.
Infrastructure Finance	Macquarie Global Infrastructure Index	Australian Data	M	1997/01/31~2006/06/30	*	Listed in the Australian stock market.
Private Equity	UK Investment Trusts Private Equity	Datastream	M	1976M02~2006M06	*	The index is constructed by Datastream that measure the performance of all UK listed investment trusts in the private equity sector
Commodities	GSCI	Goldman Sachs Commodity Index: www2.goldmansachs.com/gsci/, also available in Datastream	D/M	1969~2006	*	The index's components qualify for inclusion in the index based on liquidity measures and are weighted in relation to their global production levels. Currently there are 25 commodities that meet the eligibility requirement for the GSCI. Three GSCI indices are published: excess return, total return and spot, where the total return is the measure of commodity returns that is completely comparable to returns from a regular investment in the S&P 500 (with dividend reinvestment) or a government bond, while the return on the excess return index is comparable to the return on the S&P 500 above cash.

Others

Real Estate	Indirect Property Vehicles	Published by HSBC and the AREF	Q	1989Q4~2005Q4	*	All of the funds included in the indices are collective investment schemes offering INDIRECT exposure to the UK property market. Each total return index combines the NAV (net asset value) of each relevant fund, calculating on the basis of the relative NAV weight of the fund.
	Quoted Property Shares/REITs	Datastream	M	1989M12~2006M05	*	The FTSE EPRA/NAREIT Global Real Estate Index Series is structured in such a way that it can be considered to represent general trends in all eligible real estate stocks worldwide.
Hedge Funds	MSCI Hedge Fund Index	Datastream	M	1994M10~2006M05	*	CSFB-Tremont total return index and MSCI hedge fund global market total return index are available from Datastream, but MSCI is shorter.
Infrastructure Finance	MSCI World Transportation Infrastructure	Bloomberg	M	2000M08~2006M07	*	
Infrastructure Finance	Macquarie Global Infrastructure Index	www.ftse.com	D	2003/12/31~2006/06/30	*	Calculated by FTSE, MGII is designed to reflect the stock performance of companies within the infrastructure industry. Price and Total Return indices are calculated in local currency for each index. The indices are expected to be used as the basis for the creation of a range of tailored infrastructure investment products.
Private Equity	BVCA	www.bvca.co.uk	Y	1987-2005	*	BVCA annual report analizes the aggregate net returns to investors from independent private equity funds in the UK by vintage year and investment stage of fund. Reports are published annually in May (summary)/July (full report).
	LPX50 Private Equity	Bloomberg	M	2003M11~2006M05	*	The LPX50® is a global index that measures the performance of 50 Listed Private Equity (LPE) companies. It is most widely used benchmark for the LPE asset class and serves as underlying for the first Private Equity index tracker funds worldwide. However, available from Bloomberg, the data series is very short.
Commodities	CRB	Commodity Research Bureau: www.crbtrader.com	D/M	1947~2006	*	The Spot Market Price Index is a measure of price movements of 22 sensitive basic commodities. The prices used in the index are obtained from trade publications or from other government agencies. The index is an unweighted geometric mean of the individual commodity price relatives, i.e., of the ratios of the current prices to the base period prices.
Commodities	DJAIG	Dow Jones - AIG Commodity Index website: djindexes.com/mdsidx/, also available in Datastream	D	1991~2006	*	The index is designed to be a highly liquid and diversified benchmark for the commodity futures market. It is weighted and composed of futures contracts on 19 physical commodities traded on US exchanges.
UK Bonds	High Yield Bonds					There is no high yield bond index for the UK market.
Overseas Equity	Emerging Markets	Datastream	M	1987M12~2006M06	*	The MSCI Emerging Markets Index is a free float-adjusted market capitalization index that is designed to measure equity market performance in the global emerging markets. As of June 2006 the MSCI Emerging Markets Index consisted of the following 25 emerging market country indices.
Overseas Bonds	Government Bonds	Datastream	M	1985M11~2006M06	*	The Merrill Lynch Global Government Index tracks the performance of public debt investment grade Sovereign issuers, based on a composite of Moody's and S&P, issued and denominated in their own domestic market and currency. Here Global Government ex UK index is used.
	Investment Grade Corporate Bonds	Datastream	M	1993M01~2006M05	*	Lehman Investment Grade Corporate Bond Global Index selects qualified bonds that are rated investment grade (Baa3/BBB-/BBB- or above) using the middle rating of Moody's, S&P, and Fitch, at least 1-year until final maturity, and with fixed coupon rate.
	High Yield Bonds	Datastream	M	1997M12~2006M06	*	The Merrill Lynch Global High Yield Index tracks the performance of corporate bonds below investment grade based on a composite of Moody's and S&P. Qualified bonds must have at least one year remaining term to maturity, a fixed coupon schedule and a minimum amount outstanding of USD 100 million (or equivalent).

Table A2: Properties of monthly returns

A. Entire Sample Period: August 1990 - July 206

	UK_EQ	OVER_EQ	UK_GILTS	UK_IDX_GILTS	UKCB	OVER_GB	IPD	UNSMOOTHED_IPD	UK_TB	HEDGE	INFRA	PRIVATE_EQ	COMMODITIES
Mean	0.008	0.006	0.008	0.006	0.008	0.006	0.008	0.008	0.005	0.007	0.009	0.010	0.007
Std. Dev.	0.041	0.050	0.019	0.018	0.036	0.023	0.007	0.023	0.002	0.032	0.083	0.066	0.061
Skewness	-0.661	-0.590	-0.182	0.333	-0.480	1.367	0.450	1.497	1.681	0.405	-0.151	-0.230	0.229
Kurtosis	3.762	3.943	3.395	5.404	5.017	8.157	4.955	8.132	5.612	4.565	3.319	4.655	3.568
Jarque-Bera	18.629	18.237	2.312	49.790	39.923	272.531	37.056	281.829	144.978	19.526	0.926	23.613	4.255
Sharpe Ratio	0.196	0.119	0.420	0.360	0.233	0.259	1.222	0.361	2.714	0.220	0.114	0.144	0.108
First Order Autocorrelation	0.079	0.064	0.075	0.060	-0.069	0.101	0.830	0.329	0.957	-0.084	-0.014	0.110	0.047

B. Bull Market: August 1990 - December 1999

	UK_EQ	OVER_EQ	UK_GILTS	UK_IDX_GILTS	UKCB	OVER_GB	IPD	UNSMOOTHED_IPD	UK_TB	HEDGE	INFRA	PRIVATE_EQ	COMMODITIES
Mean	0.012	0.012	0.010	0.008	0.011	0.008	0.007	0.007	0.006	0.010	0.002	0.015	0.004
Std. Dev.	0.040	0.050	0.021	0.019	0.029	0.025	0.008	0.025	0.002	0.038	0.090	0.056	0.057
Skewness	-0.467	-0.612	-0.349	0.468	-0.640	1.518	0.750	1.696	1.399	0.229	-0.019	0.468	0.453
Kurtosis	3.480	4.601	3.237	5.738	7.098	8.030	4.970	8.543	4.021	3.902	3.455	5.567	4.247
Jarque-Bera	5.193	19.123	2.559	39.421	86.791	162.519	28.871	198.836	41.775	3.071	0.312	35.162	11.192
Sharpe Ratio	0.313	0.229	0.478	0.403	0.389	0.312	0.886	0.285	3.050	0.258	0.027	0.270	0.074

C. Bear Market: January 2000 - July 206

	UK_EQ	OVER_EQ	UK_GILTS	UK_IDX_GILTS	UKCB	OVER_GB	IPD	UNSMOOTHED_IPD	UK_TB	HEDGE	INFRA	PRIVATE_EQ	COMMODITIES
Mean	0.002	-0.002	0.005	0.004	0.004	0.003	0.011	0.010	0.004	0.004	0.013	0.001	0.010
Std. Dev.	0.041	0.049	0.014	0.015	0.044	0.019	0.005	0.020	0.001	0.025	0.079	0.077	0.067
Skewness	-0.925	-0.615	-0.178	-0.268	-0.219	0.364	1.148	0.789	0.373	0.469	-0.204	-0.466	-0.016
Kurtosis	3.859	3.023	2.794	2.790	3.548	3.928	4.138	4.764	2.076	3.800	3.178	3.451	2.963
Jarque-Bera	13.704	4.986	0.559	1.092	1.617	4.580	21.629	18.438	4.638	5.001	0.655	3.533	0.008
Sharpe Ratio	0.037	-0.039	0.328	0.291	0.093	0.166	2.294	0.502	6.132	0.179	0.159	0.017	0.150

D. Correlation Matrix (Entire Sample Period)

	UK_EQ	OVER_EQ	UK_GILTS	UK_IDX_GILTS	UKCB	OVER_GB	UNSMOOTHED_IPD	UK_TB	HEDGE	INFRA	PRIVATE_EQ	COMMODITIES
UK_EQ	1.000											
OVER_EQ	0.795	1.000										
UK_GILTS	0.242	0.128	1.000									
UK_IDX_GILTS	0.282	0.182	0.679	1.000								
UKCB	0.181	0.080	0.771	0.604	1.000							
OVER_GB	0.255	0.399	0.374	0.453	0.319	1.000						
UNSMOOTHED_IPD	0.075	0.059	0.035	0.071	0.123	-0.027	1.000					
UK_TB	0.009	-0.005	0.215	0.077	0.124	0.182	-0.187	1.000				
HEDGE	0.515	0.727	0.165	0.179	0.129	0.394	0.019	0.116	1.000			
INFRA	0.305	0.321	0.086	0.032	0.186	0.332	-0.111	0.029	0.186	1.000		
PRIVATE_EQ	0.743	0.645	0.132	0.194	0.135	0.146	0.108	-0.105	0.400	0.155	1.000	
COMMODITIES	0.101	0.185	-0.023	0.097	0.036	0.334	-0.113	0.018	0.321	0.168	0.105	1.000

7. DATA APPENDIX

Table A3: Principal Component Analysis (Entire Sample Period)

A. Core Assets (Unsmoothed IPD Used): 192 Monthly Observations from August 1990 to July 2006

	Comp 1	Comp 2	Comp 3	Comp 4	Comp 5	Comp 6	Comp 7	Comp 8
Eigenvalue	0.004	0.002	0.001	0.000	0.000	0.000	0.000	0.000
Variance Prop.	0.547	0.233	0.078	0.067	0.041	0.021	0.013	0.000
Cumulative Prop.	0.547	0.780	0.858	0.925	0.966	0.987	1.000	1.000
Eigenvectors:								
UK_EQ	31.2%	-4.0%	95.1%	-76.1%	58.0%	-62.2%	-1.7%	-0.2%
OVER_EQ	40.2%	-17.0%	-51.2%	44.2%	-58.9%	49.7%	-0.3%	0.4%
UK_GILTS	4.8%	25.6%	-16.4%	-10.0%	10.8%	105.3%	340.1%	-3.1%
UK_IDX_GILTS	5.2%	20.1%	-22.5%	2.1%	46.4%	199.2%	-206.3%	1.8%
UKCB	8.1%	58.0%	19.6%	-9.2%	-51.4%	-82.0%	-84.3%	0.3%
OVER_GB	8.7%	12.3%	-146.5%	65.4%	74.1%	-109.1%	15.9%	-1.5%
UNSMOOTHED_IPD	1.7%	4.6%	226.8%	84.4%	20.1%	1.2%	22.6%	1.4%
UK_TB	0.0%	0.5%	-5.1%	-0.8%	0.9%	-2.0%	14.1%	101.0%

B. Alternative Assets: 115 Monthly Observations from January 1997 to July 2006

	Comp 1	Comp 2	Comp 3	Comp 4
Eigenvalue	0.008	0.005	0.004	0.001
Variance Prop.	0.449	0.288	0.225	0.038
Cumulative Prop.	0.449	0.737	0.962	1.000
Eigenvectors:				
HEDGE	8.6%	26.5%	11.4%	153.0%
INFRA	47.5%	-88.3%	-41.4%	-4.5%
PRIVATE_EQ	25.7%	136.4%	-65.3%	-29.0%
COMMODITIES	18.2%	25.4%	195.3%	-19.6%

Table A4: Global Minimum Variance Portfolio Using 7 Core Assets with and without Real Estate (192 Monthly Returns from August 1990 to July 2006)

		Without Real Estate	Smoothed IPD	Unsmoothed IPD
Annual Global Minimum Standard Deviation		5.50%	2.00%	4.61%
Investment Proportions	UK_EQ	3.3%	0.0%	1.0%
	OVER_EQ	0.0%	0.0%	0.0%
	UK_GILTS	35.0%	9.6%	25.2%
	UK_IDX_GILTS	39.2%	0.4%	23.4%
	UKCB	0.0%	0.0%	0.0%
	OVER_GB	22.6%	8.6%	18.5%
	Real Estate		81.5%	31.8%

7. DATA APPENDIX

Table A5: Global Minimum Variance Portfolio Using 6 Core Assets and An Alternative Asset (115 Monthly Returns from January 1997 to July 2006)

A. Global Minimum Variance Portfolios with Alternative Assets without Real Estate

		No Alternative Assets	Hedge Funds	Infrastructure	Private Equities	Commodities
Annual Global Minimum Standard Deviation		4.43%	4.38%	4.43%	4.43%	4.41%
Investment Proportions	UK_EQ	8.0%	5.1%	8.0%	8.0%	7.8%
	OVER_EQ	0.0%	0.0%	0.0%	0.0%	0.0%
	UK_GILTS	30.8%	30.1%	30.8%	30.8%	31.7%
	UK_IDX_GILTS	38.9%	39.0%	38.9%	38.8%	38.7%
	UKCB	0.0%	0.0%	0.0%	0.0%	0.0%
	OVER_GB	22.4%	18.4%	22.4%	22.4%	19.9%
Alternative Asset			7.4%	0.0%	0.0%	1.9%

B. Global Minimum Variance Portfolios with Alternative Assets and Real Estate

		No Alternative Assets	Hedge Funds	Infrastructure	Private Equities	Commodities
Annual Global Minimum Standard Deviation		3.76%	3.73%	3.76%	3.76%	3.73%
Investment Proportions	UK_EQ	4.4%	2.2%	4.3%	4.4%	4.0%
	OVER_EQ	0.0%	0.0%	0.0%	0.0%	0.0%
	UK_GILTS	27.1%	26.5%	27.0%	27.1%	28.2%
	UK_IDX_GILTS	20.9%	21.4%	21.0%	20.9%	20.7%
	UKCB	0.0%	0.0%	0.0%	0.0%	0.0%
	OVER_GB	15.9%	13.0%	15.7%	15.9%	12.6%
	Unsmoothed IPD	31.7%	31.3%	31.8%	31.7%	32.1%
Alternative Asset			5.6%	0.1%	0.0%	2.4%

Table A6: Global Minimum Variance Portfolio Using Core Assets with and All Four Alternatives (115 Monthly Returns from January 1997 to July 2006)

		Without Real Estate	With Real Estate
Annual Global Minimum Standard Deviation		4.38%	3.71%
Investment Proportions	UK_EQ	5.3%	2.3%
	OVER_EQ	0.0%	0.0%
	UK_GILTS	30.8%	27.6%
	UK_IDX_GILTS	39.0%	21.0%
	UKCB	0.0%	0.0%
	OVER_GB	17.0%	10.7%
	Unsmoothed IPD		31.7%
Alternative Assets	Hedge Funds	6.7%	4.5%
	Infrastructure	0.0%	0.1%
	Private Equities	0.0%	0.0%
	Commodities	1.4%	2.0%

Table A7: Global Minimum Variance Portfolio Using Core Assets and All Four Alternative Assets

A. Adding One Alternative Assets (115 Monthly Returns from January 1997 to July 2006)

	Profit Life Funds	Pension Funds
Annual Standard Deviation of Core Asset Portfolio	8.410%	10.400%
Hedge Funds		
Annual Global Minimum Standard Deviation	8.21%	9.62%
Core Assets	78.5%	53.4%
Hedge Funds	21.5%	46.6%
Infrastructure		
Annual Global Minimum Standard Deviation	8.41%	10.40%
Core Assets	100.0%	99.0%
Infrastructure	0.0%	1.0%
Private Equity		
Annual Global Minimum Standard Deviation	8.41%	10.40%
Core Assets	100.0%	100.0%
Private Equity	0.0%	0.0%
Commodities		
Annual Global Minimum Standard Deviation	8.19%	9.92%
Core Assets	91.6%	86.6%
Commodities	8.4%	13.4%

B. Adding All Four Alternative Assets (115 Monthly Returns from January 1997 to July 2006)

	Profit Life Funds	Pension Funds
Annual Standard Deviation of Core Asset Portfolio	8.410%	10.400%
Annual Global Minimum Standard Deviation	8.08%	9.44%
Core Assets	77.3%	52.5%
Hedge Funds	16.2%	38.5%
Infrastructure	0.0%	0.7%
Private Equity	0.0%	0.0%
Commodities	6.5%	8.3%

C. Adding All Four Alternative Assets Alternative Assets Are Restricted to 10% (115 Monthly Returns from January 1997 to July 2006)

	Profit Life Funds	Pension Funds
Annual Standard Deviation of Core Asset Portfolio	8.410%	10.400%
Annual Global Minimum Standard Deviation	8.16%	9.95%
Core Assets	90.0%	90.0%
Hedge Funds	4.1%	1.3%
Infrastructure	0.0%	0.2%
Private Equity	0.0%	0.0%
Commodities	5.9%	8.5%

D. Bull Period (January 1997 - December 1999): Adding All Four Alternative Assets Alternative Assets Are Restricted to 10%

	Monthly Returns (36 Observations)	
	Profit Life Funds	Pension Funds
Annual Standard Deviation of Core Asset Portfolio	8.23%	10.64%
Annual Global Minimum Standard Deviation	7.99%	10.12%
Core Assets	90.7%	90.0%
Hedge Funds	0.0%	0.2%
Infrastructure	0.0%	0.0%
Private Equity	0.0%	0.0%
Commodities	9.3%	9.8%

E. Bear Period (January 2000 - July 2006): Adding All Four Alternative Assets Alternative Assets Are Restricted to 10%

	Monthly Returns (79 Observations)	
	Profit Life Funds	Pension Funds
Annual Standard Deviation of Core Asset Portfolio	8.300%	10.030%
Annual Global Minimum Standard Deviation	7.95%	9.57%
Core Assets	90.0%	90.0%
Hedge Funds	9.2%	7.3%
Infrastructure	0.1%	0.3%
Private Equity	0.0%	0.0%
Commodities	0.8%	2.3%

7. DATA APPENDIX

7.1 Information on market size

UK equity	£267,591,067,039	According to LSE's October Report (2006): Market Information and Analysis, the total market value is the sum of all UK listed companies in FTSE.
Overseas equity	£6,411,479,495,732	This number is an approximated market value of G8 ex UK equity markets at the end of October, 2006
UK gilts	£318,269,070,000	From the latest issue (24-Nov-06) from DMO (UK Debt Management Office: http://www.dmo.gov.uk/), the number is obtained as a sum of all outstanding UK gilts in nominal amount.
UK index link	£62,434,400,000	From the latest issue (24-Nov-06) from DMO (UK Debt Management Office: http://www.dmo.gov.uk/), the number is obtained as a sum of all outstanding UK index-linked gilts in nominal amount.
UK corporate bond	922 billion USD	Dec 2003, Merrill Lynch non-government bonds
Overseas government bond		The outstanding amount of US government bonds is £276,084,508,497 at the end of Oct. 2006 according to the Bureau of the Public Debt (http://www.publicdebt.treas.gov/)
UK Treasury bill	£20,000,000,000/per quarter	On average, there will be around £20 billion of Treasury bill available per quarter according to the latest report (24-Nov-06) from DMO (Debt Management Office: http://www.dmo.gov.uk/)
Hedge fund	£7,798,314,000	This number is from HFR (http://www.hedgefundresearch.com/) 2003 Annual Report (the end of 2003) on hedge fund estimated net asset.
Infrastructure		At 30 September 2006, Macquarie Capital (leasing and asset financing) portfolio of loans and leases exceeded $A5.2 billion (£2.1 billion) across a range of different industries in information technology, electronics manufacturing, motor vehicles, plant and equipment, telecommunications, aviation engines, transportation, vendor financing and utility meters.
UK private equity	£11,700,000,000	"The UK venture capital and private equity industry…in 1998, the investments amounted to £4 919 million (1332 firms)."(Burgel, 2000) According to BVCA's (Oct-06 news release) (http://www.bvca.co.uk/) industry overview, "Investments reached £11.7 billion in 2005, up 21% from £9.7 billion in 2004…"
UK commodities	£7,003,970,316	This number represents the market value (28-Nov-06) of futures on soft commodity, brent crude oil, and metal contracts traded in the UK and EU.

8. REFERENCES

Adair, A., McGreal, S. and Webb, J.R. (2006), 'Diversification Effects of Direct versus Indirect Real Estate Investments in the UK', *Journal of Real Estate Portfolio Management,* Vol. 12, pp. 85–90.

Baum, A., Callender, M., Crosby, N., Devaney, S., Law, V. and Westlake, V. (2005) *Depreciation in Commercial Property Markets,* A report prepared for the Investment Property Forum.

Blundell, G.F. and Ward, C.W.R. (1987), 'Property Portfolio Allocation; A Multi-factor Model', *Land Development Studies,* Vol. 4, pp. 145–156.

Bond, S.A. and Glascock, J.L. (2006), *The Performance and Diversification Benefits of European Public Real Estate Securities,* A report published by the European Public Real Estate Association (www.epra.com).

Bond, S.A and Hwang, S. (2003), 'A Measure of Fundamental Volatility in the Commercial Property Market', *Real Estate Economics,* Vol. 31, pp. 577–600.

Bond, S.A and Hwang, S. (2007), 'Smoothing, Nonsynchronous Appraisal and Cross-Sectional Aggregation in Real Estate Price Indices', Forthcoming *Real Estate Economics*.

Bond, S.A., Hwang, S., and Marcato, G. (2006), *An Analysis of Commercial Real Estate Returns: Is There a Smoothing Puzzle?,* mimeo Department of Land Eocnomy, University of Cambridge.

Brennan, M.J., Schwartz, E.S. and Lagnado, R. (1997), 'Strategic Asset Allocation', *Journal of Economic Dynamics and Control,* Vol. 21, No. 8, pp. 1377–1403.

Brooks, C. and Kat, H.M. (2002), 'The Statistical Properties of Hedge Fund Index Returns and their Implications for Investors', *Journal of Alternative Investments,* Vol. 5, pp. 26–44.

Burgel, O. (2000). *UK Venture Capital and Private Equity as an Asset Class,* British Venture Capital Association.

Campbell, J.Y., Chan, Y.L and Viceira, L.M. (2003), 'A Multivariate Model of Strategic Asset Allocation', *Journal of Financial Economics,* Vol. 67, pp 41–80.

Campbell, J.Y. and Viceira, L.M. (1999), 'Consumption and Portfolio Decisions When Expected Returns are Time Varying'. *Quarterly Journal of Economics,* Vol. 114, pp 433–495.

Campbell, J.Y. and Viceira, L.M. (2002), *Strategic Asset Allocation: Portfolio Choice for Long-Term Investors,* Oxford University Press, Oxford.

Campbell, J.Y. and Viceira, L.M. (2005), 'The Term Structure of the Risk-Return Tradeoff', *Financial Analysts Journal,* Vol. 61, pp 34–44.

Cochrane, J. (2005), 'The Risk and Return of Venture Capital', *Journal of Financial Economics,* Vol. 75, pp. 3–52.

Fung, W. and Hsieh, D.A. (2000), 'Performance Characteristics of Hedge Funds and Commodity Funds: Natural vs. Spurious Biases', *Journal of Financial and Quantitative Analysis,* Vol. 35, pp. 291–307.

Fung, W., Hsieh, D.A., Naik, N. and Ramadorai, T. (2006), *Hedge Funds: Performance, Risk and Capital Formation,* C.E.P.R. Discussion Papers, CEPR Discussion Papers: 5565.

8. REFERENCES

Geltner, D. (1989), 'Bias in Appraisal-based Returns', *Journal of the American Real Estate and Urban Economics Association,* Vol. 17, pp. 338–352.

Geltner, D., and Miller, N.G. (2001), *Commercial Real Estate Analysis and Investments,* South-West Publishing, Mason OH.

Geltner, D., MacGregor, B.D. and Schwann, G.M. (2003), 'Appraisal Smoothing and Price Discovery in Real Estate Markets', *Urban Studies,* Vol. 40, pp. 1047–1064.

Giliberto, M., Hamlick, F., Hoesli, M. and McGregor, B. (1999), 'Optimal Diversification within Mixed-Asset Portfolios using a Conditional Heteroskedasticity Approach: Evidence from the U.S. and the U.K.', *Journal of Real Estate Portfolio Management,* Vol. 5, pp. 31–45.

Hoesli, M., MacGregor, B., Adair, A.S. and McGreal, W.S. (2002) *The Role of Property in Mixed Asset Portfolios,* Research Review Series, RICS Foundation, London, No. 32.

Hoevenaars, R., Molenaar, R., Schotman, P. and Steenkamp, T. (2005), *Strategic Asset Allocation with Liabilities: Beyond Stocks and Bonds,* Mimeo, Maastricht University.

Kaplan, S. and Schoar, A. (2005), 'Private Equity Performance: Returns, Persistence and Capital Flows', *Journal of Finance,* Vol. 60, pp. 1791–1823.

Kat, H.M. and Amin, G.S. (2003), 'Welcome to the Dark Side: Hedge Fund Attrition and Survivorship Bias over the Period 1994–2001', *Journal of Alternative Investments,* Summer 2003.

Key, T. and Marcato, G. (2006), *Index Smoothing and the Volatility of UK Commercial Property,* A Report to the Investment Property Forum.

Knight, J., Lizieri, C. and Satchell, S.E. (2005), 'Diversification When It Hurts? The Joint Distributions of Real Estate and Equity Markets,' *Journal of Property Research,* Vol. 22, pp. 309–323.

Quan, D.C. and Quigley, J. (1991), 'Price Formation and the Appraisal Function in Real Estate', *Journal of Real Estate Finance and Economics,* Vol. 4, pp. 127–146.

Ross, S.A. and Zissler, R.C. (1991), 'Risk and Return in Real Estate', *Journal of Real Estate Finance and Economics,* Vol. 4, pp. 1115–1153.

Scott, P. (1996), *The Property Masters: A History of the British Commercial Property Sector,* E. and F.N. Spon, London.

Sirmans, C.F. and Worzala, E. (2003), 'International Direct Real Estate Investment: A Review of the Literature', *Urban Studies,* Vol. 40, Nos. 5–6, pp. 1081–114.

Terhaar, K., Staub, R. and Singer, B. (2003), 'Appropriate Policy Allocation for Alternative Investments', *Journal of Portfolio Management,* Vol. 29, pp. 101–110.

Worzala, E. and Sirmans, C.F. (2003), 'Investing in International Real Estate Stocks: A Review of the Literature', *Urban Studies,* Vol. 40, Nos. 5–6, pp. 1115–1149.

Investment Property Forum
New Broad Street House
35 New Broad Street
London EC2M 1NH

Telephone: 020 7194 7920
Fax: 020 7194 7921
Email: ipfoffice@ipf.org.uk
Web: www.ipf.org.uk

Printed on paper made from sustainably managed forests