Managing specific risk in property portfolios

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1. Introduction

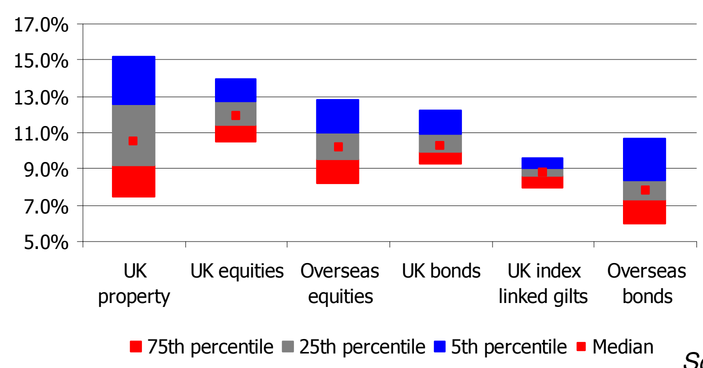
1.1 Background

Property is currently seen as an attractive investment class. Global allocations have been increasing steadily through the early years of the new millennium. Many markets appear to have delivered high relative returns and low relative risk, defined as low volatility of returns, relative to other asset classes over three, five, 10 and 15 year periods. Yet successful investment in property is challenging. Arguably two of the key reasons for this are illiquidity and 'lumpiness'.

Property is illiquid, making it difficult or slow to trade at market value. It is also 'lumpy'. Lumpiness – the large and uneven sizes of individual assets – means that diversification within property portfolios may prove to be more challenging than in equity and bond portfolios. Direct property investment requires considerably higher levels of capital investment when compared to securities, and even with significant investment typical property portfolios contain high levels of specific risk. We would argue that this fact, coupled with the growing globalisation of property portfolios, largely explains the recent boom in indirect vehicles offering alternative, less 'lumpy', routes into the asset class.

By way of illustration, Figure 1 shows the spread of returns for different managers across different UK asset classes for the period 1992 to 2001. Property has the highest divergence of return.

Figure 1: WM percentile rankings - 1992-2001 total returns



Source: The WM Company

This divergence is explained by lumpiness or specific risk, expressed as higher levels of tracking error – defined as the standard deviation of excess return relative to a benchmark - for the typical property portfolio. This is a problem for investors and managers alike.

Investors who have targeted property as an asset class will most likely be seeking to replicate the benchmark performance with few surprises; after all, the decision to invest in property is often based on an analysis of historic risk and return characteristics produced from a market index or benchmark. The tracking error of a portfolio is therefore likely to be seen as an additional and unrewarded risk.

1.2 Specific risk in property portfolios

Managers may as a result be charged with minimising tracking error - but with limited sums to invest. This is a very difficult challenge: how many properties are needed to reduce tracking error to an acceptable level?

Various studies have suggested that the appropriate number of properties is very large; but the necessary level of capital is greatly dependent on the segments of property in which one wishes to invest, as different segments of the property market exhibit vastly different lot sizes. For example, it appears obvious that a very large allocation of cash may be needed to invest in a sufficient number of shopping centres to replicate the performance of that segment with a low tracking error.

In addition, there are significant differences in the performance characteristics of properties within the different segments. Properties in some segments – for example London offices - may experience higher variations in return than others, resulting in the probability that more properties will be needed to minimise tracking error within the segment. If London offices are also relatively expensive, the problem of assembling a market-tracking portfolio at reasonable cost is magnified.

Risk reduction and portfolio size is a well known and much-studied topic in financial markets since the establishment of Modern Portfolio Theory (MPT) in the seminal work of Markowitz (1952). The majority of studies concentrate on stock portfolios and their variance in total returns. As a later extension to Markowitz by Evans and Archer (1968) and Elton and Gruber (1977), it was shown that the variation in total returns on portfolios of stocks can be split into two components, systematic and non-systematic risk. The former component explains the underlying variation in market returns while the latter is wholly attributable to the variation in returns of a portfolio's specific assets, hence often referred to as specific risk.

Due to the lack of transparency and therefore data availability, a limited number of studies investigate risk reduction and portfolio size in the property market. Most studies are concerned with the place of property in the multi-asset portfolio and only in the late 1990s has the issue of risk reduction and diversification within property portfolios been given due consideration. Brown (1988) investigates the impact of increasing numbers of properties on the variance of property portfolios' returns in the UK property market, analysing monthly return series of 135 properties over the period January 1979 to December 1982. He found that portfolios with fewer assets generally have larger variances in returns, confirming the notion of an inverse relationship between portfolio size and risk.

In Brown and Matysiak (2001) these findings are confirmed by using monthly return series of 130 properties over the periods December 1987 to December 1992 and December 1992 to December 1997, as well as annual return series of 750 properties over the period 1987 to 1996. In general, the findings are similar to those in studies on the stock market, where a relatively small number of assets, such as 20 to 30, is needed to reduce portfolio risk to a level approaching systematic risk.

Brown (1988), Morrell (1993) and Schuck and Brown (1997) analyse the effect of value-weighting returns on the reduction of property portfolio risk. Indivisibility of properties has a strong impact on portfolio performance and a noticeable impact on the ability to reduce risk. It is concluded that many more assets are needed to reduce risk to the systematic level when value-weighting returns, depending on the degree of skewness of property values in the portfolio.

Similarly, in a series of papers by Byrne and Lee (1998, 2000, 2001 and 2003) the impact of portfolio size on risk is examined. The studies relate portfolio size to risk, but also explore potential benefits of risk reduction through diversification by sector and region. Diversification by sector is on average more beneficial to risk reduction than geographical diversification (Lee, 2001). Byrne and Lee (2003) explore actual returns of 136 UK property portfolios over the period 1989 to 1999, but cannot find a conclusive negative relationship between size and risk. This is attributed to the fact that while larger property portfolios may have considerably reduced levels of specific risk, a positive relationship between systematic risk and size can be seen.

Standard performance attribution systems applied to property propose two sources of risk and return. Following Elton and Gruber, these are commonly referred to as portfolio structure and stock (Baum et al 1999). A high tracking error against a benchmark is introduced if large positions diverging from the benchmark structure are taken at the segment level; and a high tracking error will also result from poor diversification at the property or stock level. Hence the lumpiness of different property types is a double problem for the investor who wishes to reduce risk relative to a benchmark. Not only will it be necessary to spread specific risk across several properties, but it will also be necessary to achieve a benchmark-matching exposure to a segment. For reasons we will explore later, this may be very difficult.

1.3 How can specific risk be controlled?

As a way of minimising risk, investors and their managers may be charged with minimising tracking error, but all investors have limited sums to invest. This may present a very difficult challenge for many. The vital question is: how many properties are needed to reduce tracking error to an acceptable level?

Various studies, all of which concentrate on portfolios of properties of mixed types and geographies, have suggested that the appropriate number of properties is very large. However, it is also well known that the necessary level of capital required to replicate the market will be greatly dependent on the segments of property in which one wishes to invest, as different segments of the property market exhibit vastly different lot sizes. For example, it appears obvious that a very large allocation of cash may be needed to invest in a sufficient number of shopping centres to replicate the performance of that segment with a low tracking error.

In addition, there are significant differences in the performance characteristics of properties within the different segments. Properties in some segments – for example London offices - may experience higher variations in return than others, resulting in the probability that more properties will be needed to minimise tracking error within the segment. If London offices were also relatively expensive, the problem of assembling a market-tracking portfolio at reasonable cost is magnified.

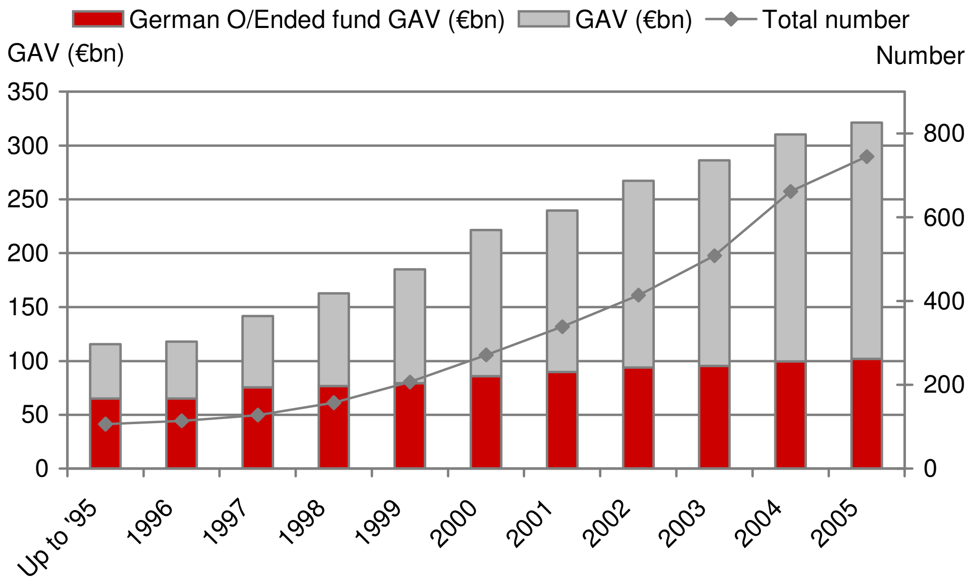
1.4 The boom in indirect vehicles

Growth in the value and number of unlisted real estate funds has been a global phenomenon of the late 1990s and new millennium. This has been centred upon Europe, but is also happening in Asia and North America, with a growing number of global property funds

The OPC Private Property database, which describes the European universe of indirect property vehicles, is now made up of some 789 funds worth over €320 billion. This compares to the NAREIT (National Association of Real Estate Investment Trusts) market capitalisation at June 2005 of $206 billion (€251 billion), and the EPRA (European Public Real Estate Association) market capitalisation at March 2005 of €80 billion. EPRA describes the European listed property market, while NAREIT describes US Real Estate Investment Trusts (REITs). Assuming 50% leverage, these market capitalisations can be doubled to produce estimated gross asset values of €502 billion and €160 billion respectively.

The number of funds in the PP Universe has grown on average by over 20% per annum over the past ten years. Over the same period GAV has grown by 10% annually. This explosive growth is demonstrated in Figure 2.

Figure 2: The OPC Private Property Europe database



Source: OPC, July 2005

A large majority of the vehicles are country- or sector-specific. It is apparent that many investors are beginning to assemble property portfolios using combinations of these funds, and the first property fund of funds products are now emerging.

Due to the tracking error problem, some property segments are not appropriate for smaller investors to access directly. In an international context, the US market presents an example of this. Meanwhile, indirect vehicles, a means of accessing the market which has boomed in the last 10 years, are more diversified across properties for the same or less investment. For some sectors, these would appear to present a more appropriate means of accessing the market.

1.5 Objectives and structure

In this paper we use market data to examine the extent of the problem of specific risk for domestic UK property investors, and we couple this issue with the proposition that the growth in the unlisted fund market is explainable by reference to this problem. The propositions being tested are as follows:

- an allocation to direct property will carry high levels of specific risk; this risk varies significantly between the segments, and it is harder to achieve efficient diversification in some segments than others

- this problem coupled with the use of benchmark-driven portfolio structures makes it exceedingly hard to control diversification by sector and well as within sectors without huge sums to invest

- there is a strong case for using indirect property vehicles to combat specific risk at the sector level

To test these propositions, we examined how much cash would have been be needed over a specific period to limit the tracking error of a group of properties within one segment to a given risk target. We then compared the results across segments; and we draw some conclusions about those segments where diversification is relatively easy and those where it is relatively hard.

Where diversification is difficult, the use of diversified indirect vehicles may help investors to achieve allocations to the 'difficult' segments. Allocations to direct property would be limited to segments of the direct property market in which the desired level of diversification requires lower levels of capital investment. Obvious candidates for this are segments that are characterised by comparatively low average lot values, but also (and less obviously) those segments within which efficient diversification is available at the property level (with low correlations between the returns on properties within the same segment). We examine, in a UK context, which those sectors are.

Given that indirect property vehicles may offer an opportunity to invest in segments which typically display large lot values and poor diversification, and hence are more capital-intensive for the process of portfolio diversification, we report whether vehicles are available in those segments.

In section 2, we describe the methodology used to explore the specific risk resident in UK property segments. In section 3, we present results. In section 4, we introduce the issue of benchmarks and the difficulties of minimising specific risk while at the same time replicating the portfolio shape suggested by the benchmark. In section 5, we discuss how indirect vehicles might assist in this effort. In section 6 we draw conclusions.

2. Methodology

2.1 Approach

The methodology used was as follows. First, we used simulated portfolios of properties comprising randomly selected properties located within each market segment to examine the *number of assets* needed within each segment to achieve particular levels of tracking error against IPD Annual and Monthly benchmarks (as proxied by the relevant index).

For low tracking errors returns on the simulated single-sector property portfolios need to be to be highly correlated with returns on the sector. This is more likely to be the case if returns on the portfolios have a similar variance to the sector variance of returns. The greater the average single property variance is in comparison to the sector variance, all other things being equal, the greater will be the tracking error. The more correlated the properties within a sector portfolio are, all other things being equal, the greater will be the tracking error. Low tracking errors will result when single property variance is low and properties within a sector a highly correlated with each other.

The data needed is therefore:

- the average variance of individual properties
- the average covariance of individual properties
- as a check, the average covariance of individual properties with the IPD market segment returns

Second, we examined the *amount of money* needed to achieve particular levels of tracking error within each segment against the benchmarks. In order to do this we took account of the average lot size of assets within each segment.

Clearly, shopping centres have larger average lot sizes than standard shop units. All things being equal, more money will be needed to reduce tracking error within the shopping centre segment than within the standard shop unit segment. However, the co-variance issue referred to above means that all things are not equal. Meaningful results are only available when the two factors are combined. The result for shopping centres, for example, is not exactly as one would expect, wholly as a result of the co-variance effect.

2.2 Data

A sample of annual direct UK property returns was assembled and grouped by each of nine standard segments (defined by property type and geographic location) in collaboration with

Investment Property Databank (IPD). The data used is derived from the IPD UK Universe and covers properties held continuously over the period 1990 to 2004, thus providing 15 data points for each property (with two exceptions, where data limitations required a slightly shorter analysis period). Table 1 lists the property type/geographic segmentation used and the respective sample size (number of properties) used in this study.

Due to the small sample sizes in the office park and shopping centre segments, IPD was not able to provide adequate data for these segments over the period 1990 to 2004 (with data for 2 and 6 assets respectively available). Instead, data was acquired for office parks for the period 1993-2004 and for shopping centres for the period 1994-2004. This adjustment damages the purity of the results, but increased the sample sizes to 26 in each case, with bigger samples in all other segments.

Table 1: segmentation and data

Property type	Geographic location	Sample size
Standard shops	UK	381
Retail warehouse	UK	33
Shopping centre	UK	26
Other retail	UK	60
Office	London	73
	South East	45
	Provincial	38
Office park	UK	26
Industrial	UK	130

Source: IPD, July 2005

IPD provided the following data for each segment:

- the average variance of individual properties,
- the average covariance of individual properties
- the average covariance of individual properties with the IPD market segment returns
- the average lot value as of June 2005 for each segment.

Using this data, simulated portfolios of direct properties were constructed with increasing numbers of properties for each segment. The portfolio sizes range from one to 100 underlying properties. For each portfolio the expected (simulated) tracking error against the respective market segment was computed.

2.3 Technical methodology

The tracking error of a portfolio of direct properties against a benchmark is defined as the standard deviation of the portfolio's excess returns over the benchmark. This can be expressed as follows:

$$TE_p = \sigma_{(r_p - r_m)}, \qquad (1)$$

where TE_p is the tracking error of a portfolio of p underlying properties, r_p the absolute return of the portfolio of p properties, r_m the absolute return of benchmark m and $(r_p - r_m)$ the excess return of a portfolio of p underlying properties over the benchmark m. Hence, $\sigma_{(r_p - r_m)}$ is the standard deviation of the portfolio's excess returns over the benchmark.

The squared standard deviation yields the variance. Thus,

$$\sigma^2_{(r_p - r_m)} = Var(r_p - r_m), \qquad (2)$$

where $Var(r_p - r_m)$ is the variance of the portfolio's absolute return less the benchmark's absolute return. This can be expressed as:

$$Var(r_p - r_m) = Var(r_p) + Var(r_m) - 2.Cov(r_p, r_m), \qquad (3)$$

where $Cov(r_p, r_m)$ is the co-variance of the portfolio's absolute return and the benchmark's absolute return.

The above co-variance term can also be written as:

$$Cov(r_p, r_m) = \sqrt{Var(r_p)}.\sqrt{Var(r_m)}.\rho_{r_p, r_m}, \qquad (4)$$

where ρ_{r_p, r_m} is the correlation coefficient of the portfolio's absolute return and the benchmark's absolute return.

We can express the squared tracking error of a portfolio against a benchmark as:

$$Var(r_p - r_m) = Var(r_p) + Var(r_m) - 2.\sqrt{Var(r_p)}.\sqrt{Var(r_m)}.\rho_{r_p, r_m} \qquad (5)$$

This expression requires the input of the variance of the portfolio's absolute return, the variance of the benchmark's absolute return and the correlation of the portfolio's and benchmark's absolute returns.

From modern portfolio theory, the variance of a portfolio's absolute return depends on the underlying properties' variances, the co-variances of the underlying properties and the capital values of the underlying properties as a percentage of the total capital value of the portfolio.

$$\begin{aligned} Var(r_p) &= \sum_{i=1}^{p} Var(w_i.r_i) \\ &\quad + \sum_{i=1}^{p} \sum_{\substack{j=1 \\ i \neq j}}^{p} \sqrt{Var(w_i.r_i)}.\sqrt{Var(w_j.r_j)}.\rho_{r_i,r_j} \\ &= \sum_{i=1}^{p} w_i^2.Var(r_i) \\ &\quad + \sum_{i=1}^{p} \sum_{\substack{j=1 \\ i \neq j}}^{p} w_i.w_j.\sqrt{Var(r_i)}.\sqrt{Var(r_j)}.\rho_{r_i,r_j} \end{aligned} \quad , \qquad (6)$$

where w_i is the capital value of property i as a percentage of the portfolio's total capital value, r_i the absolute return of property i, ρ_{r_i,r_j} the correlation coefficient of property i's and property j's absolute returns and $i = 1, \ldots, p$.

Under the assumption of equal weighting of the underlying properties in the portfolio, an average single property variance and average correlation of properties, the variance of the portfolio returns can be expressed as:

$$\begin{aligned} Var(r_p) &= \left(\frac{1}{p}\right).V\overline{a}r + \left(\frac{p-1}{p}\right).\sqrt{V\overline{a}r}.\sqrt{V\overline{a}r}.\overline{\rho} \\ &= \left(\frac{1}{p}\right).V\overline{a}r + \left(\frac{p-1}{p}\right).C\overline{o}v \end{aligned} \quad , \qquad (7)$$

where $V\overline{a}r$ is the average single property variance, $\overline{\rho}$ the average correlation of properties, $C\overline{o}v$ the average co-variance of properties and p the number of properties in the portfolio.

From above, as the number of underlying properties in the portfolio increases the portfolio variance tends to the systematic risk component, the average co-variance. To illustrate this, consider a portfolio with a single underlying property, i.e. $p = 1$. The variance of this portfolio would then be:

$$Var(r_p) = \left(\frac{1}{1}\right).V\bar{a}r + \left(\frac{1-1}{1}\right).C\bar{o}v$$

$$= V\bar{a}r \qquad (7.1)$$

Thus, the variance of this portfolio is solely consisting of the average single property variance, the specific risk component of the portfolio.

As $p \to \infty$ the variance of the portfolio tends to the systematic risk component of the portfolio, i.e.

$$Var(r_p) \to C\bar{o}v\,. \qquad (7.2)$$

The variance of the market, $Var(r_m)$, can be computed from IPD annual segment returns and, hence, does not require any manipulation.

From Brown and Matysiak (1999), the correlation coefficient, ρ_{r_p, r_m}, can be computed using the average single property variance and the average co-variance with the benchmark.

The correlation coefficient between the portfolio and benchmark is calculated as:

$$\rho^2_{r_p,r_m} = \frac{p.C\overline{o}v(r_1,r_m)}{(p-1).C\overline{o}v(r_1,r_m)+V\overline{a}r}, \qquad (8)$$

where $C\overline{o}v(r_1,r_m)$ is the average co-variance between a property and the benchmark.

We now have all necessary components to compute the tracking error for portfolios of increasing numbers of underlying properties.

The assumptions of an average single property variance, average property co-variance, average co-variance with the benchmark and the benchmark variance can be altered from segment to segment to reflect the segment-specific average return volatility characteristics.

2.4 Limitations

Historic data is used throughout and the value of the results is conditioned by this limitation. It is assumed that each asset has the same lot size – equal to the mean value. This is clearly misleading, as property lot sizes vary greatly. As shown elsewhere (for example, Morrell, 1993) lot size skewness exaggerates these problems, and the results should be seen to be conservative in their implications, meaning that direct property risk is likely to be an even bigger problem than the numbers suggest.

3. Results

3.1 Diversification power within segments

Table 2 shows the risk reduction effect of increasing the number of underlying assets whose returns are not perfectly correlated. As the number of underlying assets in a portfolio is increased the specific risk element of the portfolio is reduced; as the portfolio size tends to the market, the portfolio's risk approaches the market (systematic or non-specific) risk level.

Here, the market is the respective segment of the IPD Universe, represented by annual and monthly indices and benchmarks. The monthly index comprises a total of 3,320 properties as at June 2005, distributed across the segments in similar proportions as the sample described in Table 1 above. The annual index includes over 13,000 properties with a similar distribution. It is, however, difficult to assemble large time series datasets of continuously held properties and (as noted above) this severely limits data availability in this research.

To achieve a 5% tracking error, the results are as follows. Fewest properties are needed in the shopping centre segment, followed by office parks, retail warehouses, south east offices, provincial offices and industrials; and most in the London office segment, followed by other retail. The full results are shown in Table 2; illustrative results are shown in Figures 3 and 4.

Table 2: no. of properties needed to achieve tracking error targets

# of properties / Segment	5% tracking error	4% tracking error	3% tracking error	2% tracking error
Standard shops	6	9	16	34
Retail warehouses	4	6	12	47
Shopping centres	3	4	6	11
Other retail	8	12	20	34
London offices	10	16	30	81
South East offices	5	7	12	24
Provincial offices	5	8	12	23
Office parks	4	6	11	21
Industrials	5	8	14	33

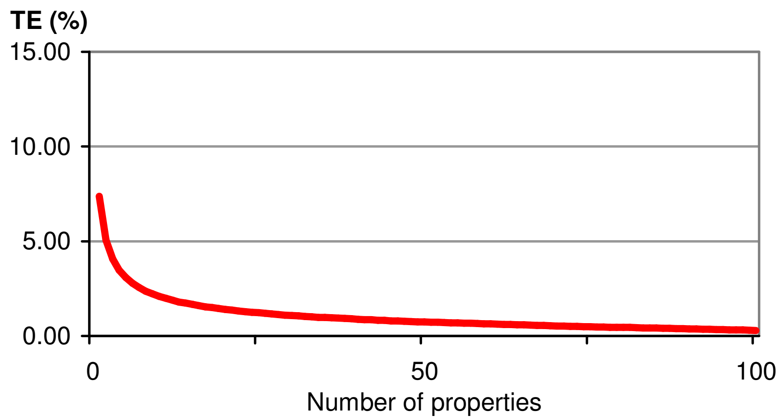
The co-variance of returns between individual shopping centres and the segment coupled with the small number of properties present in the segment at any time mean that only three properties will reduce the tracking error to 5%; only 11 are needed to achieve 2%.

On the other hand, the high variance of London office returns coupled with the correlation characteristics of properties in this segment means that on average 10 properties are needed to achieve a 5% tracking error, and no less than *81* properties are needed to reduce tracking error within the segment to 2%

Figure 3 shows how the tracking error – the standard deviation of the return relative to the return on the index for the shopping centre segment – falls as the number of shopping centres in the portfolio increases.

It shows a rapid reduction in risk for small numbers of properties, and low tracking errors of 2-3% for portfolios with more than 5-6 assets.

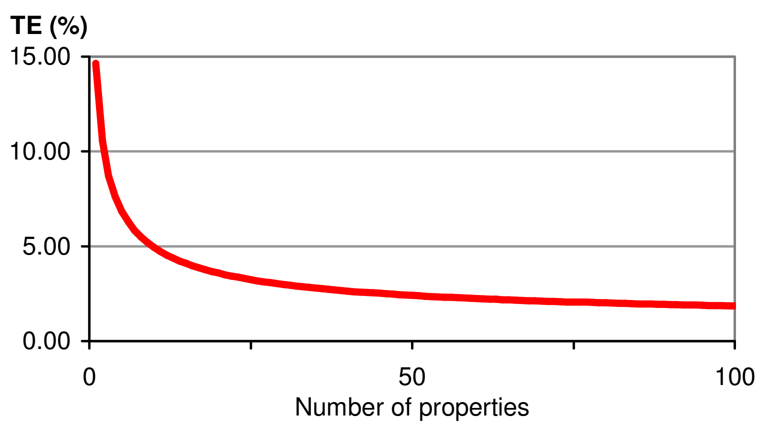
Figure 3: tracking error and portfolio size in shopping centres



Source: OPC/ IPD, August 2005

Figure 4, on the other hand, shows a less rapid reduction in risk for small numbers of London office properties, with tracking errors of 3% difficult to achieve for portfolios with less than 50 assets.

Figure 4: tracking error and portfolio size in London offices



Source: OPC/ IPD, August 2005

3.2 Lot sizes within segments

These results ignore the average costs of buying properties in these segments, which are shown in Table 3.

Clearly, while shopping centres are apparently easy to diversify, they are not cheap. A £40m average lot size compares with average values of between £4.6m and £7.2m in the standard shop, other retail, industrial and south east and provincial office segments.

Table 3: average lot sizes by segment

Property type	Geographic location	Average lot value (£m)
Standard shops	UK	4.6
Retail warehouse	UK	21.5
Shopping centre	UK	39.5
Other retail	UK	5.0
Office	London	15.2
	South East	7.2
	Provincial	7.2
Office park	UK	10.0
Industrial	UK	6.4

Source: IPD, July 2005

3.3 The combined effect: lot size and diversification power

Table 4 combines the impact of average lot sizes and the efficiency of diversification within segments. The figures show the reduction in tracking error achieved by increasing levels of investment.

Table 4: capital investment required for target tracking errors

Capital required (£m) / Segment	5% tracking error	4% tracking error	3% tracking error	2% tracking error
Standard shops	28	42	74	157
Retail warehouses	86	129	259	1,013
Shopping centres	118	158	237	434
Other retail	40	60	100	169
London offices	152	243	455	1,229
South East offices	36	50	86	172
Provincial offices	36	58	87	166
Office parks	40	60	110	210
Industrials	32	51	90	212
Total	568	851	1,498	3,762

Source: OPC/ IPD, August 2005

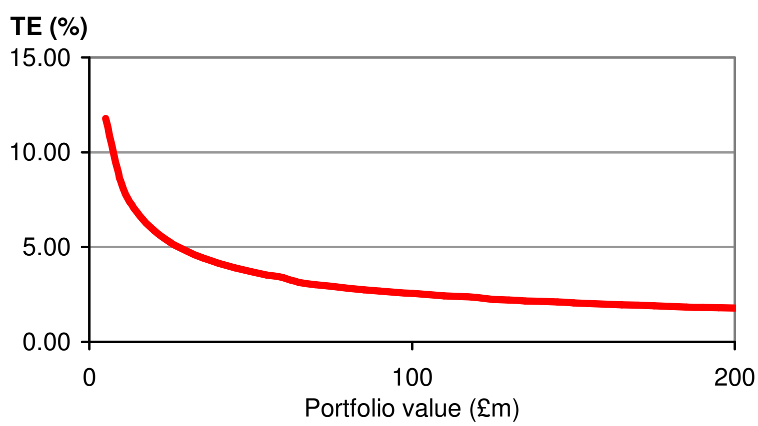
Table 4 shows the differing levels of required capital investment in the UK direct property market by segment to achieve reducing levels of tracking errors within each segment.

The required capital investment depends on both the efficiency of diversification within the segment and upon the average lot size within each segment. Investors with higher levels of risk aversion require more capital investment in property segments in order to reduce the specific risk component of the portfolio to the desired level.

To achieve a given tracking error, the least investment is needed in the standard shop, provincial office, other retail and south east office segments; most investment is needed in the London office, retail warehouse and shopping centre segments.

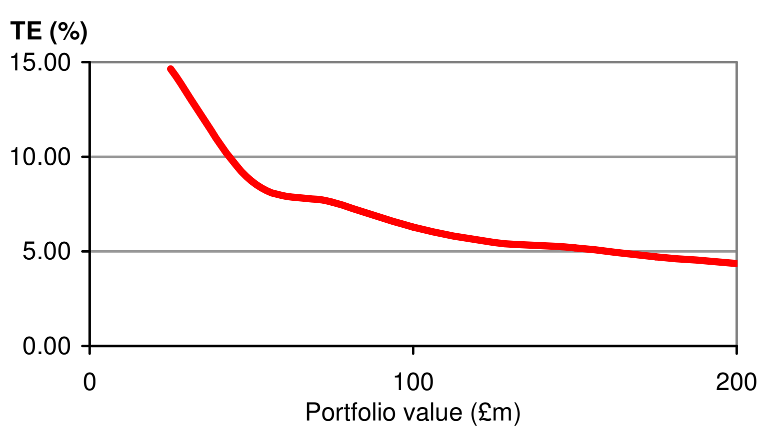
The figures also demonstrate that while the previous analysis showed that the tracking error of the shopping centre and retail warehouse segments reduce to a similar level as that of the industrial or standard shop segments, taking account of property values does not allow this degree of risk reduction. Figures 5 and 6 illustrate this issue.

Figure 5: tracking error and portfolio value in standard shops



Source: OPC/ IPD, August 2005

Fgure 6: tracking error and portfolio value in London offices



Source: OPC/ IPD, August 2005

Comparing Figures 5 and 6 is instructive: £100m achieves a tracking error of 2.5% within the standard shop unit segment, but the same commitment within the London office segment achieves a 6.5% tracking error.

While it can be seen from Table 2 and Figure 4 that a tracking error of 2% can be achieved in the London office segment at around 80 properties, within the maximum 100-property portfolio size, Figure 6 shows that an investment as large as the upper limit of £200m allows for a very limited tracking error reduction, to just below 5%.

The meaning of these values is worth considering. Roughly speaking, for two years in three a randomly-assembled £100m portfolio of standard shop units will produce returns within the range of the index return plus or minus 2.5%. For a randomly-assembled £100m portfolio of London offices, returns outside the range of the index return plus or minus 6.5% will be delivered one year in three. Can investors with limited resources cope with this uncertainty?

Another approach to this problem is as follows. For a target tracking error of 5%, the required capital investment differs greatly from segment to segment. Whereas in the standard shop segment a direct investment of £28 million results in a tracking error of 5%, £152 million is required for a similar risk level in the London office segment. The London office segment exhibits the highest average variance of individual properties (specific risk) and additionally the highest average covariance of individual properties and the poorest diversification potential.

Although increasing the number of underlying properties reduces the tracking error, the high lot size of London offices means that the reduction comes at a significant cost. Finally, it is interesting to note that increasingly large amounts of capital are needed to achieve decreasing target tracking errors across these segments. A 5% tracking error in each segment requires a total investment of over £500m; 4% requires £850m; 3% requires £1700m; and 2% requires almost £4bn.

4. The impact of benchmarks

The material presented so far deals with each segment as if it were a stand-alone component of the UK market. However, investors have to construct portfolios of segments. Two common approaches to this challenge are as follows: first, to optimise a portfolio using expected segment returns and expected segment variances and co-variances; second, and more commonly, to build portfolios by reference to standard or customised benchmarks.

Table 5 shows the implied percentage allocations by segment for an investor wishing to limit its segment tracking error risk to 5% or 2%, and the respective benchmark allocations for the IPD Monthly and Annual Universes.

Table 5: portfolio structures

Segment	5%	2%	Monthly	Annual
Standard shops	4.9%	4.2%	15.0%	13.0%
Retail warehouses	15.1%	26.9%	27.0%	19.0%
Shopping centres	20.8%	11.5%	15.0%	21.0%
Other retail	7.0%	4.5%	1.0%	2.0%
London offices	26.8%	32.7%	9.0%	15.0%
South East offices	6.3%	4.6%	6.0%	4.0%
Provincial offices	6.3%	4.4%	6.0%	4.0%
Office parks	7.0%	5.6%	4.0%	5.0%
Industrials	5.6%	5.6%	17.0%	17.0%
Total	100.0%	100.0%	100.0%	100.0%

Table 5 shows clearly how a wholly direct investor is forced into one of three uncomfortable positions.

The first alternative is that the investor has to take large underweight or overweight positions relative to the benchmark in order to control tracking error at the segment level. This promotes the reduction of stock risk over the reduction of sector risk. For example, if the benchmark is the IPD Monthly, the £500m investor will be underweight in standard shop units, retail warehouses and industrials; and overweight in other retail, London offices (hugely), and shopping centres. If the benchmark is the IPD Annual, the £4bn investor with a low tracking error target by segment will be underweight in standard shop units, shopping centres and industrials; and overweight in retail warehouses and London offices (again, hugely).

The second, equally problematic, alternative is to achieve the benchmark weights but by accepting tracking errors at the segment level which are higher than the acceptable limit. This promotes the reduction of sector risk over the reduction of stock risk.

Source: OPC/ IPD, August 2005

The third alternative is to reduce both sector and stock risk by investing more money than the target allocation to property. This is equally unacceptable.

A fourth alternative is to use indirect property vehicles. The analysis has shown that the need for indirect exposure is greatest in the London office segment. To what extent dos the market appear to have been efficient enough to cater for this need?

5. The universe of Indirect vehicles

The OPC Private Property UK database includes (at September 2005) data on 254 unlisted property vehicles worth a combined £59.1 billion. Within this universe, 115 are diversified funds and 139 are sector- or segment- specialist. Table 6 shows the number and size of fund available within each segment.

Table 6: Private Property UK specialist funds

Property type	No of vehicles	GAV (£m)
Standard shops	5	539
Retail warehouse	11	7,502
Shopping centre	18	8,862
Other retail	7	1,192
London office	15	2,662
South East office	2	215
Provincial office	4	436
Office park	6	1,519
Industrial	15	3,229

Source: OPC, September 2005

Table 6 suggests most choice for investors exists in the shopping centre segment, followed by the London office and industrial segments. Table 3 suggests that this correlated better with lot size than with the specific risk characteristics of the sectors.

An appropriate approach to managing specific risk in property portfolios therefore naturally presents itself. A combined portfolio of direct property and indirect vehicles offers the prospect of controlling segment exposure relative to benchmarks and at the same time control of tracking error within the segment.

This is as suggested in Table 7, which describes a portfolio within which each segment has a 5% tracking error. This requires roughly £570m of investment (£568m to be precise).

Table 7: The £500m 50:50 portfolio

Segment	£m	%	Execution
Standard shops	28	4.9%	Direct
Retail warehouses	86	15.1%	Indirect
Shopping centres	118	20.8%	Indirect
Other retail	40	7.0%	Direct
London offices	152	26.8%	Indirect
South East offices	36	6.3%	Direct
Provincial offices	36	6.3%	Direct
Office parks	40	7.0%	Direct
Industrials	32	5.6%	Direct

In this portfolio, the total direct exposure is £212m; the indirect exposure is £356m.

UK indirect vehicles are, however, leveraged to an average of 40% of GAV. Apart from creating distorting performance effects, assumed to be *de minimis* in this study, gearing has the effect of increasing exposure to the segment for a reduced capital investment. Applying 60% equity and 40% debt to the £356m indirect exposure, the target investment in shopping centres, retail warehouses and London offices is achieved with £214m of equity, Hence an investment of £426m, 50% invested directly and 50% invested indirectly, achieves the target tracking error in each segment.

The direct/indirect portfolio achieves several objectives. It reduces the amount of capital required to reduce stock risk; it reduces tracking error at the segment level; and it will permit a re-allocation with the segments to control the benchmark risk.

6. Conclusions

There are two basic sources of risk and return in property investment. These are: portfolio structure; and stock.

A high tracking error against a benchmark is introduced if large positions diverging from the benchmark structure are taken at the segment level; and a high tracking error will also result from poor diversification at the property or stock level. Hence the lumpiness of different property types is a double problem: not only might it be difficult to spread specific risk across several properties, but it may also be difficult to achieve a benchmark-matching exposure to a segment.

In this research we have analysed the risk characteristics of direct property segments in the UK property market. By constructing portfolios of direct properties in various segments, we have been able to relate expected tracking errors to portfolios of increasing numbers of underlying properties and increasing capital values.

We have found that for smaller investors – defined as those with less than £500m to spend – it is impossible to reduce the stock risk present within many segments of the market below an acceptable level. Even for large investors there is a trade-off between the diversification of specific risk at the segment level and the control of exposure to those segments relative to a benchmark.

We have found that for smaller investors – defined as those with less than £500m to spend – it is impossible to reduce the stock risk present within many segments of the market below an

acceptable level. Even for large investors there is a trade-off between the diversification of specific risk at the segment level and the control of exposure to those segments relative to a benchmark. For an investor primarily concerned with the diversification of specific risk, the risk of segment performance being impossible to control within reasonable limits is simply too great to permit direct investment.

As a result, a wholly direct investor is forced to take large underweight or overweight positions relative to the benchmark or to accept tracking errors at the segment level which are higher than the acceptable limit.

An appropriate approach to managing specific risk in property portfolios therefore naturally presents itself. A combined portfolio of direct property and indirect vehicles offers the prospect of controlling segment exposure relative to benchmarks and at the same time control of tracking error within the segment. The direct/indirect portfolio achieves several objectives. It reduces the amount of capital required to reduce stock risk; it reduces tracking error at the segment level; and it will permit a re-allocation with the segments to control the benchmark risk.

Evidence suggests that, in practice, the diversification benefits of multi-sector portfolios act ot reduce tracking errors below the averages for each sector. This effect, which probably results from greater diversification power for properties located across rather than within sectors, needs to be better understood. The costs of using indirect property funds – for the effects of, fees, gearing and possible reduced illiquidity - also need to be the subject of further research.

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