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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PURPOSE OF THE STUDY

- DC pensions market becoming increasingly prominent and have liquidity requirements which are challlenging for alternative assets classes
- One of the key challenges for both asset allocators and product developers is how to provide real estate exposure in a mixed asset portfolio with acceptably high levels of liquidity and low levels of cost.
- Clearly, a 100% exposure to unlisted funds or direct real estate would not be expected to meet this demanding criteria.
- 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 which highlighted both the rationale for real estate in DC funds, and specifically, the use of a blended product by NEST, 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.

KEY RESEARCH QUESTIONS

- **Return enhancement:** What is the "raw" performance impact of adding listed real estate to an unlisted real estate portfolio?
- **Risk adjusted impact:** What is the resulting impact upon real estate portfolio Volatility, Sharpe Ratio and downside risk?
- **Tracking error**: Does adding a global listed element significantly increase the tracking error of the portfolio relative to a UK direct property benchmark?
- **Cash & costs drag:** What is the impact on investor returns and volatility from adding cash and transaction costs?
- **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 PRIOR STUDIES

- We have taken actual fund data rather than index data i.e. we are analysing deliverable returns to investors 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 including the typical bid-offer spread for UK unlisted real estate funds

- 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)

- 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 risk-return impact of incorporating a real estate asset exposure for a specific investment requirement, namely the UK DC pension fund market and how this specific real estate solution would impact UK multi-asset portfolios

DATASET

- To reflect realistic investor returns this study uses actual fund data rather than index data i.e. we are analysing deliverable returns to investors which has minimal implementation issues at a practical level

- **UK unlisted real estate funds**: five funds were selected which reinvest income. Performance over the past 15 years was provided by IPD. 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 the subscription/redemption costs, but is calculated net of management fees and fund running costs

- **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.

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

METHODOLOGY

- This study was split into three sections:

1. **An overview of blended Real Estate DC Fund performance through the cycles**. We firstly explore the short run risk and return dynamics using monthly frequency data. We believe he past 15 years can be characterized by four separate phases where economic and capital market conditions have materially differed
2. **Decomposition of Blended Real Estate DC Fund risk-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. Other considerations include the effect of valuation smoothing and substituting underlying unlisted and listed fund performance depending upon their relative performance
3. **Blended Real Estate DC Funds in a mixed asset portfoli**o. 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

- To create a realistic DC Real Estate Fund peformance profile, synthetic portfolios were rebalanced on a quarterly basis so as to meet target allocations (including cash). This took account of resultant transaction costs including the typical bid-offer spread for UK unlisted real estate funds. This informaiton was sourced from the Townsend Group.

DOWNSIDE RISK ESTIMATION

- It is well understood (e.g. e.g. Young (2008)) that real estate returns are non-normal. The real estate data used in this study shows a marked departure from the assumption of normality as shown by the Jarque-Bera Normality Test

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

- 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.

- As a result this study seeks to better understand investor downside risk and so employ the Modified VaR measure which is attributable to four components – return, volatility, skewness and excess kurtosis

$$Modified\ VaR = \underbrace{\mu + \sigma c_v}_{Normal\ VaR} + \sigma\left(\frac{1}{6}(c_v^2 - 1)s - \frac{1}{36}(2c_v^3 - 5c_v)s^2\right) + \sigma\left(\frac{1}{24}(c_v^3 - 3c_v)k\right)$$

Where μ is the mean return, σ is the volatility, c_v is the confidence interval, s is skew and k is excess kurtosis

- Used a denominator to calculate the Modified Sharpe Ratio

DOWNSIDE RISK ATTRIBUTION

- Boudt et al (2008) have shown that Modified VaR is linear-homogenous and thus can be attributed further to show an asset's marginal contribution (weight w) to the above four statistical components

$$Return\ Contribution\ From\ Asset\ i = w_i \mu_i$$

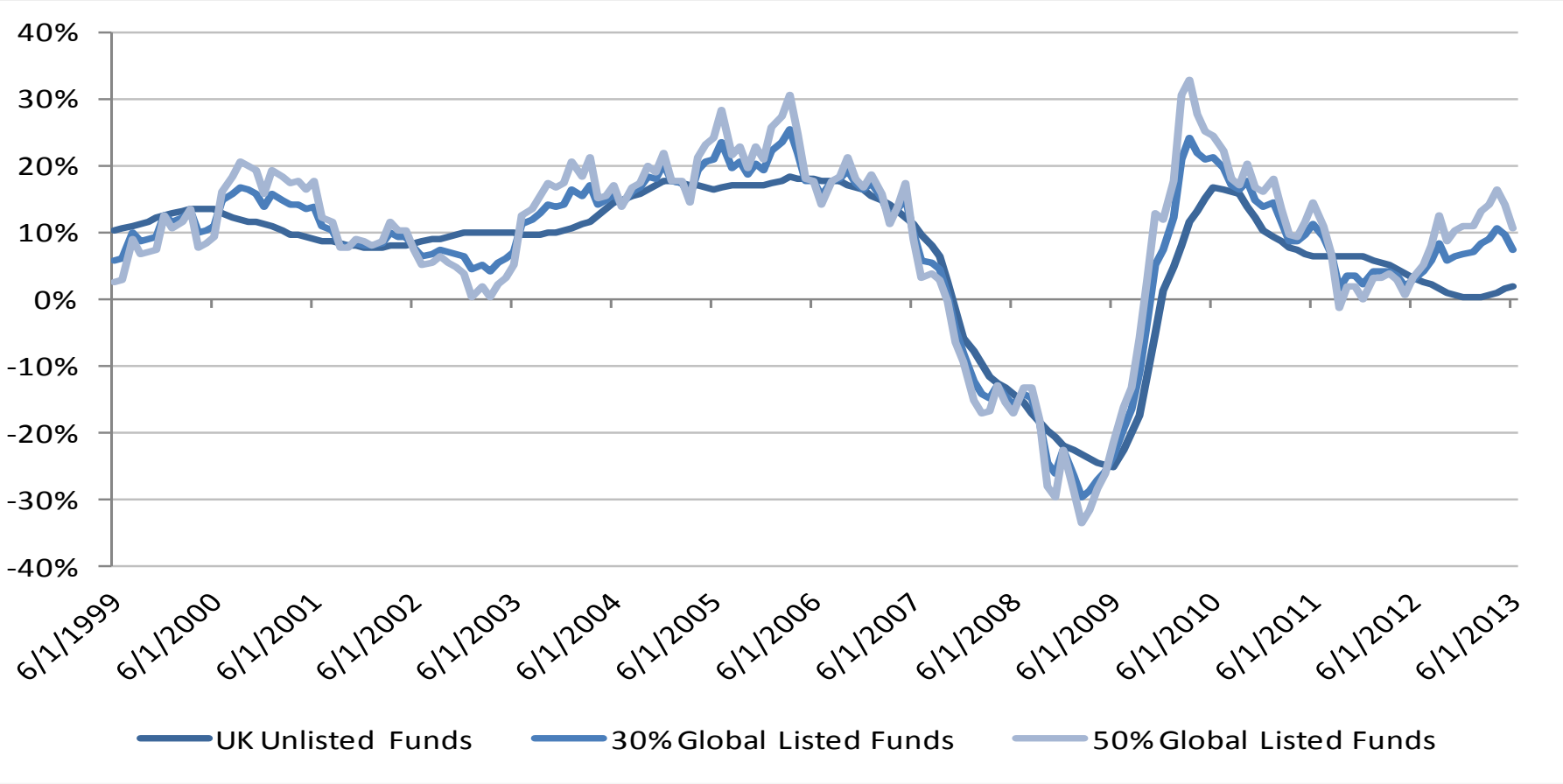
$$Volatility\ Contribution\ From\ Asset\ i = w_i + \frac{2(\Sigma w)_i}{\sqrt{w_i' \Sigma w_i}} c_v$$

$$Kurtosis\ Contribution\ From\ Asset\ i = \frac{2(\Sigma w)_i}{\sqrt{w' \Sigma w}} \left(-\frac{1}{48}(c_v^3 - 3c_v)k_I\right) + w_i \sqrt{w' \Sigma w} \left(-\frac{1}{24}(c_v^3 - 3c_v)\frac{\partial k_I}{\partial w_i}\right)$$

$$Skewness\ Contribution\ From\ Asset\ i = \frac{2(\Sigma w)_i}{\sqrt{w' \Sigma w}} \left(-\frac{1}{12}(c_v^2 - 1)s_I + \frac{1}{72}(2c_v^3 - 5c_v)s_I^2\right) + w_i \sqrt{w' \Sigma w} \left(-\frac{1}{6}(c_v^2 - 1)\frac{\partial s_I}{\partial w_i} + \frac{1}{18}(2c_v^3 - 5c_v)s_I \frac{\partial s_I}{\partial w_i}\right)$$

- Thus we can attribute the real estate conduits' risk contributions into their respective statistical attributes – not just focused on volatility which tends to penalize listed real estate vs private from a risk perspective

FINDINGS - RETURNS (ROLLING 12 MONTHS TR)



FINDINGS - RETURNS (ROLLING 12 MONTHS TR)

Cumulative Total Returns

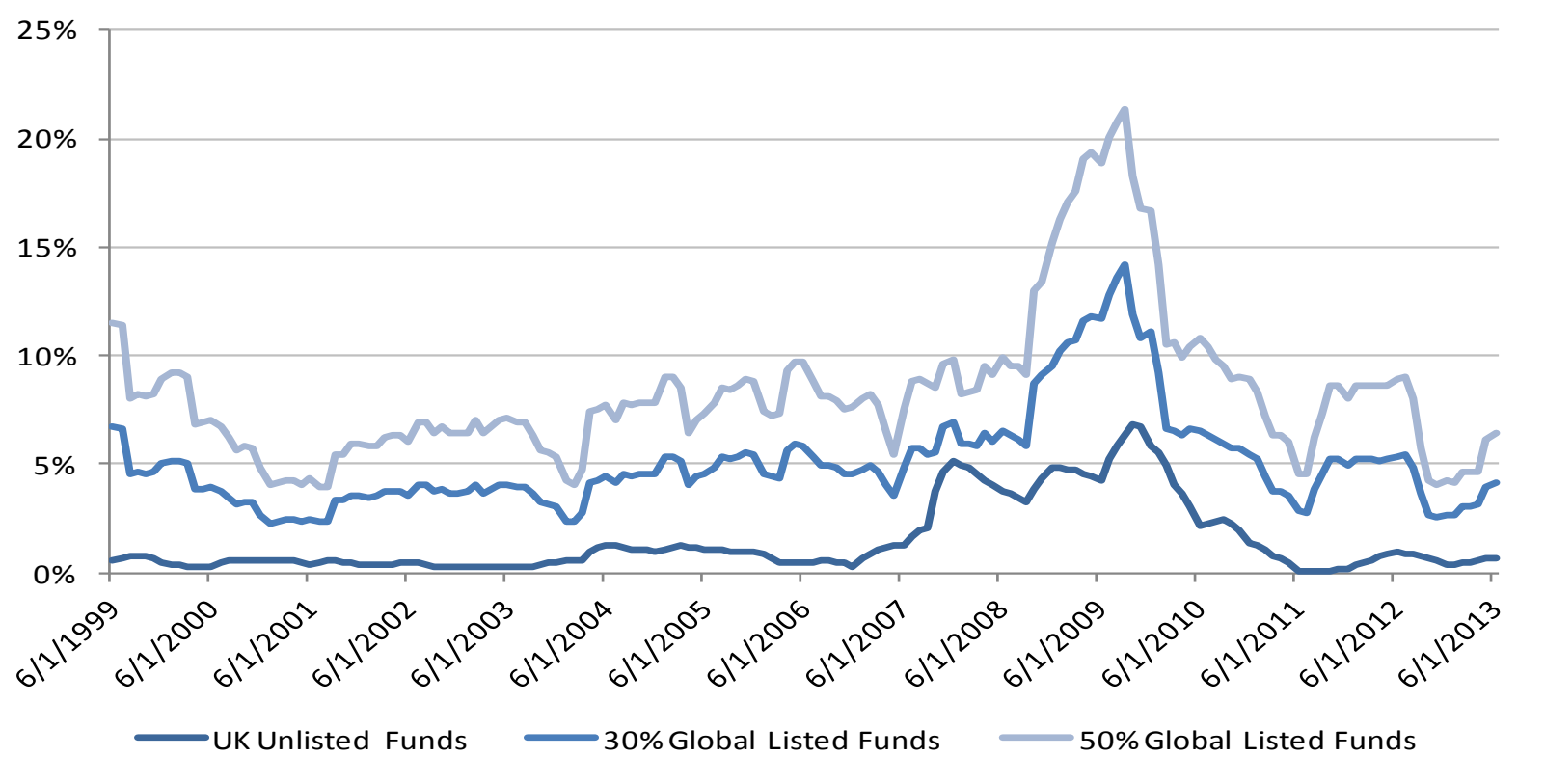
Period	Dates	Total Returns			
		UK Unlisted Funds	Global Listed Funds	70:30	Return Enhancement From Adding Listed
TMT Boom & Crash	June 1998 - June 2003	65.5	33.9	56.0	-14.4%
Rising UK Property Values	July 2003 - June 2007	81.7	107.7	88.4	8.2%
Global Financial Crisis	July 2007 - June 2009	-33.0	-34.5	-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%**

Annualized 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%**

- 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). Over five years the enhancement is c. 3% p.a. annualised, amounting to +390% in absolute terms

FINDINGS - RISK (ROLLING 12M VOLATILITY)



ROLLING RISK MEASURES

Annualized 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%**

Annualized 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%**

- Outside of the GFC period the volatility pattern remained broadly consistent.
- Tracking-error noticeably increased during the GFC, for all real estate conduits considered
- 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%.

15 YR BLENDED DC REAL ESTATE PORTFOLIO RISK-RETURN

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	0.31	0.30
Information Ratio - IPD Monthly Index	-0.34	-0.42	0.08	-0.02

- Transaction costs and cash drag inhibit performance over the period
- Sharpe ratio measures largely unchanged as listed is included in the portfolio – the incremental returns have compensated for the incremental risk

SMOOTHING ISSUE

Annualized Total Returns and Performance Volatility

	June 1990 - June 2013 Annualized Mean	June 1990 - June 2013 Annualized Volatility	June 1998 - June 2013 Annualized Mean	June 1998 - June 2013 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%

- Annualized volatility materially increases when measuring performance on an annual basis when compared to using quarterly performance numbers

$$Rt\ (Unsmoothed) = (Rt - \alpha\ Rt\text{-}1) / (1- \alpha)$$

Where α is a coefficient which adjusts for first order serial correlation in the data

- For the purposes of this study we set α to a value 0.65 which unsmoothes the unlisted fund data such that quarterly volaility is equal to the estimated annual volatility above of c. 12%

15 YR BLENDED DC REAL ESTATE PORTFOLIO RISK-RETURN

Unadjusted vs. Smoothed Unlisted Fund Returns Performance Imapct

	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

15 YR BLENDED DC REAL ESTATE PORTFOLIO RISK-RETURN DECOMPOSTIONS

Unadjusted Unlisted Fund Returns

	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%**

Unsmoothed Unlisted Fund Returns

	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%**

- 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
- When accounting for non-normaility and the smoothing impact, the contribution to risk is broadly in line with the allocation to the respective real estate investment conduits

ASSET ALLOCATION - I

- Asset allocation analysis is used to assess the long-term benefits of incorporating a real estate exposure in a multi-asset portfolio. Summary quarterly statistics and correlation matrix as follows:

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

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

- For the expected return we employ the following long term asset class return expectations:
  - Bonds: 4.0% p.a.
  - Equities 8.0% p.a.
  - Unlisted real estate funds 6.25% p.a.
  - DC real estate fund 7.0% p.a.

ASSET ALLOCATION - II

- Results of including more realistic real estate allocations (vs optimizer outcomes) in a multi-asset portfolio are as follows:

Unadjusted UK Unlisted Real Estate Fund Returns

	Asset Allocation				
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

Unsmoothed UK Unlisted Real Estate Fund Returns

	Asset Allocation				
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

- Overall portfolio risk-returns are improved when incorporating a real estate exposure. When addressing valuation smoothing this impact marginally declines
- 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

CONCLUSIONS AND NEXT STEPS

- We believe that this study demonstrates the benefit of incorporating a listed real estate element to the real estate allocation.
- In addition to enhancing performance, this satisfies the market product requirements for liquidity and low cost
- Risk decomposition analysis highlighted that if downside risks are considered the incremental risk of including listed real estate is overstated when focussing solely on volatility
- DC Real Estate solutions would still provide good diversification benefits to multi-asset portfolios
- We believe that the next steps in the evolution of this integrated approach will be related to the listed element of this hybrid approach
- In particular we expect them to revolve around the use of smart beta strategies, active tilts and mechanical trading rules rather than a simple buy and hold strategy be it active or passive

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