# REAL ESTATE IN THE INVESTMENT PORTFOLIO

A report prepared for the Investment Strategy Council of the Royal Ministry of Finance

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## Executive Summary


- *This report attempts to distill research on the role of commercial real estate within mixed-asset portfolios. It draws on research-based literature from Asia, Australasia, Europe and North America, augmented with some primary research findings, in an attempt to help the Ministry of Finance's Strategy Council to address whether there is a role for real estate in the Government Pension Fund - Global.*
- *The report covers five principal areas:*
    - *The Structure of the Market and Real Estate Investment Vehicles;*
    - *The Risk-Return Characteristics of Real Estate Investment Assets;*
    - *The Distribution of Real Estate Returns;*
    - *The Role of Real Estate in the Mixed-Asset Portfolio; and*
    - *Performance Measurement and Benchmarking of Real Estate.*

A. Market Structure

- *Real estate is an under-researched asset class. Despite major improvements over the last decade, research and analysis is hampered by poor data availability. Many markets have only low frequency, short time series data;*
- *The growth of specialist research and data provider services has greatly improved the transparency of real estate markets in recent years;*
- *There are no definitive figures for the size of the global commercial real estate market. Estimates range from $8trillion to $22trillion. The low estimate represents around 16% of the capitalization of global equity markets, the high end, some 40%.*
- *Pension fund investment in non-residential real estate varies around the world. U.S. pension funds hold around 3.5% of their assets in property; the share in some other major economies exceeds 10%.*
- *There are now many routes to gaining exposure to real estate markets, with available investment vehicles possessing distinct risk-return characteristics, market structures, liquidity and transparency. These differences alter the impact of inclusion of real estate in the mixed-asset portfolio.*

- *Available means of gaining exposure include direct private market ownership and development of investment property, private collective investment vehicles, open ended and exchange traded unitized funds, listed real estate companies and REITs, property derivatives, commercial mortgage backed securities and other debt vehicles.*
- *Some commentators treat infrastructure investment as equivalent to real estate. There are both similarities and differences. However, there is little formal analysis of risk and return characteristics due to data deficiencies and the relative immaturity of the infrastructure investment market.*
- *The new investment vehicles and opportunities have brought new types of investors into the commercial real estate market, with private capital and hedge funds playing an increasingly significant role relative to traditional institutional investors.*

B. Risk and Return

- *Analysis of risk and return is hampered by short time series. However, longer and more robust time series exist for Australia, the United Kingdom and the United States. These can be used to provide a benchmark for consideration of real estate risk and return.*
- *Available commercial real estate market performance indicators are based not on transactions but on appraisals (valuations). This is believed to result in a "smoothing" or moving average process which understates risk. It is thus important to address the smoothing issue when comparing real estate returns with other asset classes.*
- *Over the last twenty years in the United States, Equities generate real annualized returns of around 11%, listed Real Estate Investment Trusts 8% and Bonds and Private Real Estate around 5%. However, the reported risk of real estate (at around 3%) is far lower than bonds (8%), REITs (14%) and stocks (16%). Correcting for appraisal smoothing produces a higher estimate of risk, of around 8%.*
- *Analysis of the risk-return performance of different asset classes in Australia and the U.K. produces similar results to those of the United States. In Australia, Listed Property Trusts have outperformed the equity market and exhibit both higher returns and greater volatility than directly-held private real estate.*

- *U.K, listed Property Companies produce similar returns to stocks but are more risky. Private real estate returns are higher than bonds; the smoothed risk measure is lower than for bonds: desmoothing suggests higher risk, closer to that expected in a risk-return framework, but still significantly below that of property companies.*
- *Multi-factor approaches have attempted to identify factors that determine real estate returns. Most studies find that macro-economic variables (GDP, industrial output, consumption/spending) and financial variables (real interest rates and term structure) are important factors. However, many studies detect a unique, priced, real estate factor, making a case for inclusion of real estate in the mixed-asset portfolio.*
- *The evidence on the inflation hedging properties of real estate is mixed. Generally, real estate appears to be a partial hedge. It has long-run hedging qualities, but does not adjust quickly to inflation shocks. This might be related to the constraints of lease contracts (which delay rental adjustment) or to interest rate sensitivity and the interaction between inflation increases and intervention by monetary authorities.*
- *The available time series data are too short and too low frequency to permit reliable testing of mean reversion in private real estate markets. There are observable, but irregular, cycles of high and low returns around trend lines. Evidence on the behavior of listed real estate securities points to weak mean reversion.*
- *Listed real estate typically exhibits low correlation with direct private real estate indices – which, alongside the higher volatility, has led some to question whether or not real estate securities are a property investment. In many markets, listed property returns exhibit strong positive correlations with the general equity market.*
- *The low correlations may be misleading. Listed real estate firms make use of debt, so the returns should be degeared. Direct market returns should be desmoothed to reduce valuation smoothing effects. This results in higher correlations and there is evidence of long-run integration of public and private real estate returns. Furthermore, a "price discovery" effect can be observed, with information in the listed real estate market processed and priced well in advance of price movements in the private market. Again desmoothing reduces this lag effect.*
- *Illiquidity is a significant issue in private real estate markets. The high value and indivisibility of real estate, high transaction costs and the lengthy and uncertain time taken to sell assets produces additional risk for investors. It is hard to quantify this additional risk. Research points to a 50-100 basis point premium for typical holding periods and market volatility.*

C: Return Distributions

- *Research consistently finds that real estate returns are not distributed normally, with kurtosis and skewness outside standard parameters. This has implications for the appropriateness of risk measures in standard portfolio allocation models.*
- *There is evidence of non-linearity and asymmetry in return distributions. For listed property returns, there is some evidence that correlation with other asset classes increases when those asset classes are performing poorly (tail dependence), eroding some of the benefits of diversification.*
- *For private real estate, analysis of return distributions must confront the appraisal smoothing issue. The valuation process seems to result in very high serial correlation, with returns in one period influencing those in another. Desmoothing procedures seek to remove this effect by extracting the "new" information from valuation-based returns.*
- *There is no consensus on the "best" method for desmoothing appraisal-based data. The most frequently used model attempts to remove first order autocorrelation (the relationship between the return this period and that of the previous period). Initial results from transaction-based, repeat sales indices provide confirmation of the benefits of the first order autocorrelation method.*
- *Leverage also influences return distributions, adding capital structure risk to the underlying asset risk. U.S. REITs typically have debt to value ratios of around 40% while private real estate equity vehicles at the high risk-return end of the spectrum (value added or opportunity funds) frequently have debt to asset value ratios in excess of 70%. The impact of exposure to interest rate risk needs to be disentangled from the underlying real estate market risk.*

D: Real Estate, the Portfolio and Diversification

- *Correlation analysis indicates that real estate investment should bring diversification benefits to the mixed-asset portfolio. Generally, directly-held private real estate indices exhibit low positive correlations with equities and near zero correlations with bond returns in a wide range of countries.*

- *Where there are longer time series available, as in Australia, U.K. and the U.S., the correlation results appear to stand. There is variation over time and correlations are unstable, but rarely appear to be strongly positive.*
- *In mean-variance analysis, the efficient frontier for a portfolio that includes real estate (even where desmoothed and with an illiquidity premium accounted for) dominates the efficient frontier with just stocks and bonds.*
- *Optimal weightings for real estate depend on return targets and risk tolerance: it is usual to find substantial weightings for real estate in national and international analyses – weightings typical larger than institutional holdings of property.*
- *Securitized, listed real estate offers less apparent diversification and risk-adjusted return benefits than directly owned property, with stronger correlation to overall equity market movement and higher volatility – possibly offset by liquidity benefits.*
- *Given that there is return uncertainty due to the appraisal basis of private real estate returns, some researchers have constructed "fuzzy" frontiers with a range of values rather than a point estimate. Even here, most researchers point to a substantial real estate weighting.*
- *There is some debate as to what are appropriate risk measures for real estate, given non-normality and other distributional issues. Researchers using downside risk measures such as maximum drawdown, semi-variance or VaR find reduced but still substantial weightings for real estate in mixed-asset portfolios. Constant liquidity adjustment models produce similar results.*
- *Asset-Liability Matching models tend to produce lower weightings to real estate than do conventional mean-variance approaches but the property weightings remain larger than those typically found in pension fund portfolios.*
- *A weighting of 10% or more in real estate would be consistent with an investment strategy that was mindful of the global market capitalization of different asset classes.*
- *With respect to international diversification, research confirms the benefits of diversifying real estate portfolios internationally and of including real estate in an internationally diversified mixed-asset portfolio.*
- *Cross-national real estate returns appear to exhibit lower correlation than cross-national equity returns. However there is some evidence of convergence of international real estate returns: a global real estate factor has been identified by a number of researchers, while others have pointed to regional factors (e.g. for Asian markets).*

- *There are significant practical difficulties in assembling a diversified international portfolio. Most studies use national index data. However, with relatively small numbers of properties in each country, there is a risk of tracking error. The cost of reducing that tracking error to a small figure may be prohibitive for most investors.*
- *There are high information and monitoring costs associated with international real estate investment and a risk of information asymmetry and lack of awareness of local market practice and circumstances. This has driven the growth of international collective investment vehicles that provide economies of scale in acquisition and management.*
- *Hedging currency risk at project or building level is complex in real estate with the long and uncertain holding period and exit value not matching available hedging products. This may be less of a problem if exchange rate hedging is based on a portfolio level currency overlay approach.*
- *Within the property portfolio, evidence suggests that sector diversification is more effective than geographical diversification, although care should be taken to distinguish between administrative regions and economically-functioning regions.*
- *There is some evidence that there is considerable building-level variation within sectors and regions, casting some doubt on their effectiveness in structuring the optimal portfolio. Tenancy structures, yields and size are other possible dimensions structuring the risk-return profile.*

E: Performance Measurement and Benchmarking

- *Benchmarking performs multiple roles – to communicate performance to stake holders, to provide accountability for fund managers, and to support research. In all three areas, data issues in real estate cause problems.*
- *There is an increasing availability of market performance indices in commercial real estate. The Achilles' heel of such indices is that they are appraisal-based creating uncertainty as to the value of performance measures and benchmarks. While transaction-based indices assist in promoting understanding of overall market behavior, at fund level appraisals will remain an integral part of the measurement process.*
- *One consequence of valuation uncertainly (and low frequency data) is that it is very difficult to <u>prove</u> that a fund manager has outperformed (or underperformed) a target in any sense of statistical significance.*

- *Targets for fund managers may be absolute (achieve a real return of 5%) or relative (outperform IPD by 1%). The performance should be risk adjusted. Benchmarking international performance is more problematic, as not only is there incomplete coverage of return series, it is also unclear as to what weights should be applied to the national components.*
- *Benchmarking and performance measurement must be mindful of leverage. Use of debt combines asset performance and performance that is related to capital structure. Debt levels are a particular issue for public real estate securities and for value-added and opportunity funds amongst private equity real estate vehicles.*
- *The sheer diversity of private equity vehicles, allied to lack of standardization, makes performance measurement particularly difficult. There are major problems in quantifying the impact of fractional valuation, realization-based performance fees and management costs, the right to exit and the impact of debt on structure of returns.*
- *Despite major improvements in transparency and attempts by interest groups to impose standardization of reporting, there remain numerous unanswered questions concerning the performance of private real estate investment vehicles, not least in that their behavior has not been observed over a complete real estate cycle.*
- *In summary, the risk-return characteristics of real estate, the apparent existence of a priced real estate factor and the relationship between real estate returns and those of other asset classes point to a role for real estate as a diversifier in the mixed-asset portfolio at national and at national scales of analysis.*
- *An investor building a real estate portfolio strategy faces a number of complex practical difficulties both in portfolio construction and in performance measurement and benchmarking. These are compounded by a market timing issue, given cyclicality in property markets and concerns over the sustainability of values in certain markets where demand for product seems to exceed demand.*

**Contents**

# REAL ESTATE IN THE INVESTMENT PORTFOLIO: A REPORT PREPARED FOR THE INVESTMENT STRATEGY COUNCIL OF THE ROYAL MINISTRY OF FINANCE

## 1. Introduction

This report is prepared for the Ministry of Finance of Norway to provide the necessary background to analyze whether real estate should be included in the Government Pension Fund – Global (formerly known as the Government Petroleum Fund) and, if so, how that real estate allocation should be structured. The approach is very much one of a digest of the relevant literature bearing in mind that the report will be used for investment decision purposes. Hence, although academic in its thoroughness, the report is not an academic piece. Some empirical analyses have been conducted when it was felt that these would add to the discussion of results contained in the literature.

It is important to note the size of the portfolio: US$240 billion as of mid-2006. This is significant in influencing possible products and strategies. An allocation of just 3% to real estate – less than that found in the United States – would imply a portfolio with a gross asset value of $8.4billion – sufficiently large to permit acquisition of a large private direct real estate portfolio, and consideration of a range of real estate investment products and ease problems associated with constructing an international real estate portfolio.

The report begins with a consideration of the overall size of the global real estate market and the available real estate investment vehicles that give exposure to those markets: these can broadly be divided into private and public market vehicles and into direct and indirect vehicles. Acquisition of a directly managed portfolio of buildings represents private, direct investment; purchase of shares in listed real estate is public, indirect investment, but there exists a whole spectrum of products between those two poles. Section three, the core of the report, examines risk and return in real estate markets, analyzing data for three major real estate markets and summarizing the key findings from the real estate literature. This section also considers the relationship between private and public real estate markets.

The fourth section develops some of the themes of part three in examining the distribution of real estate returns and some of the measurement problems encountered in private real estate – in particular the fact that the appraisal-based nature of most real estate performance indices is believed to "smooth" returns and, hence, to understate the risks inherent in real estate investment.

The final substantive section considers performance measurement and benchmarking in real estate. What targets are appropriate for real estate fund managers and to what extent can their performance be assessed reliably, given the measurement problems discussed in section four? The final section summarizes the findings.

## 2. Real Estate Investments and Real Estate Markets: The General Context

For a long time, commercial real estate has been a relatively under-researched market, certainly by comparison to the major financial asset classes. This may seem surprising given the size of the market, but probably reflects data issues caused by the characteristics of the asset class (largely traded in private markets, with inaccessible private data and often poor quality public data). Up until the early 1990s, benchmarks were only available in a very limited number of countries (the U.S., U.K., Canada, Ireland, Australia, and New Zealand). In terms of major markets, benchmarks only really existed for the U.S. and U.K. markets. From the 1990s, new benchmarks emerged for many countries. The Investment Property Databank (IPD), a major provider of commercial real estate benchmarks, now reports on 14 European markets, and three outside Europe (Australia, Canada and South Africa). Consultation releases are also available for Japan and Belgium, and development projects well advanced in Korea and New Zealand.

There is a much wider acceptance that real estate investment decision making needs to be informed. In particular, the linkages between real estate and financial markets need to be analyzed. There are many more quality journal articles, and also books, monographs, industry publications and reports. That research has become more international in nature, with the development of global and regional real estate conferences, both academic and trade-related. These developments parallel the growth of international real estate service providers (particularly following the wave of international merger and acquisition activity in the late 1990s and early 2000s) who provide both a "one stop shop" for international investors and a growing standardization in terminology and statistics. In addition, international data providers, interest groups and trade associations (such as EPRA and INREV) have appeared improving the quality of research.

There are no official statistics on the overall size of the commercial real estate market. The capital value of the global commercial real estate market has been estimated to be as little as $8,000 billion[1] and as large $22,000 billion[2] – the differences in part reflecting whether or not

[1] Chen and Mills (2006).
[2] La Salle Investment Management (2007).

corporate real estate is included, but also whether or not "core" assets only are considered[3]. This compares to an estimated market capitalization of $49,000 billion for global stock markets and $60,000 billion for bond markets (SIFM, 2006). However, investment in real estate is more complex. The European Public Real estate Association, EPRA (2007) estimate that $1,525 billion is in listed real estate securities – 8.8% of their estimated total real estate market of $17,329 billion and around 3.1% of the equity market. AME Capital (2006) produce a higher estimate of the market capitalization of the global real estate equity market at around $1,900billion, 32% of which is in Asian markets, 31% in North America and 25% in Europe. 39% of the companies listed were REITs or equivalent – a proportion likely to grow as more countries introduce REIT legislation. The differences reflect the treatment of property development and construction companies and real estate service providers, particularly in Asian markets.

The table below sets out allocations to real estate by pension funds in six countries studied in an international project by the Pensions Real Estate Association (PREA) of the United States[4]. As can be seen, there is considerable variation, but three of the countries have allocations of 10% or more. The U.K.'s allocation is understated, since stakes in property companies have been counted as equity rather than real estate investments. Explanations for the differences across countries include history, culture, pension fund regulation, but also the structure of the market in terms of other participants and the tenure choice decisions of both commercial real estate and housing.

Figure 2.1 Pension Fund Allocations to Real Estate

| Country | Real Estate as % of Portfolio | % of Real Estate Direct | % of Real Estate Indirect |
|---|---|---|---|
| Australia | 11% | 45% | 55% |
| Germany | 12% | 58% | 42% |
| Netherlands | 10% | 56% | 42% |
| United Kingdom | 6% | 100%(*) | |
| United States | 3.5% | 46% | 54% |

Source: PREA (2006)

Note: (*) Property equities classed with equity asset class not real estate. Understates use of managed funds and private collective investment vehicles.

[3] The $8,000 billion figure is as of the end of 2005, whereas the $22,000 billion figure is as of the second quarter of 2006.

[4] PREA is a not-for-profit organization with more than 1,500 individual members representing more than 438 member firms, including retirement plans, real estate asset managers, REITs, and others.

Until comparatively recently, most investors seeking exposure to commercial real estate had two main options: assembling a directly-owned real estate portfolio in the private market or owning shares in listed real estate companies. The last decade or so has seen the creation of many new routes to investment with real estate vehicles providing a considerable range of risk-return options. We briefly review the types of vehicles that are available and their characteristics. Later in the report, the risk-return characteristics of the major vehicles are considered in more detail.

*Directly-owned real estate*

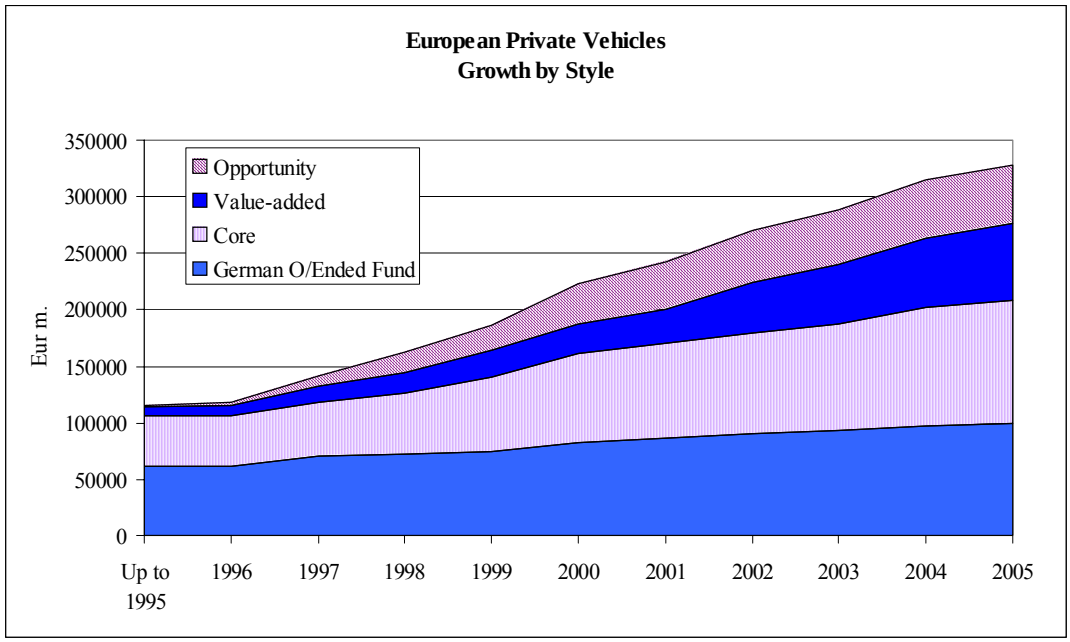
Owning a portfolio of buildings clearly gives real estate returns! However, some of the characteristics of real estate as an asset mean that the returns will not necessarily track a performance index. Real estate is characterized by large lot size, heterogeneity (partly as a function of the importance of location), high transaction costs, high management costs and illiquidity. The high transaction costs lead to longer holding periods than would be the norm in financial asset markets which, in turn, means that real estate markets tend to be thinly traded. The heterogeneity creates low correlations and high specific risk in the return performance of individual properties (which contributes towards tracking error while the large lot size makes it very difficult to diversify away specific risk). Clearly this is a constraint that applies most markedly to smaller funds. The scale of the Government Pension Fund – Global is sufficient to permit both diversification and economies of scale in management given a reasonable allocation to real estate.

*Private Collective Investment Vehicles*

The last decade has seen a dramatic rise in the use of private collective investment vehicles as a mechanism for channeling capital into real estate markets. There exist a wide range of unlisted vehicle structures, ranging from limited partnerships and master limited partnerships (as a vehicle for joint venture investing) to unit trust and private company structures. More recently, fund of fund products have emerged. Many such vehicles are domiciled in tax havens. The vehicles tend to be structured to be tax-transparent, tax-neutral or tax efficient, avoiding the tax leakage that can occur from public vehicles. The major benefits of such vehicles are that they permit access to markets (both geographical and sectoral – for example few smaller investors could directly invest in shopping malls or build a diversified global

portfolio) for lower amounts of capital eroding entry barriers; provide access to specialist management; reduce search and monitoring costs; and permit investors who are excluded from borrowing to acquire real estate access to geared property returns (Baum and Fear, 2001).

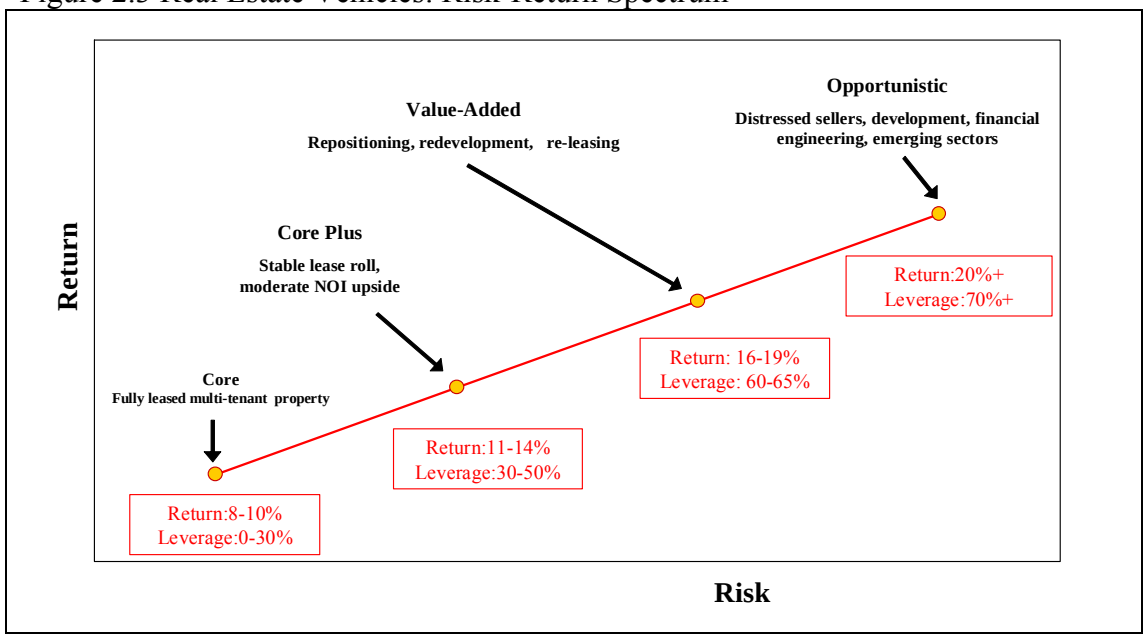
Figure 2.2 European Private Real Estate Vehicles




Source: Property Funds Research (2006)

While the underlying vehicle structure is important, so too are the capital structure and target market. Unlisted vehicles are classified by their risk-return characteristics and their target markets. Core funds typically have low gearing and aim to invest in fully let prime (Class A) real estate assets in established markets. Core-plus funds may have higher gearing levels and target markets with greater upside rental growth prospects. Value added funds seek more explicit growth opportunities through repositioning, re-leasing and redevelopment. Opportunity funds use high levels of gearing and generate returns through development, investment in distressed or emerging markets, and via financial engineering. The target internal rates of returns for these funds reflect the increased risk as one moves from core to opportunity. INREV, the European Association for Investors in Non-listed Real Estate Vehicles, provide a classification framework for funds. The risk inherent in value-added and opportunity funds has, perhaps, been masked by the strength of real estate markets and the compression of yields over the last five years.

Figure 2.3 Real Estate Vehicles: Risk-Return Spectrum




While such funds provide direct real estate returns, subject to gearing and interest rate payments, a number of issues emerge in relation to unlisted funds. These include questions about the value of fractional interests (subdividing ownership of a property asset may result in an increased aggregate value, through the erosion of entry barriers and exposure to specific asset risk, or a decreased aggregate value, due to management control issues); questions about the amount and basis of management performance fees; concerns about liquidity and about exit strategies for finite life funds. These issues will be considered further below, in relation to performance measurement. For many funds, the fund sponsor will co-invest, reducing agency problems.

*Unitised and Open Ended Structures*

The German open ended funds (*Offene Immobilienfonds*) have been a major investment force in commercial real estate. Recent problems relating to corporate governance and valuation have emerged that have dented public confidence. A major problem with open ended structures relates to investment timing and the illiquidity of real estate – particularly where many investors are from the retail market or are less informed. Capital inflows tend to follow stronger real estate market performance – forcing managers to acquire assets in strong and rising markets. Similarly, demands for redemption in poor market conditions create problems for managers who must sell assets (possibly at below the redemption valuation).

Further, illiquidity in the underlying real estate market makes it difficult to redeem quickly, forcing managers to hold cash reserves. This is less of a problem for non-regulated unit trust and open ended fund structures where the manager may have more control over capital flows and redemption.

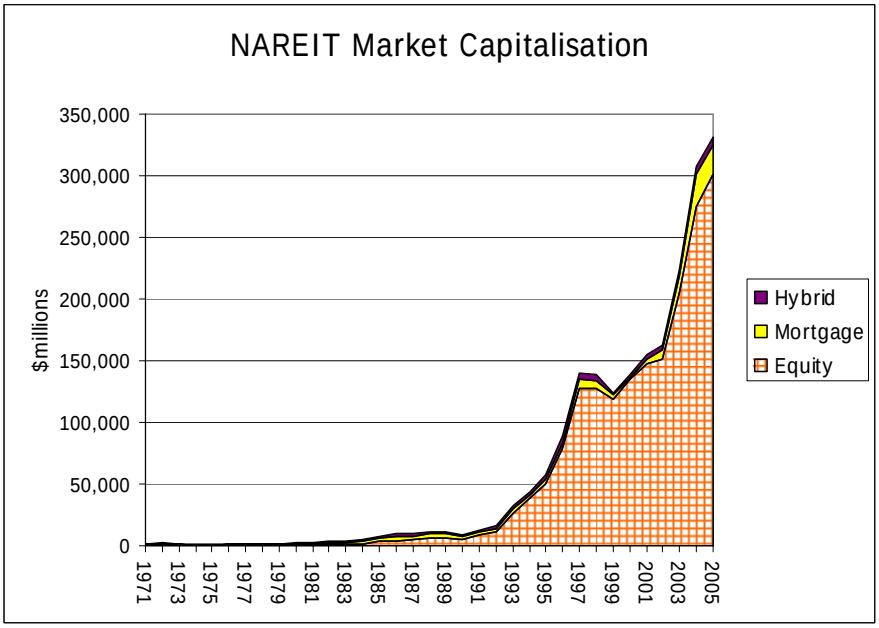
The price of units in unit trust structures is generally based on appraised values of the assets under management – that is the net asset value of the fund is divided by the number of units issued. Generally there is a bid-ask spread around that unit value. Given the strong link between NAV and unit price, unit trust return performance tends to track underlying market indices. Actual delivered returns will be dependent on whether income is reinvested or distributed to unit holders. For many authorized and regulated trusts in Europe, there is some leakage with trust income taxed, albeit often at a lower rate.

*Listed Real Estate Vehicles*

In considering listed real estate vehicles, it is important to distinguish Real Estate Investment Trust (REIT) structures from property company structures. The latter, as corporate entities, are subject to taxation at company level, leading to tax leakage effects both for taxed and untaxed investors. REITs typically do not pay tax at corporate level, subject to a set of qualifying rules which specify the nature of activities and asset base, ownership concentration, gearing structure and distribution policy. REIT rules vary by nation but common features are the requirement to be primarily a real estate investor and the requirement to distribute a high proportion of net operating income to shareholders. This restriction on retained earnings is intended to create returns that are closer to those of the underlying real estate market and less dependent on management decisions. REIT markets have proved extremely successful in U.S. and Australia, with growth expected in the "new" REIT markets in Asia and in Europe.

The risk-return characteristics of REITs and property companies are considered in more depth below. To preview the conclusions of research, listed real estate securities are linked in the long run to the performance of their assets and the real estate market but, in the short run, exhibit volatility and price movements that are linked to the equity market. REIT structures tend to have lower correlations with the equity market than do property company structures.

Figure 2.4 U.S. Real Estate Investment Trust Market Capitalization




Source: NAREIT (www.nareit.com)

*Property Derivatives*

The last few years have seen the emergence of a commercial real estate derivatives market based on published market performance indices. Perhaps the most active market has been the U.K., where the notional value of trades in over-the-counter swaps has reached £3.75bn with some 250 trades taking place in 2005 and 2006 (Frodsham, 2006). Here, trades are established as contracts for difference usually in relation to LIBOR. Investment banks have been active in establishing the market and have been prepared to warehouse deals and a number of hedge funds have been established to trade derivatives. The majority of reported deals have been for all property returns, although there have been a number of sector-specific deals and a few reported cross-national deals. Similar developments have occurred in the United States although most activity has been in relation to residential price indices (see Baum *et al*. 2006; Hoesli and Lekander, 2007 forthcoming). In principle, a property derivative market allows investors to gain exposure to diversified real estate returns with low entry costs, low to zero transaction costs and with minimal management costs. Hedging is more problematic given likely tracking error between the performance index and any actual portfolio: the tracking error also causes pricing problems since it is difficult to establish an arbitrage portfolio[5].

[5] The extent of tracking error is a function of portfolio size and portfolio structure (sector, spatial location, property size and other building characteristics). For example, Brown and Matysiak (1995), based on U.K. data, show that the tracking error of a portfolio comprising ten properties relative to the market might be

As a result, the reported margins over LIBOR have been difficult to explain using conventional derivative pricing models (Baum *et al.*, 2006). Nonetheless, the rapid growth of the market, the wide variety of market participants and the growing sophistication of pricing models and strategy offer the potential for the development of an actively-traded property derivatives market with the critical mass to survive cyclical market fluctuations in the private real estate market. The development of the market would improve the liquidity and efficiency of the real estate market. It remains to be seen, however, how widely used these products will become.

*Commercial Mortgage Backed Securities*

As with private unlisted real estate vehicles, the last decade has seen the rapid development of a commercial mortgage backed securities market. Barclays Capital (2007) report that new issuance in 2006 amounted to €65billion, with some 83 deals. They forecast close to €100billion new issuance in 2007. The CMBS market in Europe now is a significant factor in the operation of the commercial real estate market, strongly influencing interest rate margins, bank lending policies and capital availability.

Do CMBS represent a real estate investment? To some extent it depends on the particular structure of the issue. A conventional bond held to maturity provides a bond like cash flow which does not fluctuate with real estate market conditions. However, bond prices and ratings in the secondary market will reflect the real estate market environment, since repayments are sustained by rental income and security is provided by capital value. There is, however, little research on this topic either in Europe or in the U.S. where CMBS market penetration is greater. It seems likely that CMBS returns will be more strongly influenced by general bond factors (real interest rates, term structure and credit risk spread) than real estate factors. As a result, this report will focus on equity real estate investment not debt vehicles.

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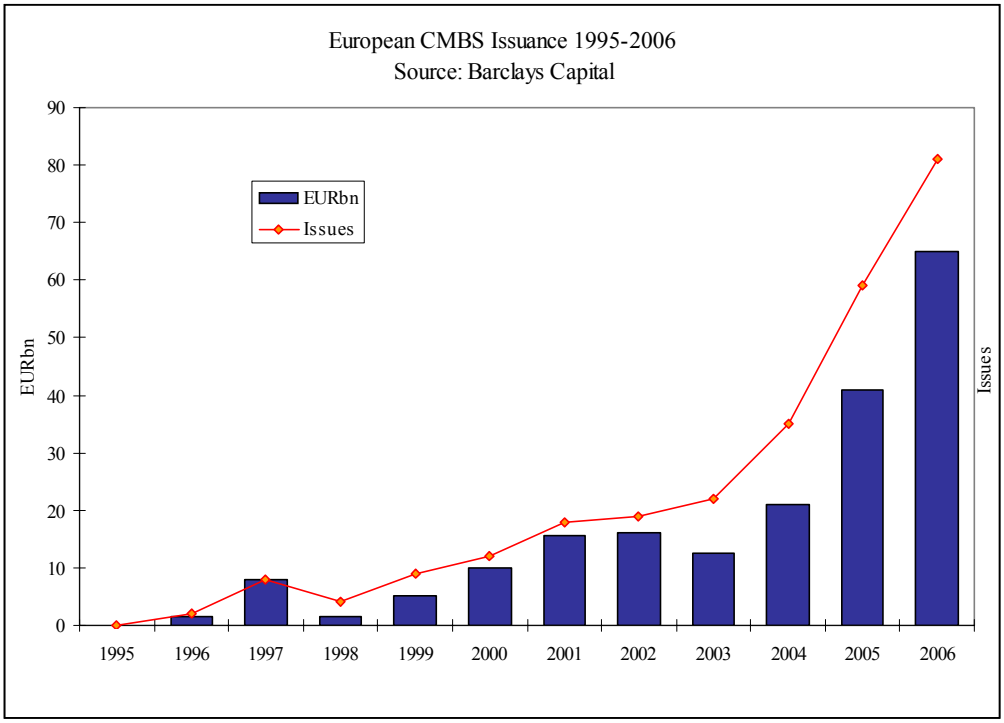
around 4.7% per annum; for a similar property mix, a portfolio of 50 properties might have a tracking error of around 2.1%. Large funds (for example unit trusts) may thus exhibit relatively modest tracking error on an appraisal basis. However, the notional principal of most current derivatives contracts is relatively small, meaning that an actually-held arbitrage portfolio might exhibit quite distinct behavior from the underlying benchmark index.

Figure 2.5 European CMBS Issuance




With the expansion of investment opportunities in real estate markets, innovation in vehicles and products, the last few years have seen the arrival of specialist real estate hedge funds and more established hedge funds moving into property markets. Examples include Blackacre Capital Management, Cambridge Place, Grove Capital, Principal Real Estate Investors, and Walton Street Capital. While the majority of these funds focus on listed real estate securities, more recent developments have seen more complex portfolios and strategies. The activities of hedge funds are outside the scope of this report.

*Infrastructure*

Over the last ten years, infrastructure investment has attracted considerable attention, fuelled in part by governments seeking Public-Private Partnerships as an alternative to deficit financing of major projects. Some pension funds – notably in Australia and Canada – have made substantial allocations to infrastructure (sometimes in excess of 5% - see, e.g. Hobbs, 2006). The growth of the market raises a number of investment questions. For the purpose of this report, two are of particular importance: first, whether or not infrastructure investment is a *real estate* investment; and, second, if not, whether infrastructure offers diversification benefits alongside or instead of real estate in the portfolio.

One immediate difficulty that is faced in examining infrastructure is the lack of data. Data deficiencies are evident in real estate but, by comparison to infrastructure, real estate market data has longer time series and substantially more robust measures. In part, this reflects the comparative immaturity of infrastructure as an investment class; in part it results from the considerable heterogeneity of infrastructure assets. These can vary from transport (toll roads, bridges), utilities (power generation, storage and distribution), communications (fixed networks, switching systems, satellites) and social provision (hospitals, housing); can be based on development and transfer of assets (e.g. port or airport construction) or operational running of services (private provision of health or prison services). Cashflow may be secured under government contract or may come from public demand, with consequent variations in volatility. Given these differences and the absence of reliable data, it is hard to be definitive about the role of infrastructure in mixed-asset portfolios.

Infrastructure shares some characteristics with real estate. Investment requirements are large; generally investment is in real assets that have a long asset life; often cashflows are contractual over long periods, bringing income stability. There are high levels of heterogeneity. In the absence of frequent transactions, periodic return calculations rely on valuation and that valuation process is complex. However there are differences that suggest that infrastructure may form a separate alternative asset class. These include the frequent presence of government or quasi-government contracts and guarantees; the long maturity of cashflows; the quasi-monopolistic position of many projects (which includes the entry barriers for competitors and, often, inelastic demand for the services provided); and the absence of an effective secondary market. For these reasons, many commentators treat infrastructure as a distinct asset (for example, Clark and Evans, 1998; Hobbs, 2006; ING, 2006; Rakowski, 2004).

What, then, are the risk-return characteristics of infrastructure compared to real estate? There is no definitive answer to this question and researchers have come out with very distinct answers. Clark and Evans (1998) suggest that infrastructure is high risk, high return. They argue that including a substantial weight of infrastructure to a balanced mixed-asset portfolio leads to an increase in returns and risk but that the risk-adjusted returns are higher. The analysis appears to be based on simulation analysis and no evidence is provided of actual returns or correlation. ING (2006), by contrast, portray infrastructure returns as low risk, low return (pointing to low sensitivity to GDP growth and interest rate shocks) and suggest low

"hypothetical" correlation with equity (0.1 to 0.4), real estate (0.2 to 0.5) and bonds (-0.2 to +0.2). No support or source for these numbers is provided. Hobbs (2006) similarly argues that infrastructure has low volatility cashflows – but notes uncertainty in the capital value component. Rakowski (2004), based on Australian evidence, suggests moderate risk and high return.

Macquarie Bank produce a global index of listed companies investing in infrastructure. Data were available from the end of 2000. In dollar terms, infrastructure firms outperformed global stocks (measured by the Morgan Stanley MSCI index) and global bonds (Lehman Brothers composite), but trailed REIT performance (GPR global). The volatility of the infrastructure index was comparable to both REITs and general stocks. The data show correlations of around 0.5 with stocks and REITs and close to zero with bonds[6]. On this basis, the benefits of infrastructure in the portfolio seem less evident but caution is necessary. The analysis period is short and possibly exceptional (encompassing the global stock market correction) and the composition of firms in the Macquarie index and the extent to which their returns are influenced by leverage is unknown. For the remainder of the report, we will focus on "conventional" real estate assets, leaving issues of infrastructure investment to those with more specific expertise.

[6] We acknowledge the assistance of Gordon Drysdale, MSc student at the University of Reading, in providing these data.

**Section 2: Summary**

- *Real estate is an under-researched asset class. Despite major improvements over the last decade, research and analysis is hampered by poor data availability. Many markets have only low frequency, short time series data;*
- *The growth of specialist research and data provider services has greatly improved the transparency of real estate markets in recent years;*
- *There are no definitive figures for the size of the global commercial real estate market. Estimates range from $8trillion to $22trillion. The low estimate represents around 16% of the capitalization of global equity markets, the high end, some 40%.*
- *Pension fund investment in non-residential real estate varies around the world. U.S. pension funds hold around 3.5% of their assets in property; the share in some other major economies exceeds 10%.*
- *There are now many routes to gaining exposure to real estate markets, with available investment vehicles possessing distinct risk-return characteristics, market structures, liquidity and transparency. These differences alter the impact of inclusion of real estate in the mixed-asset portfolio.*
- *Available means of gaining exposure include direct private market ownership and development of investment property, private collective investment vehicles, open ended and exchange traded unitized funds, listed real estate companies and REITs, property derivatives, commercial mortgage backed securities and other debt vehicles.*
- *Some commentators treat infrastructure investment as equivalent to real estate. There are both similarities and differences. However, there is little formal analysis of risk and return characteristics due to data deficiencies and the relative immaturity of the infrastructure investment market.*
- *The new investment vehicles and opportunities have brought new types of investors into the commercial real estate market, with private capital and hedge funds playing an increasingly significant role relative to traditional institutional investors.*

## 3. Risk and Return in Real Estate Markets

In this section, we examine the investment characteristics of real estate investment, analyzing risk and return for both direct property investment and investment in listed real estate securities. We begin by examining data from three countries for which longer time series of commercial real estate performance are available – Australia, the U.K. and the U.S. We then examine published evidence on risk and return from the real estate literature. Much of that research – driven by data availability – also covers the U.S. and U.K. markets. Where possible, we cite evidence from a broader range of markets.

### *3.1 Empirical Analysis of Risk and Return*

As a first step to discussing real estate risk and return, we have examined three countries which possess reasonably long time series of direct private commercial real estate returns: the United States (the NCREIF index), the United Kingdom (the IPD index) and Australia (the IPD index, formerly the PCA index). We compare the returns from real estate in those countries with returns from listed (indirect) real estate (Real Estate Investment Trusts – REITs – in the U.S.; Listed Property Trusts – LPTs – from Australia and listed property companies from the U.K.) and with returns from the two major asset classes, stocks and bonds. To provide clearer information on long-run performance, we have deflated the returns using the appropriate consumer price index for each country.

Before detailing the results, it is important to emphasize that the three national private real estate indices have characteristics that distinguish them from measures of the other asset classes. First, they are ungeared asset returns, while the returns for equity markets and listed property are influenced by leverage. Second, they only represent a sub-set of investment quality real estate in the respective countries. Third, and most important, the returns are based on appraisals (valuations) of the real estate in each database, rather than on actual transactions prices. This has important implications, discussed elsewhere in the report. In particular, appraisal-based indices are assumed to be "smoothed" – both due to temporal aggregation effects (the appraisals are spread around the reporting date) and due to appraiser behavior in updating prior information[7].

[7] There may also be compositional changes in the indices over time. This is especially true in countries where indices have been developed recently. In such countries, differences may arise as the coverage is improved. Also, indices will largely reflect the holdings of institutional investors. As these are likely to change over time, so will the composition of the index. It has been reported for instance that more weight is now placed on

This creates a moving average process that reduces the reported risk measures, creates lags in responsiveness to information shocks and may distort correlation with other asset classes. Evidence for this can be seen in the presence of serial correlation in the returns series (apparently violating market efficiency assumptions), particularly for higher frequency data.

The U.S. NCREIF quarterly data are further distorted by a "stale appraisal" problem: many properties are appraised only annually but are left in the quarterly analysis even where no appraisal has occurred. This is not a problem for the U.K. and Australian indices, which only consider buildings which have been valued in the relevant time period. Nonetheless, there is likely to be an information effect where many more buildings are valued at year end or at the end of the relevant tax year.

To counter the effects of smoothing, we have desmoothed the three series using standard desmoothing techniques based on correction of the serial correlation in the real estate returns. We report both the smoothed and desmoothed series. For the United States, a further source of evidence comes from the MIT Transactions Based Index (TBI), an index estimated using a repeat sales method from the NCREIF database. Although there are some questions about the reliability of the methods used to correct for changes in the quality of buildings between transactions (e.g. as a result of capital improvements), the TBI provides valuable evidence about underlying risk in the private real estate market.

*3.1.1. The United States*

For the United States, the NCREIF[8] and MIT Transactions Based indices are compared to the NAREIT index of REIT returns, the MCSI USA index as a proxy for stock market returns and an benchmark index of US Government 10 year Treasury bonds. The figure below shows real quarterly return indices for the U.S. asset classes between 1985 and 2006. As can readily be seen, stocks have produced much higher returns than the other asset classes and sectors, despite the post-2000 correction.

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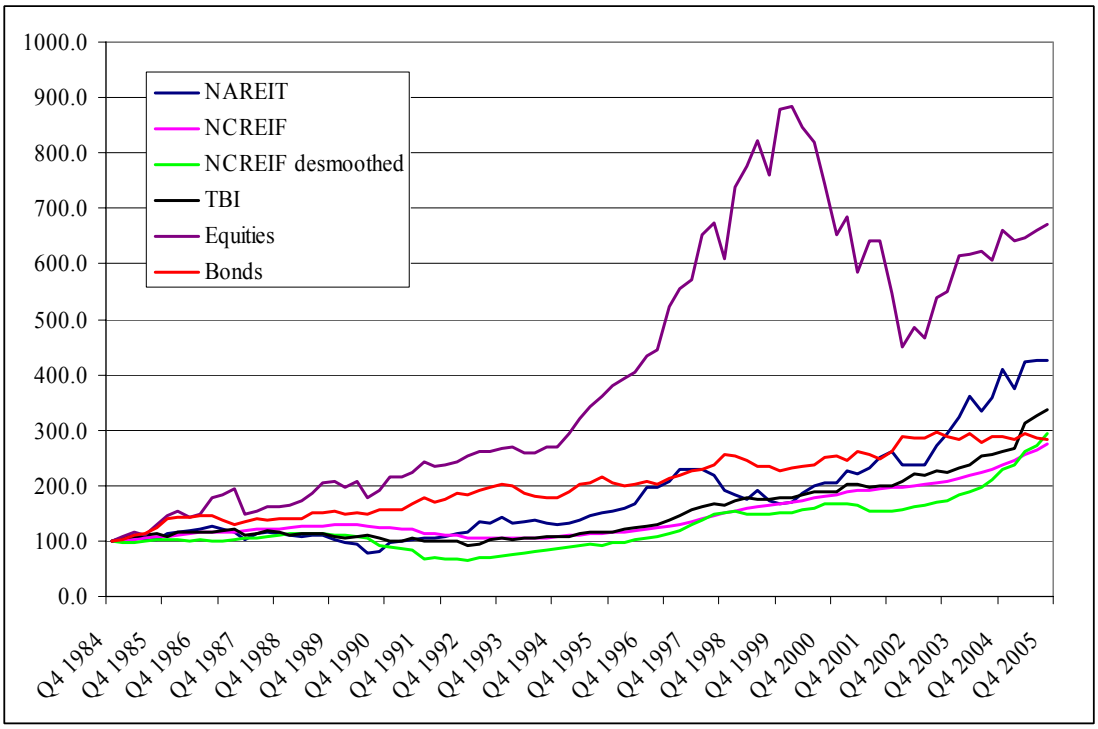
larger properties in the IPD U.K. index. However, we do not expect these compositional changes to invalidate, nor influence in any significant way, the analyses which can be done using such indices.

[8] The NCREIF index consists of properties acquired by tax-exempt institutions and held in a fiduciary environment. As at Q4 2006, the database consisted of 5,333 buildings with an appraised value of $247billion.

The three measures of private real estate markets track each other closely, while the listed REIT sector produces stronger performance from the late 1990s.

Figure 3.1 U.S. Real Asset Returns 1985-2006




The mean quarterly real return for stocks over the 1985-2005 period was 2.6% (an annualized real return of 10.9%). REITs produced an annualized return of around 8%, direct real estate as measured by NCREIF, 5%, slightly lower than bonds over the period. Given the expected risk-return trade-off, it would be expected that a ranking of the standard deviation of returns should match that of the returns themselves. Stocks do have the highest standard deviation (an annualized 16%), followed by REITs (14%) and Bonds (8%). However, the annualized reported risk for the NCREIF index, at just 3.4%, seems far too low. Evidence that the series is smoothed can be seen in the first order serial correlation coefficient – which implies that almost half of the variation in return in any one quarter is explained by the return in the previous period. Both the desmoothed series and the MIT transactions based index show levels of risk that are more than double that of the NCREIF index, figures which seem closer to intuition of the risk of commercial real estate as an asset class.

Figure 3.2 Descriptive Statistics, Quarterly Returns, U.S. Markets 1985-2005[9]

| | Stocks | Bonds | REITs | NCREIF | Desmoothed | TBI |
|---|---|---|---|---|---|---|
| Arithmetic Mean | 2.63% | 1.33% | 1.98% | 1.23% | 1.39% | 1.54% |
| Compound Growth | 2.29% | 1.25% | 1.74% | 1.22% | 1.29% | 1.47% |
| Standard Deviation | 8.17% | 4.12% | 6.97% | 1.71% | 4.36% | 3.80% |
| Skewness | -0.5602 | 0.3737 | 0.2107 | -1.278 | -1.579 | 0.445 |
| Serial Correlation | -0.034 | -0.2022 | 0.4011 | 0.705 | 0.359 | 0.066 |

### *3.1.2 The United Kingdom*

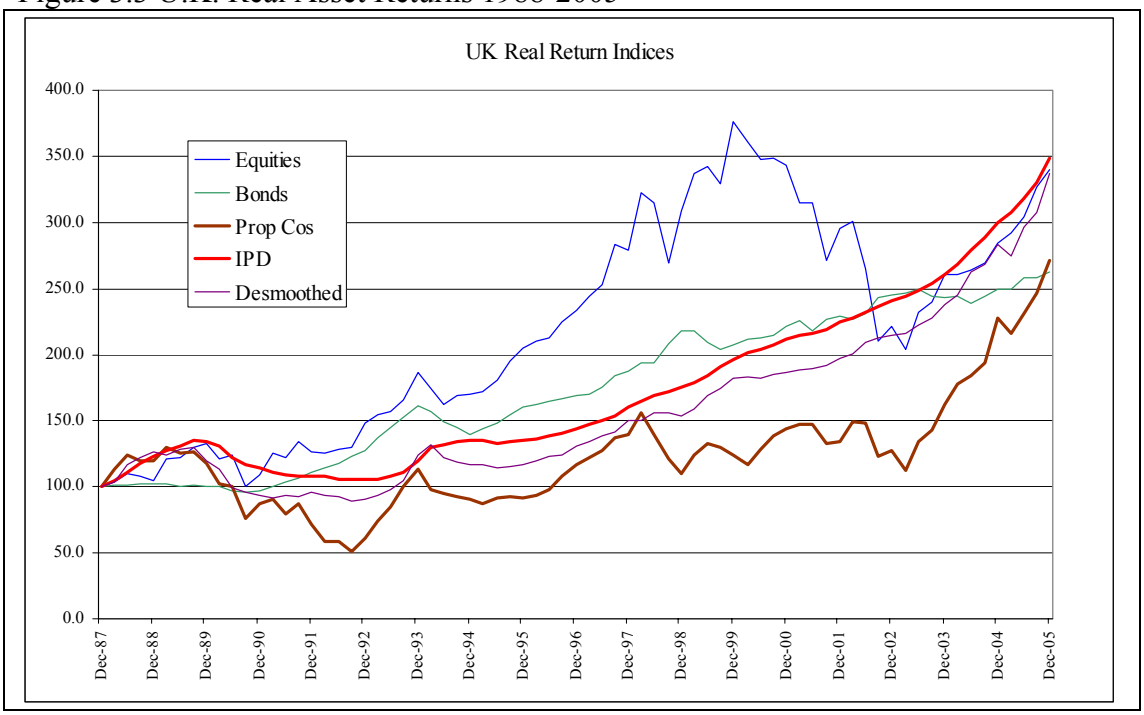
Quarterly returns for the U.K. direct market were estimated from the IPD monthly index. The monthly index – a subset of the main database – does not perfectly proxy the IPD annual index as there are some compositional differences, but provides the best sub-annual indicator of the performance of U.K. investment-quality real estate[10]. Data are available from December 1987. IPD returns are compared to the Financial Times all share index (as the best measure of the overall performance of the U.K. stock market), the FT property index (which measures the performance of the approximately 40 firms classified as real estate investment holding or development companies on the London exchange) and an index of medium-dated government bonds from the WM company. Returns were deflated using the all items retail price index with mortgage costs removed (RPIX).

The real return series are plotted in the figure below. The stocks series shows the effect of the dot.com boom and bust. In the boom period, property company returns lagged (prompting a number of prominent property firms to be taken private in the late 1990s and early 2000s), to subsequently recover sharply (aided by the declared intention to introduce a U.K. REIT, implemented in January 2007). The recent real estate market boom has contributed to the strong relative performance of private real estate.

[9] Using the Jarque-Bera criterion, normality is rejected for all these series, with the exception of the NAREIT series. This is largely as a result of positive kurtosis. The direct, private real estate series appear to be considerably "less normal" than the equity and bond series – for example, the TBI series has a Jarque-Bera statistic of 43.9, compared to 16.8 for bonds and 29.6 for stocks.

[10] As at December 2006, the IPD monthly database contained 3,820 buildings with a capital value of £50.5billion. The IPD database as a whole covered 12,137 buildings with a capital value of £192billion – some 49% of the real estate assets of institutional investors and listed property companies.

Figure 3.3 U.K. Real Asset Returns 1988-2005




In annualized terms, stocks produce a return of 8.3%, outperforming property company shares (7.8%), IPD (7.3%) and bonds (5.7%) – although compound growth is higher for IPD given the absence of the extreme negative returns experienced in the stock market. As with the U.S. data, the reported risk of private real estate as measured by IPD seems too low. Returns are between those of stocks and bonds (which is consistent with intuition of the blended bond and equity characteristics of real estate returns), but the standard deviation is below that of bonds. Desmoothing the series produces a standard deviation that is more plausible in risk-return terms, although the desmoothing process has reduced rather than eliminated first order serial correlation in the return series. Given the apparent serial correlation in the bond returns and other statistical properties of the IPD series, we have not attempted to desmooth further.

Figure 3.4 Descriptive Statistics, Quarterly Returns, U.K. Markets 1988-2005[11]

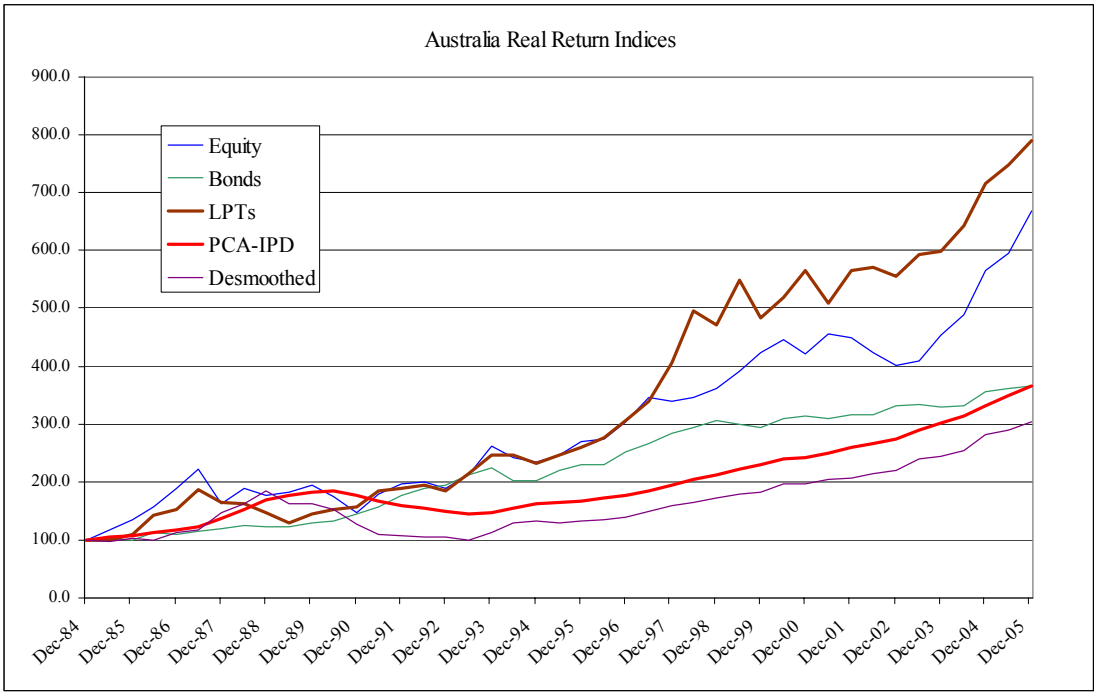
| | Stocks | Bonds | Prop. Cos | IPD | Desmoothed |
|---|---|---|---|---|---|
| Arithmetic Mean | 2.01% | 1.39% | 1.90% | 1.78% | 1.79% |
| Compound Growth | 1.71% | 1.35% | 1.40% | 1.75% | 1.70% |
| Standard Deviation | 7.73% | 2.70% | 10.07% | 2.45% | 4.37% |
| Skewness | -0.564 | -0.124 | -0.346 | -0.468 | 0.365 |
| Serial Correlation | -0.091 | 0.430 | 0.161 | 0.816 | 0.418 |

[11] The IPD and IPD desmoothed return series exhibit Jarque-Bera statistics that indicate that the return series are not normally distributed. Normality is not rejected for the bond, stock and property company series.

*3.1.3 Australia*

The broadest index of private commercial real estate performance in Australia is the IPD index, formerly published by the Property Council of Australia[12]. To provide as long a time period as possible, semi-annual returns were used (more recently the series is published quarterly). PCA-IPD returns were compared to the Australian Stock Exchange (ASX) all ordinaries total return index, the ASX Listed Property Trust index and the CBA bonds index. The striking feature of the figure of real market indices between 1985 and 2005 is the performance of listed property trusts, which have generated returns well above those experienced in the overall stock market. By contrast, the reported performance of the underlying private real estate market has been more muted.

Figure 3.5 Australian Real Asset Returns 1985-2005




[12] The IPD-PCA index covers 718 buildings with a capital value of Aus$76.2billion.

Figure 3.6 Descriptive Statistics Semi-annual Returns, Australian Markets 1985-2005[13]

| | Stocks | Bonds | LPTs | PCA-IPD | Desmoothed |
|---|---|---|---|---|---|
| Mean | 5.18% | 3.23% | 5.49% | 3.21% | 2.97% |
| Compound Growth | 4.63% | 3.13% | 5.04% | 3.14% | 2.69% |
| Standard Deviation | 10.59% | 4.47% | 9.88% | 3.79% | 7.65% |
| Skewness | -0.694 | -0.152 | 0.103 | -0.258 | 0.119 |
| Serial Correlation | -0.032 | 0.072 | -0.036 | 0.815 | 0.321 |

### *3.2 The Determinants of Real Estate Returns*

Now that we have established how real estate returns fare in comparison to other asset classes, it is important to review some main results from the literature on the determinants of real estate returns, whether real estate returns are predictable and how real estate reacts to inflation. Ling and Naranjo (1997) find that the growth rate in real per capita consumption, the real T-bill rate, the term structure of interest rates, and unexpected inflation are fundamental drivers that systematically affect real estate returns. Quan and Titman (1999) find that real estate prices are influenced by GDP growth rates. Importantly, Mei and Lee (1994) find that a real estate factor is useful in explaining direct real estate returns in addition to stock and bond factors. The method which is used by Mei and Lee (1994) is a factor analysis. They find that real estate loads highly on a factor which is not common to that of stocks or bonds. This is the factor they name the 'real estate factor'. This factor is thus a statistical factor and no straightforward intuition can be given for it. The important implication of their work is that real estate is linked to a factor other than those of financial assets. Hence, an allocation to real estate would be warranted to get exposure to that factor. Ling and Naranjo (1997, 1999) similarly find that a substantial component of real estate returns can only be explained in relation to a unique real estate factor.

Real estate returns appear to be slightly more predictable than the returns on other asset classes. Mei and Liu (1994) find that the level of predictability associated with real estate leads to moderate success in market timing, this not being the case for other asset classes. Chau *et al.* (2001) find that the level of predictability associated with real estate leads to moderate success in market timing, although this is not necessarily the case for the other asset classes examined in general. As always with real estate data, caution has to be exercised so that the conclusions are not biased by the quality of inputs.

[13] Normality is not rejected using the Jarque-Bera criterion, for any of these series. The PCA-IPD returns (smoothed or unsmoothed) exhibit higher kurtosis than the public market series. Caution is necessary in interpreting these statistics given the low frequency time series employed in the analysis.

In researching the inflation hedging qualities of commercial (investment) real estate, a distinction needs to be made between private and public assets. In both cases, there are conceptual and data-related issues. For private real estate, researchers are forced to rely largely on appraisal-based portfolio indices such as those provided by NCREIF in the U.S. or IPD in the U.K., or on proxy series based on rental values and capitalization rates. Securitized real estate returns are based on transactions; however, the delivered returns depend, in addition to the performance of the underlying property assets, on the leverage of firms and on management behavior. This last effect will depend on the structure of the firm, with the high distribution requirements of REIT-like structures providing less flexibility for management influence than, say, U.K. property company structures.

The results are mixed with early research tending to show real estate as a partial hedge (Hartzell *et al.*, 1987), while subsequent research has provided more equivocal results (Hoesli *et al*., 1997). These results, however, are based on appraisal-based indices which are influenced by appraiser behavior (for example, an appraiser might adjust a prior value to reflect known inflation) and may be distorted by appraisal smoothing. Building on the literature in financial economics, Hoesli *et al*. (2007 forthcoming) suggest that findings are somewhat mixed due to the difficulty of distinguishing long run from short run impacts and from the nature of transmission mechanisms. For this purpose, they use an error correction mechanism approach that separately identifies long run relationships and short run adjustment processes. Inflation is decomposed into anticipated and unexpected components, alongside a number of real and monetary variables. U.S. and U.K. stock, small cap stock, public and private real estate returns are examined for the period 1977-2003.

For U.S. markets, the long run models all include expected inflation with a significantly positive coefficient indicating that property returns do act as a long-run inflation hedge. Real GDP is positively linked to returns, while money supply is negatively linked to equity and small cap returns but not to real estate returns. In all of the short run models, there is very little evidence of short-term adjustment to changes in inflation (either anticipated or unexpected). The error correction variable is positive, with slow adjustment – which provides confirmation for the argument that short run analysis based on high frequency return data is unlikely to detect hedging qualities of assets. Further analysis of the U.S. private market results comparing the NCREIF results with the MIT transaction-based series suggest that the ECM adjustment process is much faster for the transaction-based series.

Reaction to shock variables is otherwise broadly similar. However, over the shorter analysis period (1984-2003), the sign on the coefficient for expected inflation in the private real estate long run model turns from positive to negative, suggesting time-varying behavior, perhaps linked to economic and monetary regimes. U.K. results are found to be similar to U.S. results in many respects.

In summary, directly-owned real estate returns seem to act as a long-run hedge against anticipated inflation, through the link to real economic variables affecting supply and demand. However they do not appear to adjust quickly to changes in inflation – particularly where the changes are unanticipated. In part, this may reflect measurement issues, in part, it may relate to the impact of lease contracts that prevent the landlord adjusting the rent on a regular basis. There does not appear to be any rigorous work analyzing real estate returns in markets where lease contracts include inflation-index rental uplift clauses. Since real estate performance is strongly influenced by (real) interest rates, the policy actions of monetary authorities in response to upward pressure on inflation may provide a further factor driving short-run divergence of property performance and inflation. Available data point to positive long-run real returns[14].

### *3.3 Real Estate Returns and Mean Reversion*

The absence of long-run, high frequency time series for real estate markets means that it is not feasible to test mean reversion in directly-owned, private property returns with any statistical reliability. Tentative preliminary results have been produced. Real property cash flows per unit space have been shown to be mean or trend reverting series in Australia (Hendershott, 1996), the U.S. (Wheaton and Torto, 1994) and the U.K. (Hendershott and MacGregor, 2005a). This appears to be intuitive. Surging real rents on newly written leases owing, for example, to rising demand for space, should be partially reversing when existing tenants face these higher rates at renewal. Moreover, higher real rents mean higher real property values and thus increased development. The additional space, too, will act to reverse the initial rise in real rents.

[14] While stocks historically exhibit marginally higher long run real returns, this additional return comes at the expense of higher volatility and lower short-run correlation between inflation and asset returns.

The results on whether real estate prices rationally reflect mean reversion are more mixed. Hendershott (2000) and Hendershott and MacGregor (2005b) argue that Australian and U.S. investors have not built the "obvious" mean reversion of real rents into their forecasts of real rental growth (see also Hendershott *et al*., 2003). As a result, investors have overvalued property at rental cyclical peaks and undervalued them at cyclical troughs. That is, investors have behaved irrationally. The reverse conclusion is reached by Hendershott and MacGregor (2005a) for the U.K. office and retail sectors. They demonstrate that their proxies for expected real rental growth forecast future real growth and that capitalization rates reflect rational expectations of mean reversion in future real cash flows. This latter result is interesting as better quality data are used and also an error correction framework is utilized.

There is also some evidence in the literature pertaining to securitized real estate. Stevenson (2002) concludes that there is no mean reversion using data from 11 markets for the period 1987-2000. His portfolio switching tests reveal price continuation on a short-term basis with the winner portfolio significantly outperforming both the loser and contrarian portfolios. Liu and Mei (1994) point to weaker mean reversion in listed real estate than in equity markets. Using a VAR approach, they suggest that a significant proportion of unexplained real estate risk relates to cash flow risk and that investors become apprehensive when there is good news on cash flows, demanding higher returns – which might imply anticipating a cycle.

To examine the behavior in time of real property returns we again use data for the U.S., U.K. and Australia. The nest two figures below show the NCREIF and TBI real returns each with a linear trend line superimposed. Two features are apparent: first, the presence of distinct, if erratic, cycles, particularly with the NCREIF and, second, the apparent upward trending returns (although the slope is not statistically significant). This may result from the sample period and the incomplete recent cycle, but may also reflect the yield compression that has followed from the fall in inflation and the glut of savings in the global economy.

Figure 3.7 U.S. Real Returns: NCREIF and Trend

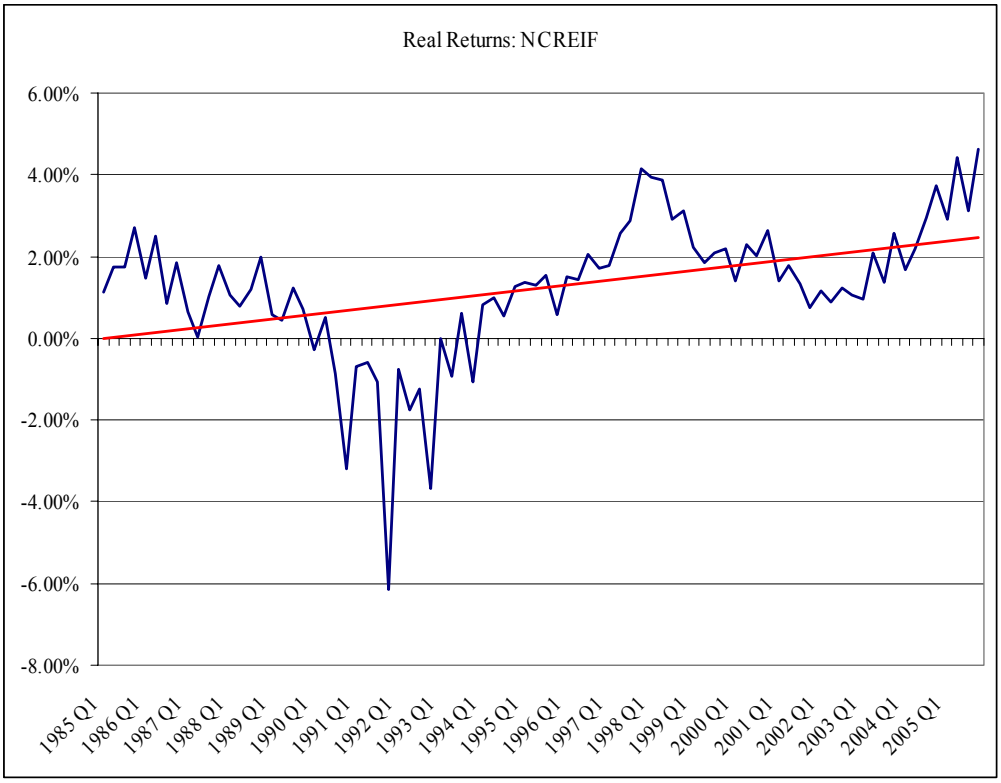
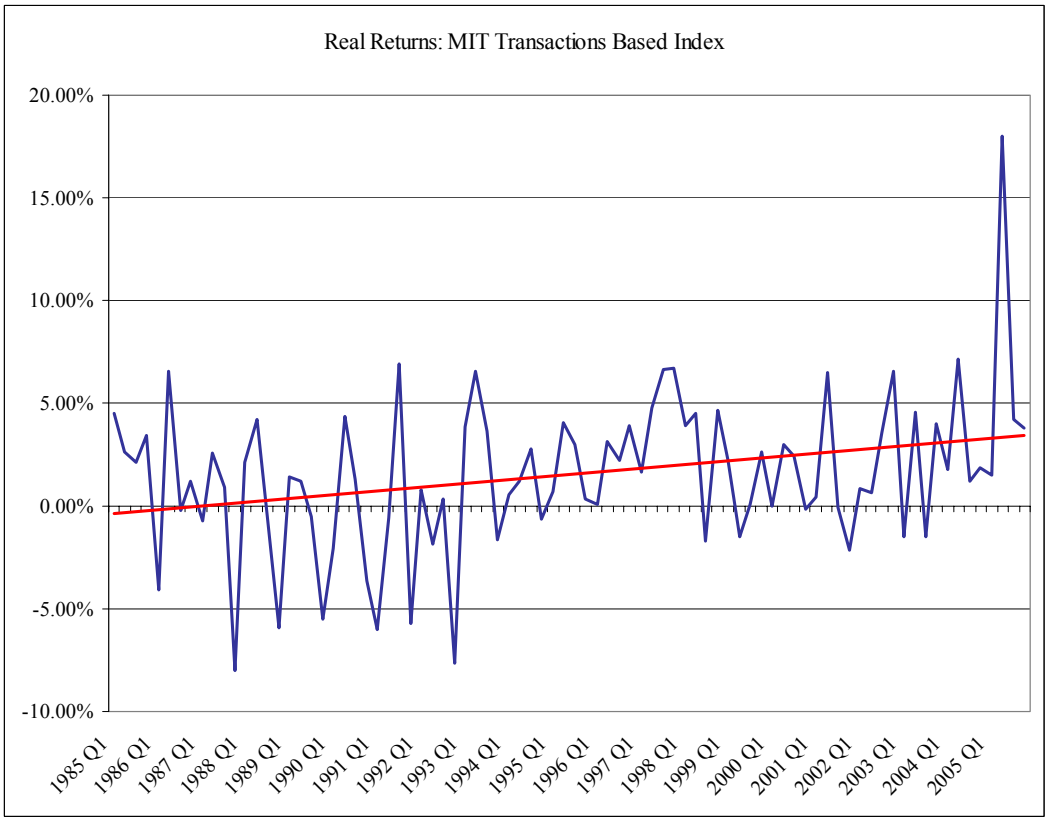



Figure 3.8 U.S. Real Returns: TBI and Trend



The figures below examine U.K. real returns (smoothed and unsmoothed). As with the U.S. market, there is evidence of cyclical behavior (particularly evident in smoothed data) but also an apparent upward trending pattern of real returns. Again consistent with the U.S. data, the slope on the trend line is non-significant and may reflect the absence of a complete final cycle. Volatility around the trend line seems to be reducing over time. This may reflect structural features in the macro-economy (in particular lower interest rate volatility) but may also be a portfolio diversification effect as the numbers of properties in the monthly index has increased over time, reducing the impact of specific risk events. The three-year market volatility of U.K. real estate returns is depicted on the next graph. It is quite clear that the volatility has decreased over the period.

Figure 3.9 U.K. Real Returns: IPD and Trend

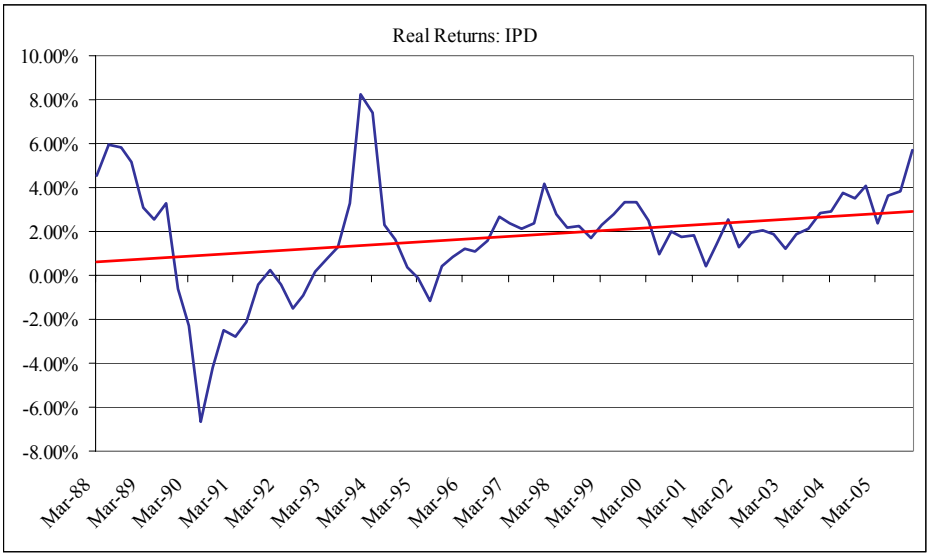


Figure 3.10 U.K. Real Returns: IPD Desmoothed and Trend

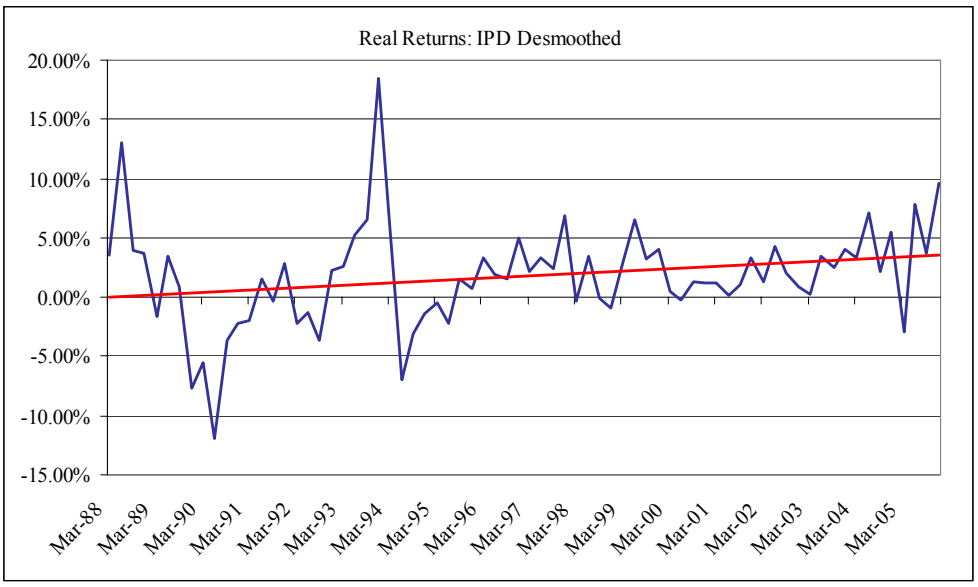
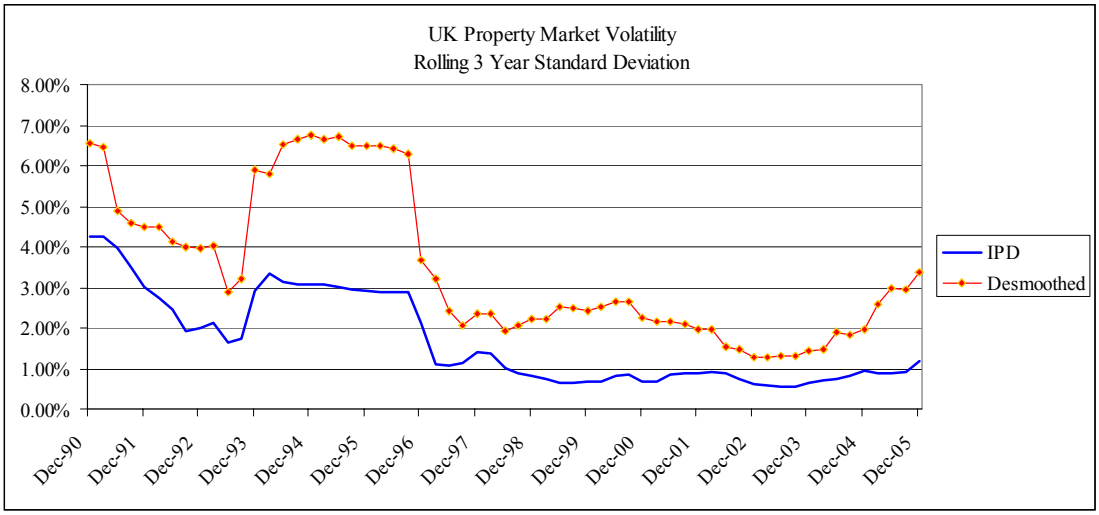



Figure 3.11 U.K. Real Returns: Changing Volatility Patterns




As with the U.S. and U.K. results, Australian private real estate exhibits strong cyclical behavior in the first half of the series (with a late 1980s boom followed by an early 1990s slump), but much lower real return volatility across the late 1990s and first half of the 2000s. The slope of the trend line is not significant and is, once again, influenced by the incomplete cycle at the end of the analysis period.

Figure 3.12 Australian Real Returns: PCA-IPD and Trend

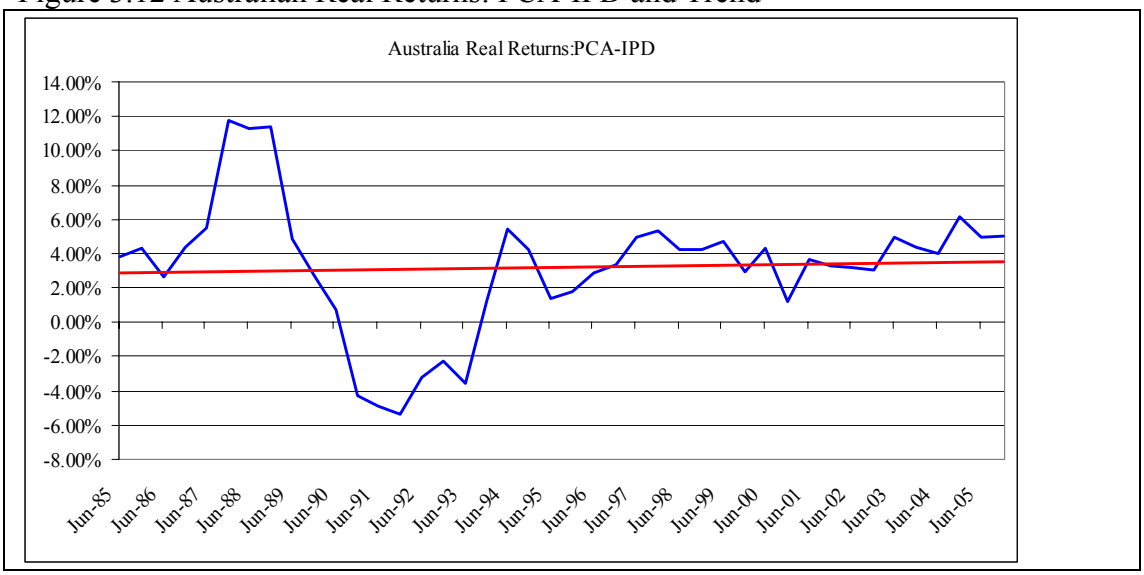
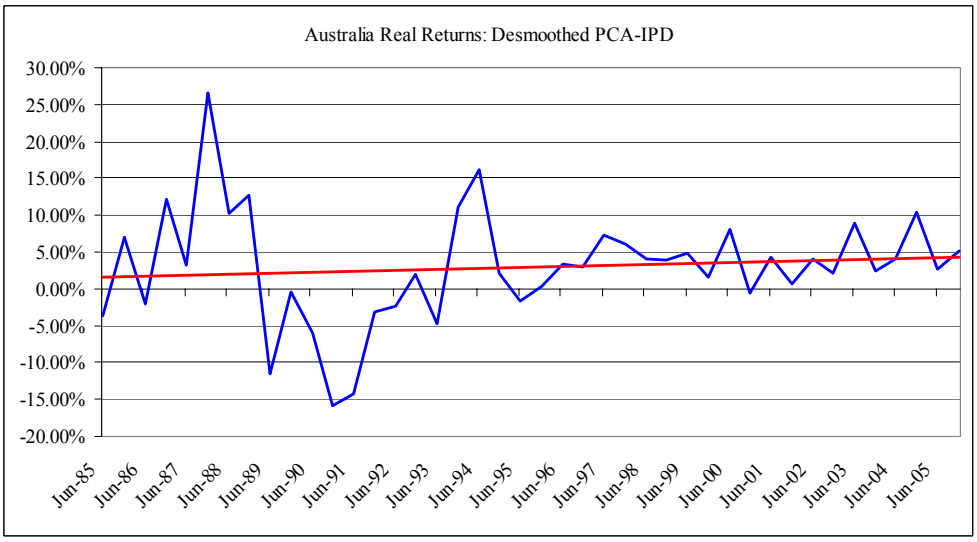



Figure 3.13 Australian Real Returns: PCA Desmoothed and Trend




### *3.4 Comparing Direct and Indirect Real Estate Performance*

In this sub-section, we compare the performance of direct private real estate investment with that of listed real estate securities. Do they offer similar performance, or do listed securities behave more like common equities? One would expect the long term performance of the two types of real estate to be similar, as the underlying asset and the souce of both income return and capital growth is the same; but this relationship may be obscured in the short term due to various effects. This sub-section's objective is to analyze these short term and long term effects.

Drawing on the data for the three markets discussed above, we are able to calculate correlation coefficients between institutional quality real estate returns and the listed property sector performance. We limit our discussion to the correlation between direct and indirect real estate (highlighted in the tables) - the correlations of real estate with other financial assets are discussed in Section 5. We then review evidence from the literature on the relationship between the private and public markets.

### *3.4.1 Correlation in the Three Markets*

The correlation between U.S. REITs and private real estate markets is very low. The correlation between REIT and equity returns, at 0.42, is higher than that between REITs and the MIT transaction based index (TBI). Given that REITs are untaxed real estate entities with a high distribution requirement and relatively modest leverage, this must lead to some concern as to the quality of information in the private market indices. In part, this seems to result from lags in processing information in the private market. The correlations increase if the NAREIT index is lagged – comparing NAREIT lagged two quarters to the TBI (that is, comparing NAREIT Q1 with TBI Q3) produces a correlation of 0.33, suggesting information processed in the public markets filters out slowly to the private market (further evidence on this issue is reported below).

Figure 3.14 Contemporaneous Correlation, U.S. Markets 1985-2005[15]

| | *Stocks* | *Bonds* | *REITs* | *NCREIF* | *Desmoothed* | *TBI* |
|---|---|---|---|---|---|---|
| Stocks | 1.000 | | | | | |
| Bonds | -0.054 | 1.000 | | | | |
| REITs | **0.428** | 0.158 | 1.000 | | | |
| NCREIF | 0.042 | -0.017 | **0.041** | 1.000 | | |
| Desmoothed | -0.016 | -0.097 | **0.136** | 0.767 | 1.000 | |
| TBI | 0.184 | 0.010 | **0.181** | 0.488 | 0.479 | 1.000 |

U.K. property company share returns exhibit a strong positive correlation with the stock market (with over 40% of the variation in property company returns explained by movements in the stock market index) and a weaker positive correlation with the IPD index, which strengthens with desmoothing.

[15] The correlation between stocks and REITs is significantly positive at the 95% level, while the correlation between REITs and direct real estate is not statistically distinguishable from zero. The latter result holds with raw and desmoothed appraisal-based returns, and also with TBI returns.

The stronger stock market – property company correlation compared to the correlation between REITs and stocks observed in the U.S. may be attributed to the status of property companies as taxable entities with the right to retain and reinvest earnings (unlike REITs) and to the fact that a significant number of property companies are ranked highly by market capitalization and hence may well feature in index-tracking portfolios.

Figure 3.15 Contemporaneous Correlation, U.K. Markets 1988-2005[16]

| | *Stocks* | *Bonds* | *Prop Cos* | *IPD* | *Desmoothed* |
|---|---|---|---|---|---|
| Stocks | 1.000 | | | | |
| Bonds | 0.113 | 1.000 | | | |
| Prop Cos | **0.641** | 0.119 | 1.000 | | |
| IPD | 0.116 | -0.014 | **0.277** | 1.000 | |
| Desmoothed | 0.159 | 0.209 | **0.391** | 0.772 | 1.000 |

The impact of smoothing on correlation structures can be seen by examining the lag structures between property company and IPD returns. The contemporaneous correlation coefficient is 0.21. This increases to 0.51 lagging the property company returns two quarters, with positive correlations persisting for four quarters. Desmoothing the series reduces this lag effect: the correlation peaks at a one quarter lag and falls sharply. This is consistent with the price discovery effects discussed below, although it is important to note that transaction costs and illiquidity constrain the ability to exploit these timing differences in the processing of information between public and private markets.

In Australia, the divergence between the reported performance of Listed Property Trusts (LPTs) and private real estate is an important indicator of the difference between the return generating processes in public and private markets. LPTs have been extremely successful in attracting capital, both retail and professional/institutional. Some estimates suggest that LPTs own over 50% of investment grade real estate in Australia (and this high level of domestic ownership has prompted many LPTs to seek international real estate opportunities). LPTs, like REITs, have constraints on activity and gearing and a high distribution requirement. Nonetheless, the risk-return behavior in the public and private markets is quite distinct, with LPTs exhibiting volatility similar to the all equity index and high returns, while the IPD-PCA measure shows returns and risk similar to bonds.

[16] The 95% confidence interval for the correlation between stock and property company returns is [0.48; 0.76]. The correlation between property company and direct real estate returns is also statistically different from zero, but the confidence intervals are much closer to zero. When real estate returns are desmoothed, for instance, the interval is [0.18; 0.57].

The correlation between LPT returns and IPD-PCA returns is negative (and is only weakly positive with LPT returns lagged one year). Desmoothing the IPD-PCA series proved difficult. The model utilized results in a doubling of the risk measure (comparable to the U.S. and U.K. results), but does little to improve the correlation between listed and private markets (the contemporaneous correlation remains negative, but the correlation with LPTs lagged six months is positive with a correlation of 0.31).

Figure 3.16 Contemporaneous Correlation, Australian Markets 1985-2005

| | *Stocks* | *Bonds* | *LPTs* | *PCA-IPD* | *Desmoothed* |
|---|---|---|---|---|---|
| Stocks | 1.000 | | | | |
| Bonds | 0.164 | 1.000 | | | |
| LPTs | **0.459** | 0.401 | 1.000 | | |
| PCA-IPD | -0.106 | -0.455 | **-0.228** | 1.000 | |
| Desmoothed | -0.117 | -0.392 | **-0.154** | 0.734 | 1.000 |

*3.4.2 Evidence from the Literature*

Three streams of the literature appear important on the topic of the behavior of indirect and direct real estate. These are (1) whether indirect and direct real estate returns are driven by the same factors, (2) whether the two markets are integrated and (3) if there is information transmission between the securitized market and the direct market (so-called price discovery). These topics are of course linked in many ways. For two asset classes to be integrated, for instance, the same risk factors have to be priced identically on both markets. Also, it could be that some common factors drive both direct and indirect returns but that these factors have a faster impact on the indirect market given the greater liquidity of that market. This would then mean that the indirect market leads the direct market leading to price discovery effects.

Concerning the *return determinants*, Mei and Lee (1994) find evidence that equity REITs and the Russell-NCREIF index are driven by the same underlying real estate factor. Clayton and MacKinnon (2003) investigate the relative impact of stock, bond and real estate factors in explaining REIT returns in the U.S. They find that the REIT market went from being driven largely by the same economic factors that drive large cap stocks through the 1970s and 1980s to being more strongly related to both small cap stock and real estate-related factors in the 1990s. Hoesli and Serrano (2007) provide international evidence on this issue. They find securitized real estate returns to be positively associated with stock and direct real estate

returns, but negatively related to bond returns. Financial assets contribute greatly to the variance of securitized real estate, while the impact of direct real estate is limited. Chan *et al.* (2005) claim that the change in REIT structure and the increase in institutional participation in the REIT market in the 1990s make REIT stocks behave more like other equities in the stock market.

This stream of research leads into the *integration* issue between real estate and stock markets. For the U.S., Ling and Naranjo (1999) find that the direct real estate market and the stock market are segmented, while the indirect market and the stock market are integrated. Liu *et al.* (1990) find preliminary evidence for the segmentation of real estate and stock markets in the U.S. For Singapore, Sing (2004) does not find any evidence of the integration of direct and indirect markets. Li and Wang (1995) find that REITs and stocks are integrated. Glascock *et al.* (2000) find that REIT returns are co-integrated with bond returns prior to 1992, but not thereafter. They also find that REITs and direct real estate are co-integrated. Pagliari *et al.* (2005) control for property-type mix, leverage and appraisal smoothing and find that the mean and volatility of the two types of real estate (direct and indirect) are not different from a statistical perspective. Finally, Bond and Hwang (2003) report that the nature of the fundamental volatility process underlying the securitized and unsecuritized commercial real estate markets is the same. This means that once the impact of noise on the volatility of both series is controlled for, both direct and indirect real estate exhibit a similar volatility process.

Barkham and Geltner (1995) find that *price discovery* occurs in U.S. and U.K. securitized markets, and that this information does not transmit to the direct market for a year or more[17]. This phenomenon is observed in other markets. Myer and Webb (1993) find that equity REIT index returns Granger cause unsecuritized real estate returns[18]. However, Chau *et al.* (2001) show that the returns to securitized real estate in Hong Kong are a mirror of broader international capital market movements. Once international capital market variables are included in the regressions, the returns to securitized real estate in Hong Kong convey little information about the appraisal-based returns to Hong Kong real estate.

[17] For a thorough discussion on price discovery, see Geltner *et al.* (2003).

[18] Granger causality is a technique for determining whether one time series is useful in forecasting another. It does not imply any economic link between two series, but merely a statistical relationship – that one series exhibits changes (e.g. price movements) in advance of the other.

It should be stressed that the lags observed in processing price-sensitive information in the private markets do not prove a violation of market efficiency. Illiquidity, high transaction costs and tracking errors between individual portfolios and market indices make profitable exploitation of such observed lags near impossible in the direct private market.

### *3.5 Property Market Liquidity*

In examining the qualities of real estate as an investment asset, "illiquidity" is a much cited disadvantage. Institutional, professional and private investors express concern at the lack of liquidity or require higher returns in compensation. Much of the justification for real estate investment vehicles - such as REITs – comes from their ability to enhance liquidity. Surprisingly, there has been very little research into such a key concept. Liquidity is a *complex, multi-dimensional concept*, which captures much more than the time taken to execute a trade. Liquidity also includes:

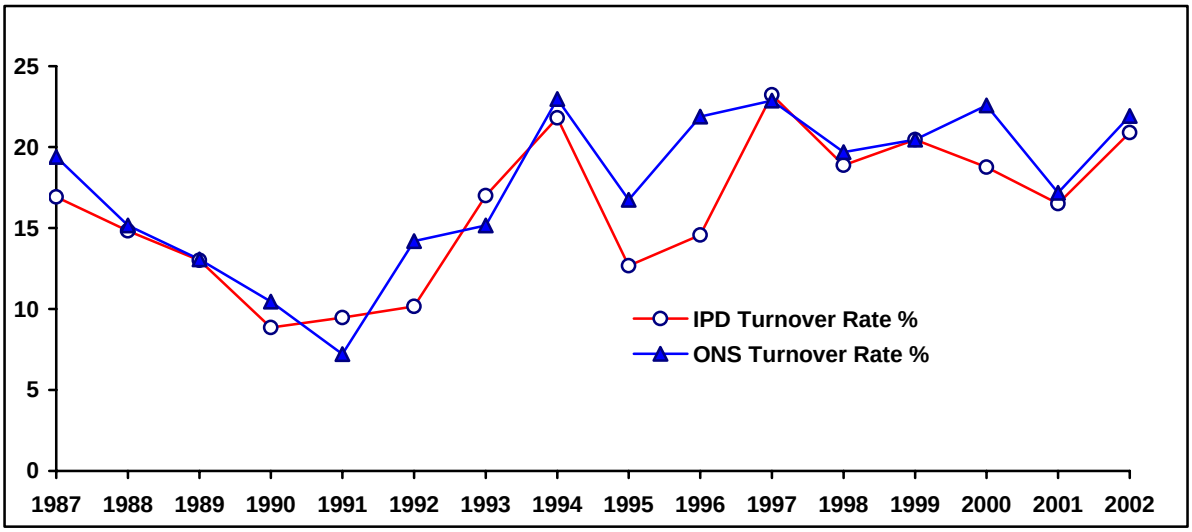
- *the costs, direct and indirect, of trading;*
- *risk and uncertainty concerning the timing of the sale;*
- *risk and uncertainty concerning the achieved sale price;*
- *trading volume and frequency; and*
- *the price impacts of the act of sale and purchase.*

The importance of these dimensions of liquidity will vary across asset classes and, within property, by type of building, sector and location. Importance will also vary according to market conditions. It is, thus, not possible to have a single, portmanteau definition of liquidity (for a more detailed discussion, see Lizieri and Bond, 2004). Investors will be concerned about liquidity both because of the additional ex ante uncertainty and because of potential difficulties in realizing values quickly in order to meet unexpected liabilities. Since most investors face such risks, then it is reasonable to expect a premium[19] for the asset class. Investors with long term horizons and low liability risk might benefit from such a premium.

[19] An analogy might be the return premium that is frequently found for small capitalization stocks: many researchers attribute this in part to the problems that an investor would face executing a block trade in the absence of an actively traded market.

In bond and stock market literature, the emphasis is on pricing impacts of trading. Five main aspects of liquidity are used to characterize markets: the cost of liquidating a portfolio quickly; the ability to sell without affecting prices; the ability of prices to recover from shocks; the costs of selling now rather than waiting; and transaction costs - the direct and indirect costs of trading. These apply largely to public traded markets where depth and the presence of market makers ensure that adjustment to supply and demand occur through the price mechanism. Real estate's high transaction costs drive longer holding periods (which, may also lead to sub-optimal portfolio allocations). Given thin trading, a fund attempting to sell out of property may suffer losses due to forced sale values. Large investors shifting their real estate weightings may influence prices. Real estate prices are sticky and change slowly. A major difference in direct (private) real estate markets, however, is that adjustments to changes in supply and demand occur as much through transactions volume and time to trade as through shifts in values and prices. The figure below (taken from the Investment Property Forum's liquidity research project, Bond *et al.,* 2004) shows the variation in turnover rate in the U.K. commercial real estate market, as measured by IPD, and the wider real estate market based on Office for National Statistics data for 1987-2002 illustrating the variability in transactions activity. Fisher *et al.* (2003) report similar pro-cyclical variation in the U.S. commercial real estate market. They report that the turnover in the NCREIF database was 4.5% in 1992 at the bottom of the cycle, while it was 17.9% in 1997 during the upsurge prior to the subsequent peak.

Figure 3.17 Turnover Rate, U.K. Investment Property, 1987-2002



The ability to enter and exit the real estate market depends on how long it takes to buy or sell. Crosby and McAllister (2004) examined the sales process analysis for 200 sales records from major professional U.K. real estate investors. They found considerable variation in the time taken from the decision to sell to final completion and receipt of proceeds. The average time from initial decision to completion was some ten months, with the mean time from formal marketing to sale averaging over six months. These averages hide considerable variation in time on the market. The distribution of times to sale was heavily skewed, with a small number of sales taking a very long time. Moreover, the funds examined tended to "filter" properties considered unsuitable for sale, biasing the averages downwards.

Bond *et al.* (2007 forthcoming) develop work by Bond and Hwang (2004) and Lin and Vandell (2006) that contrasts reported *ex post* returns from real estate with the *ex ante* risk of investing in real estate. The rationale for their analysis is that there is an additional source of risk that is related to uncertainty as to time on the market (that is, the time from the decision to sell an asset through price agreement to exchange and completion of the transaction). Given price volatility over this time on the market, there will be an additional source of risk. For liquid markets (such as stock markets), the additional risk will be trivial. For asset markets with an uncertain (and potentially lengthy) time on the market, there may be a significant additional *ex ante* risk facing a potential investor.

Making assumptions about the distribution of returns and times to sale based on the empirical evidence reported in Crosby and McAllister (2004), Bond *et al.* attempt to calibrate the impact of marketing uncertainty and illiquidity. They produce a table of "Marketing Period Risk Factors" which, for different holding periods and average times on the market, estimate the total variance including *ex ante* risk. Taking the Collett *et al.* (2003) estimate of an average institutional real estate holding period of seven years and the Crosby and McAllister (2004) estimate of an average six months time to sale, the multiple of the variance is shown to be 1.384. Applying this to the U.K. risk measure reported above increases the reported (annualized) risk from 4.90% to 5.72%. Depending on risk return preference, this suggests a risk premium of 50-100 basis points, given these assumptions. It should be stressed that this reflects only the uncertain time taken to market and sell the property. Other liquidity-related risks include difficulties faced in realizing asset value to meet liabilities and the dangers of significant asset sales (or acquisitions) causing price effects in thinly-traded markets.

Other analyses have rather subtracted an illiquidity premium from the average return on real estate. Such premium is typically measured as the difference between the observed return on real estate and the "normal" return measured in an equilibrium model.

Bond *et al.* also observe that combining properties into a portfolio rapidly diversifies away the single asset *ex ante* risk. They also suggest that applying the model to desmoothed real estate returns results in lower risk factors (suggesting some sort of interaction with the *ex ante* risk, marketing period and the appraisal smoothing process). Finally, as a note of caution, it should be stressed that time on the market and uncertainty of time to sale are time varying. As Fisher *et al.* (2003) note, marketing period times are often much longer in down markets (and shorter in up markets). This may lead the Bond *et al.* results to understate the actual number of properties required to achieve diversification of marketing period risk and the potential risks faced by investors entering the market.

It is important too to consider the typical holding period of commercial real estate assets. Real estate, characterized as an asset class with high round-trip transaction costs, thin trading and information asymmetries, might be expected to exhibit different patterns of holding periods compared to more liquid assets traded in public market places. Collett *et al.* (2003) analyze holding periods of commercial real estate in the U.K. using the IPD database. They report falling holding periods from about 12 years in the early 1980s to less than eight years at the end of the 1990s. The holding period is also found to vary by property type. For the U.S., Fisher and Young (2000) report an average holding period just shy of 10 years for NCREIF properties sold in 1999 and 2000. The holding period is substantially shorter for apartment buildings (6.2 years) than for retail properties (12.1 years).

**Section 3: Summary**

- *Analysis of risk and return is hampered by short time series. However, longer and more robust time series exist for Australia, the United Kingdom and the United States. These can be used to provide a benchmark for consideration of real estate risk and return.*
- *Available commercial real estate market performance indicators are based not on transactions but on appraisals (valuations). This is believed to result in a "smoothing" or moving average process which understates risk. It is thus important to address the smoothing issue when comparing real estate returns with other asset classes.*
- *Over the last twenty years in the United States, Equities generate real annualized returns of around 11%, listed Real Estate Investment Trusts 8% and Bonds and Private Real Estate around 5%. However, the reported risk of real estate (at around 3%) is far lower than bonds (8%), REITs (14%) and stocks (16%). Correcting for appraisal smoothing produces a higher estimate of risk, of around 8%.*
- *Analysis of the risk-return performance of different asset classes in Australia and the U.K. produces similar results to those of the United States. In Australia, Listed Property Trusts have outperformed the equity market and exhibit both higher returns and greater volatility than directly-held private real estate.*
- *In the U.K., listed Property Companies produce similar returns to the equity market but are more risky. Private real estate returns are higher than bonds; the smoothed risk measure is lower than for bonds, but desmoothing produces a higher risk estimate, closer to that expected in a risk-return framework. The desmoothed risk measure is still significantly below that of property companies.*
- *Multi-factor approaches have attempted to identify factors that determine real estate returns. Most studies find that macro-economic variables (GDP, industrial output, consumption/spending) and financial variables (real interest rates and term structure) are important factors. However, many studies detect a unique, priced, real estate factor, making a case for inclusion of real estate in the mixed-asset portfolio.*

- *The evidence on the inflation hedging properties of real estate is mixed. Generally, real estate appears to be a partial hedge. It has long-run hedging qualities, but does not adjust quickly to inflation shocks. This might be related to the constraints of lease contracts (which delay rental adjustment) or to interest rate sensitivity and the interaction between inflation increases and intervention by monetary authorities.*
- *The available time series data are too short and too low frequency to permit reliable testing of mean reversion in private real estate markets. There are observable, but irregular, cycles of high and low returns around trend lines. Evidence on the behavior of listed real estate securities points to weak mean reversion.*
- *Listed real estate typically exhibits low contemporaneous correlation with direct private real estate indices – which, alongside the higher volatility, has led some to question whether or not real estate securities are a property investment. In many markets, listed property returns exhibit strong positive correlations with the general equity market.*
- *The low correlations may be misleading. Listed real estate firms make use of debt, so the returns should be deleveraged. Direct market returns should be desmoothed to reduce valuation smoothing effects. This results in higher correlations and there is evidence of long-run integration of public and private real estate returns. Furthermore, a "price discovery" effect can be observed, with information in the listed real estate market processed and priced well in advance of price movements in the private market. Again desmoothing reduces this lag effect.*
- *Illiquidity is a significant issue in private real estate markets. The high value and indivisibility of real estate, high transaction costs and the lengthy and uncertain time taken to sell assets produces additional risk for investors. It is hard to quantify this additional risk. Research points to a 50-100 basis point premium for typical holding periods and market volatility.*

## 4. The Distribution of Real Estate Returns and Measurement Issues

In this brief section, we review the literature on real estate return distributions and highlight some key measurement problems in real estate markets – notably the issue of valuation or appraisal smoothing in private real estate markets. Many portfolio allocation and performance measurement models used in finance implicitly assume normal or log-normal returns. The available evidence suggests that this is not a sound assumption in real estate markets – a finding which suggests that careful consideration is needed in the choice of risk measures. The earlier analyses of real estate returns utilized desmoothed real estate returns. This section explores the problems of index construction, the dampening of reported risk measures and the potential distortion of correlation measures between asset markets that result from the use of appraisal-based indices.

### *4.1 Return distributions*

Myer and Webb (1993) found evidence of non-normality in terms of both skewness and kurtosis; Lizieri and Ward (2000) find that monthly data are non-normal, while quarterly data are normal (see also Brown and Matysiak, 2000b). Maurer *et al.* (2004) compare the distributional properties of U.S., U.K., and German direct real estate returns. Using quarterly data, they find that U.K. returns are normal, but not U.S. and German returns. For German data, normality is rejected due to significant positive skewness, while the U.S. data could not be classified as normal due to significant negative skewness and leptokurtosis. Once the data were desmoothed, the results changed with normality being accepted for Germany, but rejected for the U.K. and the U.S. data. Nonetheless, when annual data were used, the assumption of normality could not be rejected for any country, either using the appraisal-based or desmoothed data. Other authors, however, do reject normality at annual frequency. As noted above, in the U.S., directly-held real estate appears to be less normal than other asset classes, while in the U.K. normality is rejected for the IPD-based series but not for the public asset classes. Various attempts have been made to find a suitable return distribution for real estate returns. Lizieri and Ward (2000) find that the most appropriate distribution appears to be the logistic distribution, but that even this is rejected in most cases; Bond *et al.* (2007 forthcoming) use a negative exponential distribution to model volatility in the marketing period. Young *et al.* (2006) decisively reject normality for private U.K. real estate returns.

They also find that the characteristics of return distributions – including skewness – are time-varying. Similar findings emerge for U.S. real estate returns – see, for example, Young and Graff (1995); Chen (2005); or Young (2007 forthcoming), and for Australia (Graff *et al.,* 1997).

There is also some evidence of non-linearity and asymmetry in the behavior of real estate returns. Both Lizieri *et al.* (1998) and Maitland-Smith & Brooks (1999) obtain results that suggest there are distinct "return regimes" in which return processes vary. Lizieri *et al.* use a threshold autoregressive model conditioned on real interest rates to show that volatility increases sharply in high real interest rate environments compared to low real interest regimes. In the former, returns trend downwards sharply; in the latter there is a more erratic upward movement. Maitland-Smith and Brooks use a Markov switching model that implies periods of quite distinct performance in terms of returns and, in particular, of volatility. These results have implications for performance benchmarking and for the assessment of asset risk. Okunev and Wilson (1997) use non-linear statistical techniques to suggest that the REIT market and the general equity market are partially integrated but that, with weak mean reversion, differences may persist, providing diversification benefits.

These characteristics of asset behavior have led to suggestions that portfolio allocation models including real estate should use a risk measure other than (or in addition to) the variance. Thus Byrne and Lee (1997) propose use of a mean absolute deviation risk measure, Hamelink and Hoesli (2004a) use a maximum drawdown function and others have suggested a semi-variance measure (for example Bond and Patel, 2003). The literature, however, has not considered explicitly whether diversification benefits are uniform across the distribution. Knight *et al.* (2005) report preliminary evidence that both global and U.K. real estate stocks exhibit tail dependence with common equities – that is, that there are correlations in the presence of extreme events. The results for the U.K. in particular suggest that correlations are strongest in the negative tail – i.e. that diversification is absent when it is needed most. Similarly, Liu and Mei (1998) observe that international real estate stocks show a higher correlation with U.S. stocks when U.S. markets are performing badly.

### *4.2. Desmoothing*

Using real estate data is not straightforward as it is usually acknowledged that appraisal-based real estate indices are smoothed, i.e. that there is significant serial correlation in returns[20]. Some authors have suggested that this results from appraisers using weighted averages of the contemporaneous information set and historical appraisals (see e.g. Geltner *et al.*, 2003). Such behavior has been documented empirically. The results by Diaz and Wolverton (1998), for instance, support the hypothesis of insufficient adjustment from previous value judgments. Also, Clayton *et al.* (2001) find evidence that appraisers valuing the same property in consecutive periods anchor onto their previous appraised values. Transaction-based indices have also been shown to exhibit greater volatility and less lagging than appraisal-based indices (Fisher *et al.*, 1999; Fisher *et al.*, 2003). Smoothing will predominantly lead real estate indices to underestimate the volatility of real estate returns (see also Edelstein and Quan, 2006), although it may marginally impact on the correlation between real estate returns and the returns on other asset classes as well.

Several desmoothing approaches have been suggested. There is no clear consensus on what approach should be used, but two methods have been widely used in the literature. The first approach assumes that real estate markets are fully efficient, and hence that real estate returns should not exhibit any serial correlation. "True" real estate returns are recovered as follows:

$$r_t^u = \frac{r_t^* - \alpha r_{t-1}^*}{1-\alpha}$$

where $r_t^u$ is the desmoothed return in period t, $r_t^*$ is the smoothed return in period t, $\alpha$ is the first order serial correlation coefficient, and $r_{t-1}^*$ is the smoothed return during the previous period. An alternative desmoothing method which has been widely used is that devised by Geltner (1993), which applies a similar reverse filtering model (see also Cho *et al.*, 2003). The appealing property of this model is that it does not assume that the real estate market is efficient, and hence does not get rid of all serial correlation. It does require, however, that some assumption be made regarding the standard deviation of real estate.

[20] See Brown and Matysiak (2000a; 2000b, chapter 12); Geltner *et al.* (2003); *Geltner et al.* (2007, chapter 25).

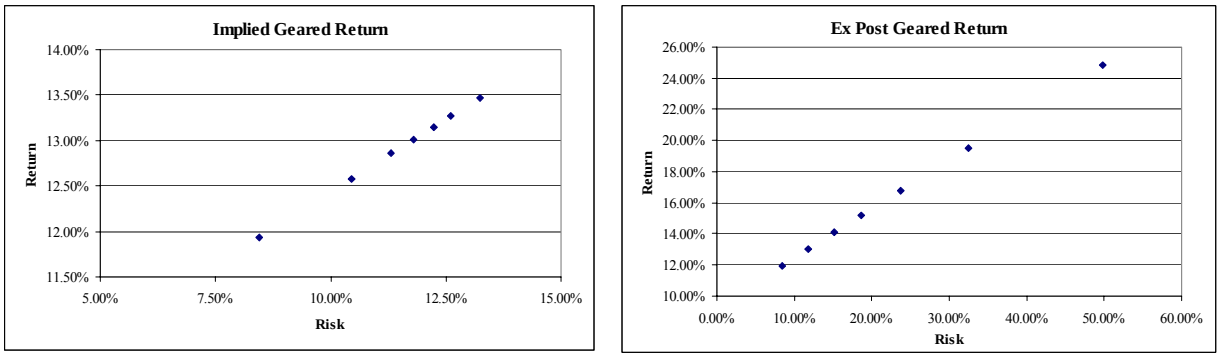
The common assumption is to assume that real estate's volatility is one half that of stocks (Geltner, 1993; Corgel and deRoos, 1999). An alternative to this is to consider a target serial correlation level or to assume *a priori* a value for $\alpha$. There have also been attempts to use a time-varying desmoothing parameter (see e.g. Brown and Matysiak, 2000b).

Although there is overwhelming support for smoothing in appraisal-based real estate returns, the smoothing assumption has been challenged by some authors. Lai and Wang (1998) argue that much of the smoothing literature starts from an assumption that smoothing exists. They argue that the favorable risk-adjusted returns observed for real estate can be explained much more by the fact that investors need to be compensated for the illiquidity and high information costs, than by the fact that the data are noisy. They analyze each of the smoothing arguments, and conclude that the variance of real estate returns can in fact be less than the variance of appraisal-based returns (empirical evidence of this is found e.g. in Webb *et al.*, 1992).

### *4.3 Leverage and Real Estate Returns*

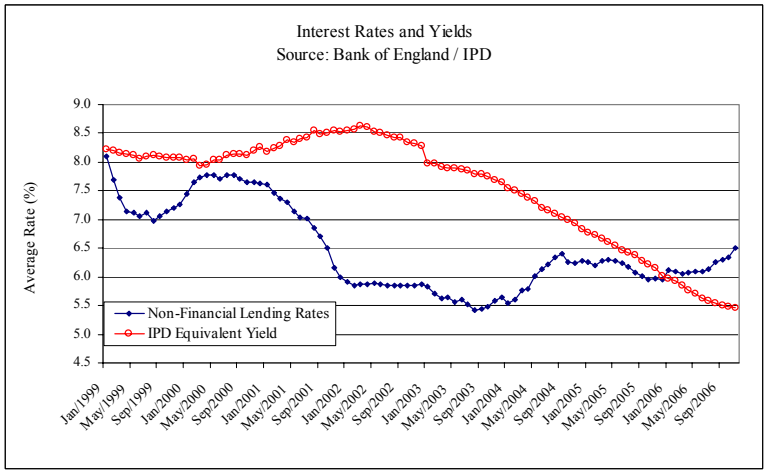
The returns reported in private real estate market performance indices not only rely on appraisal-based data, they also represent unleveraged asset returns. However, most private funds and listed real estate companies utilize debt alongside equity in acquiring asset portfolios. This clearly creates problems of comparison. Use of debt increases the potential volatility of equity returns and exposes investors to additional interest rate risk (which is generally assumed to be priced as a systematic risk factor). In the absence of tax shield effects or a relationship between loan-to-value ratio and debt costs, the risk return trade-off will be broadly linear. Figure 4.1 below shows risk-return for U.K. (IPD) real estate returns, based on a one year holding period, a cost of debt equivalent to LIBOR + 110bp and different debt/value ratios from 0% to 80%. The first panel shows the implied return (based on the standard Modigliani-Miller decomposition), the second the "ex post" delivered return. In both cases, risk and return are linked in a linear relationship with both increasing as the proportion of debt rises. Tyrell (2007) points out that, in practice, higher loan-to-value ratios (particularly at project level) are generally accompanied by higher costs of debt – due to higher margins and arrangement fees, from the use of mezzanine finance for the "top slice" of debt or the cost for insurance, guarantees and additional security. He suggests that this results in a curve in the risk-return relationship at higher proportions of debt.

Figure 4.1 The Impact of Gearing




Real estate practitioners often argue that theoretical models of the additional risk from gearing are misplaced and that leverage enhances returns. In part, this reflects a time-horizon problem. The fall in interest rates over the last decade meant that lending rates in many markets were below capitalization rates making debt funding a very favorable option. However, the experience of the major global real asset market difficulties in the late 1980s and early 1990s and the market crisis of 1973 reveal the potential risks of excess borrowing.

Figure 4.2 U.K. Cap Rates and Borrowing Rates 1999-2006




Comparisons of listed real estate investments with the private real estate market should strictly adjust for the capital structure of the vehicle (although the investor purchasing shares faces the additional financial risk from the leverage). Pagliari *et al.* (2005) estimate that U.S. REITs had an average debt-to-value ratio of around 40% in the period 1981-2001 (with the average rising to 50% towards the end of their analysis period).

Correcting for this leverage and for differences in the property type composition of REITs and NCREIF, they demonstrate that REIT volatility is statistically indistinguishable from desmoothed NCREIF volatility. Riddiough *et al.* (2005) perform a similar analysis, and demonstrate a convergence of the NCREIF indices and REIT performance adjusted for leverage and other factors. Nonetheless they find that REIT returns are on average some 300 basis points higher than NCREIF returns in the 1980-1998 period. While they suggest that this might reflect superior efficiency in public ownership of real estate, the difference could also be attributed to the analysis period, since it ends before the downward correction of equity markets after the dot.com "exuberance".

**Section 4: Summary**

- *Research consistently finds that real estate returns are not distributed normally, with kurtosis and skewness outside standard parameters. This has implications for the appropriateness of risk measures in standard portfolio allocation models.*
- *There is evidence of non-linearity and asymmetry in return distributions. For listed property returns, there is some evidence that correlation with other asset classes increases when those asset classes are performing poorly (tail dependence), eroding some of the benefits of diversification.*
- *For private real estate, analysis of return distributions must confront the appraisal smoothing issue. The valuation process seems to result in very high serial correlation, with returns in one period influencing those in another. Desmoothing procedures seek to remove this effect by extracting the "new" information from valuation-based returns.*
- *There is no consensus on the "best" method for desmoothing appraisal-based data. The most frequently used model attempts to remove first order autocorrelation (the relationship between the return this period and that of the previous period). Initial results from transaction-based, repeat sales indices provide confirmation of the benefits of the first order autocorrelation method.*
- *Leverage also influences return distributions, adding capital structure risk to the underlying asset risk. U.S. REITs typically have debt to value ratios of around 40% while private real estate equity vehicles at the high risk-return end of the spectrum (value added or opportunity funds) frequently have debt to asset value ratios in excess of 70%. The impact of exposure to interest rate risk needs to be disentangled from the underlying real estate market risk.*

## 5. The Fund's Allocation to Real Estate

Section Five formally addresses portfolio construction issues. First, we review evidence on the place of real estate in the mixed-asset portfolio. We then turn to the analysis of the optimal allocation to real estate in a diversified portfolio. Specific mention is made of potential issues with real estate data in the context of mixed-asset diversification. The issue of international diversification is also addressed. This part of the report finally addresses the topic of within real estate portfolio diversification. It is assessed whether property type or geographic dimensions are most useful in forming asset combinations. The geographic dimension is analyzed in terms of administrative and economic regions, as well as in terms of country segmentation.

### *5.1 What are the Diversification Benefits of Real Estate in a Large Global Fund?*

#### *5.1.1 Correlation of Returns*

In a Modern Portfolio Theory (MPT) framework, the positive impact from including an additional asset class to the investment universe will stem from the return and risk characteristics of that asset class, but more importantly from the correlation of the asset's returns with those of the assets already included in the portfolio. Generally speaking, the closer these correlations are to -1 the greater the diversification benefits. Consistently, the closer these correlations are to +1, the lower the diversification gains.

Much research has shown that real estate returns are lowly related to the returns on financial assets, i.e. to stocks and bonds. In the table below, we report the correlations for seven countries for the period 1987-2001 (Hoesli *et al.*, 2004). When appropriate, real estate returns have been desmoothed by these authors. The international real estate series they use for each country is based on the returns in all the other countries examined excluding the domestic market; the weightings being based on GDP.

Figure 5.1 Correlation of real estate with domestic and international stock and bond returns

| | *Correlation (RE, domestic stocks)* | *Correlation (RE, foreign stocks)* | *Correlation (RE, domestic bonds)* | *Correlation (RE, foreign bonds)* |
|---|---|---|---|---|
| Australia | -0.25 | -0.14 | -0.42 | -0.53 |
| France | 0.42 | 0.35 | -0.49 | -0.01 |
| Netherlands | 0.40 | 0.37 | 0.27 | 0.38 |
| Sweden | 0.21 | 0.22 | -0.33 | -0.20 |
| Switzerland | 0.44 | 0.35 | -0.12 | 0.17 |
| U.K. | 0.24 | 0.38 | -0.02 | -0.17 |
| U.S. | 0.11 | 0.30 | -0.20 | -0.16 |

Source: Hoesli *et al.* (2004).

Real estate returns appear to be positively correlated with the returns on common stocks, both domestic and international. The only exception to this is Australia, where the relationship is negative. In contrast, the relationship between real estate and bond returns is negative except in the Netherlands. In fact, the negative relation is quite strong in five out of the seven countries. The results pertain to 7 countries; they pertain however to a relatively short time period. Hence it is of importance to analyze results for longer time periods. Geltner *et al.* (2007) report a correlation of -0.23 between desmoothed U.S. real estate returns and long term government bonds over the period 1972-2004, while the correlation between real estate and stocks is 0.18 (see also Francis and Ibbotson, 2001). Further evidence on the weak relation between real estate returns and stock returns on an international basis is provided by Quan and Titman (1999). When we use data for the U.S., U.K. and Australia for the period 1985-2005 (1988-2005 for the U.K.), we find further evidence of a weak relationship between real estate returns and the returns on financial assets. Direct real estate returns have a near zero correlation with both stock and bond returns, a result that holds whether or not the real estate returns are desmoothed.

Figure 5.2 Contemporaneous Correlation, U.S. Markets 1985-2005[21]

| | *Stocks* | *Bonds* | *REITs* | *NCREIF* | *Desmoothed* | *TBI* |
|---|---|---|---|---|---|---|
| Stocks | 1.000 | | | | | |
| Bonds | -0.054 | 1.000 | | | | |
| REITs | 0.428 | 0.158 | 1.000 | | | |
| NCREIF | 0.042 | -0.017 | 0.041 | 1.000 | | |
| Desmoothed | -0.016 | -0.097 | 0.136 | 0.767 | 1.000 | |
| TBI | 0.184 | 0.010 | 0.181 | 0.488 | 0.479 | 1.000 |

In the U.K., IPD returns have a low correlation with the equity market and a zero correlation with the bond market; desmoothing the series makes little difference to the equity market correlation but leads to an increase in the correlation with bonds (possibly reflecting a faster adjustment to interest rate shocks). Australian real estate returns are lowly negatively correlated with the stock market and negatively related to the bond market. Hence the relationship between real estate and stocks is usually close to zero, while the relation between real estate and bonds is close to zero or negative. In all cases, the potential benefits of including real estate in a mixed-asset portfolio appear high.

Figure 5.3 Contemporaneous Correlation, U.K. Markets 1988-2005[22]

| | *Stocks* | *Bonds* | *IPD* | *Desmoothed* |
|---|---|---|---|---|
| Equities | 1.000 | | | |
| Bonds | 0.113 | 1.000 | | |
| IPD | 0.116 | -0.014 | 1.000 | |
| Desmoothed | 0.159 | 0.209 | 0.772 | 1.000 |

Figure 5.4 Contemporaneous Correlation, Australian Markets 1985-2005[23]

| | *Stocks* | *Bonds* | *PCA-IPD* | *Desmoothed* |
|---|---|---|---|---|
| Equity | 1.000 | | | |
| Bonds | 0.164 | 1.000 | | |
| PCA-IPD | -0.106 | -0.455 | 1.000 | |
| Desmoothed | -0.117 | -0.392 | 0.734 | 1.000 |

There is evidence, however, that these correlations are somewhat unstable (e.g., Fraser *et al.*, 2002; Maroney and Naka, 2006). For this purpose, we calculate correlations for varying time periods using U.S. data. Two types of analyses are performed. We first examine the case of an investor who entered the real estate market in 1985 and exited the market at various time

[21] The correlation coefficients between direct real estate (however measured) and stocks or bonds are both indistinguishable from zero at the 95% confidence level.

[22] The correlation coefficient between direct real estate and both stocks and bonds is indistinguishable from zero at the 95% confidence level.

[23] At the 95% confidence level, the correlation between stocks and direct real estate is not significantly different from zero, while the correlation between bonds and real estate is significantly negative.

periods (the minimum holding period is set at 10 years, i.e. for 1985-1994). We then posit that we are looking at the correlation coefficients as of the end of 2005 with varying years of entry on the real estate market. We start with a 10-year holding period (1996-2005), and then expand the period by adding one year at a time up to the period 1985-2005, suggesting that an investor would have entered the market a year earlier every time. The analyses are reported in Figures 5.5 and 5.6. The correlation of real estate returns with bonds returns is low in all cases. The correlation with stocks is higher but never distinguishable from zero statistically. These results suggest that the inclusion of real estate in a mixed-asset portfolio leads to substantial and sustained diversification benefits.

Figure 5.5 Correlation between U.S. Real Estate and Stocks or Bonds, Nominal Returns: Investment Made in 1985, Various Exit Periods

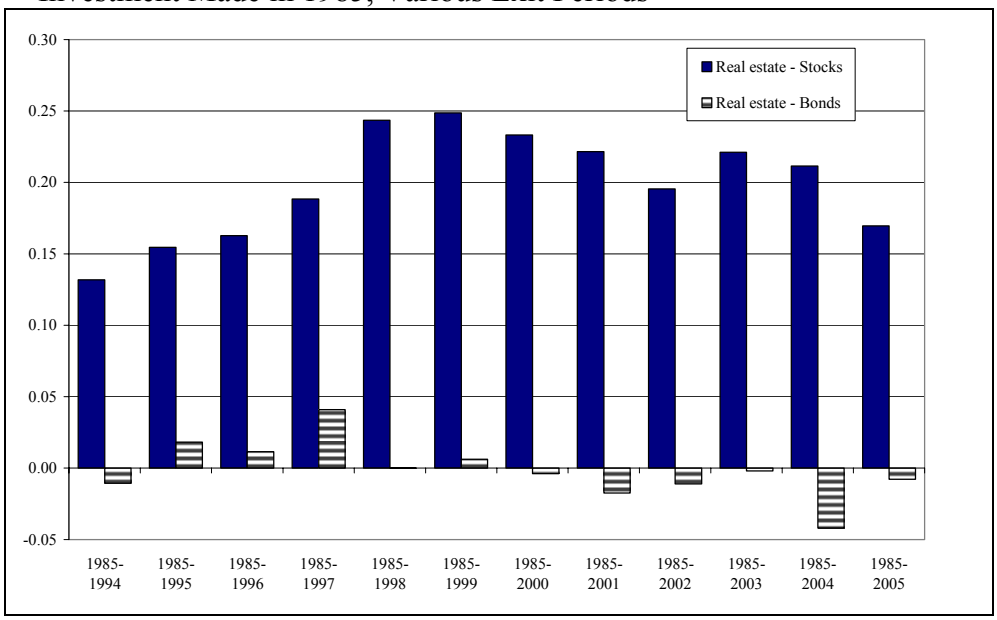
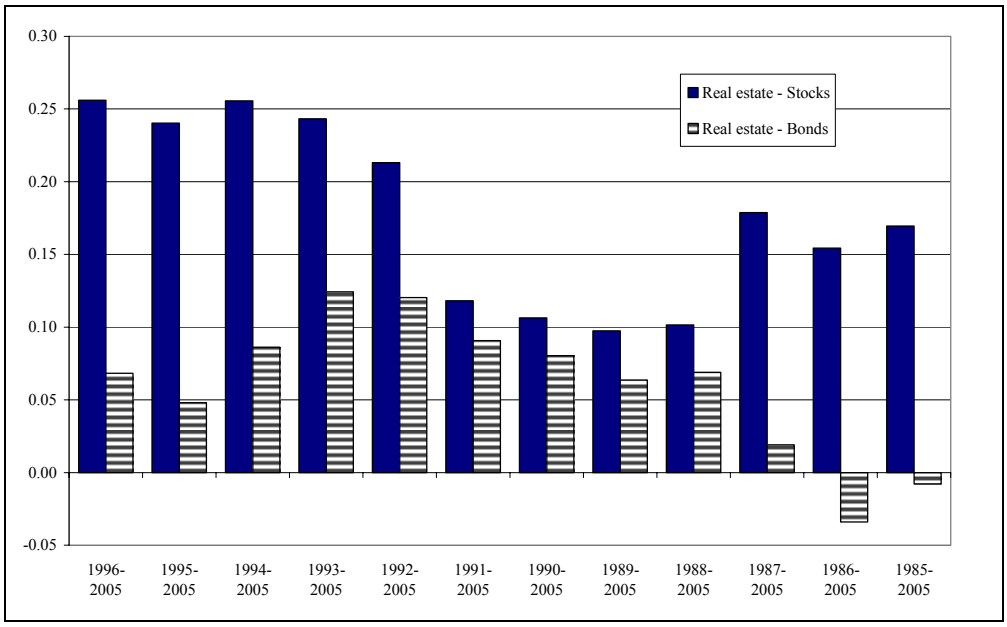



Figure 5.6 Correlation between U.S. Real Estate and Stocks or Bonds, Nominal Returns: Investment Made at Various Periods, End of 2005 Market Exit




Quarterly or annual time increments are usually used when measuring correlation coefficients. It is reasonable to assume that higher correlations between real estate and financial assets, and hence less diversification benefits, exist in the long run. Unfortunately, no long enough time series of real estate returns exist which would enable the testing of such a hypothesis (the longest time series of commercial real estate returns is the IPD U.K. index going back to 1971, but its reliability during the 1970s has been challenged). Indeed, if a minimum of 15 observations is required to compute a correlation coefficient, then 45 years of data would be needed for three-year increments to be used, and 75 years for five-year increments.

A few studies have used co-integration techniques to study the long term behavior of asset classes. Such studies suggest that real estate returns are lowly correlated with the returns on financial assets even in the long run. Chaundry *et al.* (1999) find that stocks have an inverse long-run relationship with real estate. They also find that the overall impact of stocks on the real estate market is much less than its impact on bonds and T-bills. Fraser *et al.* (2002) use Granger causality tests and co-integration techniques to demonstrate that there is no long-run relationship between real estate returns and those of either bonds or stocks. Hence, the diversification benefits of including real estate in a mixed-asset portfolio are confirmed.

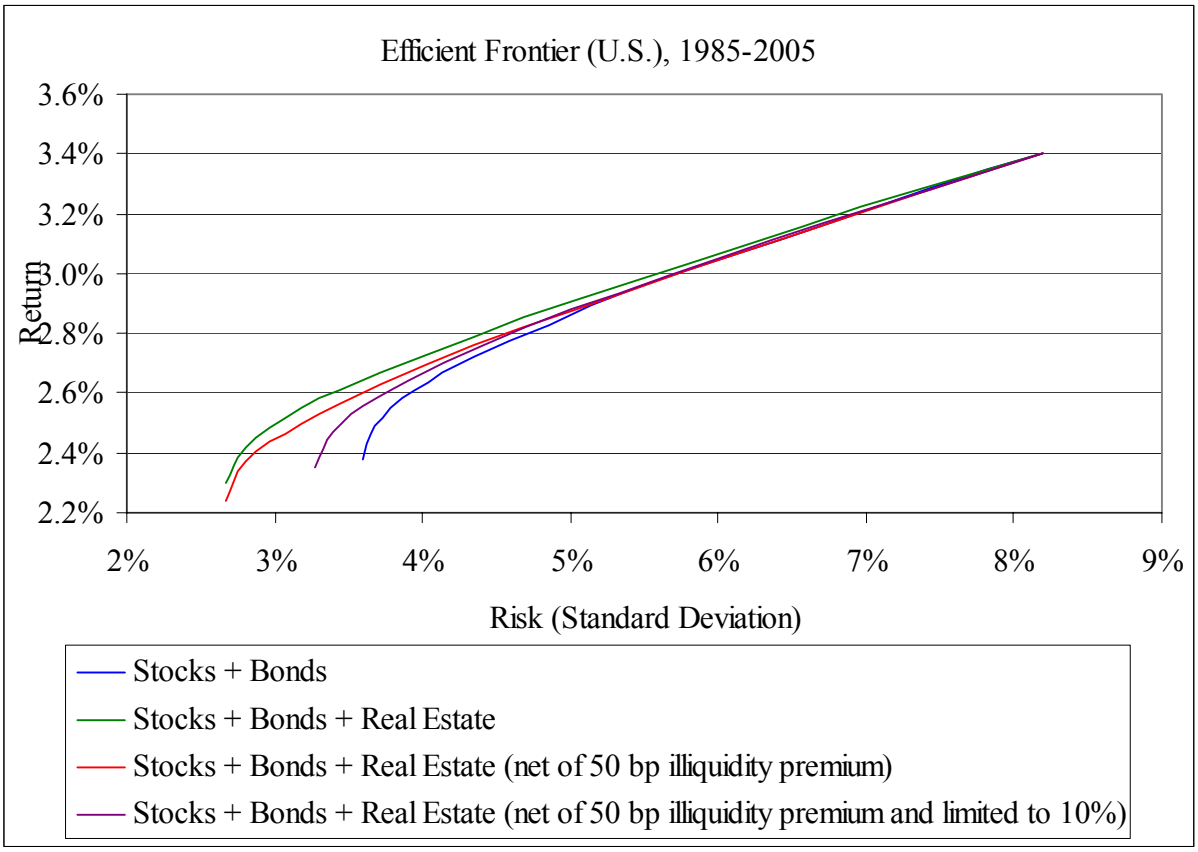
The low relation between real estate returns and the returns on financial assets is not surprising for at least two reasons. First, and as discussed above, Mei and Lee (1994) have found that there is a real estate factor and hence that asset returns are not driven by the same factors. In fact, Ling and Naranjo (1999) and Liu *et al.* (1990) point to the segmentation of

real estate and stock markets in the U.S. Second, behavioral effects, such as herd behavior, is likely to make some asset classes "hot" at given time periods and hence increase returns even further, while other asset classes are considered to be less attractive. Stated differently, investment strategies linked to behavioral aspects are likely to make real estate even more counter cyclical than it would otherwise be. To some extent, the growth of public listed real estate, securitised real estate debt markets and the presence of hedge funds may dampen cyclical movement while introducing greater trading volatility.

*5.1.2 Diversification Benefits*

In terms of the return and risk benefits, the results can be summarized as follows. For a given return level, the addition of real estate to a portfolio containing financial assets leads to the portfolio's standard deviation being diminished by 5 to 15%. For a given risk level, the average annual return can be enhanced by 50 to 70 basis points. Figure 5.7 shows the benefits from including real estate in a mixed-asset portfolio in the U.S. over the period 1985-2005. We perform the analysis without and with taking into account a 50 basis point illiquidity premium which is subtracted from the average return on real estate. We also include a frontier where the allocation to real estate is capped at 10%. The diversification gains from adding real estate emerge clearly.

Figure 5.7 Efficient frontiers without and with real estate in the U.S., 1985-2005



### *5.2 What is the Proper Weight of Real Estate in a Mixed-Asset Portfolio?*

*5.2.1 Basic Results*

Several U.S. authors have suggested an optimal weight for real estate in mixed-asset portfolios in the 10-20% range (Fogler, 1984; Ennis and Burik, 1991; Ziobrowski and Ziobrowski, 1997). An analysis of the ability of real estate assets in diversifying a portfolio of financial assets has been conducted for many other countries (e.g. the U.K., Australia, France, Ireland, and Switzerland). Fairly similar weights as those for the U.S. are reported in these studies (see e.g. Brown and Schuck, 1996, for the U.K. and Hoesli and Hamelink, 1997, for Switzerland).

For our analysis of the impact of including real estate in a mixed-asset U.S. portfolio over the period 1985-2005, Figure 5.8 and 5.9 show the relative asset weights for the two frontiers with real estate (without and with taking into account a 50 basis point illiquidity premium which is subtracted from the average return on real estate).

Figure 5.8 Portfolio weights with real estate (no illiquidity premium)

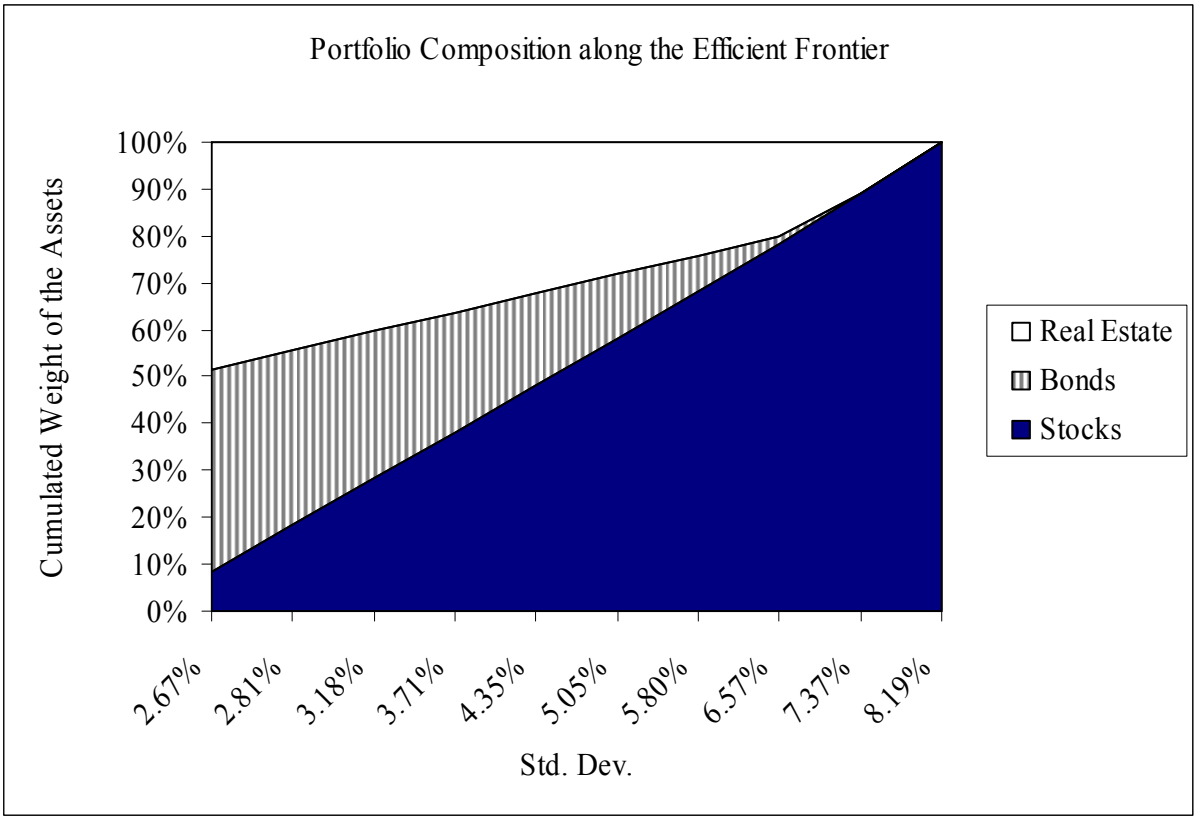
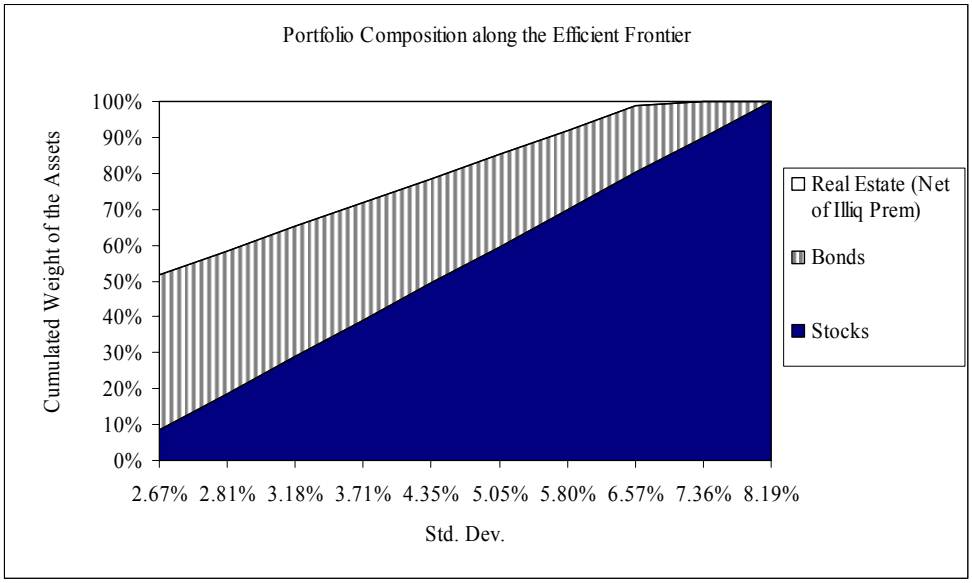


Figure 5.9 Portfolio Weights with Real Estate in the U.S., 1985-2005
(50bp annual illiquidity premium)




A study by Hoesli *et al.* (2004) supports the general consensus by providing evidence for seven countries on three continents. The following table gives the allocation to domestic real estate in each of seven countries for various portfolios along the efficient frontier. The minimum variance portfolio denotes the least risky portfolio, while the maximum risk portfolio is the portfolio with the highest variance. The latter portfolio contains exclusively stocks in all seven countries. The other five portfolios are calculated at various distances between the least risky and the most risky portfolios. The "10% of distance" portfolio, for instance, relates the portfolio which is 10% of the distance between the minimum and maximum variance portfolios. Note that the absolute variance levels are not the same across countries.

Figure 5.10 The Efficient Frontier, Real Estate Allocation and Risk, Seven Countries

| | *Minimum variance portfolio* | *10% of distance* | *30% of distance* | *50% of distance* | *70% of distance* | *90% of distance* | *Maximum risk portfolio* |
|---|---|---|---|---|---|---|---|
| Australia | 14.9% | 13.9% | 10.9% | 8.9% | 14.3% | 7.7% | 0.0% |
| France | 6.6% | 11.4% | 18.5% | 2.5% | 0.0% | 0.0% | 0.0% |
| Netherlands | 3.4% | 5.4% | 7.0% | 7.4% | 5.4% | 3.3% | 0.0% |
| Sweden | 2.1% | 6.7% | 12.2% | 16.2% | 0.0% | 0.0% | 0.0% |
| Switzerland | 4.7% | 6.9% | 5.0% | 3.2% | 0.0% | 0.0% | 0.0% |
| U.K. | 13.0% | 13.1% | 12.2% | 11.2% | 10.3% | 1.3% | 0.0% |
| U.S. | 3.6% | 8.0% | 15.6% | 20.4% | 15.8% | 5.2% | 0.0% |

These allocations to real estate result from using returns calculated from available performance benchmarks. Two comments are warranted. First, returns have been adjusted to take into account the smoothing of appraisal-based indices. Second, the returns to real estate do not take into account the possibility to gear investments. Indeed, the most widely used return indices are based on investment-grade 100% equity financed properties. The possible impact of leveraging properties can be summarized as follows. Gearing should have no major impact on the correlation coefficients between real estate returns and the returns on financial assets. The return on real estate will increase insofar as the return on investment is greater than the mortgage interest rate. The variability of real estate returns will also increase. Whereas the benefits from including real estate in a mixed-asset portfolio are traditionally at the bottom end of the efficient frontier, leveraging properties will shift those benefits towards the right of the efficient frontier.

An investment in securitized real estate constitutes an investment with gearing in most cases. However, as discussed above, securitized real estate returns have been found to be quite highly correlated with the returns on common stocks and much more so than direct real estate investments. It should come as no surprise then that the benefits from including securitized real estate in a mixed-asset portfolio are more limited than when direct real estate is considered. Hoesli *et al.* (2004) show that the allocation to real estate stocks is in most cases well below 10% or even zero over the period 1987-2001. The only exception is for Australia where real estate stocks experienced a higher return and lower risk than common stocks. When direct real estate is added to the portfolio, the allocations to securitized real estate diminish even further. These results are based on short holding periods; the returns to private and public real estate however are likely to be more related in the longer run (Glascock *et al.*, 2000). This would suggest greater diversification potential from investing in REITs in the long run (Lee and Stevenson, 2005).

### *5.2.2 Further Analyses*

The results discussed above by and large rely on studies have been conducted in a Modern Portfolio Theory (MPT) framework. The basic MPT framework has been challenged and enhanced in various ways. Kallberg *et al.* (1996), for instance, examine the role of real estate investment in a portfolio context incorporating the real estate imperfections of indivisible assets and no short sales. Their study suggests that a 9% allocation to real estate is optimal.

Some authors have suggested that confidence bounds should be constructed around the efficient frontiers to assess the statistical significance of results. Liang *et al.* (1996) use bootstrap simulation and show that the confidence intervals are large enough to render efficient frontiers effectively useless[24]. They argue that the efficient frontier is fuzzy and the weight vectors even fuzzier. Bootstrapping, however, relies on very loose assumptions regarding the distribution of asset returns; large confidence bounds thus would be expected. Moreover, the confidence intervals for the weights of the other asset classes are wide as well. The results by Liang *et al.* (1996) have been challenged by Ziobrowski *et al.* (1997) who show that confidence intervals are not as large as those reported by Liang, Myer and Webb. More to the point, Ziobrowski *et al.* (1999) show that the optimum amount of real estate in mixed-asset portfolios is remarkably stable at all risk levels when investors hold their portfolios for five years rather than for one year or less.

The issue of the width of confidence intervals of optimal weights is a consequence of the impact of parameter uncertainty, which is the focus of much research. It has been shown that the practical application of portfolio analysis is hampered by estimation error, especially in expected returns. Variances and covariances are also unknown, but are somewhat more stable over time (Jorion, 1985, for common stocks; Stevenson, 2001, for international real estate stocks). Given these results, it would seem appropriate to increase the reliability of the means' point estimates for the optimal asset allocations. This can be done using the Bayes-Stein shrinkage approach (Jorion, 1985). When such an approach is used, the means are "shrunk" towards a common value (the common mean, i.e. the mean across all assets considered). This approach is used by Hoesli *et al.* (2004), whose main results are discussed in this section.

It has further been argued that the theoretical weights that are reported in the literature are flawed by the fact that real estate returns are in several instances not normally distributed, and hence that Markowitz portfolio optimization may be inadequate. It has been suggested that in such cases a downside risk framework should be used, i.e. that risk should be measured as the deviation below a pre-specified target rate of return. Sing and Ong (2000) show that the weights allocated to real estate do no change in any substantial manner when downside risk is

[24] See also Rubens *et al.* (1998) and Gold (1996).

considered, but Cheng and Wolverton (2001) argue that comparing the results obtained in such a framework with those obtained in a classic modern portfolio theory framework is not as straightforward as it may appear. Hamelink and Hoesli (2004a), using data for Switzerland, show that portfolio allocations to real estate are slightly less when the maximum drawdown, i.e. the loss suffered when an asset is bought at a local maximum, and sold at the next local minimum, is used as the measure of risk rather than the standard deviation.

Finally, Fisher *et al.* (2003) examine the impact of constant liquidity on portfolio weights in the U.S. Constant liquidity is defined by these authors as a constant time to sell. When unadjusted appraisal-based returns are used, the portfolio with the highest Sharpe ratio contains 52% of real estate. This weight drops to 33% when a transaction-based index is used, and to 9% with a constant liquidity transaction-based index. Bond *et al.* (2006) find that the allocations to real estate in a portfolio with a short holding period (one year) fall dramatically following the incorporation of the illiquidity risk into the analysis. For longer holding period portfolios (five years), however, the impact of the illiquidity risk on portfolio allocation is less significant.

It has also been argued that an asset-liability optimization framework, rather than an asset only framework, should be used when making investment decisions. In other words, institutions aim at optimizing their net wealth portfolio, subtracting the present value of future liabilities from the present value of assets, and an appropriate framework should be used. In such a context, institutions would place stronger emphasis on assets that are negatively correlated to the present value of liabilities, e.g. on bonds, and hence less emphasis on real estate. Chun *et al.* (2000) report that the optimal weight which should be allocated to real estate is approximately 10%, again at the bottom end of the suggested allocations to real estate (see also Craft, 2001). If pension obligations, however, are sensitive to inflation, then real estate's inflation-hedging effectiveness may still call for a large allocation to real estate, even in an asset-liability framework.

Booth (2002) shows that the importance of ALM depends a bit on the regulatory structure of the pensions industry and a bit on the balance between defined contribution and defined benefit pension schemes. In a strongly regulated environment and with a preponderance of defined benefit schemes, a failure to match the changes in liabilities can leave pension funds under-funded with adverse effects; furthermore, an asset mix that does not move in line with

changes in liabilities may force frequent portfolio rebalancing with associated costs. Booth (2002) shows that the allocations obtained using a mean variance (Markowitz) approach differ from those based on ALM. For a mature pension fund, real estate ALM allocations are around 10% of total assets for low to medium risk portfolios, compared to 14-19% in an asset only, mean variance analysis. However, for an immature fund, the real estate allocation is markedly lower and only appears if index-linked bonds and non-domestic equities are excluded from the opportunity set (see also Craft, 2005).

In sum, whereas there has been some debate on the issue of mixed-asset portfolio diversification with real estate, in particular due to data concerns, an allocation to real estate is warranted. A very conservative allocation would entail 10% of the portfolio. The diversification benefits stem for the low relation between real estate returns and the returns of financial assets, even in the longer term. Also, there is also some evidence on real estate as an inflation hedge.

*5.2.3 Consistency with Market Size Estimates*

The question which arises is whether the suggested allocation to real estate in a portfolio is consistent with the size of real estate markets. Real estate is estimated to account for 14% of global market capitalization as of the end of 2003 (Chen and Mills, 2004). The size of the real estate universe is estimated at $6,200 billion by these authors. The size of global real estate markets has been continuously increasing since then and the figure is updated to $8,000 billion in Chen and Mills (2006). Breakdowns by region are given: North America $3,338 billion, U.K. $582 billion, Continental Europe $2,343 billion, Asia (ex-Japan) $662 billion, Japan $874 billion and Australia/New Zealand $170 billion). As mentioned previously, there is significant discrepancy in the global commercial real estate market estimates, with figures ranging from $8,000 billion to $17,000 billion (EPRA, 2007) and even $22,000 billion in the latest report by La Salle Investment Management (2007). The discrepancy primarily arises from various market definitions, i.e. whether or not core assets only are considered and whether or not corporate real estate is included. A real estate share of between 7% and 17% of global market capitalization is consistent with the suggested allocation to real estate from empirical analyses. From a financial economics perspective, an investor would hold the market portfolio if 10-15% of its assets were invested in the real estate market.

### *5.3 International Diversification*

The usefulness of international real estate diversification also has been addressed in the literature. Data are more readily available for indirect real estate investments, so most research has made used of return series pertaining to such investments. Eichholtz (1996) finds strong evidence that international real estate share returns are correlated less strongly than international common stock and bond returns. International indirect real estate portfolio diversification is found to work better than for stocks and bonds. Gordon *et al.* (1998) go one step further in that they construct international mixed-asset frontiers rather than efficient frontiers for each of the three asset classes. They find that international stock diversification is more effective than domestic inter-asset diversification through REITs. They also report that international real estate stock diversification is more effective than international common stock diversification[25].

The lower correlation of international real estate across countries and with other asset classes leads to higher suggested mixed asset weightings. Figure 5.11 reproduces the efficient frontiers from mean variance analysis reported in Figure 5.10, above, but includes international real estate alongside domestic real estate. The impact of the additional asset "class" is to increase the suggested weighting quite sharply, notably at the lower end of the risk spectrum.

Figure 5.11 Portfolio Allocation, International Real Estate included

| | *Minimum variance portfolio* | *10% of distance* | *30% of distance* | *50% of distance* | *70% of distance* | *90% of distance* |
|---|---|---|---|---|---|---|
| Australia | 17.3% | 14.2% | 10.9% | 8.9% | 14.3% | 7.7% |
| France | 14.4% | 17.0% | 18.5% | 2.5% | 0.0% | 0.0% |
| Netherlands | 14.0% | 18.8% | 19.5% | 12.9% | 5.4% | 3.3% |
| Sweden | 18.8% | 15.4% | 12.2% | 16.2% | 0.0% | 0.0% |
| Switzerland | 14.8% | 21.9% | 35.6% | 49.2% | 42.4% | 14.1% |
| U.K. | 15.3% | 14.6% | 12.2% | 11.2% | 10.3% | 1.3% |

[25] A similar conclusion is reported by Liu and Mei (1998), Stevenson (2000) and Conover *et al.* (2002).

Nonetheless, there is some evidence of convergence of real estate returns across Europe. Lizieri *et al*. (2003) and McAllister and Lizieri (2006) examine the impact of the introduction of the Euro on the return performance of listed real estate in Europe. An increase in cross-national correlation is observed, for both Eurozone and non-Eurozone countries. There is no clear evidence that this is related to monetary integration (as opposed to broader economic integration). There is evidence that national returns are influenced both by a global and a European real estate factor. Although there is evidence of convergence, the cross-market linkages appear to be lower than for common equities and small capitalization stocks.

More limited evidence exists concerning the benefits of international direct real estate diversification. Using data for 21 cities world-wide, Case *et al.* (1997) find that international real estate diversification within the three types of commercial property would have been beneficial for a U.S.-based investor. Quan and Titman (1997) find that U.S real estate returns are less highly correlated with real estate returns in other countries, than is the case of U.S. stocks with international stocks, suggesting significant benefits from international real estate portfolio strategies. Similar results are reported by Newell and Webb (1996) for the U.S., Canada, the U.K., Australia and New Zealand.

It is important to address practical issues with respect to international direct investment strategies in real estate. Models typically utilize national indices (or hypothetical city returns) and implicitly assume that an investor will be able to track such indices. However, as noted above, large lot size makes it difficult to diversify away specific risk, since most investors will only hold a handful of properties. Given information asymmetry (and local knowledge), higher search and monitoring costs and currency issues, global investment strategies are more complex than theoretical papers imply (Lizieri and Finlay, 1995; Baum, 2002). Furthermore, concentration of investment in a small range of cities (those with more mature markets, greater liquidity and which offer market research) can induce correlation risk since returns are more likely to be driven by common global demand factors (for example, the office markets of major financial centers are all influenced by the state of global capital markets).

The somewhat limited evidence in the area of currency hedging suggests that currency fluctuations can be – at least partially – hedged, and that swaps constitute the best hedging instrument (Worzala *et al.*, 1997; Ziobrowski *et al.*, 1997). When hedging costs are taken into account, however, the benefits of international diversification appear limited.

These studies, however, have only investigated the case of real estate in one foreign country. If a full-blown diversification strategy is carried out, the risk reduction benefits should be substantially greater (as illustrated in the studies by Case *et al.*, 1997, and Quan and Titman, 1997), and some of the currency effects will diversify away. In such a context, it can be argued that hedging strategies may not be needed when several currencies are considered; in any case the cost of hedging should be weighted against the risk it eliminates.

The results in Hoesli *et al.* (2004) make it possible to examine the impact of including both domestic and international direct real estate in a mixed-asset portfolio. Generally speaking, the allocation to domestic real estate diminishes as international real estate is added to the investment universe. The only exception to this is the U.S. where the allocation remains exclusively in domestic real estate. This result reflects the fact that in small countries the size of the real estate market will not allow for a large allocation to a diversified real estate portfolio and that investment opportunities have to be sought after in other countries.

### *5.4 How Should an Investor Diversify a Real Estate Portfolio?*

The question of how to diversify optimally a real estate portfolio has been the focus of much academic and professional research. One of the fundamental questions, especially in large economies such as those of the U.S. and U.K., is whether real estate diversification by property type of by region is the most appropriate. There is a general consensus that sector diversification, i.e. diversification across the various property types, is more useful than regional diversification based on administratively defined areas (see, for instance, Eichholtz *et al*., 1995). Most of these studies have made use of efficient frontiers. Another approach which has been used is one of decomposing property type and regional influences on property returns. Lee (2001) finds that for the U.K., over the period 1981 to 1995, the performance of real estate is largely property type-driven (a similar conclusion prevails in the U.S., Fisher and Liang, 2000). This implies that the property type composition of the real estate fund should be the first level of analysis in constructing and managing the real estate portfolio. Hoesli *et al.* (1997) use cluster analysis and also find that property type is the most important dimension in determining different market behavior.

Within countries, there has also been quite some debate on whether economically defined areas would provide for better diversification opportunities than administratively defined regions. Early studies on this topic include Malizia and Simons (1991) and Mueller (1993). Economic areas are found to offer greater diversification potential than administrative regions. The intuition is appealing: returns on properties located in regions with different economic bases should be less correlated than returns of properties across arbitrarily defined areas. Hamelink *et al*. (2000) use cluster analysis to construct homogenous property groupings in 157 U.K. local markets, by means of commercial real estate returns. Strong property-type dimensions and only very broad geographical dimensions emerge in the clusters. So property type still appears to emerge as the main dimension of real estate portfolio diversification. But the economic base of regions is important, on an international basis of course as well. Hartzell *et al.* (1993) use regional employment characteristics to investigate diversification in European real estate portfolios. This confirms the need to think of geographical diversification not in terms of broad regions, but rather in terms of smaller and economically homogeneous areas.

The benefits of sector or regional diversification of the property portfolio are predicated on the validity of the definitions of sector and region used in performance indices and the extent to which actual properties within a sector-region segment behave in a similar manner. Hamelink *et al.* (2000) found that, for the U.K., standard geographical boundaries did not adequately capture local market variation. Devaney and Lizieri (2005) examine the extent to which individual properties are correctly classified by sector-region groupings. Their results are not encouraging. Analyzing building level return data for some 1,500 properties using a multiple discriminant analysis technique, they found that just 35% of individual properties were correctly classified by IPD's standard ten segment Portfolio Analysis Service classification (which is used for performance measurement and attribution analysis). By implication, there is little guarantee that two individual buildings within a sector or region grouping will perform in similar fashion. As with other U.K. research, sector performed better than region. The Devaney and Lizieri analysis suggests that yield (capitalization rate) and tenancy structure may be important factors explaining variation in returns.

An important question is that of cross-country diversification versus property type diversification, especially in smaller countries. The evidence on this issue is limited to the work by Case *et al.* (1997). They find that returns to commercial real estate tend to move

together (although not perfectly) across property types within each country and that international diversification within three segments of the real estate market (industrial, office and retail) would have been beneficial over the period 1986-1994. This result is appealing as one would expect the drivers of returns to differ across property types; it is very likely, however, that the drivers of real estate returns across countries exhibit even more dissimilarities. There is quite ample evidence of the latter in the literature, mainly based on traded real estate securities data. Ling and Naranjo (2002), for instance, report evidence of a worldwide factor in international indirect real estate returns, but also of a highly significant country-specific factor. Hamelink and Hoesli (2004b) use data for the ten largest real estate security markets and find that country factors are the dominant factors. Eichholtz *et al*. (1998) find evidence of a continental factor in Europe and in North America, but not in the Asia-Pacific region. Their results also suggest growing integration within Europe. Hence, a parsimonious international real estate diversification strategy may be most beneficial when conducted across continents rather than within continents.

**Section 5: Summary**

- *Correlation analysis indicates that real estate investment should bring diversification benefits to the mixed-asset portfolio. Generally, directly-held private real estate indices exhibit low positive correlations with equities and near zero correlations with bond returns in a wide range of countries.*
- *Where there are longer time series available, as in Australia, U.K. and the U.S., the correlation results appear to stand. There is variation over time and correlations are unstable, but rarely appear to be strongly positive.*
- *In mean-variance analysis, the efficient frontier for a portfolio that includes real estate (even where desmoothed and with an illiquidity premium accounted for) dominates the efficient frontier with just stocks and bonds.*
- *The optimal weighting for real estate depends on return targets and risk tolerance, but it is usual to find substantial weightings for real estate in national and international analyses – weightings that are larger than typical institutional holdings of property as an asset class.*
- *Securitized, listed real estate offers less apparent diversification and risk-adjusted return benefits than directly owned property, with stronger correlation to overall equity market movement and higher volatility – possibly offset by liquidity benefits.*
- *Given that there is return uncertainty due to the appraisal basis of private real estate returns, some researchers have constructed "fuzzy" frontiers with a range of values rather than a point estimate. Even here, most researchers point to a substantial real estate weighting.*
- *There is some debate as to what are appropriate risk measures for real estate, given non-normality and other distributional issues. Researchers using downside risk measures such as maximum drawdown, semi-variance or VaR find reduced but still substantial weightings for real estate in mixed-asset portfolios. Constant liquidity adjustment models produce similar results.*
- *Asset-Liability Matching models tend to produce lower weightings to real estate than do conventional mean-variance approaches but the property weightings remain larger than those typically found in pension fund portfolios.*
- *A weighting of 10% or more in real estate would be consistent with an investment strategy that was mindful of the global market capitalization of different asset classes.*

- *With respect to international diversification, research confirms the benefits of diversifying real estate portfolios internationally and of including real estate in an internationally diversified mixed-asset portfolio.*
- *Cross-national real estate returns appear to exhibit lower correlation than cross-national equity returns. However there is some evidence of convergence of international real estate returns: a global real estate factor has been identified by a number of researchers, while others have pointed to regional factors (e.g. for Asian markets).*
- *There are significant practical difficulties in assembling a diversified international portfolio. Most studies use national index data. However, with relatively small numbers of properties in each country, there is a risk of tracking error. The cost of reducing that tracking error to a small figure may be prohibitive for most investors.*
- *There are high information and monitoring costs associated with international real estate investment and a risk of information asymmetry and lack of awareness of local market practice and circumstances. This has driven the growth of international collective investment vehicles that provide economies of scale in acquisition and management.*
- *Hedging currency risk at project or building level is complex in real estate with the long and uncertain holding period and exit value not matching available hedging products. This may be less of a problem if exchange rate hedging is based on a portfolio level currency overlay approach.*
- *Within the real estate portfolio, evidence suggests that sector diversification is more effective than geographical diversification, although care should be taken to distinguish between administrative regions and economically-functioning regions.*
- *There is some evidence that there is considerable building-level variation within sectors and regions, casting some doubt on their effectiveness in structuring the optimal portfolio. Tenancy structures, yields and size are other possible dimensions structuring the risk-return profile.*

## 6. Performance Measurement and Benchmarking

Brown and Matysiak (1999) suggest that performance measurement performs three principal tasks:

- Communication: informing trustees, shareholders and stakeholders about the performance of the fund;
- Accountability: judging the performance of professional advisors and managers, usually in relation to a pre-set target;
- Research: investigating ways in which performance can be improved.

In all of these areas, the nature of real estate as an asset presents problems. These are most acute in relation to direct, private investment in real estate, since public listed real estate can be subjected to the same market analyses as general equities. Even here, though, the impact of the general equity market on returns, considered above, makes it hard to assess the (short-run) performance of REITs or property companies *as a real estate investment.*

The growth of private market real estate indices like the NCREIF index and the IPD indices have led to greater transparency in private real estate investment. As coverage improves and time series lengthen, it becomes increasingly possible to conduct detailed research and subject fund performance to more rigorous analyses. The Achilles heel of such indices, however, is that they are based on appraisals and not on transactions, with the attendant problems of smoothing discussed earlier in the report. Superficially, it might seem that the arrival of transaction-based indices offer a solution to this problem. However, individual *fund* performance will still need to be valuation-based since transaction costs mean that individual properties will continue to be traded infrequently and holding periods will remain long.

In judging the performance of a fund manager, it is customary to set an *ex ante* target. This might be an absolute return target – to achieve a real return of 5% per annum, for example. Often, however, the manager is judged on a relative basis. A common target is to beat the national market index by a fixed percentage (IPD plus 1%). If that is basis for performance measurement, it is important to select an appropriate benchmark. In most instances, this would be the broadest available for the target market. There is a case, however, for a customized benchmark that reflects competitor funds or funds of comparable size.

In the latter case, the large lot size of certain types of property (for example, regional shopping malls or prime offices in global cities) exclude many smaller investors, so the broad national benchmark may be inappropriate. IPD offer a customized benchmark service in the U.K., but this requires a large database to provide reliable sub-indices.

Given the low frequency of real estate benchmark indices and of periodic fund valuations, a problem exists in demonstrating the statistical significance of any observed out-performance. As *Geltner et al.* (2007) note, superior investment ability implies the ability to outperform the benchmark *consistently*. They show how low frequency data creates large standard errors around the benchmark and fund return, making it near impossible to prove under- or over-performance. Specifically the standard error for abnormal performance is given by $\sigma_{Bi} / \sqrt{n}$ , where $\sigma_{Bi}$ is tracking error[26], $\{\sigma_i^2 + \sigma_B^2 - 2\rho_{tB}\sigma_i\sigma_B\}^{½}$ , $\sigma_i$ is the variance of the fund, $\sigma_B$ is the variance of the benchmark and $\rho_{tB}$ is the correlation between the fund and the benchmark. Applying this model to the transaction-based U.S. risk-return data considered above, assuming that both the benchmark and the fund have quarterly standard deviations of 3.8%, that the fund has a 0.7 correlation with the benchmark and that the analysis uses 20 quarters of data, then the standard error is 0.0157, implying that to be 95% confident that out-performance had occurred, one would need a return 2.7% above the benchmark[27]. Typical performance targets are 0.5% to 1% above a national benchmark.

Indices such as NCREIF and IPD report investment returns without leverage. This provides an appropriate benchmark for assessing asset performance, but may need adjusting if fund returns are reported on a geared basis. Clearly, the use of debt exposing the fund to interest rate risk and increases the potential volatility of equity returns. There is thus a trade-off between higher expected returns and greater risk. This is reflected in the target returns of the different types of private real estate equity investment vehicles, with low geared core funds offering much lower anticipated returns than, for example, opportunity funds – the differences reflecting both capital structure and the nature of activities performed.

Booth *et al.* (2002) provide a comprehensive analysis of risk and performance measurement in an Investment Property Forum research review. They point out that risk is context specific and depends on the objective of the fund, the level of aggregation (that is risk of a specific

[26] That is, the standard deviation of the difference between the fund return and the benchmark.
[27] T-statistic, one tailed, for 19 degrees of freedom = 1.729.

asset class or contribution to overall portfolio risk) and the targets set for the fund managers. Thus a fund manager may be given an absolute return target, a target relative to an investment benchmark or a target relative to a liabilities benchmark. Even given a particular benchmark, investors might be concerned with total variability (for example a measure based on the standard deviation), downside risk (or the risk of performing worse than an absolute value), value at risk (the maximum loss for a particular probability) and other risk metrics.

In similar fashion, there exist a broad range of risk-adjusted return ratios (for example, the Sharpe ratio, Treynor ratio, Jensen's alpha, the Sortino ratio). A general review of risk measurement can be found in Dowd (2002). He demonstrates, based on a sample of 83 property funds, that there is very little consistency in the ranking of performance based on the different measures. While all measures are positively correlated, correlations as low as 0.3 were observed. The implication of this result is that performance measurement has to be strongly linked to fund objectives and that there can be no one "preferred" measure.

Tracking error measures are problematic in direct private real estate due to the appraisal based nature of the benchmark (e.g. IPD, NCREIF) and the characteristics of real estate as an asset: the large lot size and heterogeneity making it difficult for most investors to assemble portfolios that reliably track an index[28]. Similar problems occur in attribution analysis – wherein manager performance is split into the effects of portfolio allocation decisions (the proportion invested in particular types of building or market) and stock selection (the actual properties acquired for the fund). Standard attribution analysis systems tend to use sector and geographical factors to classify portfolio structure and hence to measure the allocation effect. However, as the Devaney and Lizieri (2005) research, shows, there is considerable variation *within* sector-geography segments. This suggests that the stock selection component of performance may be understated in conventional attribution analyses models.

Particular problems are faced when benchmarking an international portfolio. It has only been comparatively recently that real estate market performance indices have become available in a wide range of countries. They are not accompanied by accurate statistics on the size of the investment real estate market in those countries. Yet the national indices must be weighted somehow to create any international index. It would be possible to use the market values of

[28] This also has implications for the development of real estate derivatives markets, since it is extremely difficult to assemble an arbitrage portfolio.

the constituents of the national indices as weights but, unfortunately, coverage levels differ greatly across countries. Similarly, a macro-economic proxy such as GDP does not consider the differing institutional structures of real estate markets and variations in the amount of real estate available for investment. Weighting national indices by the fund's own structure fails to assess the fund's geographical investment strategy. Even were it possible to identify optimal weights, construction of the benchmark will require decisions in relation to currency. Are the indices to be converted to the "home" currency (implicitly assuming no hedging), or domestic returns combined (implying full hedging)? There is no consensus on these issues. The recently published consultation release of the IPD Global Index sets out one approach to constructing an international direct market index, following an extensive consultation exercise with users of IPD products (IPD, 2006).

Listed real estate securities are more amenable to conventional equity-style performance measurement analyses including those based on CAPM and multifactor models. Any analysis of REIT or property company fund performance that includes a comparison of the fund to an underlying real estate index must be mindful of the impact of capital structure and the impact of interest rate risk on volatility of performance. Risk-adjusted return analyses of REIT and property company performance tend to find limited evidence of systematic out-performance at either sector or company level. For example, Brown and Matysiak (1997), utilizing a time-varying Jensen measure, found no evidence that U.K. property companies generated significantly positive alphas (indeed, most alphas were negative, if statistically insignificantly different from zero). Such results tend to be strongly conditional on the time-period used for analysis. Earlier work by Chan *et al.* (1990) using an arbitrage pricing framework, similarly failed to find abnormal returns for U.S. REIT stocks.

As Kutsch *et al.* (2006) observe, a significant feature of the indirect real estate market is the sheer diversity of vehicles. Indirect real estate investment generally takes one of three legal formats: partnerships, unit trusts or companies. These types lie on a spectrum in terms of size, trading activity, number of investors and regulatory framework. At one extreme, there is poor information, thin trading, little liquidity and a restricted number of investors; at the other, as the vehicles become quasi-listed, rich information, active trading, relatively high liquidity and many investors. Vehicles differ greatly in terms of their asset mix, target markets and capital structure. Given this diversity, it will be very difficult to establish a consistent and reliable performance measurement.

Kutsch *et al.* (2006) argue that a vital issue facing investors using real estate private collective vehicles rather than through acquisition of a directly-held portfolio of property assets themselves, is that "*investors are investing in assets with different investment qualities than ownership of the underlying assets. Relative to direct ownership, there are significant differences in, among other things, liquidity, trading and price formation, search costs, management control, lot size, taxation and transaction costs. A priori, we expect these differences to have pricing implications. It would be surprising if a simple pro-rata division of NAV accurately reflected their pricing implications - even if the NAV was reliably appraised*." They highlight problems linked to "fractional valuation" – the value of a part stake in a building. There are arguments both in favor of a discount (for example, the lack of management control of the asset, the additional risk imposed by vehicle-level gearing and the need to deal with partners) and in favor of a premium (the reduction of the "large lot-size" problem that can exclude certain investors from acquiring particular types of asset, economies of scale and the spread of risk across investors) – but no empirical research to quantify the impacts. The private nature of the vehicles, their unregulated structure and absence of public information on transactions forces researchers to rely on survey-based research and simulations.

Baum and Fear (2001) identified a number of other issues which complicate performance measurement. These included the lack of standardization or consistency in the reporting of fund and asset management fees (and, in particular, performance fees), gearing, issues concerning the life of the fund (and possible extension of that life), pre-emption rights held by other investors in the fund or vehicle, concerns over liquidity – particularly in falling markets – and a general lack of transparency. All of these are problematic in assessing performance of funds or portfolios of funds. The fee issue is particularly problematic. Most vehicles provide an incentive structure for managers in the form of a performance fee relative to an absolute or relative target. However, until the fund is wound up, any total return performance can only be based on appraisal values (and for most vehicles, there is no necessity to obtain arms-length independent valuations): investors are reluctant to pay fees based on valuations alone. However, realization-based fees create two major problems: first, they assume that the fund will be wound up; second, if an investor wishes to withdraw from the fund before expiry, then there must be an adjustment between buyer and seller that reflects the contingent liability for that performance fee – but with no basis to estimate the reliability of the fee.

There appears to be little consistency as to whether contingent fees are deducted from the fund's net asset value in determining the "price" of a unit or share in the fund. In similar fashion, there appears to be no consistency as to whether or not debt in the vehicle is marked to market or left at historic cost[29].

Organizations such as INREV (the European Association for Investors in Non-Listed Real Estate Vehicles) play an important role in establishing common standards for reporting which help reduce the problems of fund comparison. For example the Core Definitions (INREV, 2006), published in December 2006, set out definitions of fund type (including a classification into Core, Value Added and Opportunity) and a wide range of financial and property-related reporting items, ranging from net and gross asset value and yields to fund and asset management fees and hurdle rates. Although these definitions have no legal or regulatory backing (and many are couched in very general terms), the support of a significant body of institutional and professional investors helps to ensure adherence. The growing significance of the CFA Institute's Global Investment Performance Standards should also help to create standardization in reporting – Norway, through the Norwegian Society of Financial Analysts, has adopted a translated version of GIPS as its standard, for example[30].

A further issue in assessing the performance of indirect real estate vehicles occurs with open ended fund structures. In an open ended structure – particularly where the fund is regulated (for example, within the EU and the EEA under the national implementation of UCITS[31]) – the manager may have little control over flow of funds. Where there are significant numbers of retail investors, this may result in an inflow of funds when markets have been performing well and an outflow of funds in depressed markets – that is, capital follows returns. This can damage performance. In real estate markets, given illiquidity, forced redemptions can be particularly problematic – even in balanced markets, it takes considerable time to sell a real asset, a problem exacerbated in falling markets. This forces managers to hold cash or liquid assets, potentially damaging returns. In similar fashion, in "hot" markets, it may be difficult for fund managers to find product in response to inflows of capital. Use of time-weighted, rather than money-weighted, rates of return reduce this problem to some extent.

[29] In passing, it is worth noting that many of these vehicles have relatively high asset and fund management fees, generally as a percentage of the gross asset value. Fund-of-fund vehicles result in the layering of fee structures, which dampens the benefit of reduced search and monitoring costs.
[30] See www.finansanalytiker.no.
[31] In Norway through the Norwegian Securities Funds Act.

In summary, there are problems in assessing the performance of private indirect real estate funds and vehicles that result from the lack of a standard structure, the lack of transparency and difficult issues concerned with fractional valuation and fee structures. Given that the market has grown from a minor part of overall real estate activity to a dominant feature of the property investment market in less than a decade, such measurement and monitoring issues are, perhaps, to be expected and much progress has been made with the efforts of INREV, AREF, IPD and private data providers such as Property Funds Research playing a significant role in achieving greater transparency. We should also note that the market has evolved in the context of sustained strong commercial real estate performance (particularly in the U.K.) and there is little information about the performance of such funds across a complete cycle. This is particularly important for the highly geared opportunity end of the fund spectrum.

**Section 6: Summary**

- *Benchmarking performs multiple roles – to communicate performance to stake holders, to provide accountability for fund managers, and to support research. In all three areas, data issues in real estate cause problems.*
- *There is an increasing availability of market performance indices in commercial real estate. The Achilles' heel of such indices is that they are appraisal-based creating uncertainty as to the value of performance measures and benchmarks. While transaction-based indices assist in promoting understanding of overall market behavior, at fund level appraisals will remain an integral part of the measurement process.*
- *One consequence of valuation uncertainly (and low frequency data) is that it is very difficult to <u>prove</u> that a fund manager has outperformed (or underperformed) a target in any sense of statistical significance.*
- *Targets for fund managers may be absolute (achieve a real return of 5%) or relative (outperform IPD by 1%). The performance should be risk adjusted. Benchmarking international performance is more problematic, as not only is there incomplete coverage of return series, it is also unclear as to what weights should be applied to the national components.*
- *Benchmarking and performance measurement must be mindful of leverage. Use of debt combines asset performance and performance that is related to capital structure. Debt levels are a particular issue for public real estate securities and for value-added and opportunity funds amongst private equity real estate vehicles.*
- *The sheer diversity of private equity vehicles, allied to lack of standardization, makes performance measurement particularly difficult. There are major problems in quantifying the impact of fractional valuation, realization-based performance fees and management costs, the right to exit and the impact of debt on structure of returns.*
- *Despite major improvements in transparency and attempts by interest groups to impose standardization of reporting, there remain numerous unanswered questions concerning the performance of private real estate investment vehicles, not least in that their behavior has not been observed over a complete real estate cycle.*

## 7. Conclusions: Real Estate in the Investment Portfolio

In analyzing the investment potential and portfolio contribution of real estate, an important first step is understanding the nature of the product. There are now many routes and vehicles that provide an exposure to the commercial real estate market. Some are traded in private markets, some trade on public markets; some involve direct management of the underlying real estate, others are financial, paper, investment underpinned by real estate cashflows but where the returns may be as much influenced by capital market as asset market factors. The risk-return characteristics of the different vehicles and products differ, as does the potential to offer diversification gains in the mixed-asset portfolio.

Analysis of private ownership of, and investment in, commercial real estate is hampered by data deficiencies. Most available time series are short and relatively low frequency. They are also generally based on appraisals rather than transactions. This can have a distorting effect on reported risk, return and correlation measures. However, a growing body of research exists that addresses the valuation smoothing issue and that attempts to provide more comparable returns. In general, average private real estate returns fall between those of equity and bonds, and exhibit, even adjusted for valuation effects, considerably lower risk than equity. While standard deviations tend to be low, there is evidence of cyclic behavior in the market. Public listed real estate returns (from REITs or property companies) exhibit volatility that has similar characteristics to the general equity market. Some of that extra volatility relates to capital structure, the use of debt and exposure to interest rate risk.

Correlation analysis indicates that real estate has considerable potential as a risk diversifier in the mixed-asset portfolio. Even correcting for valuation smoothing and liquidity, private real estate tends to have low correlation with equities and bonds. As a result, in a mean-variance framework, most portfolios on the efficient frontier tend to contain substantial proportions of real estate, and the efficient frontier containing real estate dominates that excluding real estate as an investment. These results hold with use of alternative (downside) risk measures and in an asset-liability matching framework: while the real estate weightings are lower than for conventional mean-variance analysis, they still typically exceed those observed in the portfolios of institutional investors. In part, this may reflect management issues; in part concern over tracking error and exposure to specific risk due to the scale of investment required in building a diversified portfolio.

Large investors can overcome these problems directly by achieving economies of scale; smaller investors can utilize the growing private property fund sector to achieve a similar effect, albeit one with concerns over liquidity and transparency.

There is some evidence that international real estate investment provides an efficient mechanism for global diversification. Although there do seem to be global and regional real estate factors and convergence in performance over time, these effects are more muted than those observed in relation to equity markets. Particular practical difficulties face any investor attempting to construct an international real estate portfolio, including the scale of investment required to overcome tracking error, additional, search, information and monitoring costs, dangers of information asymmetry in local markets and the difficulty in establishing benchmarks.

Benchmarking and performance measurement is problematic in commercial real estate, particularly where a relative benchmark is used rather than an absolute benchmark. For private directly-owned real estate there are data issues relating to the valuation-based comparator indices and the valuation-based fund performance measures. For private real estate equity vehicles, there are questions about fee structure, the impact of performance bonuses, fractional valuation of property interests, illiquidity and the ability to exit. For public traded real estate, the investor must unpack the influence of the wider equity market, the leverage structure of the company and the role of management in determining cashflow over time. There has been great progress in risk management procedures in real estate but the available techniques are still constrained by data.

One final issue fell outside the brief, but needs to be considered: market timing. If it were decided to build a weighting in commercial real estate, what is the correct time to enter the market? There have been many commentaries that have highlighted the amount of capital chasing real estate assets in Europe and in other parts of the world. The creation of new investment vehicles, the arrival of new market players, the widespread availability of debt and equity capital has led to an apparent excess of demand over supply of product. Many argue that this has driven prices up and capitalization rates down to levels where the sustainability of value is open to question.

Not all analysts accept this view. Some argue that structural changes to interest rates and inflation expectations, allied to the greater transparency of the market and the ability to separate out cashflow components allowing investors greater flexibility in risk-return choices, has meant that required returns have fallen sharply, that values are sustainable and that there remain buying opportunities. Others, though, flag a possible correction in real asset markets or question whether income growth will be sufficient to generate target rates of return. Given those concerns, any market entry strategy needs to be pursued with care.

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**APPENDIX: ACRONYMS**

| | |
|---|---|
| ALM | Asset-Liability Matching |
| APT | Arbitrage Pricing Theory |
| AREF | The Association of Real Estate Funds |
| ASX | Australian Stock Exchange |
| CAPM | The Capital Asset Pricing Model |
| CMBS | Commercial Mortgage Backed Securities |
| CPI | Consumer Price Index |
| ECM | Error Correction Mechanism |
| EPRA | The European Public Real Estate Association |
| FT | Financial Times |
| FTSE | Financial Times - Stock Exchange |
| INREV | The European Association for Investors in Non-listed Real Estate Vehicles |
| IPD | Investment Property Databank |
| GAV | Gross Asset Value |
| GDP | Gross Domestic Product |
| GIPS | Global Investment Performance Standards |
| LIBOR | London Inter-Bank Offer Rate |
| LPTs | Listed Property Trusts (Australian REITs) |
| MIT | Massachusetts Institute of Technology |
| MPT | Modern Portfolio Theory |
| NAREIT | National Association of Real Estate Investment Trusts |
| NAV | Net Asset Value |
| NCREIF | National Council of Real Estate Investment Fiduciaries |
| ONS | Office for National Statistics (UK) |
| PCA | Property Council of Australia / Principal Components Analysis |
| PREA | The Pensions Real Estate Association (USA) |
| REIT | Real Estate Investment Trust |
| RPIX | Retail Price Index excluding mortgage costs |
| TBI | Transactions Based Index |
| VaR | Value at Risk |
| VAR | Vector AutoRegression |