Can real estate investors avoid specific risk?

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Abstract

Using modern portfolio theory, the traditional asset allocation process employs measurements of risk and return delivered by asset classes –for example, stocks, bonds and real estate - to build efficient portfolios. To build efficient portfolios in practice using this type of analysis requires that the risk and return characteristics of the asset class can be replicated in real portfolios. This may be true of stocks and bonds, but is it true of real estate?

Using new analysis coupled with previous UK-based research based on the uniquely rich MSCI (IPD) dataset for UK direct real estate, this paper compares the risk and return characteristics of real estate investment approaches (direct exposure, balanced and specialist unlisted funds, a multi-manager approach and listed securities) relative to a UK market index. Based on a random stochastic simulation of historic performance data from 2003 to 2012, we draw several conclusions.

Firstly, the difficulty of diversifying away specific risk in such a lumpy asset class means that it is extremely difficult and/or costly to access or replicate direct property market returns. This suggests that an investor/manager setting out to deliver returns in line with a market index would have to demonstrate significant levels of skill. Secondly, listed real estate, which is more readily diversifiable, fails to deliver returns that are correlated with direct real estate in the short term (one to five years). In contrast, it is clear that multi-manager strategies were able to deliver returns that more effectively replicated a direct benchmark.

However, multi-manager fees negatively impacted on returns and largely accounted for average under-performance of 0.15% against the direct benchmark. While it is estimated that over a 10 year analysis period both direct and listed investment strategies out-performed multi-manager strategies (by 121 bps and 59bps per annum respectively), this out-performance would have been delivered at the cost of significant tracking error against direct property benchmarks. Specific risk can be avoided by real estate investors, but at a cost.

1. Introduction

Using new analysis coupled with previous UK-based research based on the uniquely rich MSCI (IPD) dataset for UK direct real estate, this paper compares the risk and return characteristics of real estate investment approaches (direct exposure, balanced and specialist unlisted funds, a multi-manager approach and listed securities) relative to a UK market index. Based on a random stochastic simulation of historic performance data from 2003 to 2012, we will test a series of hypotheses about the risk and return characteristics of multi manager and fund of fund solutions.

Using modern portfolio theory (MPT), the traditional asset allocation process employs measurements of risk and return delivered by asset classes - stocks, bonds, real estate - to build efficient portfolios. MPT reflects the desire of investors to achieve higher returns, low individual asset risk and (more importantly) a smooth return on the entire portfolio. Asset allocation advice has, since the acceptance of MPT, traditionally required a view on three values: the likely future return on an asset class; its risk (usually defined as volatility and measured in units of standard deviation of return over a given period); and its correlation with other asset classes. This last factor measures the extent to which upward and downward movements in the values of two variables are linked together.

MPT has both led to, and has been further encouraged by, the development of asset allocation models. Strong prospective returns, coupled with low standard deviation of returns and a low correlation with equities and government bonds, would provide a very strong argument for holding an asset. When assets are combined in a portfolio, the expected return of a portfolio is the weighted average of the expected returns of the component assets. However, unless the assets are perfectly correlated the portfolio risk is not the weighted average: it is determined by the correlations of the component assets. The way in which asset returns co-vary is central to portfolio risk, as low covariance produces diversification opportunities.

MSCI/IPD's UK annual index provides the longest available run of consistent annual data describing the performance of a well-diversified portfolio of real properties. The results show the following:

- Property returns have been below the return on equities but competitive with the return on government bonds.

- Property volatility has been less than the volatility of equities and comparable to that of government bonds.

- Property returns have been less well correlated with returns on equities and government bonds than returns on equities and government bonds have been correlated with each other. In other words, while equities and government bonds have usually performed well or badly at the same time, property has outperformed or underperformed at different times, thus smoothing out the overall performance of a portfolio with assets of all three classes.

To build efficient portfolios in practice using this type of analysis requires that the risk and return characteristics of the asset class can be replicated in real portfolios. This may be true of stocks and bonds, but is it true of real estate?

Commercial real estate is a large part of the universe of potential investments presented to global investors. As PREA (2013) suggests, it is very difficult to measure the size of the market exactly; but a report from the US-based Prudential, 2012, estimates the size of the global institutional-grade commercial real estate market as being over $26 trillion. (Other updated estimates put this figure at $32 trillion, according to Baum, 2015.) For comparison, the end-of-2012 total market capitalization of publicly traded equities was $55 trillion (World Bank, 2015). If we had no view of its likely risk or return attributes, its size as an asset class suggests that commercial real estate should be seriously considered as a significant part of any investor's portfolio, say around 50% of the typical equities allocation, which (in the UK, for example) has varied between 40% and 80% of all assets over time (NAPF, 2013).

Within this $32 trillion, the listed universe (the gross asset value of property owned by REITs and listed property companies) comprised around $4.4 trillion or 14% of the investable universe at 2015, and the global unlisted property market universe, valued in 2015 at around $2.8 trillion, was estimated to comprise around9% of all global investable property (Baum, 2015).

The development of indexes and benchmarks which measure the performance of real estate has been an extremely helpful contribution to our understanding of the risk and return characteristics of this asset class. The NCREIF Property Index in the USA and the work of IPD/MSCI in several countries allows asset allocators to form risk and return expectations founded on data, albeit flawed data. While 'valuation smoothing', which reduces apparent price volatility and distorts the reported returns, produces a limitation on the value of this information - see, for example, Barkham and Geltner (1994) - investors continue to use this data as the basis of asset allocation modelling. However, we and others observe two further limitations to the usefulness of this data.

First, an issue which is directly connected with valuation smoothing is the illiquidity of real estate, which creates difficulties for investors/asset allocators struggling with the challenges involved in mixing traded

securities with privately traded assets. Listed equity real estate – shares in real estate investment trusts (REITs) and non-REIT property companies – become attractive in this context. However, the performance of listed real estate stocks is believed to have characteristics that differ from that of direct, illiquid real estate. Research and analysis suggests that real estate stocks are much more volatile than (smoothed) private real estate, that real estate stock prices might lead the price of private real estate with a lag of 6-12 months, and that there is little or no correlation between the returns on public and private equity real estate over rolling periods of up to (say) five years. Thereafter, over periods of more than five years, public and private real estate might behave more similarly. These issues have been well documented by Clayton and MacKinnon (2003), Pagliari, Scherer and Monopoli (2003); Hoesli and Oikarinen (2012) and others (see Section 2). We can expect that the tracking error of listed real estate portfolios against a direct benchmark will be very large.

Second, it is widely accepted that portfolios comprising private real estate will likely contain significant specific risk. Real estate is said to be a 'lumpy' asset, with large and non-standard lot sizes. The sampling that takes place in the assembly of a private real estate portfolio is largely without replacement, because one asset cannot generally be shared between two owners (which is not true of divisible listed securities). These characteristics, when taken together, mean that a typical real estate portfolio will not be large enough to be well-diversified and will exhibit a significant tracking error against an index or universe of private real estate. This issue has been explored most in the UK context by, among others, Morrell (1993); Lee and Byrne (2001); Baum and Struempell (2005); and Devaney, Callendar, Sheahan and Key (2007).Hence, we can expect that the tracking error of direct real estate portfolios against a direct benchmark will be significant and will vary inversely with portfolio size.

These limitations on the usefulness of private real estate universe data provide significant challenges to investors. The universe data describes performance characteristics for the asset class that, according to the literature referred to above, cannot be captured by investors in direct real estate (because of the specific risk they take on) or by investors in real estate equity securities (because of the short to medium term divergence in returns between public and private real estate markets).

Recently, a new form of access to real estate has become possible through the growth of the unlisted real estate fund. Baum and Struempell (2006) found that over £1bn is needed to build a diversified portfolio of London offices with a 2% tracking error. This presents a very strong case for using an unlisted fund focussed on London offices. Assuming that such a fund is financed by equity alone, 20 investors committing £50m each will produce enough capital to achieve the diversified fund. Yet the investor's £50m is enough to buy only two or three London offices of average lot size.

Kennedy and Baum (2011) suggested that some unlisted funds – including highly leveraged value-add or opportunity funds and funds focussed on debt - are likely to be sufficiently non-correlated with direct property indexes as to cause significant difficulties for asset allocators. We use the term *core funds* to describe unlisted real estate funds which do not invest in debt and are not value-add/opportunity funds. Bearing this limitation in mind, we can suggest that core unlisted funds will diversify away much of the specific risk held by direct portfolios.

The development of the unlisted fund has expanded the apparently investable real estate universe, and with it has come the multi-manager proposition (a separate account portfolio by means of which an investor's capital is spread across a number of unlisted real estate funds) and funds or funds (a similar proposition, but in a fund format and thereby pooled between a number of investors), with the result that professional investors now select from a variety of routes to exposure (see, for example, Andonov, Kok and Eicholtz, 2013; Baum and Hartzell, (2011); and Baum (2015). In this research, therefore, we set out to examine a set of approaches to real estate exposure suggested by, among others, Baum and Hartzell (2011). These are: investing directly in real estate assets; investing in REITs and listed property companies; investing directly in core unlisted funds; and investing indirectly in core unlisted funds using a multi-manager approach.

This paper employs a random stochastic simulation of historic performance data from 2003 to 2012 in order to test a series of hypotheses about the risk and return characteristics of multi manager and fund of fund solutions. Using these results we compare the risk and return characteristics of real estate investment approaches (direct exposure, balanced and specialist unlisted funds, a multi-manager approach and listed securities) relative to a UK market index.

2. Relevant literature

Valuation smoothing, illiquidity and lumpiness are referred to in Section 1 as the three major problems facing real estate investors who seek to access the return characteristics of private real estate as described by the accepted MSCI and NCREIF benchmarks. Over the last ten years, considerable attention has been paid to these problems in academic literature, and this literature helps us to further develop our hypotheses.

2.1 Direct real estate

We can hypothesise that direct real estate portfolios are likely to contain significant specific risk and that increasing the number of assets held in a portfolio will produce lower levels of risk. Research into the relationship between portfolio size and risk in the UK market was conducted by both Baum and Struempell (2006) and Callender *et al* (2007). Baum and Struempell (2006), using individual asset time-weighted returns data from the IPD UK database, employed longitudinal analysis between 1990 and 2004 for the different property segments as defined by IPD. Their results showed that shopping centre portfolios required the

smallest number of assets (11 individual assets) to reduce within-segment tracking error against the IPD universe to 2%, with the central London office segment requiring 80 assets, the highest number for any market segment. Accounting for average segment lot sizes the retail warehouse and central London office sectors required the largest capital outlays of £1.0 billion and £1.2billion respectively to construct portfolios with a 2% tracking error.

Callender *et al* (2007) conducted a similar analysis but also applied cross-section analysis in addition to a longitudinal analysis. The cross-section study was conducted between 1981 and 2004 with the sample size ranging from 11,000 assets in 2004 to 15,000 in earlier years. The longitudinal analysis was conducted between 1994 and 2004, and comprised a sample of 1,728 assets. This research applied simulation analysis and constructed hypothetical portfolios using individual asset returns. The authors found that cross-section return dispersion (the standard deviation of annual total returns) declined as the number of assets held in a portfolio increased with a 10 asset portfolio reducing individual asset dispersion risk by 65-75% and 100 assets reducing this further to 85-90%. The longitudinal analysis found the correlation between individual assets to be very low at 0.18, although there was wide variation around this. The average asset correlation with the IPD All Property Index was found to be 0.41, but this value increased only marginally when individual assets were compared to their respective market segment performance indices. This is consistent with the findings of Devaney and Lizieri (2005), who found that market segmentation had weak explanatory power in determining asset returns. Callender *et al* (2007) found that only 13 assets were required to reduce property risk by 80% and only 30 were need to reduce this further to 90%. However, the authors found that much larger portfolios were required to track the market with an investor who wants to reduce tracking error to 2% requiring approximately 60 assets, and a 1% tracking error target requiring in excess of 250 assets.

A recent study by Mitchell (2015) conducted a follow up study to the work published by Callender *et al* (2007)using data covering the period from 2002-2013, and found that the volatility of returns had increased significantly when compared with the 1994-2004 time period with an average standard deviation for a portfolio of 50 assets of 12.7% compared to the 4.7% reported by Callender. One significant difference between the two studies is that portfolio risk through the 2002-2013 time period was more associated with market rather than asset level risk and as a consequence an investor would have required fewer assets than implied in Callender to achieve a similar level of total risk present in the benchmark returns. The Mitchell study reported similar results to Callender with tracking errorsof 3.7% compared to 4.1%in a 10 asset portfolio, and 1.7% in comparison to 2.1% for a portfolio of 50 assets. Mitchell (2015) concluded that it was not clear whether the small reductions in estimated tracking errors were the result of differences in methodology or a fundamental change in property market characteristics.

A study using US market data by Fisher and Goetzman (2005) adopted a different approach by using property cashflow data for assets acquired and disposed between 1977 and 2004, thereby removing the impact of valuation smoothing on returns. The use of cashflow data also meant that the authors could analyse internal rates of returns rather than time-weighted rates of return. They also used a simulation analysis to construct random portfolios and found that portfolios with greater numbers of assets exhibited lower levels of volatility.

Research into the direct market provides clear evidence that by increasing the number of assets held in a portfolio an investor will experience lower levels of risk. To achieve lower levels of risk requires significant amounts of capital that is available to only the largest investors with a reduction in tracking error proving to be particularly capital intensive.

2.2 REITs

We can hypothesise that long-run REIT market performance is likely to be more closely related to the direct real estate market than to the general stock market. Hoesli and Oikarinen (2012)follow the findings of studies by Pagliari *et al* (2005) and Ling and Naranjo (2014) in which returns were adjusted for the impact of appraisal smoothing, leverage and differences in sector composition, and no notable difference was found between the return means and variances of the NCREIF and NAREIT indices between 1993 and 2001.Consequently, REITs and direct real estate should be relatively good substitutes in a long-horizon investment portfolio. However, we can also suggest that the short term returns on REITs are not highly positively correlated with short terms returns on direct real estate; this is well documented by, among others, Baum and Hartzell(2012). Given that REITs are securities traded on major stock exchanges, the short term volatility of these markets imposes itself on short term REIT returns, creating a divergence away from the influence of pure property market performance.

2.3 Unlisted funds

We know less about the performance of unlisted funds and (especially) portfolios of unlisted funds, although research into the cost and returns of different investment strategies was conducted by Andonov *et al* (2012). This research analysed the real estate returns of 844 pension funds domiciled in US, Canada, Europe, Australia and New Zealand over a 20 year period (1990-2009). The authors found that larger pension funds are more likely to invest via an internal management team and this approach was associated with lower costs and higher gross performance than investing via external managers. Smaller pension funds were more likely to invest through funds of funds and this typically meant significantly higher fees and significant under-performance against an investor specific benchmark on both a gross and net of fee basis. For instance, US pension funds investing via a fund of funds approach under-performed on a net of fee basis compared to the benchmark by 3.76% compared to an under-performance of 1.29% when investing via external fund managers (whereby the investor decided in which funds to invest). The authors also noted

that listed real estate investment strategies had the lowest average cost of 41bps compared to the fund-of-funds strategy (highest) where the average cost was 182bps. The authors also reported some evidence that the listed strategy had out-performed the investor-specific benchmark on a gross of fee basis although out-performance at the net of fee level was statistically insignificant.

This research and the consequent findings are somewhat flawed. The authors suggested that smaller investors would be better investing in real estate through REITs rather than via external direct fund managers, and in particular funds of funds. However, the research does not attempt to quantify the relative risks of these investment strategies and the extent to which the delivered returns reflect the performance of the underlying direct real estate market. The fund of funds sample is also limited to the experience of a small number of US pension funds investing via this strategy, and it perfectly possible that the performance of a statistically insignificant and under-performing number of funds of funds has been multiplied in importance by the sampling method used (one pension fund investing in a fund of funds is reported as one performance result; another pension fund investing in what could be the same fund of funds is reported as a second result; and so on).

2.4 Mutual funds and funds of funds

Being reasonably modern creations, published research examining the performance of real estate funds of funds is hard to come by Andonov *et al* (2012), referred to above, is a rare example. To find any indication of the likely performance of property vehicles which pool funds together, we need to look more widely.

Mutual fund research provides a starting place. While REITs are not funds, they are investment vehicles, and we might expect the performance of REIT mutual funds to provide something of a guide to the risk characteristics of funds of other property funds. There have been numerous studies into the performance of US REIT mutual funds: these have provided mixed results as to whether managers have been able to demonstrate skill and out-perform benchmarks. As an example, Chiang *et al* (2008) compared the returns of REIT mutual returns against randomly-selected REIT portfolios and found that only 12 out of the 54 mutual funds studied delivered returns superior to the 95th percentile of returns generated by randomly-constructed REIT portfolios. This, like Andonov *et al*, is not encouraging.

Private equity funds of funds are another close analogy to a real estate fund of funds. Weidig *et al* (2005) examined the potential performance of private equity funds of funds by constructing random portfolios of venture capital funds covering the period 1983-2004. The authors found that distributions of fund-of-fund returns were less skewed and had thinner tails than the distribution of individual fund returns. The risk as measured by the standard deviation of returns was also lower for the fund of funds investment strategy, with the standard deviation for the US sample falling from 54.47% for single funds to 5.53% for the fund

of funds approach. The study also found that the level of idiosyncratic risk reduced as the number of funds held in the portfolio increased. These findings are more in line with expectations.

However, other than the study by Andonov *et al* (2012) very little reported research has been conducted into the performance of multi-manager/fund-of-fund strategies invested specifically in unlisted real estate funds. Hence we believe that more detailed analysis on the risk and return characteristics of unlisted real estate funds, and especially portfolios of unlisted real estate funds, is required.

3. Hypotheses and data

Previous work has established that for investors wishing to replicate the risk and return characteristics of real estate as described by the standard index measure, direct real estate ownership suffers a problem, namely the difficulty of diversifying away specific risk. More easily diversified listed real estate suffers a different problem, namely a very large tracking error against the market index.

Since the early 2000s it has been possible to use unlisted funds - or a portfolio of core unlisted funds - to invest in real estate. Investing in a single fund has the advantage of simplicity, and if the choice of fund is random there is no cost involved in selection. This approach has a disadvantage, specifically the risk involved in choosing the wrong (low return or high risk) fund. Investing in a portfolio of funds, on the other hand, reduces this risk but may have a fee implication if a portfolio manager is employed to assemble and manage this exposure. We call this a multi-manager approach.

The research questions which arise are as follows: (i) do unlisted funds diversify away specific real estate risk? and(ii) are there any risk and return costs involved in this approach? Given the foregoing literature review, we can expect that the greater the number of funds held in a portfolio the lower will be the tracking error against a direct property benchmark, and that returns will fall as two sets of fees are incurred by investors following a multi-manager strategy.

3.1 Hypotheses

Through this review, we have arrived at a set of hypotheses, as follows.

Hypothesis 1: Core unlisted funds will diversify away much of the specific risk held by direct portfolios.

Hypothesis 2: The greater the number of funds held in a portfolio the lower will be the tracking error against a direct property benchmark.

Hypothesis 3: Returns will fall as two sets of fees are incurred by investors following a multi-manager strategy.

In Sections 4 and 5 we will describe a series of tests which we use to test these hypotheses. Each test will involve random sampling of returns in a controlled experiment. The particular aim of the research is measure the performance that might reasonably be expected from a randomised multi-manager solution relative to randomised investment in (a) direct real estate; (b) a single co-mingled fund; and (c) a separate REIT account.

3.2 Data

The analysis and tests which we propose to present in the following sections require good quality data and research results describing direct real estate returns; direct real estate specific risk; listed real estate returns; and returns for core unlisted real estate funds. There are very few markets for which this data is available, including the US, the UK and perhaps Australia. There is also a very limited time period for which this data is available, beginning around the year 2000. Only in the UK has direct real estate data been used to measure specific risk characteristics of portfolios, as at 2013; and in the UK we also have access to data over the period 2002-2012 covering direct real estate returns; direct real estate specific risk; listed real estate returns; and returns for core unlisted real estate funds. Hence we have used UK data for this period as our example of a global real estate market.

In this analysis we use historic returns delivered by UK funds and typical multi-manager fees as summarised in Tables 1-3; apply random fund selection; and suggest the level of return and risk likely to have been delivered by these strategies relative to an IPD benchmark. Fund returns are provided by The Association of Real Estate Funds (AREF). We use two AREF fund universes: the constituents of the AREF/IPD all-balanced UK property fund index (26 funds) and the AREF/IPD all-pooled UK property fund index (44 funds, including the 26 in the all-balanced universe). The former is focussed on diversified open-ended funds; the latter is a broader measure, including balanced funds and so-called specialist funds which are sector-specific and more likely to be leveraged, to be closed-ended and of limited life. We also compare these results with the levels of return and risk likely to have been delivered by a single fund, randomly selected; by two funds, randomly selected (the dual fund approach); by a portfolio of randomly selected direct real estate assets; and by a typical REIT manager.

Table 1: Purchase cost assumptions

Strategy	Initial Purchase Costs	Source
Direct	5%	CBRE GIP
Single Fund	5%	CBRE GIP
Dual Fund	5%	CBRE GIP
Multi-manager	5%	CBRE GIP

Listed	0.12%	Consillia Capital

Table 2: Management fee assumptions

Strategy	Annual Management Fee	Source
Direct	0.5% of NAV	CBRE GIP
Single Fund	Fund specific (no adjustment made)	n/a
Dual Fund	Fund specific (no adjustment made)	n/a
Multi-manager	0.25% NAV	CBRE GIP/PFR
Listed	0.50%	Consillia Capital

Table 3: Portfolio balancing fee assumptions

Strategy	Portfolio rebalancing fee	Source
Direct	n/a	
Single Fund	n/a	
Dual Fund	n/a	
Multi-manager	n/a	
Listed	0.12%	Consillia Capital

The analysis uses the AREF database of returns on pooled property funds from 2003 to 2012 to assemble random multi-fund portfolios (see Table 4). (The AREF fund level returns are only available at a net of fees level, so it is not possible to produce gross of fee comparisons across all of the strategies. The fund return data is calculated on an NAV basis only, so we cannot isolate the impact of leverage. This is also true of the listed REIT data.)

Table 4: Funds and simulation runs, multi-manager strategies

Multi-manager strategy	Number of funds in portfolio	Number of simulation runs
£25m	10	5,000
£50m	15	5,000
£100m	20	5,000

4. Method

The analysis is founded upon a controlled experiment rather than an empirical study. The results are therefore normative - demonstrating what *ought* to happen - rather than positive - demonstrating what *did*

happen. The nature of a controlled experiment means that many precise limiting assumptions have to be made. While we have calibrated these limiting assumptions with the practice of a leading multi-manager they remain assumptions and there can be no guarantee that the real world will mimic the experiment.

4.1 Invested capital

We assume separate account mandates of (i) £25m, (ii) £50m and (iii) £100m across all real estate investment types. For the multi-manager portfolio we assume a typical average exposure to each fund, thereby producing a target number of funds invested. The multi-manager portfolio is standardised with 10 funds in a £25m portfolio, 15 in a £50m portfolio and 20 funds in a £100m portfolio. This has been calibrated by reference to the average number of funds in typical multi-manager portfolios of these sizes.

4.2 Investment universe

The dataset we use for direct property is the IPD UK All Property Index. The dataset we use for property funds is the all-pooled UK property fund index (the balanced universe plus specialist funds) as at January 2003. We run this universe on a random basis, sampling from both the more restricted balanced fund universe and the broader pooled fund index. The investment universe for listed investments in the EPRA/NAREIT UK Index.

4.3 Benchmark

In all tests, the benchmarks used will be the annual total return of the IPD UK All Property Index to act as a proxy for direct market returns.

4.4 The multi-manager investment strategy

Portfolio simulation process

Stage 1: We use random (without replacement) fund selection to simulate a large (5,000) number of multi-fund portfolios. For each simulated multi-manager portfolio every underlying fund has an equal probability of selection and has equal weight at the beginning of the analysis period, so that in the £25m portfolio each fund is allocated an initial investment of £2.5m in the first year. No trading is assumed during the analysis period.

Stage 2: For each of the simulation runs we compute the mean 10 year returns relative to the benchmark, and the tracking error for each portfolio. We then average these results across the entire sample.

Stage 3: As we randomly select funds without replacement (so that no fund can be selected more than once in each portfolio) statistical inference might be compromised. We employ bootstrap re-sampling to mitigate this by providing confidence intervals for the average we calculated from the simulations. To calculate confidence intervals for the point estimates calculated in stage 2 we employ a bootstrap re-sampling

methodology whereby a further 1,000 re-samples of 5,000 observations are created by selecting random (with replacement) observations of the statistic of interest from the sample of portfolios calculated in stage 1. This will provide a distribution of re-sampled means from which 95% and 99% confidence intervals can be calculated. For instance, the 97.5% and 2.5% percentiles will act as the upper and lower bounds for the 95% confidence level.

Simulation model: parameters and return calculation methodology

Fees

Multi-manager fees are defined as 0.25% of net asset value (NAV) and are deducted annually using the NAV at the start of each respective year and deducted from income return. Fee levels are assumed to be uniform across mandate size and strategy. The cost of entering a fund is defined as 5%, so that a £100m investment will cost £105m, with £105m set as the starting value of the investment. This reflects a typical entry price spread. We deduct typical or industry average fees from returns in each case. Funds and properties are acquired using a standard acquisition spread of 5% and are held to the end of time period without a sale fee or spread. No adjustments are made to the spread to take account of fund gearing, as it is assumed that fees will be partially capitalised and fund NAVs will reflect this distortion.

Closed end funds

All capital is drawn down at the same time for each fund regardless of the fund being open-ended or closed ended. For open-ended funds this is not an issue, but with closed-ended funds it is assumed that the investment is made at a 'second close' at the end of the launch year. This will eliminate the impact of a cash drag from the portfolio.

Annual total return calculations

The fund of funds' year end NAV is the sum of the year end NAV of constituent investments. Each constituent NAV is calculated by adjusting the NAV by reference to the reported annual capital returns for each underlying fund. Income return is calculated by reference to the reported annual income return and is not reinvested in the fund. Fees are deducted from the income portion of the return.

Survivor bias

We avoid survivor bias by following the funds initially selected through their lifetime. If a fund merges with or is taken over by another, the performance of the successor fund is used. If the fund fails, we assume a receipt of capital, in line with what happened, and there is no investment in a replacement fund at that point.

Single/dual fund strategy

For the single fund approach we simply average the relative returns and tracking errors of each fund in the universe. For the dual fund approach we assume 50% weights to two randomly selected funds, and compute relative returns and tracking errors of each pair. Annual total returns are calculated using the same method as detailed in the multi-manager strategy specification with no re-investment of income.

4.5 Direct property

For the direct portfolio, we will use tracking errors reported for different portfolio sizes in the Callender *et al* (2007) report. These results are broadly similar to those found by Mitchell (2015). For each mandate the number of assets that can be acquired by the £25m, £50m, or £100m mandate is calculated by using the average lot size of assets of the IPD index (i.e. the capital value of the index divided by the total number of properties). The total number of assets is then used to determine the respective tracking error as reported in previous research.

Fees

We deduct an annual management fee of 0.5% of asset value and a 5% transaction fee on acquisition.

Annual total return calculation

The average capital value of assets in the IPD index is used as the entry price for investors. This value is then increased (or decreased) by the capital return reported by the IPD All Property Index to calculate the year end capital value. The annual income return reported by IPD is used to calculate the income received for that year and is not reinvested in the mandate. Management fees are deducted from the income.

4.6 REITs

For REITs, we use the annual total returns on the EPRA/NAREIT UK REIT index and apply an appropriate management and acquisition fee. For the EPRA UK tracking investment we deduct an annual management fee of 0.5% and an annual transaction fee of 0.12% to rebalance the portfolio weightings to replicate the index. The fund is an accumulation fund that reinvests dividends and tracks the EPRA UK REIT index.

5. Analysis and Results

5.1 Summary results

This section provides the headline results from the analysis. These results are summarised in Table 5, which presents the mean 10 year time-weighted rate of return (TWRR), 10 year excess returns and tracking errors over the 2003-2012 analysis.

Table 5 presents the time weighted rate of return, the excess return relative to the tracking error relative to the IPD all-property index and the tracking error relative to the IPD all-property index of a series of strategies providing real estate exposure. These strategies include direct property acquisitions; single, dual and multi fund strategies derived from the all-balanced AREF universe and the all-pooled AREF universe; and a portfolio of REITs. For the direct and multi-fund strategies we test exposures of £25m, £50m and £100m, as tracking errors will vary with size (whereas the number of assets in the single fund, dual fund and REIT portfolios is invariant as regards size).

The table shows that the tracking error of direct real estate portfolios against a direct benchmark is significant and varies inversely with portfolio size. For this test, we simply use the estimated tracking errors found by Callendar *et al* (2007). Applying these estimates directly, we find that the tracking errors for portfolios of £25m, £50m and £200m are 7.59%, 5.35% and 4.06% respectively. For a £25m exposure, this means that returns will be up to 7.59% above or below the IPD universe return in two years put of three, and more dispersed one year in three. We would say that these are indeed significant values: the average return on the IPD UK index since its inception has been around 10%, so tracking errors of 4.04% - 7.59% are large.

Table 5 also shows that the tracking errors for listed portfolios are invariant as regards size of mandate, as these investments are divisible. However, the tracking error against the IPD benchmark is an enormous 22.43% with formal t-tests showing that this figure is statistically different to the tracking errors recorded for direct and unlisted fund strategies (Table 6). The balanced and pooled fund benchmarks under-performed the direct benchmark by 2.06% and 2.27% respectively. Fund management fees will partly explain this; a manager fee of between 0.5% and 1% of gross assets is typical, and this will reduce returns by a similar amount. Another possible reason for this is the impact of volatile markets and cash flows into and out of the funds which comprise the benchmark, many of which are open-ended and may be forced to sell assets in weak markets and buy assets in strong markets. There is also some leverage in the benchmark, with more in the all-pooled fund benchmark due to specialist funds typically being more highly leveraged. As Alcock, Baum, Colley and Steiner (2014) showed, this was damaging to fund performance over this analysis period.

The tracking error of the all-pooled index is also much greater than the tracking error of the all-balanced index as measured against the IPD direct benchmark. From this table it is also clear that no investment strategy either matched or delivered a superior return to the direct market index. The results suggest that investors would have been disappointed with the total return performance of each investment strategy compared to the average or time-weighted rate of return of the gross of fee direct market (6.31%) as measured by the (uninvestable) IPD benchmark. The level of under-performance ranges from 100bps for the average direct mandate up to 322bps for a single fund strategy not restricted to balanced funds. The

highest average total return for multi-manager strategies was 4.11% for a £50m mandate that was invested purely in the balanced fund universe. An investment that tracked the EPRA/NAREIT UK REIT Total Return Index would have delivered returns of 4.69% p.a., which is marginally higher than the highest average return for unlisted fund strategies, but is still 162bps below the performance of the direct market benchmark.

Table 5: Real estate investment strategy risk/return comparison, 2003-2012

Universe	Strategy	TWRR	Excess return	Tracking error
Benchmarks	IPD All Property Index	6.31	n/a	n/a
	AREF Balanced Fund Index	4.25	-2.06	1.41
	AREF All-pooled Fund Index	4.04	-2.27	3.71
Direct Mandate	£25m	5.31	-1.00	7.59
	£50m	5.31	-1.00	5.35
	£100m	5.31	-1.00	4.06
Unlisted Balanced Fund Universe	Single Fund	4.27	-2.04	3.77
	Dual Fund	4.31	-2.00	3.07
	£25m multi-manager	4.09	-2.22	2.12
	£50m multi-manager	4.11	-2.20	2.01
	£100m multi-manager	4.10	-2.21	1.95
Unlisted All-pooled Property Fund Universe	Single Fund	3.09	-3.22	7.64
	Dual Fund	3.46	-2.85	6.04
	£25m multi-manager	3.50	-2.81	3.63
	£50m multi-manager	3.54	-3.17	3.33
	£100m multi-manager	3.51	-2.80	3.19
Listed Mandate	UK REITS	4.69	-1.62	22.43

Source: IPF (2007), IPD, AREF, EPRA

Table 6: Test for equality of tracking error means (listed vs direct and unlisted fund strategies)

Strategy 1	Strategy 2	Strategy 1			Strategy 2			t-test*	
		Mean	Std. dev	#obs	Mean	Std. dev	#obs	t-stat	Prob.
£25m direct	**Listed**	7.59	3.23	20,000	23.43	0.00	1	-692.44	0.0000
£50m direct	**Listed**	5.35	1.94	20,000	23.43	0.00	1	-1315.43	0.0000
£100m direct	**Listed**	4.06	1.45	20,000	23.43	0.00	1	-1893.00	0.0000
Single all-balanced fund	**Listed**	3.77	2.39	22	23.43	0.00	1	-38.57	0.0000
Single all-pooled fund	**Listed**	7.64	6.61	43	23.43	0.00	1	-15.65	0.0000
Dual all-balanced fund	**Listed**	3.07	1.52	231	23.43	0.00	1	-203.61	0.0000
Dual all-pooled fund	**Listed**	6.04	3.69	903	23.43	0.00	1	-141.48	0.0000
£25m all-balanced mm*	**Listed**	2.12	0.22	5,000	23.43	0.00	1	-6725.25	0.0000
£25m all-pooled mm	**Listed**	3.63	3.51	5,000	23.43	0.00	1	-399.44	0.0000
£50m all-balanced mm	**Listed**	2.01	0.12	5,000	23.43	0.00	1	-12690.20	0.0000
£50m all-pooled mm	**Listed**	3.33	3.28	5,000	23.43	0.00	1	-432.90	0.0000
£100m all-balanced mm	**Listed**	1.95	0.05	5,000	23.43	0.00	1	-30066.55	0.0000
£100m all-pooled mm	**Listed**	3.19	3.16	5,000	23.43	0.00	1	-452.99	0.0000

Notes:
* mm = multi-manager
1. Due to the listed fund strategy tracking the performance of the EPRA index, the variance of the listed portfolio is zero with an effective sample size of infinity. For these calculations the authors have used a sample size of 1.
2. *Satterthwaite-Welch

However, despite the direct benchmark out-performing all other strategies, for a given amount invested (£25m, £50m or £100m) a direct market strategy would have delivered the widest range of returns for investors. For example, the tracking error of a £100m direct mandate would have averaged 4.06%, which compares to 3.19% or 1.95% for £100m multi-manager strategies derived from the pooled and balanced universes respectively and 3.77% for a single fund randomly selected from the all-balanced universe (but 7.64% for a fund randomly selected from the all-pooled universe.)

5.2 Hypotheses

We set out to examine three hypotheses summarised in section 3, and now present the results of our analysis as it affects each hypothesis in turn.

Hypothesis 1: Core unlisted funds will diversify away much of the specific risk held by direct portfolios.

Table 5 shows that the random selection of a single fund from the all-balanced universe delivers a lower tracking error against a direct benchmark than does a direct portfolio of any size, even £100m. However, while the average tracking error for a single balanced fund was lower at 3.77% compared to 4.06% for a £100m direct mandate, an analysis of t-tests for equality of means results in the null hypothesis being rejected, indicating that there is insufficient evidence to say that the two means are different. Using the all-pooled universe, the tracking error is 7.64% against 7.59% for a £25m direct mandate, again statistically indistinguishable (Table 6).The random selection of two funds from the all-balanced universe reduces the relative tracking error further. The tracking error is 3.07% against 4.06% for a £100m direct mandate; using the all-pooled universe produces a tracking error of 6.04% against 7.59% for a £25m direct mandate. This time the t-test results confirm that the means in both comparisons are statistically different.

When the mandate follows a multi-manager strategy restricted to the all-balanced fund universe, tracking errors fall further. For a £25m exposure, the tracking error is 2.12% against 7.59% for a direct mandate; for a £50m exposure, 2.01% against 5.35%; for a £100m exposure, 1.95% against 4.06%.Again, formal statistical t-tests provide confirmation that the means for the respective samples are statistically different (Table 7).

When the mandate follows a multi-manager strategy which can use the all-pooled fund universe, tracking errors are less impressive. For a £25m exposure, the tracking error is 3.63% against 7.59% for a direct mandate; for a £50m exposure, 3.33% against 5.35%; for a £100m exposure, 3.19% against 4.06%, all statistically different (Table 8).

Table 7: Test for equality of tracking error mean, all-balanced multi-manager vs direct

Strategy 1	Strategy 2	Strategy 1			Strategy 2			Satterthwaite-Welch t-test	
		Mean	Std. dev	#obs	Mean	Std. dev	#obs	t-stat	Prob.
Single fund	Direct £25m	3.77	2.39	22	7.59	3.23	20,000	-7.4990	0.0032
Single fund	Direct £50m	3.77	2.39	22	5.35	1.94	20,000	-3.1041	0.0054
Single fund	Direct £100m	3.77	2.39	22	4.06	1.45	20,000	-0.5817	0.5670
Dual fund	Direct £25m	3.07	1.52	231	7.59	3.23	20,000	-44.0778	0.0000
Dual fund	Direct £50m	3.07	1.52	231	5.35	1.94	20,000	-22.5646	0.0000
Dual fund	Direct £100m	3.07	1.52	231	4.06	1.45	20,000	-9.8601	0.0000
£25m multi-manager	Direct £25m	2.12	0.22	5000	7.59	3.23	20,000	-237.1091	0.0000
£25m multi-manager	Direct £50m	2.12	0.22	5000	5.35	1.94	20,000	-229.0781	0.0000
£25m multi-manager	Direct £100m	2.12	0.22	5000	4.06	1.45	20,000	-181.5997	0.0000
£50m multi-manager	Direct £25m	2.01	0.12	5000	7.59	3.23	20,000	-243.4798	0.0000
£50m multi-manager	Direct £50m	2.01	0.12	5000	5.35	1.94	20,000	-241.2113	0.0000
£50m multi-manager	Direct £100m	2.01	0.12	5000	4.06	1.45	20,000	-198.0967	0.0000
£100m multi-manager	Direct £25m	1.95	0.05	5000	7.59	3.23	20,000	-246.4638	0.0000
£100m multi-manager	Direct £50m	1.95	0.05	5000	5.35	1.94	20,000	-246.7469	0.0000
£100m multi-manager	Direct £100m	1.95	0.05	5000	4.06	1.45	20,000	-205.7215	0.0000

Table 8: Test for equality of tracking error mean, all-pooled multi-manager vs direct

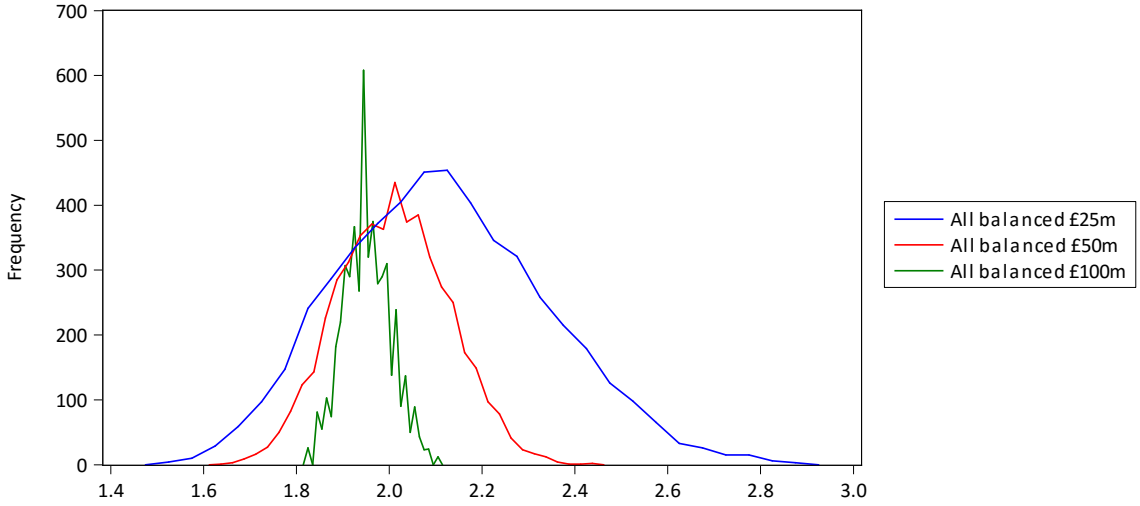
Strategy 1	Strategy 2	Strategy 1			Strategy 2			Satterthwaite-Welch t-test	
		Mean	Std. dev	#obs	Mean	Std. dev	#obs	t-stat	Prob.
Single fund	Direct £25m	7.64	6.61	43	7.59	3.23	20,000	0.0484	0.9616
Single fund	Direct £50m	7.64	6.61	43	5.35	1.94	20,000	2.2727	0.0282
Single fund	Direct £100m	7.64	6.61	43	4.06	1.45	20,000	3.5481	0.0010
Dual fund	Direct £25m	6.04	3.69	903	7.59	3.23	20,000	-12.4239	0.0000
Dual fund	Direct £50m	6.04	3.69	903	5.35	1.94	20,000	5.5805	0.0000
Dual fund	Direct £100m	6.04	3.69	903	4.06	1.45	20,000	16.0245	0.0000
£25m multi-manager	Direct £25m	3.63	1.20	5,000	7.59	3.23	20,000	-139.1751	0.0000
£25m multi-manager	Direct £50m	3.63	1.20	5,000	5.35	1.94	20,000	-78.7988	0.0000
£25m multi-manager	Direct £100m	3.63	1.20	5,000	4.06	1.45	20,000	-22.0022	0.0000
£50m multi-manager	Direct £25m	3.33	0.90	5,000	7.59	3.23	20,000	-162.9711	0.0000
£50m multi-manager	Direct £50m	3.33	0.90	5,000	5.35	1.94	20,000	-107.9241	0.0000

£50m multi-manager	**Direct £100m**	3.33	0.90	5,000	4.06	1.45	20,000	-44.8881	0.0000
£100m multi-manager	**Direct £25m**	3.19	0.71	5,000	7.59	3.23	20,000	-176.3731	0.0000
£100m multi-manager	**Direct £50m**	3.19	0.71	5,000	5.35	1.94	20,000	-127.0103	0.0000
£100m multi-manager	**Direct £100m**	3.19	0.71	5,000	4.06	1.45	20,000	-61.0852	0.0000

Hypothesis 2: The greater the number of funds held in a portfolio the lower will be the tracking error against a direct property benchmark.

Figures 1 and 2 show that for both all-balanced and all-pooled mandates the greater the number of funds held in a portfolio the lower is the tracking error against the direct property benchmark. However, the reduction of risk as size increases is much less impressive for the all-pooled universe.

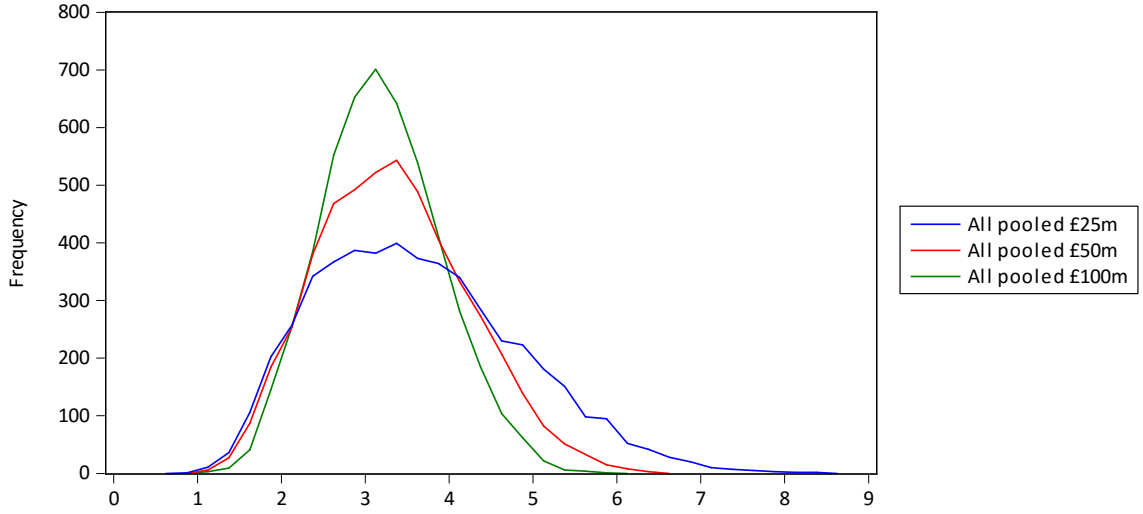
Figure 1: Distribution polygons of direct tracking errors -all-balanced multi-manager mandates



When comparing the risk of unlisted fund strategies only, our analysis indicates that the greater the number of individual funds held in a portfolio the lower the tracking error a hypothetical investor would have experienced. Using the all-balanced fund universe (Table 7) the average tracking error recorded for a single fund approach was 3.77%, with this value declining to 1.95% for a portfolio of 20 balanced funds. The reduction in tracking error achieved by adding one more fund also appears to have a diminishing marginal impact, with the 0.17% difference in absolute tracking errors between a £25m multi-manager strategy (five funds) and £100m multi-manager strategy (20 funds) being small compared to the 0.7% reduction achieved when adding a second balanced fund to a single fund strategy (Table 7). However, Table 8 shows that these are not statistically different observations. An analysis of the distribution of tracking errors for each strategy indicates that as the number of funds increases the range of possible tracking errors declines. Table 9 shows that, for instance, the highest tracking error recorded for the £25m all-balanced multi-manager strategy is 2.9% compared to 2.4% for the £50m portfolio and 2.1% for a £100m portfolio. Therefore, while investing in a £100m portfolio would not, on average, produce a large reduction in the absolute tracking risk, the maximum downside tracking error would fall to a level below the *mean* tracking error of a £25m portfolio.

However, and curiously, the £100m mandate produces a higher minimum tracking error of 1.83% compared to 1.50% for a £25m multi-manager mandate (Table 9). This result may be driven by negative or low correlations between a small number of funds.

Figure 2: Distribution polygons of direct tracking errors - all-pooled multi-manager mandates



Investing randomly in the all-pooled fund universe would have produced similar results but at greater magnitudes for similar sized unlisted strategies, with portfolios with a higher number of funds recording the lowest tracking errors. The mean tracking error for the £25m mandate was 3.63% compared to 3.19% for the £100m mandate (Table 5). An investor increasing the number of funds in a portfolio would have also benefited from protection against higher tracking errors with a maximum tracking error of 8.37% for a £25m mandate compared to 5.83% for a £100m mandate, but this would again come at the cost of a higher minimum tracking error of 0.95%,compared to 1.14%.These minimum tracking errors are lower than for any of the all-balanced fund multi-manager mandates. Again, this result appears to be driven by negative correlations between certain funds.

Table 9: Descriptive statistics for tracking errors of all-balanced unlisted strategies

	Single balanced fund	Dual balanced funds	All-balanced £25m	All-balanced £50m	All-balanced £100m
Mean	3.765455	3.070996	2.117396	2.007803	1.952034
Median	2.980000	2.630000	2.106275	2.006562	1.948528
Maximum	13.42000	8.810000	2.896692	2.445913	2.102713
Minimum	2.170000	1.260000	1.501037	1.644278	1.829628
Std. Dev.	2.391054	1.519684	0.224085	0.119366	0.050512
Skewness	3.187609	2.185994	0.258578	0.073813	0.176092
Kurtosis	13.36750	7.100979	2.822549	2.776582	2.807637
Jarque-Bera	135.7844	345.8485	62.27883	14.93938	33.54925
Probability	0.000000	0.000000	0.000000	0.000570	0.000000
Sum	82.84000	709.4000	10586.98	10039.02	9760.170

Sum Sq. Dev.	120.0599	531.1709	251.0209	71.22745	12.75466
Observations	22	231	5000	5000	5000

Table 10: Descriptive statistics for tracking errors of all-pooled unlisted strategies

	Single all-pooled fund	Dual all-pooled funds	All-pooled £25m	All-pooled £50m	All-pooled £100m
Mean	7.640930	6.038660	3.625376	3.331180	3.186350
Median	4.050000	5.640000	3.505900	3.282975	3.160000
Maximum	25.20000	21.08000	8.373379	6.339588	5.830000
Minimum	1.610000	0.840000	0.953037	1.017338	1.140000
Std. Dev.	6.613932	3.693900	1.202455	0.895572	0.710011
Skewness	1.262558	0.909791	0.504289	0.298285	0.232749
Kurtosis	3.490179	3.481825	2.924664	2.750881	2.854653
Jarque-Bera	11.85453	133.3066	213.1053	87.07406	49.54454
Probability	0.002666	0.000000	0.000000	0.000000	0.000000
Sum	328.5600	5452.910	18126.88	16655.90	15931.75
Sum Sq. Dev.	1837.252	12307.70	7228.049	4009.442	2520.072
Observations	43	903	5000	5000	5000

Table 11: Test for equality of tracking error means between all-balanced multi-manager mandates

Strategy 1	Strategy 2	Strategy 1			Strategy 2			Satterthwaite-Welch t-test	
		Mean	Std. dev	#obs	Mean	Std. dev	#obs	t-stat	Prob.
£25m	**£50m**	2.12	0.22	5,000	2.01	0.22	5,000	30.52206	0.0000
£25m	**£100m**	2.12	0.22	5,000	1.95	0.05	5,000	50.90327	0.0000
£50m	**£100m**	2.01	0.12	5,000	1.95	0.05	5,000	30.42486	0.0000

Table 12: Test for equality of tracking error means between all-pooled multi-manager mandates

Strategy 1	Strategy 2	Strategy 1			Strategy 2			Satterthwaite-Welch t-test	
		Mean	Std. dev	#obs	Mean	Std. dev	#obs	t-stat	Prob.
£25m	**£50m**	3.63	1.20	5,000	3.33	0.90	5,000	13.87486	0.0000
£25m	**£100m**	3.63	1.20	5,000	3.19	0.71	5,000	22.23086	0.0000
£50m	**£100m**	3.33	0.90	5,000	0.71	0.71	5,000	8.960763	0.0000

Hypothesis 3: Returns to investors following a multi-manager strategy will fall as two sets of fees are incurred.

All fund-based returns are lower than the returns delivered by a direct portfolio (5.31%). However, it is not clear that the investor pays in full for the extra fees charged by a multi-manager. When selecting from the all-balanced universe, the multi-manager returns are only 20 basis points below the single and dual fund returns. When selecting from the all-pooled universe, the multi-manager net of fee returns are on average slightly *higher* than the single and dual fund returns. This suggests some downside skewness in the fund universes. Some very bad results in the fund universe over this period may appear not to have been

compensated by equally extreme strong performers, while the diversification delivered by a multi-manager avoids this problem and effectively earns back some - or all - of the second layer of fees.

Evidence from the simulations indicates that multi-manager mandates provide investors with some protection against poor performance in individual funds, with the lowest return in the single all-balanced fund strategy of 1.22% rising to 3.93% for the £100m multi-manager mandate (Table 13). This trend is particularly evident in the all-pooled fund universe with the lowest single fund return being -10.46% compared to 1.59% for the £100m multi-manager mandate (Table 14).

The descriptive statistics for the respective samples provide further evidence that as the number of funds included in a portfolio increases investors are protected against lower returns, with the distribution of returns for unlisted fund strategies progressing from a negative to a positive skew in the case of the all-balanced universe (Table 13). In the all-balanced sample the level of skew recorded in the 10 year TWRR moves from negative at -0.73 for a single fund strategy to 0.36 for the £100m multi-manager mandate, meaning that investors are more likely to achieve a return above the mean than would otherwise be expected in a normal distribution. A similar trend is evident in the all-pooled fund universe with the observed level of skew in the distribution of returns progressing from -1.77 for the single fund sample to -0.10 for the £100m multi-manager mandate (Table 14).

Evidence from this research suggest that increasing the number of funds held in a portfolio not only reduces the probability of an investor receiving a lower return but it also narrows the range of possible returns within each strategy providing greater levels of certainty for investors (Tables 13 and 14, Figures 3 and 4).

Table 13: Descriptive statistics for all-balanced strategies, 10year time-weighted rates of return

	Single	Dual	£25m	£50m	£100m
Mean	4.270000	4.308745	4.094582	4.105301	4.101095
Median	4.650000	4.420000	4.101504	4.106997	4.095549
Maximum	6.060000	6.010000	5.009347	4.687339	4.343495
Minimum	1.220000	1.460000	2.991351	3.541256	3.933806
Std. Dev.	1.358630	0.898079	0.295487	0.182345	0.083157
Skewness	-0.728390	-0.532092	-0.160814	0.040534	0.360388
Kurtosis	2.613907	2.869852	2.811414	2.793174	2.601671
Jarque-Bera	2.082004	11.06323	28.96034	10.28102	141.2881
Probability	0.353101	0.003960	0.000001	0.005855	0.000000
Sum	93.94000	995.3200	20472.91	20526.50	20505.48
Sum Sq. Dev.	38.76340	185.5055	436.4743	166.2160	34.56818
Observations	22	231	5000	5000	5000

Table 14: Descriptive statistics for all-pooled strategies, time-weighted rates of return

	Single	Dual	£25m	£50m	£100m
Mean	3.165349	3.458970	3.503354	3.522064	3.511593
Median	4.400000	3.980000	3.550113	3.532401	3.518134
Maximum	8.870000	8.370000	5.798345	5.435177	4.958509
Minimum	-10.46000	-8.600000	0.406768	1.587408	1.594973
Std. Dev.	3.697506	2.219060	0.758747	0.568355	0.443456
Skewness	-1.772325	-1.156145	-0.326596	-0.171558	-0.108074
Kurtosis	6.601502	5.154069	3.049450	2.810384	2.959573
Jarque-Bera	45.75087	375.7497	89.39684	32.01728	10.07386
Probability	0.000000	0.000000	0.000000	0.000000	0.006494
Sum	136.1100	3123.450	17516.77	17610.32	17557.97
Sum Sq. Dev.	574.2051	4441.654	2877.909	1614.812	983.0702
Observations	43	903	5000	5000	5000

Table 15: Test for equality of mean 10 year TWRR, all-balanced multi-manager mandates

Strategy 1	Multi-manager strategy 2	Strategy 1			Strategy 2			Satterthwaite-Welch t-test	
		Mean	Std. dev	#obs	Mean	Std. dev	#obs	t-stat	Prob.
Single fund	**£25m**	4.27	1.36	22	4.09	0.30	5,000	0.0484	0.9616
Single fund	**£50m**	4.27	1.36	22	4.11	0.18	5,000	2.2727	0.0282
Single fund	**£100m**	4.27	1.36	22	4.10	0.08	5,000	3.5481	0.0010
Dual fund	**£25m**	4.31	0.90	231	4.09	0.30	5,000	-12.4239	0.0000
Dual fund	**£50m**	4.31	0.90	231	4.11	0.18	5,000	5.5805	0.0000
Dual fund	**£100m**	4.31	0.90	231	4.10	0.08	5,000	16.0245	0.0000
£25m multi-manager	**£50m**	4.09	0.30	5,000	4.11	0.18	5,000	-139.1751	0.0000
£25m multi-manager	**£100m**	4.09	0.30	5,000	4.10	0.08	5,000	-78.7988	0.0000
£50m multi-manager	**£100m**	4.11	0.18	5,000	4.10	0.08	5,000	-22.0022	0.0000

Table 16: Test for equality of mean 10 year TWRR between all-pooled multi-manager mandates

Strategy 1	Strategy 2	Strategy 1			Strategy 2			Satterthwaite-Welch t-test	
		Mean	Std. dev	#obs	Mean	Std. dev	#obs	t-stat	Prob.
Single fund	**£25m**	3.17	3.70	43	3.50	0.76	5,000	-0.599336	0.5522
Single fund	**£50m**	3.17	3.70	43	3.52	0.57	5,000	-0.632561	0.5304
Single fund	**£100m**	3.17	3.70	43	3.51	0.44	5,000	-0.614018	0.5425
Dual fund	**£25m**	3.46	2.22	903	3.50	0.76	5,000	-0.594793	0.5521
Dual fund	**£50m**	3.46	2.22	903	3.52	0.57	5,000	-0.849384	0.3959
Dual fund	**£100m**	3.46	2.22	903	3.51	0.44	5,000	-0.710051	0.4779
£25m	**£50m**	3.50	0.76	5,000	3.52	0.57	5,000	-1.395523	0.1629
£25m	**£100m**	3.50	0.76	5,000	3.51	0.44	5,000	-0.662889	0.5074

£50m	**£100m**	3.52	0.57	5,000	3.51	0.44	5,000	1.027066	0.3044

Figure 3: All-balanced funds 10 year time-weighted rate of return boxplots (%, pa)

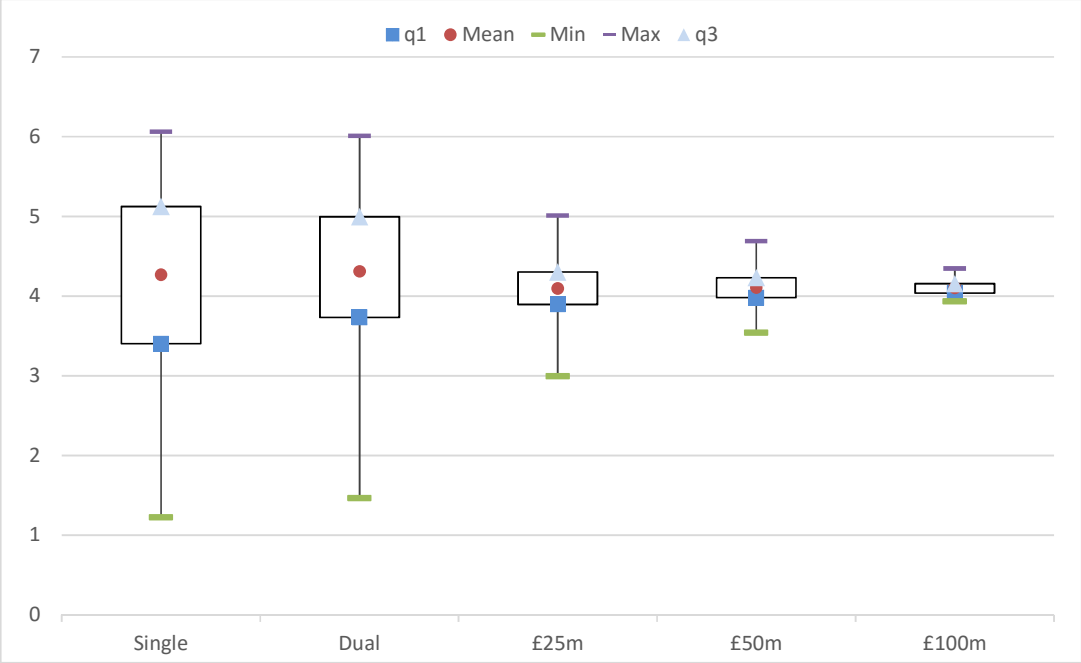
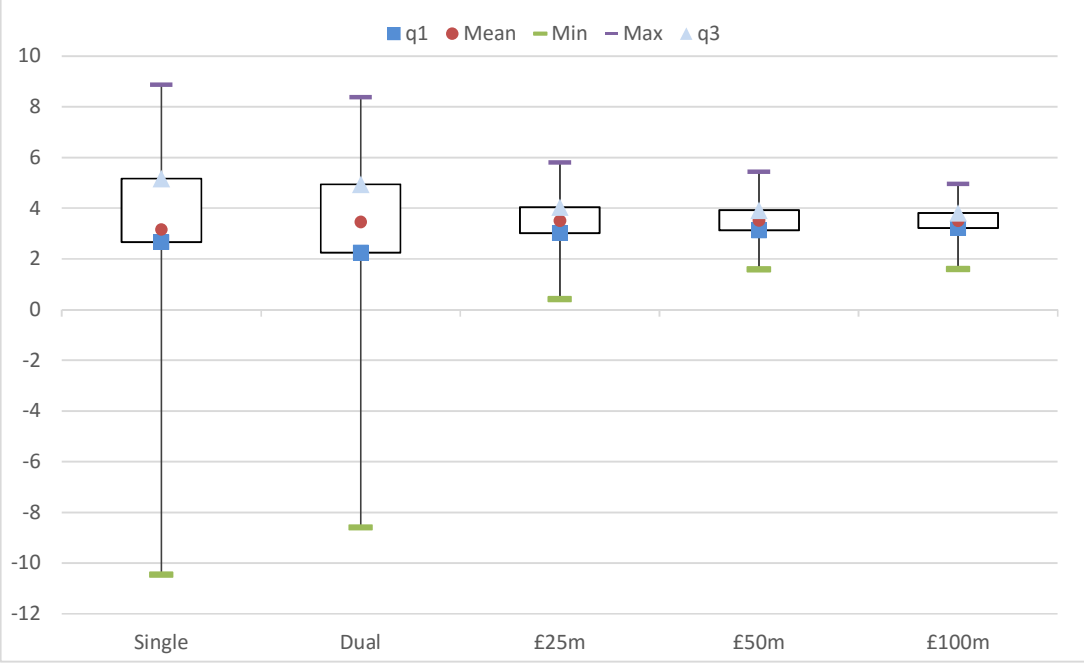


Figure 4: All-pooled funds 10 year time-weighted rate of return boxplots (%, pa)



6. Conclusions and limitations

This paper compares the risk and return characteristics of real estate investment strategies which employ varying formats of domestic real estate (direct exposure, balanced and specialist unlisted funds, a multi-manager approach and listed securities) to deliver returns relative to a UK market index. Because there is an absence of relevant published literature, the particular aim of the research is to examine the case for the multi-manager solution to institutional real estate investment. Based on a random stochastic simulation of historic performance data from 2003 to 2012, we draw several conclusions which accord reasonably well with finance theory.

Previous work suggests that the tracking error of direct real estate portfolios against a direct benchmark will be significant and will vary inversely with portfolio size, as we confirm. This means that investors preferring to buy buildings will need to employ a lot of capital or accept significant risk relative to a market benchmark. As expected, we also confirm find that the tracking error of listed real estate portfolios against a direct benchmark have been very large (over 22%). This means that while investors preferring to buy REITs and other listed real estate securities may not need to employ a lot of capital, they will be forced or accept enormous short-term risk relative to a direct market benchmark.

We present our more original results as a justification for the clear support of three hypotheses based on finance theory. As expected, we find that for smaller sums invested core unlisted funds will diversify away much of the specific risk held by direct portfolios, and that the greater the number of funds held in a portfolio the lower will be the tracking error against a direct property benchmark. However, we find that this only holds when fund selection is confined to balanced funds. In addition, increasing the number of funds held in a portfolio not only reduces the probability of an investor receiving a lower return but it also narrows the range of possible returns within each strategy providing greater levels of certainty for investors. We also find, as expected, that returns will fall as two sets of fees are incurred by investors following a multi-manager strategy.

The paper suffers from several limitations, the major one being founded upon its nature as a controlled experiment rather than an empirical study. The results are therefore normative - demonstrating what *ought* to happen - rather than positive - demonstrating what *did* happen. The reason we adopted this approach is due to a lack of availability of suitable empirical data. The nature of a controlled experiment means that many precise limiting assumptions have to be made. While we have calibrated these limiting assumptions with the practice of a leading multi-manager they remain assumptions and there can be no guarantee that the real world will mimic the experiment. For example, multi-managers may be subject to business pressures which lead to a bias in fund selection which our study assumes away.

The study is also confined to one period of time which includes a severe financial crisis, and the results are for one country only. In time, as more data become available, we would hope to see, and to be able to contribute to, empirical studies based on longer periods of time and covering several markets.
To conclude, our analysis shows that for small sums invested (less than £100m) unlisted funds and in particular multi-manager approaches to real estate appear to offer a plausible solution to the search for direct real estate style returns with less risk (tracking error) against a direct real estate benchmark. Relative to a direct market benchmark, listed securities deliver the maximum risk caused by impossibly uncorrelated short term returns, while the minimum risk delivered by the multi-manager approach comes at the price of reduced returns. As in most of applied finance, an efficient market operates and there is no free lunch.

In this context; core direct real estate delivers a relatively high risk, high return strategy; and the multi-manager solution delivers a lower risk for a reduced return. It is clear that multi-manager strategies were able to deliver returns that more effectively replicated a direct benchmark. However, multi-manager fees negatively impacted on returns and largely accounted for average under-performance of 0.15% against the direct benchmark. While it is estimated that over a 10year analysis period both direct and listed investment strategies out-performed multi-manager strategies (by 121 bps and 59bps per annum respectively). This out-performance would have been delivered at the cost of significant tracking error against direct property benchmarks. Specific risk can be avoided by real estate investors, but at a cost.

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Appendix 1: capital market line analysis

Our analysis shows that unlisted funds and in particular multi-manager approaches to real estate appear to offer a plausible solution to the search for direct real estate style returns with much less risk (tracking error) against a direct real estate benchmark. Relative to a direct market benchmark, listed securities deliver the maximum risk caused by impossibly uncorrelated short term returns, while the minimum risk delivered by the multi-manager approach comes at the price of reduced returns. As in most of applied finance, an efficient market operates and there is no free lunch. In this context; core direct real estate delivers a relatively high risk, high return strategy; and the multi-manager solution delivers a lower risk for a reduced return.

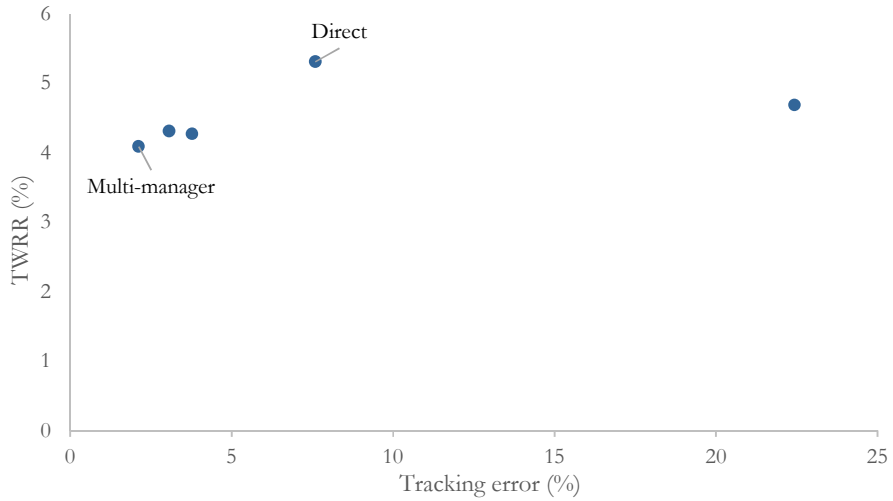
In this appendix we examine these findings in more detail.

Table A1 shows the risk-return results and the coefficient of variation (return dived by risk) and Figure A1 shows the capital market line for £25m invested, plotting the risk and return for the direct solution against a single fund randomly selected, two funds randomly selected, and a multi-manager solution, all confined to the all balanced universe, plus the listed portfolio.

Table A1: Risk and return, £25m invested, all balanced universe

	Return	Risk	CV
Direct	5.31	7.59	0.70
One fund	4.27	3.77	1.13
Two funds	4.31	3.07	1.40
Multi-manager	4.09	2.12	1.93
Listed	4.69	22.43	0.21

Figure A1: Risk and return, £25m invested, all balanced universe



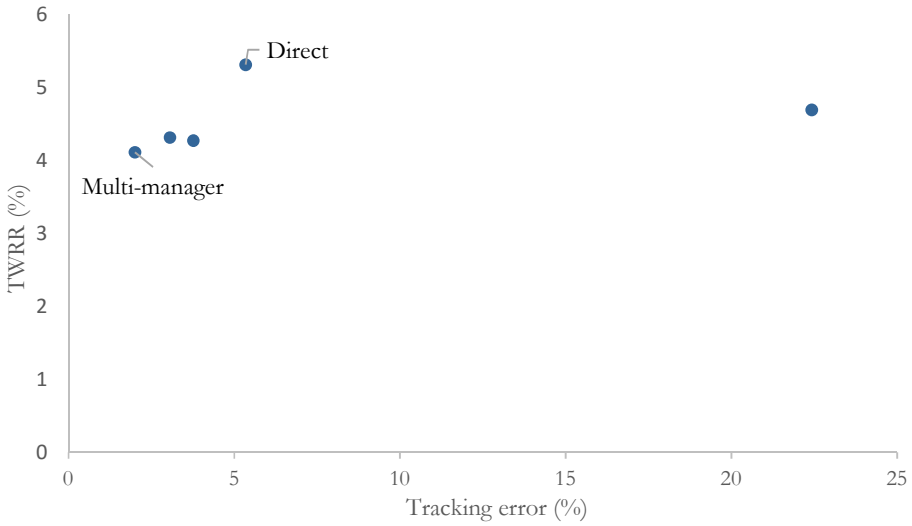
These results show risk-return combinations in line with expectations, with the coefficient of variation rising above the direct solution as more funds are added, with the exception of the listed approach, which offers more risk for less return than the direct solution, and the two fund approach which offers marginally more return than the single fund approach for less risk. Otherwise, funds offer less return for less risk and the multi-manager solution appears especially efficient as measured by the coefficient of variation.

Table A2 shows the risk-return results and the coefficient of variation and Figure A2 shows the capital market line for £50m invested, plotting the risk and return for the direct solution against a single fund randomly selected, two funds randomly selected, and a multi-manager solution, all confined to the all balanced universe, plus the listed portfolio.

Table A2: Risk and return, £50m invested, all balanced universe

	Return	Risk	CV
Direct	5.31	5.35	0.99
One fund	4.27	3.77	1.13
Two funds	4.31	3.07	1.40
Multi-manager	4.09	2.01	2.04
Listed	4.69	22.43	0.21

Figure A2: Risk and return, £50m invested, all balanced universe



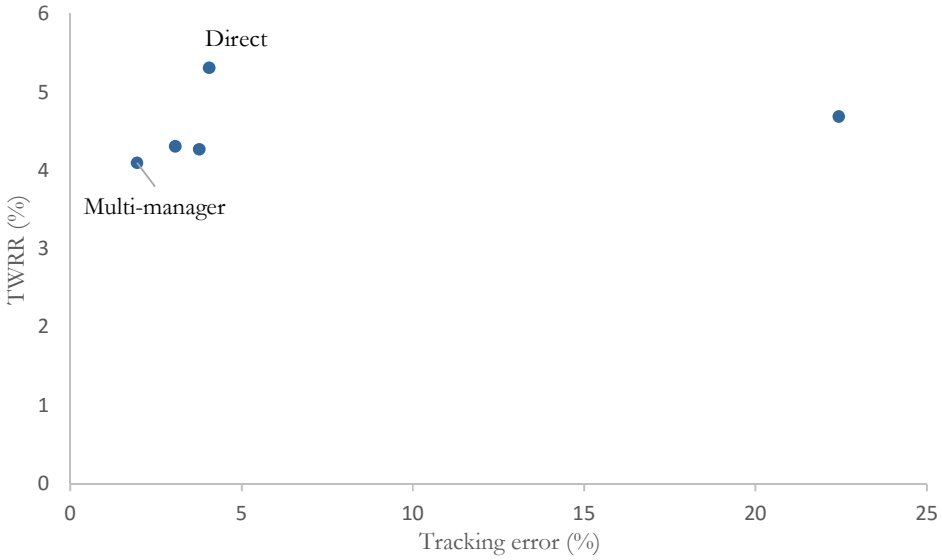
These results again risk-return combinations in line with expectations, with the coefficient of variation rising above the direct solution as more funds are added, with the exception of the listed approach, which offers more risk for less return than the direct solution, and the two fund approach which offers marginally more return than the single fund approach for less risk. Otherwise, funds offer less return for less risk and the multi-manager solution appears especially efficient as measured by the coefficient of variation.

Table A3 shows the risk-return results and the coefficient of variation (return divided by risk) and Figure A3 shows the capital market line for £100m invested, plotting the risk and return for the direct solution against a single fund randomly selected, two funds randomly selected, and a multi-manager solution, all confined to the all balanced universe, plus the listed portfolio.

Table A3: Risk and return, £100m invested, all balanced universe

	Return	Risk	CV
Direct	5.31	4.06	1.31
One fund	4.27	3.77	1.13
Two funds	4.31	3.07	1.40
Multi-manager	4.10	1.95	2.10
Listed	4.69	22.43	0.21

Figure A3: Risk and return, £100m invested, all balanced universe



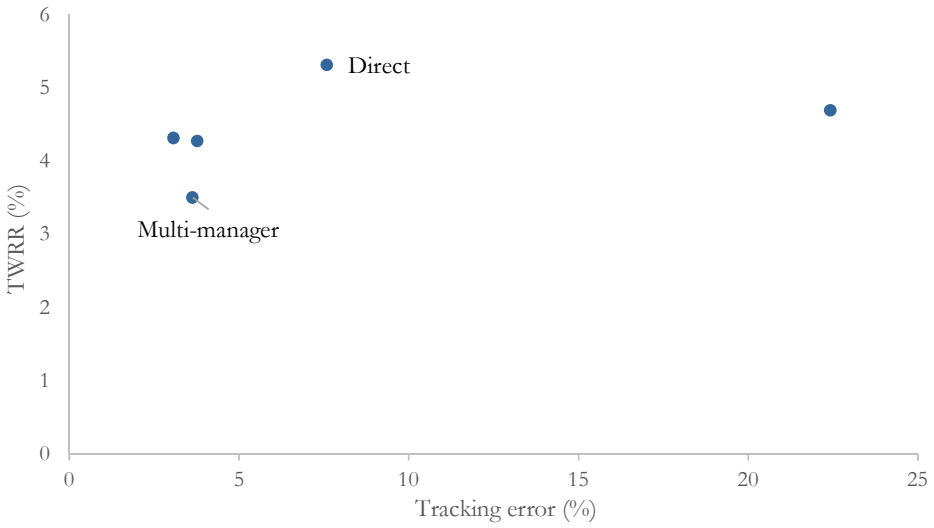
These results are less clear. £100m invested allows a direct approach to diversify some risk away, and while risk falls as more funds are added the cost in return loss appears greater, The listed approach offers more risk for less return than the direct solution, and the two fund approach offers marginally more return than the single fund approach for less risk. Otherwise, funds offer less return for less risk and the multi-manager solution appears especially efficient as measured by the coefficient of variation.

Table A4 shows the risk-return results and the coefficient of variation and Figure A4 shows the capital market line for £25m invested, plotting the risk and return for the direct solution against a single fund randomly selected, two funds randomly selected, and a multi-manager solution, all accessing the all pooled universe, plus the listed portfolio.

Table A4: Risk and return, £25m invested, all pooled universe

	Return	Risk	CV
Direct	5.31	7.59	0.70
One fund	4.27	3.77	1.13
Two funds	4.31	3.07	1.40
Multi-manager	3.50	3.63	0.96
Listed	4.69	22.43	0.21

Figure A4: Risk and return, £25m invested, all pooled universe



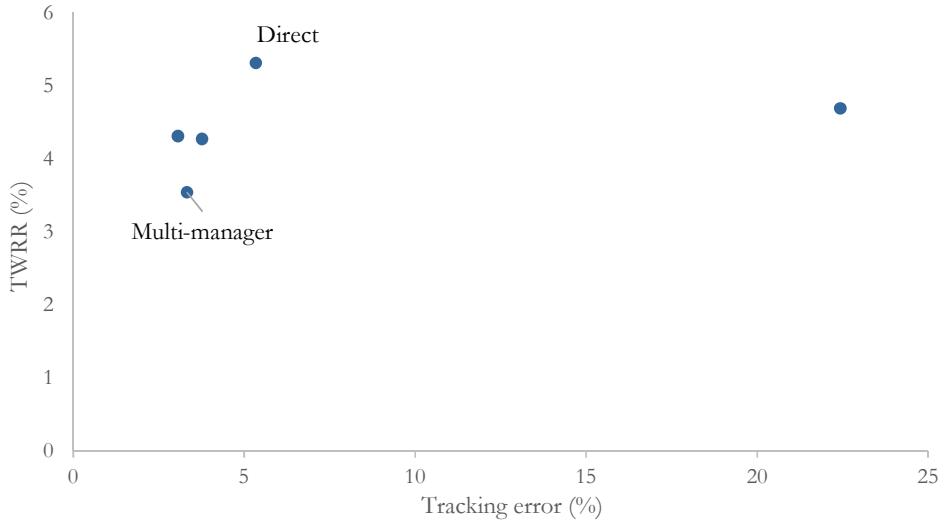
Using the all-pooled fund universe damages the fund approach by introducing more risk and these results are less clear than those shown by Table 1 and Figure 1. £25m invested means a direct approach suffers from high risk, but risk no longer falls as more funds are added. The multi-manager solution is no longer efficient and the random selection of two funds would have been better.

Table A5 shows the risk-return results and the coefficient of variation and Figure A5 shows the capital market line for £50m invested, plotting the risk and return for the direct solution against a single fund randomly selected, two funds randomly selected, and a multi-manager solution, all accessing the all pooled universe, plus the listed portfolio.

Table A5: Risk and return, £50m invested, all pooled universe

	Return	Risk	CV
Direct	5.31	5.35	0.99
One fund	4.27	3.77	1.13
Two funds	4.31	3.07	1.40
Multi-manager	3.54	3.33	1.06
Listed	4.69	22.43	0.21

Figure A5: Risk and return, £50m invested, all pooled universe



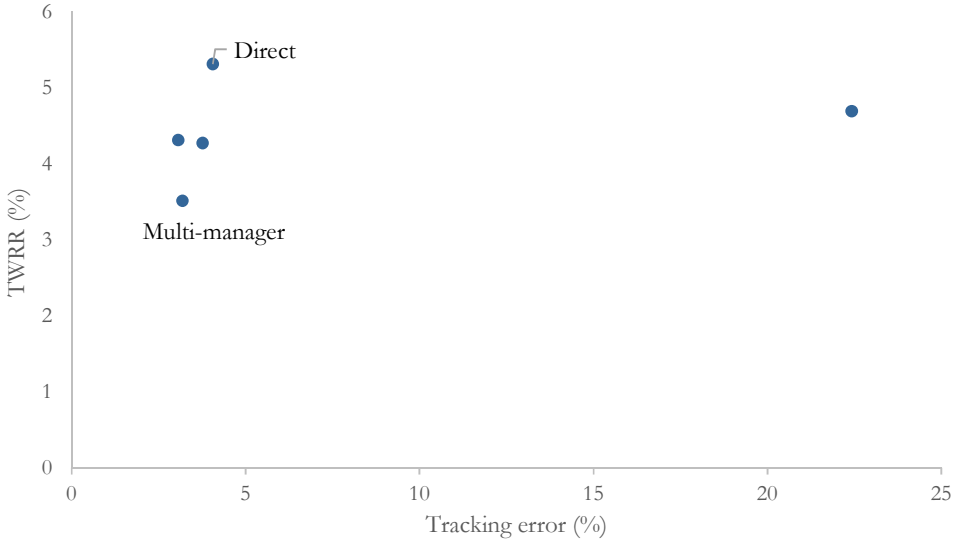
Again, using the all-pooled fund universe damages the fund approach by introducing more risk. For £50m invested a direct approach continues to suffer from high risk. However, risk does not fall as more funds are added, the multi-manager solution is no longer efficient and the random selection of two funds would have been better.

Table A6 shows the risk-return results and the coefficient of variation and FigureA6 shows the capital market line for £100m invested, plotting the risk and return for the direct solution against a single fund randomly selected, two funds randomly selected, and a multi-manager solution, all accessing the all pooled universe, plus the listed portfolio.

Table A6: Risk and return, £100m invested, all pooled universe

	Return	Risk	CV
Direct	5.31	4.06	1.31
One fund	4.27	3.77	1.13
Two funds	4.31	3.07	1.40
Multi-manager	3.51	3.19	1.10
Listed	4.69	22.43	0.21

Figure A6: Risk and return, £100m invested, all pooled universe



Again, using the all-pooled fund universe damages the fund approach by introducing more risk. For £100m invested a direct approach only marginally more risk and offers considerable more return. The random selection of two funds would have reduced risk by one percentage point at the cost of a similar fall in return, while a multi-manager approach would have delivered returns of nearly two percentage points less for a risk reduction of less than one point.

Appendix 2: re-sampling statistics

Table A7 presents the confidence intervals for the multi-manager mean TWRR and tracking errors estimated from the bootstrap re-sampling.

Table A7: Multi-manager strategy bootstrap re-sampling 99% confidence intervals

Universe	Strategy	TWRR			Tracking error		
		Lower bound (0.5%)	Mean (see table 1)	Upper bound (99.5%)	Lower bound (0.5%)	Mean (see table 1)	Upper bound (99.5%)
Unlisted All Balanced Property Fund Universe	£25m multi-manager	4.08	4.09	4.10	2.11	2.12	2.13
	£50m multi-manager	4.10	4.11	4.11	2.00	2.01	2.01
	£100m multi-manager	4.098	4.10	4.104	1.950	1.95	1.954
Unlisted All-pooled Property Fund Universe	£25m multi-manager	3.47	3.50	3.53	3.58	3.63	3.67
	£50m multi-manager	3.50	3.54	3.54	3.30	3.33	3.37
	£100m multi-manager	3.50	3.51	3.53	3.16	3.19	3.21