

The performance implications of adding global listed real estate to an unlisted real estate portfolio: A case study for UK Defined Contribution funds

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Alex Moss

Alex formed Consilia Capital in 2012 and has over 30 years experience in real estate finance and global capital markets. He is a Visiting Lecturer at Cass Business School.



Kieran Farrelly

Kieran is a Portfolio Manager at The Townsend Group. Prior to joining Townsend Kieran was a Director within the multi-manager team at CBRE Global Investors.

Contact

Alex Moss
Alex.moss@consiliacapital.com

Kieran Farrelly
kfarrelly@townsendgroup.com

Fraser Hughes, EPRA Research
 Director: f.hughes@epra.com

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The performance implications of adding global listed real estate to an unlisted real estate portfolio: A case study for UK Defined Contribution funds

Executive summary

This paper seeks to provide a better understanding of the performance implications for investors who choose to combine listed real estate with an unlisted real estate allocation. Specifically, it provides a detailed investor level analysis of the impact of combining UK unlisted fund and global listed real estate fund exposures to satisfy the requirements of a real estate allocation in a UK Defined Contribution Pension fund.

The catalyst for this paper was the recent report by the Pensions Institute: “Returning to the core: rediscovering a role for real estate in Defined Contribution pension schemes”. This highlighted both the rationale for real estate in DC funds, and specifically, the use of a blended product, which combined a 70% UK unlisted allocation with a 30% global listed allocation, to provide this exposure. We call this 70/30 mix a DC Real Estate Fund.

In addition there are currently three factors which are of utmost importance to investors, which lie behind the increased interest in blending listed and unlisted real estate:

- i) Liquidity
- ii) Cost
- iii) Ease of implementation

It is well understood that direct real estate can be a beneficial component of a multi-asset portfolio primarily due to the diversification benefits that it provides. However, one of the key challenges for both asset allocators and product developers is how to provide a direct or at least a direct-proxy real estate exposure in a mixed asset portfolio with acceptably high levels of liquidity and low levels of cost. This is a challenge for all private market asset classes. Clearly, a 100% exposure to unlisted funds or direct real estate would not be expected to meet this criteria.

Key Questions : In this paper we set out to answer the following questions:

- * **Return enhancement:** What is the “raw” performance impact of adding listed real estate to an unlisted portfolio?
- * **Risk adjusted impact:** What is the impact on portfolio Volatility and Sharpe Ratio?
- * **Tracking error:** Does adding a global listed element significantly increase the tracking error of the portfolio relative to a UK direct property benchmark?
- * **Currency impact:** Does adding a global listed portfolio introduce a material currency risk into portfolio returns?
- * **Cash drag:** What is the impact on returns and volatility of adding cash to the portfolio?
- * **Risk attribution:** What adjustments are necessary to understand the true relative contributions to portfolio risk?
- * **Portfolio contribution:** Does this blended real estate product provide the diversification benefits of real estate in a multi-asset portfolio?

Differences from other studies

Firstly, we have taken actual fund data rather than index data i.e. we are analysing deliverable returns to investors. Similarly, by using fund data not only are we seeking to capture the impact of identifiable costs at all levels, but also provide a structure which has minimal implementation issues at a practical level. We rebalanced the portfolio quarterly so as to meet the target allocations (including a cash holding), and took account of resultant transaction costs.

Secondly, rather than use a single period, or peak to trough periods, we have broken down the study into an analysis during distinct stages of the cycle and over the full horizon (15 years).

Thirdly, our dataset comprises UK unlisted funds and global real estate securities funds, whereas previous studies have looked at the performance impact of combining listed and unlisted indices of the same country.

Finally, our study is seeking to provide greater understanding of the resultant impact of incorporating a real estate asset exposure for a specific investment requirement, namely the UK DC pension fund market.

Conclusions

* **Return enhancement:** Over the past 15 years a 30% listed real estate allocation has provided a total return enhancement of 19% (c. 1% p.a. annualised) to our unlisted real estate portfolios. Over the past 10 years this was 43% (c. 2% p.a. annualised), a result which is consistent with the previous Consilia Capital study. Over five year the enhancement is c. 4% p.a. annualised, amounting to +390% in absolute terms).

* **Risk adjusted impact:** The price of this enhanced performance and improved liquidity profile is, unsurprisingly, higher portfolio volatility, of around 2% p.a., from 6.4% to 8.4%. . However, because of the improved returns, the impact on the Sharpe ratio is limited.

* **Tracking Error.** We found that there is an additional 4% tracking error cost vs. the direct UK real estate market when including 30% listed allocations. We believe that this is surprisingly small given that the listed element comprises global rather than purely UK stocks. We also find that c. 1.3% tracking error arises for a well-diversified unlisted portfolio highlighting that pure IPD index performance is unachievable. This tracking error rises to 2% if subscription costs are included.

* **Currency impact:** We found that the annual difference in returns and volatility between a hedged and an unhedged global listed portfolio over the 15 year period of the study was not material.

* **Cash drag:** We found that the impact of adding a 5% cash buffer to the portfolio was to reduce annualised returns over the period by 0.6%, from 7.7% p.a. to 7.1%, and reduce volatility from 8.4% to 8%.

* **Risk attribution:** While the volatility of listed exposure is well-known, it is equally well-recognised that the true volatility of unlisted funds is greater than commonly stated. We refined our measurements for risk by accounting for non-normalities and valuation smoothing and found that unlisted funds contributed to a greater share of overall risk.

* **Portfolio contribution.** We modelled the impact of using our DC Real Estate Fund rather than 100% unlisted exposure in a mixed asset portfolio of equities and bonds. The impact was extremely similar, and marginally better if unsmoothed data was used as a comparable, modestly raising the Sharpe ratio for the mixed asset portfolio over the 15 year period, whether a 10% or 20% real estate weighting was used.

Introduction

We have divided this paper into eight sections.

Following this Introduction **Section 1** presents the background and rationale for this paper, both in the general context of combining listed real estate exposure with unlisted, and the specific context of developing a real estate product that is suitable for use in UK Defined Contribution (DC) schemes given their liquidity constraints i.e. a need for daily pricing/ dealing.

Section 2. examines the differences between this and previous studies. Most notably we have used actual fund rather than index data, chosen a global rather than single country listed real estate securities allocation, and focussed on providing clarity around optimum real estate exposure for a specific investment requirement, the UK DC Pension Fund market.

Section 3. is a review of the academic literature on this topic. We have sought to clarify this section for the practitioner by clearly stating the six questions of principle that we are trying to address, providing the summary conclusions of the seminal work(s) on the topic, and determining their applications for this paper.

Section 4. describes our methodology and the dataset used. Using fund level data from the databases of The Townsend Group and Consilia Capital we seek to simulate the historic performance of portfolios comprising varying allocations of unlisted pooled real estate funds, global listed real estate securities funds and cash. We refer to the resultant portfolios collectively as Blended Real Estate DC Funds. We deal with the issues of the impact of currencies and the choice of data frequency in this section.

Section 5. provides an overview of the Blended Real Estate DC fund performance through the cycles. This is an extension of a previous Consilia Capital study. We seek to gain an overview of how a simple 70% Unlisted /30% Listed Fund would have performed relative to a 100% Unlisted Fund over different stages of the cycle in terms of raw returns, volatility, and tracking error. The findings are consistent with the previous study in that over the comparable 10 year period the 70/30 Fund outperformed the 100% Unlisted Fund by 26% in absolute terms (30% in the previous study) representing 43% in relative terms (50%).

Section 6. presents the detailed findings of our study. Here we have considered a realistic investor return from a DC Real Estate Fund which reflects subscription costs, the transaction costs incurred for quarterly rebalancing and cash component. This is shown using different portfolio weightings and their impact upon risk adjusted returns, using different risk metrics such as VaR, the non-normality of returns and risk attribution, the impact of smoothing and using best and worst fund returns rather than an unweighted average.

Section 7. looks at the performance impact of adding a DC Real Estate Fund to a multi asset portfolio.

Section 8. draws together our conclusions.

N.B. In the following results all tables and charts, unless stated otherwise, are sourced as follows:

“Consilia Capital, The Townsend Group, IPD, Bloomberg”.

1) Background and rationale for this paper

Recent evidence identifies that there has been reluctance by a number of UK and European institutions to incorporate listed real estate into their real estate allocation (Moss and Baum 2013). This can be attributed to a number of reasons, ranging from the different volatility profile of listed real estate to practical aspects of integrating a team that invests in both listed and unlisted vehicles.

This is despite the significant body of work undertaken by both practitioners and academics on the beneficial impact of adding listed real estate to a portfolio. It has been shown that REITs can act as both a return enhancer and diversifier in a mixed asset portfolio (Lee, 2010), and that adding listed real estate to an unlisted portfolio can not only enhance returns but also liquidity (NAREIT, 2011). REITs are seen to produce real estate returns over the medium (three year) term (Hoesli and Oikarinen, 2012), as well as having useful predictive properties (Cohen & Steers 2009). Whilst investors can benefit from the clear long term relationship between direct and listed real estate, the trade-off faced is between the enhanced liquidity and heightened short-term volatility, which creates a higher degree of correlation with broader equity markets.

The rationale for this paper is to provide a better understanding of the performance implications for investors who choose to combine listed real estate with an unlisted real estate allocation. For these investors there needs to be greater clarity on the longer term delivered risk-return and multi-asset implications of creating portfolios comprising both private and public real estate. At a practical level, this will include an understanding of the impact of the need to hold some cash in the portfolio, as well as incorporating the associated transaction costs of managing and rebalancing portfolios of this nature.

Aside from these general considerations, there are a number of specific reasons why this topic is particularly relevant currently. These include, but are not limited to the following:

- 1) Most recently, and of most significance to investors, the decision by the UK's National Employment Savings Trust ("NEST") to include a 20% allocation to real estate in its Defined Contribution ("DC") fund, and for that 20% allocation to be executed via a hybrid vehicle (managed by Legal and General). This comprises a 70% weighting to UK direct real estate via their unlisted fund, and a 30% weighting to listed real estate via a Global REIT tracker fund.
- 2) An increase in the emphasis placed by investors and consultants on liquidity post the GFC. This clearly is an advantage for listed real estate.
- 3) Significant growth in "real asset" allocations (i.e. real estate, commodities, and infrastructure). A number of commentators (Towers Watson, JP Morgan, Brookfield et al.) have suggested that this real asset allocation could increase to 20% of portfolio weightings.
- 4) Greater use of alternative risk measures to standard deviation (volatility). Elevated volatility has always been seen by non-users of listed real estate as a major disadvantage.

Prima facie, a simple, cost effective, and mechanistic approach to combining listed and unlisted real estate should satisfy the criteria outlined above. To assess whether this is the case we need to examine in detail the risk and return implications of adding (global) listed real estate to an (UK) unlisted real estate portfolio

2) Differences from previous studies

We believe that there a number of reasons why this study differs from prior work and adds to the current thinking on real estate asset allocation.

Firstly, we have taken actual fund data rather than index data i.e. we are analysing deliverable returns to investors. A number of previous studies have used IPD/NCREIF indices as a proxy for direct real estate and an EPRA Index as a proxy for listed real estate. The sample we have used in this study comprises UK unlisted real estate funds, and actively managed global listed real estate funds. The reason for using funds data is that we are interested in investor level returns, and capturing both the cost leakage and tracking error that arises at when implementing an investor's exposure. Whilst listed markets can be passively replicated this is not possible for direct real estate and so tracking error is inevitable when allocating to the asset class. For the single series of returns we use an un-weighted average of the fund returns. The sample comprises five large unlisted UK real estate funds, and four of the leading global real estate securities funds. We have chosen global listed funds for reasons of liquidity, diversification, fund availability, and the Legal & General / NEST precedent.

Secondly, rather than use a single period, or peak to trough periods, we have broken down the study into analysis during distinct stages of the cycle and over the full horizon (15 years). We believe that this is relevant to asset allocators to help them assess how listed and unlisted perform at times when real estate criteria is a key driver , as well as times when macro themes are the most significant determinant of returns.

Thirdly we have shown the impact of different thresholds of listed real estate on portfolio performance, which are maintained throughout the period. We have not used any portfolio optimisation techniques to determine these weightings. We have also assessed risk using measures which account for the non-normality seen in direct real estate performance.

Fourthly, our dataset comprises UK unlisted funds and global real estate securities funds, whereas previous studies have looked at the performance impact of combining listed and unlisted indices of the same country.

Finally, our study is seeking to provide greater understanding around the real estate asset exposure for a specific investment requirement, namely the UK DC market.

3) Literature review

In this paper we draw upon a number of principles established in a wide range of previous research. We show below what we believe to be the six most relevant questions asked by these papers, together with their findings and the applications for our study.

3.1 Does direct real estate have a role in a mixed-asset portfolio?

Lee (2005) looked at the justification for including direct real estate in mixed asset portfolio. Lee's starting point was the Booth and Fama (1992) observation that the compound returns and so the terminal wealth of a portfolio is greater than the weighted average of the compound returns of the individual investments, a difference referred to as the RDD. This counterintuitive result stems from the fact that although variance is an appropriate measure of risk of a portfolio, it is not the relevant measure of the risk of the investment within a portfolio. The risk of an investment within a portfolio should be measured by its covariance with the portfolio. Thus, an asset that has relatively good returns and a low covariance with a mixed-asset portfolio may be more desirable, in terms of the RDD of the portfolio, than an asset with high returns but a high covariance.

In other words, assets that offer high RDD to a portfolio should be particularly attractive investments to long-term investors. Previous studies found that real estate is an asset that displays good returns and low covariance within the mixed-asset portfolio. Hence, an allocation to direct real estate, higher than that observed in practice, may be justified by its potentially high RDD on the compound returns of the mixed-asset portfolio. The paper tested this proposition using annual data for the five asset classes: real estate, large cap stocks, small cap stocks, bonds and cash over the period 1951-2001. The results show that adding real estate to an existing mixed-asset portfolio generally increases the RDD and so the terminal wealth of the mixed-asset portfolio. He did note, however, that the results are dependent on the percentage allocation to real estate and the asset class replaced.

Applications for this paper: Having established the case for real estate in principle we look at the specific impact of adding our unlisted/listed portfolio to equities and bonds over the period 1998-2013 in the Multi-Asset Portfolio section. In practice anecdotal evidence would suggest that the increase in real estate allocations is expected to come almost exclusively from the bond content of portfolios. Prima facie this suggests that aside from a core strategic role in mixed asset portfolios, real estate can be used to play a specific tactical asset substitution role at certain stages in the cycle.

3.2 Is listed real estate a return enhancer in the mixed-asset portfolio?

Lee (2010) found that whilst a number of studies have examined the allocation of public real estate securities (REITs) in the mixed-asset portfolio, no study had explicitly examined what benefits REITs offer to the traditional capital market mixed-asset portfolio (i.e., whether REITs are a return enhancer, diversifier, or both). This paper examined this issue using the method suggested by Liang and McIntosh (1999), which decomposes the overall risk-adjusted benefits of an investment to an existing portfolio into its diversification benefits and return benefits. The results show that REITs offer different benefits to different asset classes in the mixed asset portfolio and that these benefits have changed over time. Thus, whether REITs can have a place in any future mixed-asset portfolio largely depends on the relative return performance of REITs versus the alternative asset classes within the mixed-asset portfolio

Applications for this paper: Following the conclusion that the extent of any performance enhancement varies over time we have broken down the period of the study into different stages of the capital market cycle to isolate broad trends in the divergence of separate asset class returns over these periods.

3.3 Do listed and unlisted real estate vehicles have the same performance drivers over the medium term?

Hoesli and Oikarinen (2012) demonstrated very clearly the link between listed and unlisted real estate in their international study. Their study covered the period 1994-2010 and the aim of the study was to

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examine whether securitized real estate returns reflect direct real estate returns or general stock market returns using international data for the U.S., U.K., and Australia. In contrast to previous research, which generally relied on overall real estate market indices and neglected the potential long-term dynamics, their econometric evaluation was based on sector level data and catered for both the short-term and long-term dynamics of the assets as well as for the lack of leverage in the direct real estate indices. In addition to the real estate and stock market indices, the analysis included a number of fundamental variables that are expected to influence real estate and stock returns significantly. They estimated vector error-correction models and investigated the forecast error variance decompositions and impulse responses of the assets.

They found that both the variance decompositions and impulse responses suggest that the long-run REIT market performance is much more closely related to the direct real estate market than to the general stock market. The results are of relevance regarding the relationship between public and private markets in general, as the 'duality' of the real estate markets offers an opportunity to test whether and how closely securitized asset returns reflect the performance of underlying private assets.

Yunus et al (2012) looked at the long-run relationships and short-run linkages between the private (unsecuritised) real estate markets of Australia, Netherlands, United Kingdom and the United States. Their results indicated the existence of long-run relationships between the public and private real estate markets of each of the markets considered. Consistent with other studies they found that the public real estate markets lead the private real estate markets.

Applications for this paper: It is an important part of the principle of combining listed and unlisted that their returns will converge over the medium term. The latest international research from Hoesli et al clearly demonstrates this. Similarly the paper from Yunus et al also shows the linkage. One important point to note is that these studies compare domestic listed with domestic unlisted (i.e. US with US, UK with UK etc). Our study concentrates on combining a UK unlisted fund with a global listed fund. Therefore we seek to show that there is a benefit in holding both asset classes, which may not always be the case when combining domestic unlisted or direct with domestic listed.

3.4 Does blending listed and unlisted allocations provide optimal returns?

Two studies in particular have looked at the impact of combining listed and unlisted portfolios to enhance risk-adjusted performance in a pension fund context. The NAREIT study (2011) which focussed on US markets started with the premise that for most investors, gaining access to real estate exclusively through publicly traded REITs is the most practical way to invest in the asset class. For example, defined contribution retirement plans and other postemployment benefit trusts require significant, if not daily, liquidity and market pricing. However, defined benefit pension plans and some other institutional investors present a more complex picture. Traditionally, these investors have not looked to their real estate portfolios as a source of liquidity, and many have allocated most of their real estate investment capital to direct property investment or to private equity real estate funds. While many defined benefit plan investors include publicly traded REITs within their investment programs, REITs generally occupy a surprisingly small portion of the total real estate portfolio. It is surprising, not only because of the strong historical investment performance of REITs when compared with private real estate investment alternatives, but also because of institutions' heightened focus on risk management in the wake of the recent financial crisis, during which the value of REIT liquidity, transparency and investor-aligned governance structures became more apparent.

The NAREIT Report was intended to help pension funds and other institutional investors reassess their relative allocations to two parts of the equity real estate asset class—private funds and publicly traded REITs. The past 22 years of historical data show that an optimally blended portfolio including approximately one-third in REITs has provided stronger returns, even on a risk-adjusted basis, than portfolios dominated by private real estate investments, because of:

i) Strong outperformance by REITs: Publicly traded REITs have provided not only liquidity and transparency to commercial real estate investors, but also a significant performance premium, on average, compared with private equity real estate funds over long-term holding periods. Plus, REIT investing is much less costly than private real estate investing.

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ii) Reduced volatility through private/public diversification: While publicly traded REITs and private real estate funds both invest in commercial properties, the difference in the timing of returns – the “lead/lag” relationship between REITs and private real estate – creates an opportunity for diversification within the real estate asset class that can demonstrably reduce volatility. Conversely, investors with insufficient holdings of publicly traded REITs have higher portfolio risk.

NAREIT (2011) showed that an optimally blended portfolio of private equity real estate and about one-third publicly traded REIT investments produced positive double-digit or single-digit average annual returns for all rolling five-year periods over the past 22 years without a single period of negative returns – even during the most recent real estate market crisis. Given the performance advantages of publicly traded REITs relative to private real estate funds and the risk-reduction benefits of combining public and private real estate investment, it now is clear that many pension funds should reassess how they invest in real estate. The “REIT third” can be a valuable tool to help rebuild some of the pension fund wealth lost during the real estate downturn, and to cushion against future shocks

Moss (2013) used actual fund data rather than representative indices, and took a sample of UK unlisted funds and global real estate securities funds. The results highlighted the extent to which unlisted real estate portfolio returns are enhanced by adding listed real estate. At the most basic level, over the 10 year period studied, adding 30% global listed exposure to UK unlisted funds would have added 30% in absolute terms and 50% in relative terms to the performance of unlisted funds in isolation.

Period	Total returns (%)		
	UK Unlisted Funds	Global listed funds	70% unlisted 30% listed
June 03-June 2013	60.98	160.95	90.97

Source: Consilia Capital

Whilst this was to be expected during the property driven bull market due to the gearing, and forward looking nature of listed real estate valuations, what should be noted is i) the consistency of return enhancement in positive or stable market conditions, and ii) the fact that during the GFC the inclusion of a 30% listed real estate weighting led to only a marginal (-2.2% over a two year period) diminution in returns. This represents an extremely small cost when taken against the dramatic improvement in liquidity as a result of the listed weighting.

Applications for this paper: The NAREIT paper outlined very clearly the performance advantages of a blended portfolio, and the reasons for this, albeit in a US context. The Consilia Capital study noted similar benefits from combining a UK unlisted and a global listed allocation in similar proportions to the NAREIT study. We are looking to extend the original Consilia Capital study from 10 to 15 years and take account of transaction costs, with a slightly different sample due to the longer observation period to see if the conclusions still hold true.

3.5 Can risk-adjusted returns from listed real estate be improved by using mechanical trading rules rather than a buy-and-hold strategy?

One of the key issues with direct or unlisted real estate is that because of the illiquidity and time it takes to rebalance portfolios, unrealised gains can disappear before they can be captured in practice. One of the key advantages in using listed real estate is that can allow tactical or rules-based rebalancing to capture gains and minimise losses. This should lead to enhanced performance relative to a buy and hold strategy. Clare et al (2012) examined the effectiveness of applying a trend following methodology to global asset allocation between equities (split between emerging and developed), bonds, commodities and real estate. For real estate they focussed on listed real estate, using the FTSE/EPRA/NAREIT Global REIT Index, as well as country level EPRA Indices for Australia, Belgium, France, Germany, Hong Kong, Italy, Japan, Netherlands, Singapore, Sweden and the UK. The period covered was 1994-2011. The application of trend following led to a substantial improvement in risk-adjusted performance compared to traditional buy-and-hold portfolio.

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In that period the maximum drawdown for REITs as an asset class using an Equal Weighted (EW) buy and hold strategy was 62.2%, but using trend following rules with signals varying between 6 and 12 months this was reduced to between 8.8% and 9.9%. Similarly the annualized volatility was reduced from 18.2% to between 9.2% and 9.4%. In terms of returns the impact was to improve annualised returns from 8.4% to between 9.9% and 11.5%. As a result of the improvement in both risk and returns the Sharpe ratio improved from 0.29 over the period to between 0.74 and 0.89. The one metric which deteriorated because of the monthly rebalancing and mechanical trading rules was the maximum monthly return, which came down from 16.0% to a lowest figure of 9.7%.

Applications for this paper: We concentrate purely on rebalancing to a fixed allocation on a quarterly basis rather than following pre-determined trading strategies to optimise returns. The findings of the Clare study are significant, and have implications for further refinement of our findings, as they indicate that the risk adjusted returns of a blended portfolio could be enhanced further by applying these strategies.

3.6 Does Real Estate have a unique role within the alternative category of asset allocation?

There has been a significant trend towards classifying assets which are not equities and bonds together. These groupings have variously been described as Alternative, where there is typically a common characteristic of illiquidity, or where performance drivers differ to those of equities and bonds. Bond et al (2007) investigated the performance of a set alternative asset classes and their contribution to a multi-asset portfolio. The historical risk-adjusted performance of these asset classes differed dramatically over the sample period. Private equity and infrastructure had high returns but also high levels of risk. Real estate was shown to have attractive risk and return characteristics for a U.K. institutional investor. They found that portfolio volatility could be substantially reduced by including real estate but that a significant reduction wasn't achieved by including one of the other alternative assets classes.

Commodities were found to provide some diversification benefit during bull market conditions, and hedge funds were the preferred diversifying asset class during bear markets. The analysis clearly shows the importance of real estate as the principal hedging instrument in portfolios. Encouragingly for investors this evidence provides strong support for the current trend toward higher allocations to real estate. On a risk-adjusted basis, real estate was one of the best-performing asset classes over the sample period studied, and real estate had a significantly better risk hedging characteristic than any of the other asset classes. As to whether these benefits could be derived by substituting other alternative assets for real estate, the emphatic answer is that no other asset class delivered the same level of risk adjusted returns.

Applications for this paper: Although a number of commentators would argue that the third element of a portfolio (after equities and bonds) should be a real asset or alternative category, this paper concludes that real estate is capable of fulfilling this role. Therefore, the blended DC real estate product which we analyse in this paper could be regarded as a key component of a mixed asset portfolio.

4) Dataset & methodology

The methodology used in this study is to simulate the historic performance of portfolios which comprise varying allocations of unlisted pooled real estate funds, global listed real estate securities funds and cash. To that end we are seeking to understand the characteristics of the performance delivered to investors through using a DC friendly real estate product which provides a requisite level of liquidity.

In terms of portfolio composition we have decided to make an allocation to cash to provide an active liquidity buffer, which is consistent with market practice. Clearly listed securities provide significant additional liquidity although we do not view an allocation to them as a liquidity buffer. Rather they form an important performance component of a blended portfolio which should contain sufficient liquidity and daily valuation information so as to be compatible with DC pension plan requirements.

As this study seeks to estimate realistic investor total returns from exposure to a pooled fund solution, we have created a sample comprising both existing unlisted real estate and real estate securities (REIT)

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funds. The unlisted real estate funds were sourced from The Townsend Group database and the global real estate securities funds from the Consilia Capital database. The sample comprises five unlisted managed real estate funds and four global listed securities funds which have the following characteristics:

* UK unlisted real estate funds: the five funds selected were large managed real estate funds (i.e. they reinvest income) and quarterly performance was provided by Investment Property Databank (“IPD”). All of these funds have relatively liquid open-ended structures and typical hold cash balances of 5-8% of NAV. Monthly total returns have been created by interpolation and we recognise that this will create a degree of artificial smoothing. All performance provided did not include the impact of the subscription/redemption costs, but is calculated net of fees and fund running costs. The estimated TER for these funds is approximately 0.9% of NAV p.a.

* Global listed real estate securities funds: these funds were required to have a 15 year track record. This excluded some funds which had previously been used in the Consilia Capital study. The performance data was sourced from Bloomberg and is denominated in US dollars. The funds are all open-ended, and we have provided investor level returns by deducting transaction costs on rebalancing within the detailed study.

We have split the study’s findings into three parts

i) An overview of blended Real Estate DC Fund performance through the cycles.

Using this sample we firstly explore the short run risk and return dynamics using monthly frequency data. We believe the past 15 years can be characterized by four separate phases where economic and capital market conditions have materially differed. Within these phases we assess the relative performance of unlisted UK real estate funds and global listed securities, as well as a blended 70:30 allocation.

ii) Decomposition of Blended Real Estate DC Fund returns

The key aim of this study is to provide a better understanding of the risk-return dynamics of a ‘real-life’ DC real estate portfolio which reflects investor level charges and underlying costs. A range of risk measures are employed including tracking, volatility and value at risk (VaR). These are calculated over the full 15 year horizon. We also consider the non-normal characteristics of real estate performance and use the Modified VaR measure a risk measure which addresses this issue. These risk measures are also decomposed to assess the key contributors over the full 15 year horizon. Other considerations include the effect of valuation smoothing and substituting underlying unlisted and listed fund performance depending upon their relative performance.

iii) Blended Real Estate DC Funds in a mixed asset portfolio

Finally using our ‘realistic’ DC real estate product the benefits of this in a multi-asset context is considered. Firstly we assess the periodic benefits generated by a DC real estate fund and second we analyse the strategic position of such an investment within a UK investor’s multi-asset portfolio. In both instances the DC Real Estate Fund is contrasted with an unlisted real estate portfolio.

Two additional issues should be dealt with in this section, namely how we dealt with the impact of currencies and data frequency.

4.1 Currency impact

When introducing a global exposure investors must also contend with the associated currency risk, although specific asset class characteristics will determine the extent to which this risk will be actively mitigated. A non-domestic fixed income allocation is typically thought to require hedging so as to mitigate currency risk which dominates investor returns. Conversely listed equity allocations are generally not fully hedged. With the global listed funds being USD denominated and approximately 50% of the global REIT universe also being USD denominated, the USD is the key currency to hedge although an exposure to a global basket of currencies would remain. Additionally we would also expect that this currency basket would ‘hedge-itself’ to a certain extent given the net effect of various currencies moving in different directions. To assess the currency risk faced by a UK investor we have calculated the

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performance of the global listed real estate fund exposure on an unhedged and hedged GBP basis. The results are as follows:

Figure 1 *Currency impact – global real estate securities funds (monthly statistics)*

	Local (\$USD)	GBP Unhedged	GBP Hedged
Annualised Mean	10.23%	10.56%	10.36%
Annualised Volatility	20.20%	18.84%	20.25%
Correlation With USD Total Return	-	0.90	1.00
RSq With USD Total Return	-	0.82	1.00

Clearly unhedged GBP based performance is closely related to performance in USD terms. Whilst both risk and return has marginally improved for a UK investor on this basis, the key finding is that currency risk essentially neutral over the full 15 year period. Both the correlation and R-Squared measures point to a close association in GBP based returns and this is due to the impact of currency risk being denominated by global listed real estate security market movements. Given this and due to the additional complexity of managing a currency hedging programme and the potential incompatibility of currency derivative instruments within many UK pension scheme types, we have assumed an unhedged USD exposure for the purposes of this study.

4.2 Data frequency

The summary statistics for the sample used in this study are shown in Figure 2. These have been calculated on both a monthly and quarterly basis:

Figure 2 *Impact of data frequency*

Monthly Summary Statistics

Asset	Mean	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis
Unlisted Property Funds	0.6%	2.4%	-4.2%	1.1%	-2.1	8.6
Global Listed Funds	0.9%	16.3%	-18.2%	5.4%	-0.5	4.3
Cash	0.3%	0.6%	0.0%	0.2%	-0.4	1.8

Quarterly Summary Statistics

Asset	Mean	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis
Unlisted Property Funds	1.7%	7.1%	-11.5%	3.2%	-2.0	8.1
Global Listed Funds	2.7%	29.1%	-21.4%	10.0%	-0.3	3.2
Cash	0.9%	1.9%	0.1%	0.5%	-0.5	1.8

In Figure 2 mean is the historic arithmetic average, Std. Dev. is a measure of historic dispersion from the mean, Skewness measures the degree to which historic returns are distributed either side of the mean and kurtosis measures the 'peakedness' of the historic return distribution.

We believe that quarterly returns are the most justifiable for the detailed study for the following reasons:

- * Unlisted fund returns are measured on a quarterly basis.
- * Monthly performance for private real estate is overly smoothed.
- * Quarterly performance horizons are more typical for institutional investors.

As can be seen in the summary statistics in Figure 2 the choice of whether to assess performance on a quarterly or monthly basis will have a material impact on the conclusions drawn. For example the annualised volatility measured for the unlisted fund performance series increases from 3.7% to 6.4% when switching from monthly to quarterly periods, whereas for global listed funds the shift is less significant, increasing from 18.8% to 19.9%.

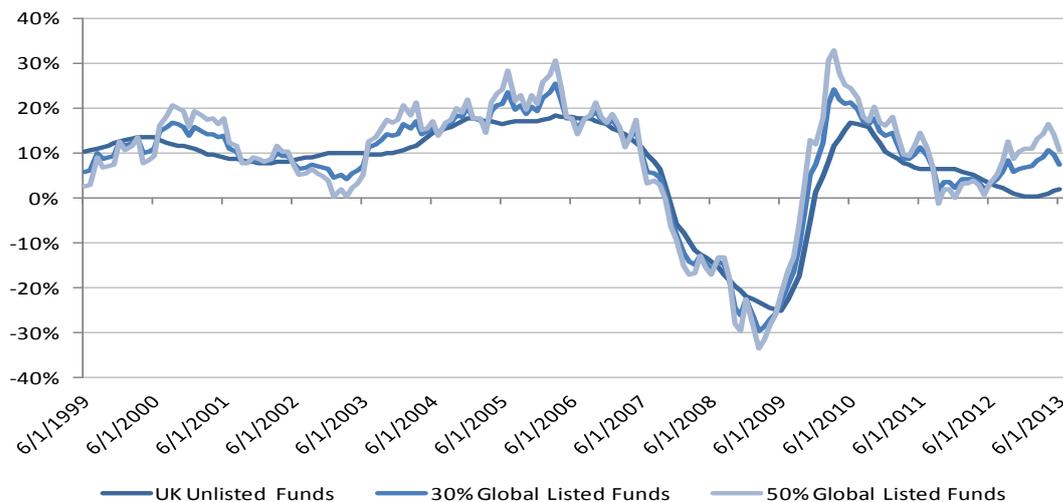
5) An Overview of blended real estate DC fund performance through the cycles

Firstly, we examine the impact on returns. We have used 12month rolling returns, with monthly frequency for valuations. Our data starts from June 1998, so the first data point is June 1999. We believe that showing the results on a rolling monthly basis shows a far better impression of the dynamics and quantum of the results.

The pattern is as we would expect, given the gearing, predictive nature and equity market characteristics in the listed sector, namely that when direct real estate values are rising steadily (2003-2007) listed real estate enhances unlisted returns, when real estate values are falling (2007-2009) they detract from performance (but only marginally), and when capital values are steady (+/- 2% p.a.) the result will be more dependent upon non real estate influences. This can be seen during the TMT led boom and bust where between 1998 and 2003 real estate returns were positive, yet listed performance was mixed in relative terms.

However, what is noticeable in Figure 3 is the consistency of the return enhancement from adding listed. Of the 180 months in the period listed real estate enhanced returns in 105 (i.e. 58% of them).

Figure 3 Rolling 12-month total returns



The next question to be asked is regarding the cumulative impact of these gains, and what strategies could be used to minimise the maximum drawdown seen from 2007-2009. To do this we need to divide the study into our clearly identifiable periods:

- i) The TMT led boom and bust – June 1998 to June 2003.
- ii) Rising real estate values – June 2003 to June 2007.
- iii) The global financial crisis – July 2007 to June 2009.
- iv) The QE led recovery September 2009 to June 2013.

As can be seen from Figures 4 and 5 the results provide a strong case for incorporating listed into an unlisted portfolio. At the most basic level, over the 15 year period studied, adding 30% global listed exposure to UK unlisted funds would have added 18.8% to the cumulative performance of unlisted funds in isolation and 0.9% p.a. on an annualised basis. In terms of breaking down these returns into different periods of the cycle, clearly the impact of the Dot-Com bubble and subsequent busting has dragged the historical benefit of including a listed exposure, although performance during this period was still

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positive, an additional 4% portfolio return in 2003-07, and an extra 15% in the period of QE led recovery 2009-2013. Whilst this was to be expected during the real estate driven bull market due to the gearing, and predictive power of listed real estate what we believe will surprise many is the fact that during the GFC the inclusion of a 30% listed real estate weighting led to only a marginal (-1.3% over a two year period) diminution in returns. This represents an extremely small cost when taken against the dramatic improvement in liquidity as a result of the listed weighting.

Figure 4 Cumulative total returns

Period	Dates	Total Returns			
		UK Unlisted Funds	Global Listed Funds	70:30	Return Enhancement From Adding Listed
TMT Boom & Crash	June 1998 - June 2003	65.5	33.9	56.0	-14.4%
Rising UK Property Values	July 2003 - June 2007	81.7	107.7	88.4	8.2%
Global Financial Crisis	July 2007 - June 2009	-33.0	-34.5	-33.5	-1.3%
QE Led Recovery	July 2009 - June 2013	32.3	103.6	52.2	61.6%
Past Five Years	July 2008 - June 2013	4.1	62.6	20.3	390.6%
Past Ten Years	July 2003 - June 2013	59.7	154.8	85.6	43.3%
Full Period	June 1998 - June 2013	166.4	270.8	197.7	18.8%

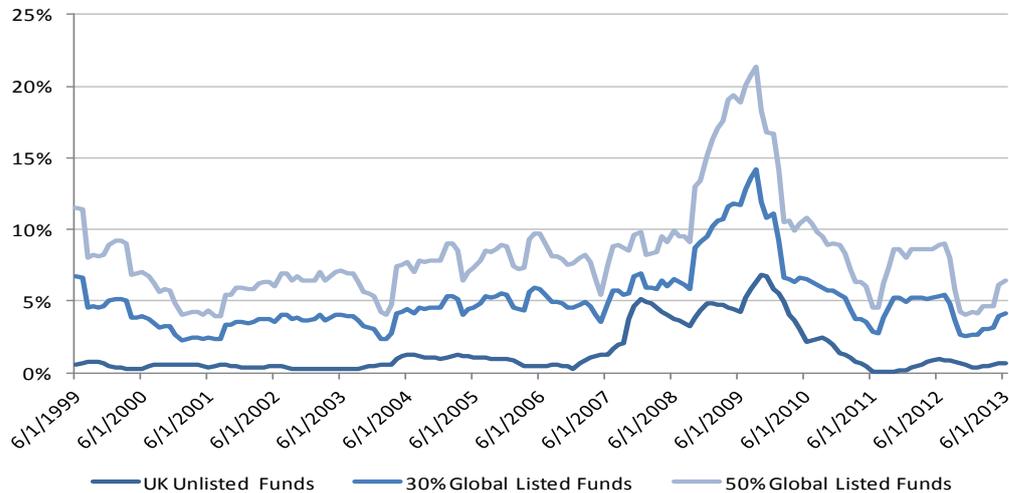
Figure 5 Annualised total returns

Period	Dates	Annualised Total Returns (%)			
		UK Unlisted Funds	Global Listed Funds	70:30	Return Enhancement From Adding Listed
TMT Boom & Crash	June 1998 - June 2003	10.1%	7.2%	9.0%	-1.1%
Rising UK Property Values	July 2003 - June 2007	15.0%	19.7%	16.1%	1.0%
Global Financial Crisis	July 2007 - June 2009	-19.8%	-16.3%	-19.8%	0.0%
QE Led Recovery	July 2009 - June 2013	7.0%	19.0%	10.7%	3.6%
Past Five Years	July 2008 - June 2013	0.6%	12.6%	3.8%	3.3%
Past Ten Years	July 2003 - June 2013	4.9%	12.2%	6.7%	1.9%
Full Period	June 1998 - June 2013	6.6%	10.6%	7.5%	0.9%

Having looked at the impact on returns we now turn to the impact on volatility, in Figure 6 below, using a similar approach to above. As before, we have used a 12 month rolling volatility window, with monthly frequency for valuations. Again the pattern is broadly as would be expected, with the portfolio volatility increasing with the percentage of listed added. However, we would point out that the returns data we have taken for the unlisted funds is based on stated NAV, and takes no account of secondary pricing. If we were to take account of this (which broadly mirrors the NAV based pricing in the listed sector) then the difference between the volatility of listed and unlisted would be smaller.

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Figure 6 Rolling 12-month total volatility



Looking at the breakdown of volatility by period in Figure 7 we can see that taking fund NAVs rather than secondary pricing volatility has reduced post GFC whilst the price of liquidity in listed funds is reflected in the maintained higher level of volatility post GFC. Outside of the GFC period the volatility pattern remained remarkably consistent. It should also be noted that the unlisted fund returns shown below were interpolated from quarterly performance numbers and so exhibit a high degree of valuation smoothing, an issue we return to later in the paper.

Figure 7 Annualised volatility

Period	Dates	Annualised Volatility (%)		
		UK Unlisted Funds	Global Listed Funds	70:30
TMT Boom & Crash	June 1998 - June 2003	0.6%	16.5%	4.3%
Rising UK Property Values	July 2003 - June 2007	1.3%	16.1%	4.9%
Global Financial Crisis	July 2007 - June 2009	4.2%	31.0%	9.3%
QE Led Recovery	July 2009 - June 2013	2.0%	15.3%	5.1%
Past Five Years	July 2008 - June 2013	4.6%	22.5%	7.9%
Past Ten Years	July 2003 - June 2013	4.4%	19.9%	7.2%
Full Period	June 1998 - June 2013	3.7%	18.8%	6.4%

We also conduct the same analysis using tracking error as the risk measure. One of the major issues that has been raised by asset managers is that whilst adding a global real estate listed securities fund exposure may improve returns, surely it significantly increases tracking error to the underlying (domestic) real estate benchmark? In this instance this is the IPD Monthly Total Return Index which represents a 'true' direct return exposure.

Looking at Figure 8 we can see the result. By moving from a 100% weighting to UK real estate, to a 70% weighting in a pooled fund solution (with 30% Global REITs) the tracking error increases from 1.2% to 5.2%. Practitioners can therefore now attempt to quantify the tracking error risk they are likely to encounter when adding global listed real estate to the portfolio. Tracking-error noticeably increased during the GFC, for all real estate exposures considered.

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Figure 8 Rolling 12-month tracking error

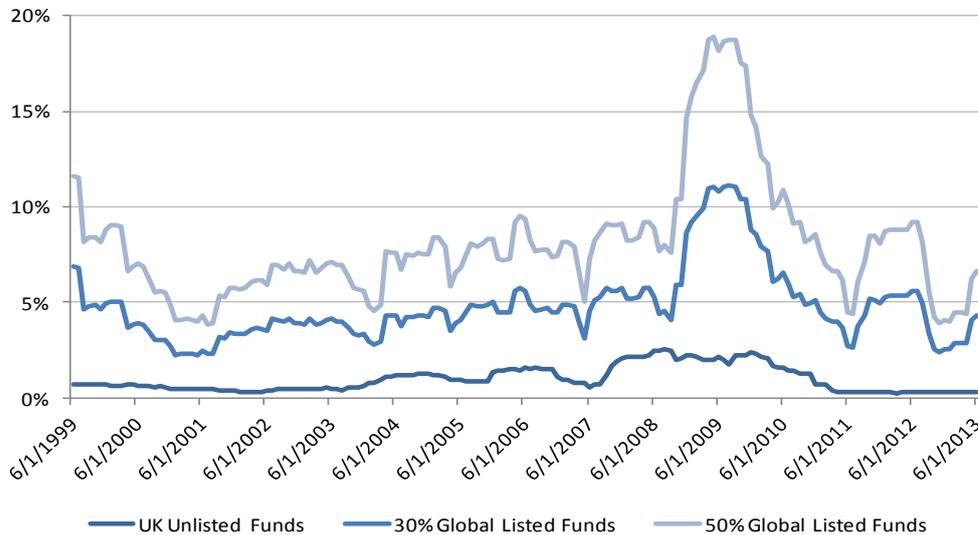


Figure 9 Annualised tracking error

Period	Dates	Annualised Tracking Error (%)		
		UK Unlisted Funds	Global Listed Funds	70:30
TMT Boom & Crash	June 1998 - June 2003	0.5%	16.6%	4.4%
Rising UK Property Values	July 2003 - June 2007	1.1%	15.8%	4.6%
Global Financial Crisis	July 2007 - June 2009	2.3%	30.7%	8.3%
QE Led Recovery	July 2009 - June 2013	0.9%	15.2%	4.9%
Past Five Years	July 2008 - June 2013	1.4%	22.0%	6.4%
Past Ten Years	July 2003 - June 2013	1.5%	19.3%	5.6%
Full Period	June 1998 - June 2013	1.2%	18.4%	5.2%

The results in Figure 9 show that there is a strong case for UK investors to include a global listed real estate securities exposure to their domestic real estate allocation. Over the period considered in this study a 30% allocation to global listed led to a 0.9% p.a. improvement in performance. However, this exposure clearly led to increases as measured by both absolute volatility and tracking error when measured against the IPD Monthly Index, a measure of direct private real estate market returns. So given the need to create a more liquid portfolio to satisfy the needs of the burgeoning DC market, we can see that over the past 15 years that the inclusion of a 30% global securities exposure provided improved returns of c. 1% p.a. but came at the 'expense' of an additional c. 4% tracking error. This isn't high in the context of active equity funds e.g. Vanguard (2012) and as a result of the inability of managers to closely replicate the performance of a direct property benchmark such as the IPD Monthly Index, we consider this to be an attractive trade-off.

6) Decomposition of blended real estate DC fund performance

We now turn to the more detailed strategic analysis over the full 15 year sample history and study the risk-return characteristics of varying unlisted and listed allocations. This analysis is undertaken using 'realistic' DC real estate portfolios whereby we incorporate the initial subscription costs of unlisted real estate fund investments, a cash allocation for liquidity purposes and ongoing rebalancing costs to maintain desired target allocations. For these portfolios we then calculate a number of measures such as tracking error and risk adjusted measures. We believe that this is the first study to estimate the 'true' investor risk-return payoff when making a real estate allocation. Following the Legal and General/Nest 70%:30% lead and including a cash allocation we define a 70%:25%:5% UK unlisted, global listed and cash allocation to be the "DC Real Estate Fund". As noted above this analysis is conducted on a quarterly basis.

6.1 The impact of adding cash to the portfolio and transaction costs - "cash drag"

In practice funds will typically hold an element of cash in their portfolio. This can be either for administrative reasons (as a liquidity buffer for redemptions), transaction related reasons (cash held pending (re)investment), or strategic reasons (a negative investment outlook for the underlying assets). Given the requirement for additional liquidity in any DC real estate fund product we have assumed an additional 5% cash requirement is incorporated in the portfolio. The entry costs into unlisted real estate funds and necessary rebalancing cost to maintain a target allocation have also been incorporated. Entry costs into unlisted UK real estate funds are 3-6% and exit costs range from 1-2%. We recognise that a secondary market has developed for UK unlisted real estate funds which can help to reduce investor entry/exit costs but pricing data for the sample is not available. A 0.25% fee is applied to global listed real estate security fund transactions. To maintain a target allocation over time there is a requirement to rebalance the portfolio on an on-going basis which will lead to cost leakage. We assume that the DC Real Estate Fund is rebalanced on a quarterly basis to bring its allocations back in-line with set targets.

To isolate the impact of holding an element of cash in the portfolio we have separated the portfolios into two groups in the table below. The first three columns of Figure 10 below show portfolios comprising of purely unlisted real estate funds, unlisted and cash and then incorporating subscription costs. The second group shows the blended 70:30 portfolio and then the DC Real Estate Fund which includes a cash holding of 5% and the various transactions costs associated with maintaining this target allocation on an ongoing basis. In the Appendix we have also shown multiple DC Real Estate Fund portfolios with varying combinations of listed and unlisted exposures. These portfolios are all net of subscription and rebalancing costs. We estimated the following 15 year risk-return measures using quarterly performance and this can be seen in Figure 10:

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Figure 10 15-year risk-return measures

	UK Unlisted Funds	UK Unlisted Funds Inc Subscription Costs	70:30 UK Unlisted Funds: Global Listed Funds	70:25:05 UK Unlisted Funds: Global Listed Funds:Cash
Portfolio Allocation				
Unlisted Property Funds	100%	100%	70%	70%
Global Listed Funds	0%	0%	30%	25%
Cash	0%	0%	0%	5%
Portfolio Statistics				
Annualised Mean	6.8%	6.4%	7.7%	7.1%
Annualised Geometric Mean	6.8%	6.3%	7.5%	7.0%
Annualised Volatility	6.4%	6.5%	8.4%	8.0%
Beta vs IPD Monthly Index	0.88	0.88	0.93	0.88
Tracking Error vs IPD Monthly Index	1.3%	2.0%	5.4%	5.2%
RSq with IPD Monthly Index	0.97	0.92	0.60	0.60
Sharpe Ratio	0.67	0.60	0.62	0.58
Modified Sharpe Ratio	0.35	0.32	0.33	0.19
Information Ratio - IPD Monthly Index	-0.34	-0.42	0.08	-0.02

6.2 Annualised mean returns

In Figure 10 we can see that both transaction costs and cash “drag” performance of the unlisted real estate funds incrementally. This is initially by 0.4% p.a. from costs and then by a further 0.2% p.a. due to the cash. The additional performance benefit from including a 30% listed allocation is evident with an improvement of c. 0.9% p.a. over an unlisted only exposure post the impact of costs and cash. Further analysis showed that there was an approximate 0.2% p.a. return enhancement for each 5% absolute increase in global listed securities funds at the expense of unlisted real estate.

6.3 Annualised volatility

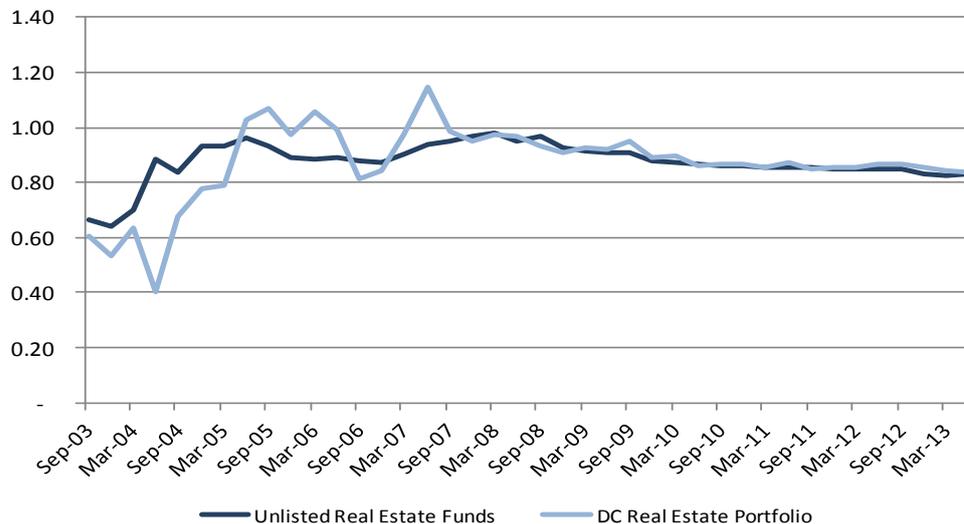
Clearly the absolute volatility of the DC Real Estate Fund reflects a material increase over a pure unlisted real estate fund portfolio. When including both cash and transaction cost drag, volatility increases from 6.2% to 8.0%. However, an issue we turn to later is that by using quarterly valuation based performance data, the annualised volatility estimates for unlisted real estate funds are understated due to the impact of valuation smoothing.

6.4 Beta vs. IPD Monthly Index

It can be seen that the Betas of the unlisted and blended portfolios have very similar coefficient sizes of c. 0.9. The unlisted real estate funds used in this study typically carry significant cash balances and hold predominantly stabilised assets. Due to the cash balances that they carry and the fact that no debt finance is employed i.e. they are partially short the direct market due to their negative net leverage ratio, a beta of less than one is an expected result. What is interesting is that the listed component does not materially increase beta although the associated R-Squared does fall from 0.9 to 0.6.

The equivalence in the betas between the unlisted only and blended portfolios hasn’t always been in place as can be seen below. Figure 11 shows a rolling five year beta based using the same data and compared an unlisted exposure to the DC Real Estate Portfolio. What the analysis shows is that post the GFC there has been a very close correlation in this measure.

Figure 11 Rolling five-year beta



6.5 Tracking error

Due to the impact of cash positions and subscription costs even a well-diversified UK unlisted real estate fund exposure carries a meaningful degree of tracking error (2%) against the UK direct real estate market, as measured by the IPD Monthly Total Return Index. What the analysis shows is that a DC Real Estate Fund incurs an additional 3% tracking error over an investor level exposure to unlisted real estate funds. Ultimately this additional tracking error is the cost to investors of garnering both additional liquidity and returns.

Whilst Information Ratios are a popular tool for Mutual Funds, we find in this study that as the Ratio is negative over the period that it is not a meaningful tool to assess performance against direct real estate indices such as those produced by IPD. This due to the fact that direct IPD indices do not incorporate the impact of fund management fees and costs.

6.6 Sharpe Ratio

We have used a standard Sharpe Ratio to assess the impact on risk adjusted returns of adding listed to the portfolio (a 2.5% risk free rate has been assumed). Given that (stated) annualised volatility increased from 6.5% when there was 100% unlisted real estate exposure to 8.0% for the DC Real Estate Fund and subsequent 0.9% improvement in returns, there has been a reduction in the Sharpe Ratio. That being said the ratio only modestly declines suggesting on a risk adjusted basis investors are broadly compensated for the additional volatility of a listed exposure. This measure also ignores the improved liquidity and therefore on an absolute risk adjusted basis we consider the DC Real Estate Fund to be at least as attractive as an unlisted portfolio.

6.7 Substituting best and worst funds for average returns

On an annualised basis we can see that there is a 1.1% differentiation between the best and worst performing funds and the unweighted average. Interestingly the best funds also delivered a lower risk portfolio and the worst funds a higher risk profile than the average.

Figure 12 Impact of substituting best and worst funds

	Average Funds	Best Funds	Worst Funds
Portfolio Allocation			
Unlisted Property Funds	70%	70%	70%
Global REIT Funds	25%	25%	25%
Cash	5%	5%	5%
Portfolio Statistics			
Annualised Mean	7.1%	7.9%	6.8%
Annualised Geometric Mean	7.0%	7.8%	6.5%
Annualised Volatility	8.0%	7.6%	8.8%
Beta vs IPD Monthly Index	0.88	0.82	0.96
Tracking Error vs IPD Monthly Index	0.05	5.1%	5.8%
RSq with IPD Monthly Index	0.60	0.58	0.58
Sharpe Ratio	0.58	0.71	0.48
Information Ratio - IPD Monthly Index	-0.02	0.13	-0.08

6.7 Non-normality and risk attribution

A feature of financial market and private investment returns is that the historic return distributions differ markedly from the often assumed normal distribution, due to material skewness and/or kurtosis. Thus far the non-normal characteristics of the real estate performance data used in this study has not been considered. The high negative skewness and positive kurtosis statistics demonstrate that it is likely that the real estate total return distributions will differ from a normal distribution. Whilst the industry continues to be focussed on volatility based risk measures given the inherent non-normality of direct real estate performance, volatility is not an ideal risk measure for this asset class. There is a substantial body of literature which has addressed this issue e.g. Young (2008).

Figure 13 Jarque-Bera normality tests

Asset	Jarque-Bera	Prob
Monthly Periods		
Unlisted Property Funds	372.3	0.00
Global Listed Funds	21.4	0.00
Cash	17.2	0.00
Quarterly Periods		
Unlisted Property Funds	107.3	0.00
Global Listed Funds	0.9	0.64
Cash	5.8	0.06

To test for this we have used the Jarque-Bera normality test and the results of this are shown in Figure 13. The statistics show that for the monthly series all of the variables can be considered non-normal whereas when quarterly periods are used only unlisted real estate funds is found to be non-normal at the 5% statistical significance level.

For example not considering the significant negative skew seen in real estate total return distributions could lead to downside risk being understated. We make use of the Modified VaR statistic to better account for this characteristic of the performance data. This adjusts the standard deviation to account for both skew and kurtosis in the returns distribution. We consider VaR to be a useful risk measure as it seeks to quantify the maximum loss within a period to a specified probability level. Below we show both the normal and modified VaR measures for the DC Real Estate Fund and an attribution of these risk measures.

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Figure 14 shows the VaR estimates and also the attribution of risk and return to the three asset class components within the DC real estate portfolio. The risk attribution is considered for three absolute measures of risk:

Figure 14 Real estate DC fund risk-return decomposition

	Total Portfolio	UK Unlisted Funds 70%	Global Listed Funds 25.0%	Cash 5.0%
Return	1.8%	1.1%	0.7%	0.0%
Volatility	-6.5%	-3.0%	-3.5%	0.0%
Normal VaR - 95%	-4.7%	-1.9%	-2.8%	0.1%
Skewness	-1.3%	-1.2%	-0.1%	0.0%
Kurtosis	0.2%	0.2%	-0.1%	0.0%
Non-Normal	-1.1%	-1.0%	-0.2%	0.0%
Modified VaR - 95%	-5.8%	-2.9%	-2.9%	0.1%
Return Contribution		60.2%	37.2%	2.6%
Volatility Contribution		46.7%	53.4%	-0.1%
Normal VaR Contribution		41.5%	59.6%	-1.1%
Modified VaR Contribution		50.4%	50.5%	-0.9%

What the risk attribution shows is the impact of global listed market volatility which contributes over 50% of total portfolio volatility, which is double its allocation. Interestingly when accounting for non-normality unlisted funds account for almost the entirety of risk emanating from this source. Whilst only a modest shift, the Modified VaR measure shows that unlisted funds contribute 50% total risk whereas when VaR is estimated assuming a normal distribution the contribution is 40%.

We now cover the issue of valuation smoothing and estimate a more realistic annualized volatility number for unlisted real estate performance which has a significant impact upon its contribution to overall portfolio risk.

6.8 Impact of valuation smoothing upon performance

As noted above direct/unlisted real estate performance is characterized by valuation smoothing, which is a characteristic which acutely manifests when a greater period frequency is assumed for performance. This occurs due to the fact that as the periodic frequency increases then there is less new available information for advisors to update their valuations, which leads to a greater dependence upon prior period values. This creates what is known as valuation smoothing and the consequences are well documented, namely that volatilities and co-variances with more liquid asset classes are underestimated.

This effect can be seen below where we have used the longest series of unlisted UK real estate fund total returns available to estimate historical annualised total returns and volatilities. The AREF/IPD Managed Property Funds Index has been used as it the most relevant index for the sample of unlisted real estate funds used in this study. These have been calculated using both quarterly and annual total returns and contrasted with direct market performance, as measured by the IPD UK Monthly Total Return Index, as well as the sample UK unlisted and global listed funds.

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Figure 15 Annualised total returns and performance volatility

	June 1990 - June 2013		June 1998 - June 2013	
	Annualized Mean	Annualized Volatility	Annualized Mean	Annualized Volatility
Quarterly Data				
IPD UK Monthly Property Index	7.3%	6.3%	7.2%	7.1%
AREF/IPD Managed Property Funds Index	6.0%	6.2%	6.3%	6.5%
UK Unlisted Funds (Study Sample)			6.8%	6.4%
Global Listed Funds			10.8%	19.9%
Annual Data				
IPD UK Monthly Property Index	7.9%	11.7%	8.0%	12.9%
AREF/IPD Managed Property Funds Index	6.5%	11.3%	6.9%	11.5%
UK Unlisted Funds (Study Sample)			7.4%	11.7%
Global Listed Funds			10.6%	18.8%

As can be seen in Figure 15, when using the same return series the annualised volatility materially increases when measuring performance on an annual basis when compared to using quarterly performance numbers. This isn't the case for more liquid asset classes, for example the volatility estimate for the global listed securities fund sample used in this study shows a far less material difference in annualised performance volatility when switching between quarterly and annual measurement periods.

There are a number of econometric approaches that can be employed to correct for smoothing bias in performance series. This includes methods which account for varying degrees of smoothing throughout the market cycle, a characteristic which has been shown to be the case. Given the relatively limited historic time series available in this we have adjusted the unlisted UK real estate funds using the following simple formula:

$$R_t (\text{Unsmoothed}) = (R_t - \alpha R_{t-1}) / (1 - \alpha)$$

Where α is a coefficient which adjusts for first order serial correlation in the data. This is typically estimated using a first order autoregressive model.

For the purposes of this study we set α to a value 0.65 which unsmoothed the UK unlisted real estate funds performance data. The impact that this adjustment has upon risk and return can be seen in Figure 16 the performance of the DC real estate fund has been estimated using these unsmoothed unlisted real estate fund returns:

Figure 16 Summary statistics

Asset	Mean	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Prob
Unlisted Real Estate Funds	1.6%	7.1%	-11.5%	3.2%	-1.9	7.4	84.7	0.00
Unlisted Real Estate Funds - Unsmoothed	1.6%	16.4%	-23.8%	6.1%	-2.1	10.5	183.1	0.00
DC Real Estate Fund	1.8%	8.8%	-11.5%	4.0%	-1.3	5.0	26.1	0.00
DC Real Estate Fund - Unsmoothed	1.8%	15.3%	-20.1%	5.6%	-1.5	7.9	82.3	0.00

As a result the annualised performance volatility of unlisted real estate funds has increased from 8.0% to 12.0%. This broadly matches the historic annual volatility estimate for UK unlisted managed property funds shown above. This coefficient essentially means that over a given quarterly period approximately a two-thirds weight was assigned to previous performance and one-third current period market conditions.

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Figure 17 Unadjusted vs. smoothed unlisted fund returns

	Unadjusted	Unsmoothed
Portfolio Allocation		
Unlisted Property Funds	70%	70%
Global REIT Funds	25%	25%
Cash	5%	5%
Portfolio Statistics		
Annualised Mean	7.1%	7.1%
Annualised Geometric Mean	7.0%	6.6%
Annualised Volatility	8.0%	11.2%
Beta vs IPD Monthly Index	0.88	1.17
Tracking Error vs IPD Monthly Index	5.2%	7.9%
RSq with IPD Monthly Index	0.60	0.53
Normal VaR - 95%	-4.7%	-7.3%
Modified VaR - 95%	-5.8%	-8.9%
Sharpe Ratio	0.58	0.41
Modified Sharpe Ratio	0.20	0.36
Information Ratio - IPD Monthly Index	-0.02	-0.02

The impact of unsmoothing the data leads to a clear increase in all risk measures with the absolute volatility of the DC portfolio increasing by c. 40% to 11.2% p.a. tracking error also materially increases. As returns are stable the Sharpe Ratio is materially lower. Again the aim here was to show risk-return based upon a realistic level of annualised volatility so that a 'true' picture of investor performance and risk can be shown. This is particularly relevant for contrasting performance with liquid traditional asset classes and this is addressed below. Turning to an attribution of absolute risk it is unlisted funds that now contribute to a much a greater extent:

Figure 18 Risk return decomposition – unsmoothed data

	Total Portfolio	UK Unlisted Funds 70%	Global Listed Funds 25.0%	Cash 5.0%
Return	1.8%	1.1%	0.7%	0.0%
Volatility	-9.1%	-6.3%	-2.8%	0.0%
Normal VaR - 95%	-7.3%	-5.2%	-2.1%	0.1%
Skewness	-2.1%	-2.4%	0.3%	0.0%
Kurtosis	0.6%	0.7%	-0.2%	0.0%
Non-Normal	-1.6%	-1.7%	0.2%	0.0%
Modified VaR - 95%	-8.9%	-6.9%	-2.0%	0.1%
Return Contribution		59.8%	37.6%	2.6%
Volatility Contribution		69.2%	30.9%	-0.1%
Normal VaR Contribution		71.5%	29.2%	-0.8%
Modified VaR Contribution		78.2%	22.4%	-0.6%

When non-normalities are considered then unlisted funds contribute a higher pro-rata share. What we believe is interesting here is that when accounting for smoothing impact, the contribution to risk is broadly in line with the target allocation. Again unlisted funds contribute all of the 'non-normality' risk. Whilst we recognise that this is a synthetic exercise the analysis nonetheless shows that when

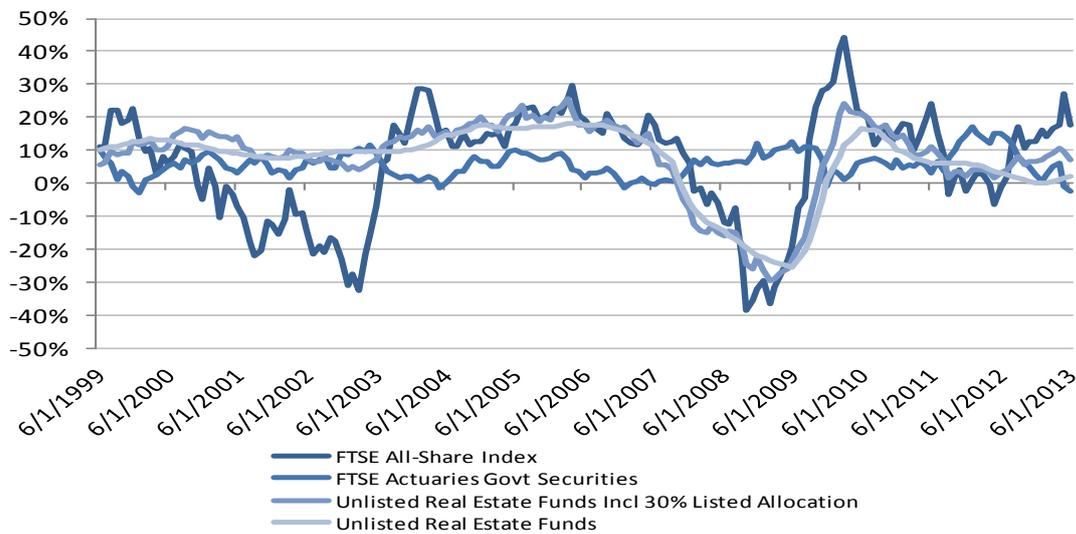
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estimating the ‘true’ risk of unlisted real estate performance, it contributes to overall risk to a much greater extent than ‘raw’ periodic data analysis suggests and investors should be mindful of this point.

7) A Blended real estate DC fund in a mixed asset portfolio

In similar vein to the analysis above we initially assess the shorter-term periodic risk-return dynamics of both unlisted real estate fund performance and a combined 70:30 allocation to unlisted and global listed securities funds. This is contrasted with UK equity market and UK government bond performance over the same period. Firstly we consider rolling annual performance patterns:

Figure 19 Rolling 12-month total returns



As can be seen in Figure 19, the performance of both real estate portfolios’ was initially largely uncorrelated with equity markets. This relationship shifted post 2003 and through the GFC, a closer correlation is evident. If investors seek to make real estate allocations so as to diversify against equities then asset allocation frameworks will need to account for these changing correlation regimes. However, when contrasted with government bond market performance both real estate portfolios were uncorrelated. Over the entire 15 year time period both real estate portfolios outperformed equities and bonds:

Figure 20 Cumulative total returns

Period	Dates	Total Returns			
		FT All Share Index	FTSE Actuaries Govt Securities	Unlisted Property Funds	70:30
TMT Boom & Crash	June 1998 - June 2003	-16.4	40.2	65.5	56.0
Rising UK Property Values	July 2003 - June 2007	101.7	11.7	81.7	88.4
Global Financial Crisis	July 2007 - June 2009	-30.0	19.9	-33.0	-33.5
QE Led Recovery	July 2009 - June 2013	77.3	24.5	32.3	52.2
Full Period	June 1998 - June 2013	109.4	133.8	166.4	197.7

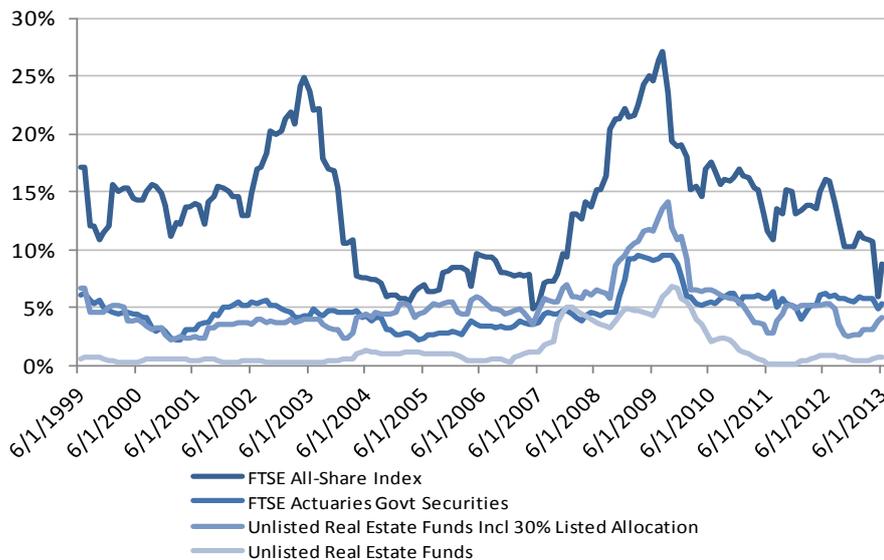
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Figure 21 Annualised total returns

Period	Dates	Annualised Total Returns (%)			
		FT All Share Index	FTSE Actuaries Govt Securities	Unlisted Property Funds	70:30
TMT Boom & Crash	June 1998 - June 2003	-2.1%	6.9%	10.6%	9.3%
Rising UK Property Values	July 2003 - June 2007	17.9%	2.8%	16.1%	17.2%
Global Financial Crisis	July 2007 - June 2009	-15.7%	9.4%	-18.2%	-18.4%
QE Led Recovery	July 2009 - June 2013	14.2%	5.8%	7.3%	11.1%
Full Period	June 1998 - June 2013	6.1%	5.8%	6.8%	7.5%

The outperformance of unlisted real estate funds over bonds was 1% p.a. and when factoring in the typical 1-1.25% p.a. fund fees/costs and cash performance drag this equated to an approximate delivered risk premium from direct real estate above bonds of 2-2.25%. However, equity market performance was significantly negatively impacted by two severe market downturns during the period and as a result underperformed both real estate portfolios and only marginally outperformed bonds. Clearly this is out of line with typical institutional investor expectations of c. 4-6% p.a. premium from this asset class.

Figure 22 Rolling 12-month Volatility



The rolling volatility profile shows the extreme movement seen in equity market volatility. It is also interesting to see the correlation spike in volatility during the GFC where dislocated capital markets led to both the risk and return of multiple asset classes moving in tandem. Outside of the GFC period the volatility pattern for bonds and real estate remained broadly consistent. It should also be noted that the unlisted fund returns were interpolated from quarterly performance numbers and so exhibit a high degree of valuation smoothing, an issue already addressed in this paper.

We next conduct strategic asset allocation analysis to assess the longer-term benefits of incorporating a real estate exposure in a multi asset portfolio. This is based upon annual period analysis and as result it is important to adjusted unlisted performance for valuation smoothing so as to factor-in a true annualized level of volatility for real estate (see above). We present the analysis on both an unadjusted and unsmoothed basis. The summary statistics below show volatilities and return profiles of the asset classes addressed and this again highlights the non-normality in private real estate returns relative to liquid asset classes.

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Figure 23 Summary statistics

Asset	Mean	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Prob
FT All Share	1.6%	22.4%	-19.5%	8.4%	-0.3	3.0	0.9	0.64
FT All Govt Bonds	1.5%	10.2%	-3.8%	2.9%	0.7	3.5	4.9	0.09
Unlisted Real Estate Funds	1.6%	7.1%	-11.5%	3.2%	-1.9	7.4	84.7	0.00
Unlisted Real Estate Funds - Unsmoothed	1.6%	16.4%	-23.8%	6.1%	-2.1	10.5	183.1	0.00
DC Real Estate Fund	1.8%	8.8%	-11.5%	4.0%	-1.3	5.0	26.1	0.00
DC Real Estate Fund - Unsmoothed	1.8%	15.3%	-20.1%	5.6%	-1.5	7.9	82.3	0.00

The correlation matrix in Figure 24 shows the negative relationship between both real estate exposures and bonds. When compared to equities the global listed real estate securities component of the DC portfolio, clearly leads to an increase in correlation. This is as expected given the greater correlation between listed real estate and broader equity markets, which is shown below. However, as can be seen in the rolling total return chart above this full period correlation coefficient masks significant changes in this relationship through the cycle. Whilst there are statistics methods available to address this, for instance using copulas to model relationships between asset classes, we do not have sufficient observations to utilize them efficiently.

Figure 24 Full sample correlation matrix

	FT All Share	FT All Govt Bonds	Unlisted Property Funds	DC Property Fund	Global Listed Funds
FT All Share	1				
FT All Govt Bonds	-0.35	1			
Unlisted Property Funds	0.36	-0.34	1		
DC Real Estate Fund	0.64	-0.32	0.82	1	
Global Listed Funds	0.70	-0.19	0.41	0.85	1

To assess the impact of including both real estate exposures within a multi asset portfolio we show the impact of including the real estate exposures to an existing UK equity and UK government bond portfolio with a 55%:45% weighting. This is based upon a recent survey of UK pension fund holdings (Towers Watson (2013)). We recognise that this is a stylistic exercise in that other global and alternative asset classes are excluded from the analysis.

Whilst the sample's historical data has been used to estimate correlations and volatilities, we have not used the historic asset class returns given the equity market performance seen over the period. Instead we have used long term return expectations. For bonds we have assumed an expected return of 4.0% p.a. and an equity risk premium over this of 4% p.a.. These have then been adjusted for passive management fees of 0.10% for bonds and 0.15% for equities. A 6.25% p.a. return expectation has been assigned to UK unlisted real estate funds and 7.0% to the DC real estate product.

Whilst portfolio optimization studies tend to suggest very high real estate allocation, this type of analysis excludes the relative illiquidity of real estate which is a key risk consideration. To assess the benefits of including real estate in a multi asset portfolio we show the multi-asset portfolio and its corresponding risk-return statistics, including 10% and 20% allocations to both forms of real estate exposure. This level of allocation is not uncommon, although allocations of 5-10% are more typical. By way of example NEST has allocated 20% to real estate which is likely to reduce to 15% over time as other real assets are included.

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Figure 25 Asset allocation – risk return tradeoffs unadjusted unlisted funds data

	Asset Allocation				
	55.0%	49.5%	49.5%	44.0%	44.0%
FTSE All-Share Index	55.0%	49.5%	49.5%	44.0%	44.0%
FTSE Actuaries Govt Securities	45.0%	40.5%	40.5%	36.0%	36.0%
UK Unlisted Funds		10.0%		20.0%	
DC Real Estate Fund			10.0%		20.0%
Expected Return	6.1%	6.2%	6.2%	6.3%	6.3%
Volatility	8.7%	8.0%	8.3%	7.4%	8.0%
Sharpe Ratio	0.41	0.46	0.44	0.51	0.47
Modified VaR	-5.3%	-4.8%	-5.1%	-4.4%	-4.9%
Modified Sharpe Ratio	0.17	0.19	0.18	0.21	0.19

Figure 26 Asset allocation risk return tradeoffs – unsmoothed unlisted funds data

	Asset Allocation				
	55.0%	49.5%	49.5%	44.0%	44.0%
FTSE All-Share Index	55.0%	49.5%	49.5%	44.0%	44.0%
FTSE Actuaries Govt Securities	45.0%	40.5%	40.5%	36.0%	36.0%
UK Unlisted Funds		10.0%		20.0%	
DC Real Estate Fund			10.0%		20.0%
Expected Return	6.1%	6.2%	6.2%	6.3%	6.3%
Volatility	8.7%	8.1%	8.4%	7.8%	8.2%
Sharpe Ratio	0.41	0.45	0.44	0.48	0.46
Modified VaR	-5.3%	-4.8%	-5.0%	-4.6%	-4.9%
Modified Sharpe Ratio	0.17	0.19	0.18	0.20	0.19

Firstly the results in Figures 25 and 26 demonstrate that portfolio risk-returns are improved when incorporating a real estate exposure. When addressing valuation smoothing this impact marginally declines. Given that we are only including 10-20% exposures to real estate the overall impact was always likely to be relatively small.

However, the key conclusion here is that based upon typical investor allocation to real estate, the DC real estate product is still able to provide diversification benefits to investor portfolios. For example when assuming a 20% real estate allocation and unsmoothed unlisted fund returns, overall portfolio volatility reduces by 0.5% (a 5% reduction) versus 0.9% (a 10% reduction) for unlisted funds. Again, due to the presence of a listed component the DC product sees its risk-return benefit decline when compared to a pure real estate allocation, but it is nonetheless still there. This analysis ignores the additional liquidity benefit provided but from a pure expected performance perspective we have quantified the trade-offs faced by DC investors.

8) Conclusions

A number of funds have the ability to include listed real estate in their portfolio but choose not to do so. Similarly a number of investors do not regard listed real estate as part of their real estate allocation. These results demonstrate very clearly how the returns of a portfolio of UK unlisted real estate funds can include (global) listed real estate funds without materially diminishing the diversification benefits of direct real estate yet enhance performance, in a very simple and straightforward manner. In addition we have answered a number of specific issues relating to the integration of a global listed real estate portfolio with a UK unlisted portfolio, namely:

* **Return enhancement:** Over the past 15 years a 30% listed real estate allocation has provided a total return enhancement of 19% (c. 1% p.a. annualised) to our unlisted real estate portfolios. Over the past 10 years this was 43% (c. 2% p.a. annualised), a result which is consistent with the previous Consilia Capital study. Over five year the enhancement is c. 4% p.a. annualised, amounting to +390% in absolute terms).

* **Risk adjusted impact:** The price of this enhanced performance and improved liquidity profile is, unsurprisingly, higher portfolio volatility, of around 2% p.a., from 6.4% to 8.4%. However, because of the improved returns, the impact on the Sharpe ratio is limited.

* **Tracking Error.** We found that there is an additional 4% tracking error cost vs. the direct UK real estate market when including 30% listed allocations. We believe that this is surprisingly small given that the listed element comprises global rather than purely UK stocks. We also find that c. 1.3% tracking error arises for a well-diversified unlisted portfolio highlighting that pure IPD index performance is unachievable. This tracking error rises to 2% if subscription costs are included.

* **Currency impact:** We found that the annual difference in returns and volatility between a hedged and an unhedged global listed portfolio over the 15 year period of the study was not material.

* **Cash drag:** We found that the impact of adding a 5% cash buffer to the portfolio was to reduce annualised returns over the period by 0.6%, from 7.7% p.a. to 7.1%, and reduce volatility from 8.4% to 8%.

* **Risk attribution:** While the volatility of listed exposure is well-known, it is equally well-recognised that the true volatility of unlisted funds is greater than commonly stated. We refined our measurements for risk by accounting for non-normalities and valuation smoothing and found that unlisted funds contributed to a greater share of overall risk.

* **Portfolio contribution.** We modelled the impact of using our DC Real Estate Fund rather than 100% unlisted exposure in a mixed asset portfolio of equities and bonds. The impact was extremely similar, and marginally better if unsmoothed data was used as a comparable, modestly raising the Sharpe ratio for the mixed asset portfolio over the 15 year period, whether a 10% or 20% real estate weighting was used.

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