The University of Reading Business School

Department of Real Estate & Planning

Working Papers in Real Estate & Planning 05/06

The University of Reading

Depreciation and its Impact on the Total Return of UK Commercial Real Estate, 1994-2003.

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Abstract

Depreciation is a key element of understanding the returns from and price of commercial real estate. Understanding its impact is important for asset allocation models and asset management decisions. It is a key input into well-constructed pricing models and its impact on indices of commercial real estate prices needs to be recognised.

There have been a number of previous studies of the impact of depreciation on real estate, particularly in the UK. Law (2004) analysed all of these studies and found that the seemingly consistent results were an illusion as they all used a variety of measurement methods and data. In addition, none of these studies examined impact on total returns; they examined either rental value depreciation alone or rental and capital value depreciation.

This study seeks to rectify this omission, adopting the best practice measurement framework set out by Law (2004). Using individual property data from the UK Investment Property Databank for the 10-year period between 1994 and 2003, rental and capital depreciation, capital expenditure rates, and total return series for the data sample and for a benchmark are calculated for 10 market segments. The results are complicated by the period of analysis which started in the aftermath of the major UK real estate recession of the early 1990s, but they give important insights into the impact of depreciation in different segments of the UK real estate investment market.

Keywords: Depreciation, commercial real estate, investment performance.

1. Introduction

Understanding the nature of depreciation of property values is important for investors and advisors and they need to have some indication of the impact it has on expected total returns. Property has to compete with other assets in the multi asset portfolio and the case for property must take account of any financial or asset based issues which make it in any way different to the competing assets. Asset allocation models tend to suggest that property should form a significantly higher proportion within investment portfolios than its current allocation, but property performance figures are treated with some suspicion for a variety of reasons (see, for example, Hamelink and Hoesli, 2004). The heterogeneous nature of the asset, illiquidity, the lack of divisibility and the reliance on valuations have all been cited, and depreciation in value, often related to obsolescence, has also figured prominently in this debate.

The basic return model for property includes depreciation. Total return is a function of income yield plus cash flow growth. Models that ignore the impact of depreciation on cash flow growth may overstate the potential returns. Although analysis of past depreciation rates will not provide direct evidence of future rates, knowledge of the impact of depreciation on past returns must inform the asset allocation decision.

Pricing models are also based on projected cash flows discounted at target rates of return. Depreciation impacts on both the choice of discount rate and the growth projections. Pricing models can be used for both acquisition/sale decisions and asset management decision-making and both require some element of the life cycle of the site and buildings to be assessed (either explicitly in the cash flow or implicitly in the exit yield). This life cycle involves forecasting cash flow from the existing building and this is subject to depreciation through time. However, the location is as likely to appreciate as depreciate and therefore appraisal models need to reconcile any growth in the location with any growth in the actual building after depreciation. Redevelopment occurs when the increasing gap between rents based on actual buildings in the location and new buildings expands so that the increased value of redevelopment (including some element of yield change) outweighs the cost. Irrecoverable capital expenditure additional to periodic redevelopment also impacts directly and indirectly on cash flow. It is a direct liability, yet it may also relatively enhance the cash flow. Increased knowledge of these items reduces the uncertainty surrounding cash flow estimates at both portfolio and individual level, contributing to managing that risk.

Apart from asset allocation, management decision making and appraisal issues, depreciation rates are increasingly required for bank lending decisions. Market valuations are sometimes

subject to special assumptions and one of those is to value the building at both the beginning and end of the loan. Even if both appraisals are based on current value levels, the impact of the passage of time on rents and yields needs modelling. Depreciation rates inform these adjustments and are therefore increasingly being used to adjust market values for lenders' requirements.

Finally, depreciation is of relevance to indirect investors in real estate. Apart from its influence on rental values and growth prospects of vehicle assets, capital expenditure will have an important impact on the income that can be distributed to the share or unit holders. Meanwhile, vehicles must be able to manage depreciation effectively, an issue that is particularly important where their actions are constrained by distribution rules or other restrictions laid down in return for tax transparency. Information on depreciation and expenditure therefore informs debates about how such vehicles should be structured and has contributed to the recent debate in the UK on creating a REIT-type vehicle (HM Treasury, 2004; IPF, 2004).

The above discussion highlights the need for the depreciation of investment property to be studied and this paper aims to identify long-term depreciation rates for UK commercial and industrial property and examine the inter-relationship between rental depreciation, capital value shifts and capital expenditure. In 2005, the industry funded a major project into depreciation and this paper builds off the results and findings of that longitudinal study of 10 and 19 year depreciation rates across the main sub-sectors of the UK commercial real estate market (IPF, 2005). The overall objective of this paper is to identify the effect of depreciation on total returns.

Section 2 discusses the framework for the study drawing mainly off the findings of Law (2004). Section 3 discusses the approach and includes a commentary on a number of data issues raised by the study and how they were addressed. Section 4 sets out the empirical results and section 5 discusses the implications of the research, while conclusions are drawn in section 6.

2. Framework for the study

2.1 Definition and measurement of depreciation

Law (2004) examined in detail the theoretical framework for the measurement of depreciation. Drawing off the work of Hotelling (1925), Hulton and Wykof (1976; 1981a; 1981b; 1996), Jorgenson (1996) and Wolverton (1998) amongst others, she defined depreciation as follows:

> "the rate of decline in rental/capital value of an asset (or group of assets) over time relative to the asset (or group of assets) valued as new with contemporary specification" (Law, 2004).

This definition creates a basis for the measurement of depreciation.

There have been several previous studies of depreciation in the UK commercial property market commencing with CALUS (1986) and including Baum (1991,1997), JLW (1987), Barras and Clark (1996) and CEM (1999). Despite the apparent consistency of the results, commented upon by a number of authors (Hoesli and MacGregor, 2000; Turner, 2001), Law (2004) found that they included a wide variety of measurement approaches and when she used these varying methods on the same dataset, major differences in results were revealed. Therefore, she set out to determine a consistent framework for the definition and measurement of depreciation, concentrating on rental depreciation only.

Having critically evaluated the various steps involved in measuring rental depreciation, her main findings were as follows:

- There is a distinction between data control and measurement issues. It is the latter that are critical to the correct calculation of depreciation while the former depend on the data available for any study.
- Differences in methodology and calculation implicitly represent different attitudes towards the concept and timing of depreciation, though these are not always recognised.
- A cross-sectional approach shows change in value solely as a function of age and only at a particular point in time. Longitudinal measurement permits the measurement of depreciation due to both time and age over a period, but does raise significant data issues with a trade off between length of study and biases in the dataset.
- The rate of change can be calculated on a growth or a decline basis. A decline rate properly reflects the timing of change.

- The calculation function should calculate the relative change between a sample and a benchmark, as well as being consistent with a decline basis.
- To calculate a rate for a portfolio of properties or a market segment, the change in *values* over the period should be measured, since this is consistent with value weighting, not an average of individual depreciation rates.

These findings point to a best practice measurement approach, which is determined to be a longitudinal study relative to a benchmark, adopting a multiplicative decline measurement function and value weighting. Law (2004) therefore recommends the following formulae, which is consistent with these characteristics;

$$d = 1 - \{[\sum R^{s}_{t2}/\sum R^{s}_{t1}]^{(1/(t2-t1))} / [\sum R^{b}_{t2}/\sum R^{b}_{t1}]^{(1/(t2-t1))}\}$$

where d = the rate of depreciation, R^s = sample rental value and R^b = benchmark rental value

This formulae can also be used to measure depreciation in capital value as well as the relative decline in rental value. However, the measurement of capital value depreciation includes rental value depreciation, if the capital value measurement is based on the decline relative to a new property in the same location. The assessment of capital value is often undertaken via a capitalisation of rental value and therefore any element of rental value decline will be included. However, capital values could decline further than rental values if, in addition to falls in rental value, capitalisation rates move upwards. Capital depreciation has been calculated in this paper as the movement in capital values relative to the benchmark, with the impact of yield changes assessed by subtracting rental depreciation from the capital depreciation rate.

However, capitalisation rates are assessed by reference to future expectations rather than current or past performance. One of those expectations is the prospect of capital expenditure on the asset in order to minimise or even eradicate both declines in rental value and capital value. For example, capital expenditure on the existing asset may enhance rental values and, as capitalisation rates include future expenditure, they may also impact on them by reducing the expected future liability. The ultimate capital expenditure eliminating all depreciation is the replacement of the building with the benchmark new building; although, in reality, changes in factors such as planning use or allowable floorspace usually mean that the nature or size of a building has changed as well.

Total returns from property over the long term are a function of cash flow and the two main items for a long-term depreciation study are rental values and the extent of capital expenditure

necessary to support the rents. Hence, if holding periods are ignored and all capital expenditure included, it is from these that true depreciation rates can be observed. However, capital expenditure is not constant and, if major replacement expenditure is not included, changes in the valuation yield[1] do give some indication of depreciation in value, as the prospect of a major capital injection coming closer would cause these yield levels to increase, so reducing capital value relative to the current income. Investors may also be interested in shorter term holding periods and the relationship between capital expenditure (or lack of it), rental depreciation and yield change. However, given the all risks nature of capitalisation rates and the changes in lease structures in the UK since 1990, capitalisation rate changes may well include factors other than depreciation. In this study, for practical data reasons, buildings with major capital expenditures have been eliminated and yield shift used as a proxy for full refurbishment, but it is arguable that the measurement of depreciation should include major expenditures and definitions include notions of the cost of asset enhancement as well as replacement.

Given this relationship between rental values and capital expenditure, capital expenditure may be most usefully measured relative to the rental value rather than the capital value. Rental value in the UK is normally recorded in databases gross of any expenditure each year and so the average annual capital expenditure can be viewed as a deduction from gross rent to net rent, reducing the initial yield. This measurement also gives some indication of the deduction in rent necessary to support maintaining the asset and arresting some elements of depreciation.

However, over both long and short terms, total returns to property can be isolated by examining rental income/initial yield, capital value change and expenditure. Therefore, this paper examines rental value depreciation, capital value depreciation, the impact of yield change (the residual of capital depreciation – rental depreciation) and capital expenditure as a percentage of both total rental value and total capital value over the period of analysis. This paper also measures total returns and therefore determines the reduction in total returns caused by depreciation.

2.2 Benchmarks

Depreciation measurements are decline measures compared to a benchmark, as depreciation has been defined as a relative concept. However, there are a number of different benchmarks of different types available in the UK and a number of these different types have been used by studies in the past. Law (2004) explored the use of the different benchmarks, again with the objective of creating a framework for their choice within depreciation studies. She identifies a

1 In many countries termed either Capitalisation (Cap) Rate or All Risks Yield.

model benchmark but finds that this model is practically impossible to replicate. The key findings for benchmarks were as follows:

- The choice of benchmark should flow from the definition of depreciation. Ideally, depreciation should be measured as the fall off in value from a new building in that same location.
- The model benchmark therefore has three key characteristics;
  - Specification as new to an appropriate modern design. This is preferred to matching the specification of the existing property, as it ensures that the effect of obsolescence is captured by the measurement.
  - In the absence of site specific data, the benchmark should have sufficient coverage and disaggregation so that the location of the property can be matched to the benchmark in as much detail as possible.
  - The benchmark itself should not contain depreciation.
- Available benchmarks can be categorised as internal or external and, within the latter category, as market or prime.
- Internal benchmarks are derived from the depreciating sample and therefore include some depreciation. For example, if the top rent in a set of held properties was chosen as the benchmark in that year, this would also be depreciating through the measurement period.
- Market benchmarks of rental or capital values are normally measured using held samples of properties over the measurement period. They therefore include depreciation as they comprise a sample that ages over the measuring period, regardless of the shortness of that period. For example, in an annual rental value index, the rental value of a set of properties would be measured at the beginning and end of the year. Changes in portfolio make-up are only incorporated at the end of the period and are measured from that point forward.
- Prime indices constructed on a hypothetical rather than 'top rent' basis do not include depreciation as they are constructed based on a hypothetical rental value of a new property usually in the 100% pitch of the chosen location. Further, the use of a continually prime index allows the resultant depreciation rate to account for obsolescence. However, the use of a prime index when a sample is comprised of non-prime properties may mis-state depreciation as there may be relative differences in performance between prime and non-prime locations through different market conditions. For example, in times of high occupier demand, the differential between prime and non-prime buildings may reduce.

Of the available series in the UK, the CBRE *Rent and Yield Monitor* (CBRERYM) was identified as the most appropriate benchmark in the absence of the model benchmark. This index is constructed from observations made in individual locations based on a new building on a prime site within those locations (see CB Hillier Parker, 2000, for more details). Data on the individual

locations is not normally available but they were kindly provided by CBRE for this research. The data includes rental values and, for a less extensive set of locations, capitalisation rates for new buildings in the locations. It is a valuation-based set of data.

2.3 Research methods

As indicated previously this paper aims to create long-term indicators of depreciation on commercial property investments in the UK. To undertake this investigation, the same dataset as that constructed for the IPF industry study (IPF, 2005) was used. This dataset contains information on individual properties within the UK database of Investment Property Databank (IPD).[2] The properties represent assets held by major UK investing institutions, such as insurance companies, pension funds and quoted property companies. However, although they are institutionally owned, this does not mean that all the properties in the database are prime properties and, indeed, within the samples, both prime and non-prime assets were included.

The data required for measurement were open market rental values and capital values for each property at both the start and end of each period, the amount of capital expenditure over the period and codes to indicate the sector and market segment of each property. It also included annual rent, rental value and capital value and supporting information on equivalent yields[3] and reversionary potential.[4] This additional information enabled the more detailed investigation of total returns in this paper, which is presented in section 5. In particular, this paper concentrates on a sample of properties held over the 10 years 1994-2003 for which all aspects of depreciation could be measured[5]. This sample has been reduced by 10 properties from all the properties available owing to changes in the level of part ownership of some assets during the analysis period, which generated some inconsistencies in the floorspace and value records.

The final 10 year sample comprised 1,787 properties in total and the number of properties by segment is shown in Table 1.

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2 Analysis was undertaken whilst one of the authors was employed at IPD, and within its confidentiality restrictions.

3 IPD use equivalent yield as their indicator of the level of capitalisation rates/all risks yield. Equivalent yield is defined as the internal rate of return of the cash flow assuming increases/decreases in rent to current rental value at the next rent change date. The rent change date may not be the next rent review in cases where a property is over-rented.

4 Reversionary potential is the ratio between the current rental value and the rent expressed as an index. Where rents are higher than rental values the index is less than 100.

5 The IPF dataset (IPF, 2005) also included a sample held over a longer period (1985-2003) for which only rental depreciation and capital expenditure could be measured.

Table 1: Number and value of properties in the measurement sample – by segment

	Number of Properties	Capital Value at end 2003 (£ million)	% of Total Capital Value
Std Shops – South East	430	2,152	17.7%
Std Shops – Rest of UK	421	1,746	14.4%
Retail Warehouses	54	1,005	8.3%
Offices – City	74	899	7.4%
Offices – West End	166	1,739	14.3%
Offices – South East	201	1,766	14.6%
Offices – Rest of UK	109	746	6.1%
Industrials – South East	208	1,577	13.0%
Industrials – Rest of UK	124	504	4.2%
All Property	1787	12,133	100.0%

The sample, as measured by capital value at the end of 2003, included 40% retail, 42% offices and 17% industrial. At the end of 2003, the IPD UK Annual Index was made up of 52% retail, 30% offices and 16% industrial (IPD, 2005). Any all property results will therefore overstate the influence of offices and understate the influence of retail.

Each of the properties in the sample was matched to an appropriate rent and yield point from the CBRERYM dataset. The rent observations for the benchmark are made in £ per square foot and these were multiplied by the property floorspace in each case to create a benchmark rental value for comparison. In order to measure rental depreciation of an individual property, this step would in fact be unnecessary, but it does matter for correctly weighting properties when calculating aggregated results. For the calculation of capital depreciation, the benchmark rental value was divided by the benchmark yield to create a comparison capital value. The rent observations are made with the assumption that the hypothetical properties are rack-rented, so capitalisation in this way is appropriate.

The ideal benchmark for each property would be a rental and capital value observation at exactly the same site as the property itself. However, there are no available data series at this level of detail and so, in using the CBRERYM data points, set in prime locations, some micro-location differences between property and benchmark will be reflected. This means that individual depreciation rates include physical factors and improvement or decline in the property's location relative to where the benchmark observation was made, an issue explored in more detail in Law (2004). Of all the segments, this issue may particularly affect standard shops, for which prime

areas are more tightly defined than in the case of other property types, but at the segment level, improvements in some non-prime locations offsets the impact of decline in others.

As well as the segments listed in Table 1, some analysis of Shopping Centres was also possible. When constructing the dataset, the IPF study (2005) noted that too few Shopping Centres had been continuously held by one investor for their inclusion in the main sample. However, a separate sample of these assets was constructed by IPD by tracing the histories of those centres that had been sold between two or more contributors to the IPD service. A further issue was that no benchmark observations existed that were specific to this segment. As the sample centres were all town centre located, it was decided to make use of the shop rent points as benchmarks representing prime retail space. The shop yields, though, were deemed inappropriate for making a capital value comparison, as the differences in terms of type and scale of investment were felt to be too great. Therefore, only rental depreciation and capital expenditure rates for Shopping Centres were measured and these were not incorporated into the all property results.

3. Investigation and Results

3.1 Rental depreciation

Table 2 presents the rental depreciation rates measured for the sample of properties outlined above[6].

Table 2: Rental Depreciation Results for the 10 Year Sample, % per year

	Rental Growth for CBRE data	Rental Growth for the Sample	Rate of Rental Depreciation
PROPERTY TYPES			
Standard Shops	4.8%	4.5%	0.4%
Shopping Centres	4.1%	4.0%	0.1%
Retail Warehouses	8.9%	7.3%	1.5%
Office	4.6%	3.9%	0.7%
Industrial	3.2%	2.7%	0.5%
All Property (excl. Shopping Centres)	4.8%	4.0%	0.7%
PAS SEGMENTS			
Std Shop - South East	5.2%	4.8%	0.3%
Std Shop - Rest of UK	4.5%	4.0%	0.4%
Shopping Centres	4.1%	4.0%	0.1%
Retail Warehouses	8.9%	7.3%	1.5%
Office – City	3.6%	4.2%	-0.6%
Office - West End	7.5%	6.4%	1.0%
Office - South East	3.7%	2.9%	0.8%
Office - Rest of UK	3.5%	1.9%	1.6%
Industrial – South East	3.3%	3.1%	0.2%
Industrial - Rest of UK	3.0%	1.7%	1.2%

Looking first at the standard shop, office and industrial sectors, which were measured in previous depreciation studies, there are few surprises in the results, with offices showing the greatest rental depreciation and standard shops the least. Baum (1991) also found that offices depreciate more than industrial properties, whilst CEM (1999) looked at these three sectors and found the same relative ranking.

6 Note that the depreciation figures will not be the difference or ratio between the growth rates since they are calculated on a decline basis, as per the formula set out in section 2.

The simple sector pattern, though, hides interesting variations in depreciation rates across different sub-markets. For instance, within both the office and industrial sectors, provincial assets display higher rental depreciation than those in the South East. One possible reason suggested in IPF (2005) for the higher rates in the Rest of UK is that rental and capital values per square metre on new buildings are typically lower than in the South East. If it is assumed that building cost variations per square metre are lower than value variations in each area, and that the lifetime of an office building is approximately the same, it follows that the provincial property will depreciate more than a comparable property in South East England since the residual value (i.e. land value) is smaller. However, in the capital depreciation rates, this pattern persists only for offices, whereas the industrial rates are broadly similar.

It can also be seen that the Retail Warehouse sample suffered relatively high rental depreciation in comparison to other segments. This may be surprising given the strong investment performance of the segment as a whole, but it can be explained by the age of the sample properties. By definition, the retail warehouses in the sample were all constructed prior to 1993 and before the emergence of a new class of prime retail warehouse parks in the mid-1990's. So while they saw impressive rental growth of 7.3% per year, the prime rental growth series saw even faster growth of 8.9% per year overall. Therefore, the experience of the pre-1993 cohort of retail warehouses provides evidence that modern buildings in emerging segments can suffer rapid depreciation if they are superseded by a newer generation of buildings.

Meanwhile, the Shopping Centre result may seem surprising for the opposite reason; that it is low for a segment that might be perceived as vulnerable to obsolescence. On the other hand, in many towns, the shopping centre is the dominant prime pitch, so the centre's rental growth and that of the benchmark often have been identical (effectively, the centre has been used as the benchmark). In order to maintain a minimal rate of rental depreciation, these centres have also had a considerable amount of capital expenditure spent upon them and this reinforces the proposition that depreciation is a function of both relative rental decline and expenditure that can arrest that decline (see Table 4). Measurement of one aspect without the other is a meaningless indicator of depreciation.

There is another segment that appears to have an inconsistent result and that is City offices at a appreciation rate of 0.6% pa. Without a case study approach to these results, no explanation is apparent from observation of the aggregated data. However, two possibilities could be hypothesised. The first is that is that a number of large City buildings have had major refurbishments carried out and this has meant a re-rating of the rental values back to prime grade

A space levels. A high capital expenditure rate would therefore be expected. Alternatively a data problem may exist based on the start date of the study in the aftermath of the UK property market crash in 1990. The City office market was most affected by the phenomenon of over-renting and by difficulties in assessing rental value due to the paucity of letting evidence and the disguising of rents with incentives. This issue is examined further later in this paper.

3.2 Capital depreciation

Table 3 presents the capital depreciation results for the sample. The capital depreciation rates show a similar sector ranking to the rental rates, with offices displaying most depreciation and shops the least.

Table 3: Capital Depreciation Results for the 10 Year Sample, % per year

	Capital Growth for CBRE data	Capital Growth for the Sample	Rate of Capital Depreciation
PROPERTY TYPES			
Standard Shops	5.3%	4.4%	0.9%
Shopping Centres	-	-	-
Retail Warehouses	12.4%	10.5%	1.7%
Office	5.5%	3.0%	2.4%
Industrial	5.6%	3.6%	1.9%
All Property (excl. Shopping Centres)	5.5%	4.0%	1.4%
PAS SEGMENTS			
Std Shop - South East	5.6%	4.5%	1.1%
Std Shop - Rest of UK	4.8%	4.2%	0.6%
Shopping Centres	-	-	-
Retail Warehouses	12.4%	10.5%	1.7%
Office – City	3.7%	0.9%	2.7%
Office - West End	7.9%	5.5%	2.3%
Office - South East	4.9%	2.4%	2.4%
Office - Rest of UK	5.4%	2.1%	3.1%
Industrial – South East	5.8%	3.9%	1.8%
Industrial - Rest of UK	4.9%	2.7%	2.1%

As discussed earlier, these figures include the effects of rental depreciation, as rental values are a key input into the capital valuations of property assets. However, without exception, the

segment results are all larger than their corresponding rental depreciation rates, and this is owing to the fact that, during the period, the samples also experienced relative decreases in capital value over and above rental value changes compared to the prime benchmark.

This would be expected to take the form of equivalent yield changes relative to the yield on the benchmark properties. Part of any negative re-rating of yields on the sample properties will be because they have aged and expectations for future growth may have been downgraded (despite the fact that there is no empirical analysis that suggests the rate of depreciation accelerates with age), but also that the time until prospective refurbishment or redevelopment will have reduced so the increased present value of the liability will be built into the capitalisation rate. But relative yield change may also be due to other factors, the most obvious of which is lease expiry reductions either because the same lease has been in place throughout the measurement period or because any renewal or new lease was for a shorter period than the original. DETR (2000) and Crosby, *et al*, (2005) set out the long term reduction in lease lengths and other lease structure changes in the UK since the early 1990s and illustrate the virtual abandonment of the institutional 20-25 year lease in favour of median lease lengths of 15 years for retail properties and 5-10 years for offices and industrial properties. This underlines the difficulties of measuring the real impact of depreciation on properties when capital values are chosen for analysis.

The actual movement in yields are set out in Table 4. Given the capital depreciation figures surprisingly, relative to the benchmark, they do not appear to show any major change.

Table 4: Changes in equivalent yield for the sample and for the benchmark, and changes in the reversionary potential of sample properties[7].

	As at end-1993			As at end-2003		
	Equivalent Yield for CBRE benchmarks	Equivalent Yield for sample properties	Reversionary Potential of sample	Equivalent Yield for CBRE benchmarks	Equivalent Yield for sample properties	Reversionary Potential of sample
PROPERTY TYPES						
Standard Shops	6.0%	7.0%	104.9	5.8%	6.6%	111.9
Shopping Centres	-	-	-	-	-	-
Retail Warehouses	8.6%	8.6%	116.2	6.2%	6.3%	113.3
Office	7.8%	9.2%	83.8	7.1%	8.1%	100.4
Industrial	9.1%	10.2%	101.2	7.3%	8.4%	113.5
All Property (excl. Shopping Centres)	7.5%	8.7%	94.0	6.6%	7.5%	106.9

7 These figures are weighted averages, using capital value (or benchmark capital value) as at the start of the measurement period.

PAS SEGMENTS						
Std Shop - South East	6.0%	7.0%	101.0	5.7%	6.6%	115.6
Std Shop - Rest of UK	6.0%	7.0%	109.7	5.9%	6.7%	107.8
Shopping Centres	-	-	-	-	-	-
Retail Warehouses	8.6%	8.6%	116.2	6.2%	6.3%	113.3
Office – City	7.0%	8.3%	60.1	6.9%	7.9%	87.8
Office - West End	6.9%	9.1%	75.4	6.6%	7.5%	101.5
Office - South East	8.7%	9.7%	97.8	7.7%	8.7%	100.8
Office - Rest of UK	8.5%	9.5%	99.4	7.1%	8.5%	113.5
Industrial – South East	9.1%	10.2%	99.4	7.2%	8.2%	115.7
Industrial – Rest of UK	9.1%	10.3%	106.3	7.6%	8.9%	107.3

In absolute terms, the gap between the all property equivalent yield for the sample and the all risks yield for the benchmark has reduced from 1.2% to 0.9%. Both yields have fallen over the period. The relative increase in the capitalisation factor is also, on the surface the wrong way round with the benchmark increasing by 13.2% while the property capitalisation factor appears to have increased by 15%

Yield movements should be treated with caution. Equivalent yields as indicated previously are defined as the internal rate of return of the cash flow assuming no change in future rental values. In rising markets, they include reversions to current rental value, but ignore any future growth in rental values. This is therefore implied in yield levels. In falling or fallen markets, this growth potential is badly distorted by lease provisions, especially in the UK where upwards only reviews dominate. For the benchmark, which is assumed to be fully let, this does not constitute an issue but the equivalent yields of the sample do reflect the actual leases in place on those properties and the capital values used therefore reflect the rental levels as well as the potential reversions to rental value.

The reversionary potential columns in Table 4 suggest that the London office market at the start of the period was heavily over-rented and equivalent yields would be higher to reflect this situation. For example, equivalent yields would be calculated assuming the over-renting lasted until the end of the lease while the capital valuations may have been assumed a shorter period. By the end of the analysis period, the situation had changed with less over-renting, although the City office market still exhibits that characteristic. It may be expected that this phenomenon would result in some narrowing of the yield gap between benchmark and sample over the ten-year period in those markets which were over-rented at the start. This would compensate for any

widening of the yield gap caused by depreciation. In office and industrial markets which were fully let or reversionary at the start date, the yield gaps have widened and in the West End of London, which was heavily over-rented at the start but not the finish, the yield gap has narrowed. In the one market that has remained heavily over-rented at both start and finish date, the City of London office market, the yield gap has narrowed slightly. The results are therefore fairly consistent. However, the equivalent yield level of 9.1% at the start of the period for the West End of London appears very high compared to the City of London at 8.3%, although for such such a heavily over-rented sector it may seem low in the City. . The other segment to show a result where the fall in yield is higher in the sample than in the benchmark is standard shops, where the benchmark yield has fallen by 0.2% while the sample yield has fallen by 0.4%.

The yield data appears to contradict the capital depreciation analysis. However there are doubts over the construction of equivalent yield figures for the actual sample set against more simplistic assessments of capitalisation rate for the benchmark locations. This suggests that use of yield shift to break out the residual capital valuation figures from the rental depreciation within capital value depreciation rates is fraught with difficulty.

3.3 Capital expenditure

The capital expenditure rates for each segment are shown in Table 5, both as a proportion of capital values and as a proportion of rental values over the period. The amounts do not include expenditure that could be recouped from tenants through service charges or otherwise under the terms of a lease; they are irrecoverable spending by property owners on the maintenance of their assets. These rates reveal that not only did offices experience the highest rates of depreciation, but that their owners also spent a higher proportion of value to keep them from further decline.

Table 5: Capital Expenditure Rates for the 10 Year Sample, (% per year)

	Total amount of capital expenditure (£m)	Capital Expenditure as a % of Capital Value (p.a.)	Capital Expenditure as a % of Rental Value (p.a.)
PROPERTY TYPES			
Standard Shops	179.2	0.5%	7.6%
Shopping Centres	796.0	2.5%	30.1%
Retail Warehouses	59.6	0.9%	11.8%
Office	469.5	0.9%	12.0%
Industrial	83.4	0.4%	5.0%
All Property (excl Shopping Centres)	701.7	0.7%	9.4%
PAS SEGMENTS			
Std Shop - South East	85.1	0.5%	6.7%
Std Shop - Rest of UK	94.1	0.6%	8.7%
Shopping Centres	796.0	2.5%	30.1%
Retail Warehouses	59.6	0.9%	11.8%
Office – City	124.3	1.2%	19.4%
Office - West End	175.6	1.1%	15.0%
Office - South East	115.2	0.6%	7.7%
Office - Rest of UK	54.4	0.8%	9.2%
Industrial – South East	67.7	0.5%	5.6%
Industrial - Rest of UK	15.7	0.3%	3.6%

There are some issues coupled with the measurement of capital expenditure from IPD data returns. It is not easy to distinguish between regular small items and one-off expenditures, whilst very large refurbishments may be defined within the database as redevelopments, with the property taken out of the standing investment portfolio. But it does constitute all the irrecoverable expenditure apart from these possible major refurbishments and redevelopments.

As already indicated, the shopping centre rental depreciation rates show virtually no depreciation but the expenditure rates are very high. Similarly, West End and City Offices attract significant elements of capital expenditure in order to arrest rental depreciation rates

4. The implications for portfolio returns

In order to examine the effect of depreciation on total return, a comparison was made of the total return to the benchmark and the total return of the sample of properties over the 10-year period. Total returns are a function of the cash flow including any growth and capital expenditure over the return period, plus any terminal value.

The benchmark total returns can only be generated by forming a hypothetical total return series using rental values during the period and capitalisation rates at the beginning and end of the period. In contrast, the sample properties have capital values at the beginning and end of the analysis period and full cash flow details, including irrecoverable expenditure. Two total returns have been developed; the returns from the actual cash flows and the returns from using rental values instead of rents to generate a more comparable series to the benchmark. The results of this exercise are set out in Table 6.

Table 6: Total Returns for the 10 Year Sample, (% per year)

	Total Return of benchmark based on rental values	Total Return of sample based on rental values	Total Return of sample based on net income	Depreciation in Total Returns based on rental values	Depreciation in Total Returns based on net income
PROPERTY TYPES					
Standard Shops	11.3%	10.5%	10.0%	0.7%	1.1%
Shopping Centres	-	-	-	-	-
Retail Warehouses	19.2%	17.2%	16.5%	1.7%	2.3%
Office	13.9%	9.6%	9.9%	3.8%	3.5%
Industrial	13.8%	11.7%	11.5%	1.8%	2.0%
All Property (excl Shopping Centres)	12.1%	10.7%	10.6%	1.3%	1.3%
PAS SEGMENTS					
Std Shop - South East	11.7%	10.6%	10.3%	1.0%	1.3%
Std Shop - Rest of UK	10.8%	10.4%	9.8%	0.4%	0.9%
Shopping Centres	-	-	-	-	-
Retail Warehouses	19.2%	17.2%	16.5%	1.7%	2.3%
Office – City	12.1%	6.0%	7.6%	5.5%	4.0%
Office - West End	16.3%	11.5%	11.7%	4.2%	4.0%
Office - South East	13.7%	10.1%	9.9%	3.2%	3.3%
Office - Rest of UK	13.0%	9.3%	9.3%	3.3%	3.2%
Industrial – South East	14.0%	11.8%	11.6%	1.9%	2.1%
Industrial – Rest of UK	13.4%	11.5%	11.3%	1.6%	1.8%

The headline results indicate that total returns for the whole sample are 10.7% pa compared to 12.1% for the benchmark using the comparative rental value series. This constitutes an overall total return fall of 1.3% pa. When the actual property rents are used, rather than rental values, the total returns are usually lower, reflecting the lower income returns of a generally reversionary portfolio due to periodic rent reviews. The depreciation in total returns should therefore increase.

The sector results are as expected given the findings from the individual element analyses in previous sections of this paper. Standard shops show the lowest depreciation in total returns at 0.7%, while industrial and retail warehouses are all much higher at nearly 2% pa. Offices show significant overall levels of depreciation at nearly 4% pa, a combination of higher rates of both capital value, including rental value, depreciation and capital expenditure.

Individual segments illustrate further variation. City and West End of London offices have the highest total return depreciation. As they were the segments most affected by over-renting in the early 1990s, the growth in capital values in the benchmark will not have been matched within the sample, causing significant capital value depreciation. The arguably most important centre for real estate investment in the UK has the worst performance record insofar as depreciation is concerned.

Generating these results uncovers some major issues concerning the analysis and interpretation of property market data. Despite the fact that the rental value series should generate higher total returns and therefore lower depreciation rates for the sample properties than those using rents, the segment results using rents indicate that the depreciation in returns actually diminishes for West End of London offices. The discussion in the previous section concerning the impact of over-renting on equivalent yields/capitalisation rates may also be the explanation here. At the start of the analysis period, rents exceeded rental values in this segment by about a third and this position would have been held into the future for several years due to the prevalence of long leases with upwards only rent reviews at that time.

In the over-rented scenario, cash flows are higher than a series generated using rental values. Where the properties are under-rented, the opposite is true. Yet, this issue would not cause problems if the level of over-renting or reversionary potential had remained constant over the analysis period. However, by the end of the analysis period, the reversionary potential or level of over-renting had changed for most of the segments. Unfortunately, this does not explain the result for the City of London office market where over renting did not result in higher total return depreciation. Again, the 1993 equivalent yield levels are suspicious in this respect and would

have caused the sample to have a relatively high capital value at the start, reducing capital growth during the analysis period and therefore lower total returns and higher depreciation.

Nonetheless, this analysis reveals the fact that the actual impact of depreciation on portfolios is more complex than isolated measurements of either rental or capital depreciation would suggest.

5. Conclusion

This paper sets out depreciation rates measured for a held sample of properties within the UK IPD database for a ten year period between 1993 and 2003. The sample is relatively large and is based on the aggregation of individual properties. However, there are significant difficulties in interpreting results based on property market data without a thorough understanding of the underlying market processes from which that data is generated. Quantitative research into property markets which lacks this process element is naive and dangerous, giving the illusion of precision generated by highly sophisticated analysis of data with the underlying sources not investigated.

In the case of these results, the limitations of the data relate primarily to the difficulties in identifying values in the market of the early 1990s following a major fall in rental values. The situation is complicated by the unique lease structures prevailing in the UK throughout the analysis period; despite the fact that lease structures changed significantly during that period, current lease lengths and terms are still close to being some of the most lengthy and inflexible in the world. Changes in capital value relate not only to relative depreciation caused by the passage of time, but also to changes in the relationship between rent and rental value and the unexpired term of leases.

Despite these limitations, the results represent the most comprehensive investigation of depreciation rates undertaken to date in the UK and the first attempt to identify the effect depreciation has on total investment returns. The rental depreciation figures give a clear indication of the effect of the passage of time on the rates of rental value change and the capital expenditure figures give some context on the cost of keeping rental depreciation to the levels identified for each sub segment of the market. The low depreciation rates of standard shop units situated outside of shopping centres is confirmed although perhaps more than might be expected given the importance of location rather than building in prime retail. The importance of capital expenditure in arresting the relative decline in rental values within shopping centres is also illustrated. The case of retail warehouses raises interesting questions for evolving property types; despite the highest rates of rental growth they also exhibit higher rates of rental depreciation in existing properties caused by the rapid change in occupier requirements as the market develops.

In the UK, the City and West End of London office markets are arguably the most comprehensively researched and data rich. However, in this case, the City of London rental depreciation results show wide variation. The City of London sample indicates a very low rental depreciation rate but high capital expenditure. A preliminary suggestion would be that this

prestigious location, with a large number of international corporate tenants, generates a higher level of active management to attempt to keep buildings in prime condition, possibly to retain the best tenants longer. This suppresses rental depreciation at the cost of high levels of irrecoverable expenditure. The British Land Company refurbishment of Broadgate in the City of London may fit that model with a 15 year old complex still reported as generating prime rents but at a significant refurbishment cost. An individual case study based extension to this study is required to understand the individual elements which drive the segment results.

However, the overall impact of depreciation on the total return from offices, in particular the major markets of the City and West End of London should be a cause for concern to investors. We have not undertaken any analysis of whether capitalisation rates have fully reflected the rates of depreciation experienced in the market. Yet the poor performance of offices over the last 10 years, illustrated by the total returns across the Investment Property Databank (IPD, 2005) is a matter of record, with offices under-performing retail and industrial property by around 2.5% pa since 1993. This shortfall is fully reflected in our results, possibly suggesting elements of relative over-pricing in the past 10 years.

Overall, there is little doubt that offices do suffer higher rates of rental depreciation than the other two sectors, with industrial property suffering higher rates than retail. In addition, offices require more capital expenditure than the other two sectors. In this particular study, they dominate the all property results despite the fact that modern property portfolios are weighted towards retail. Therefore, the overall results should not be used as an indicator of depreciation at the all property level.

The results should be treated with caution. In order to try and create an overall effect of depreciation on the performance of property we have generated a synthetic total return measure for both the benchmark and the sample. However, this measure is fraught with difficulty. It was generated to analyse the sample data in the same way as the benchmark data, but the different market states at the beginning and end of the data and the use of equivalent yields to generate capital values means that the rates owe much to the level of yields for properties let on long leases and upwards only rent reviews, which are artificially high for the capitalisation of rack rents. However, using rents rather than rental values as the basis of the total return also distorts the comparison as the benchmark cannot mimic this market process. The benchmark data is based on fully let properties at the market capitalisation rate and takes no account of over-renting in the early 1990s. In addition, longitudinal studies only record those properties which have been in datasets for the full time period, so the impact of retirements and new additions to real portfolios is not taken into account. This also restricts sample size. Despite these limitations,

there are some clear messages for investors in terms of asset allocation, pricing individual assets and the management of existing assets.

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