DEPRECIATION IN COMMERCIAL PROPERTY MARKETS

A PROJECT FOR THE INVESTMENT PROPERTY FORUM AND IPF EDUCATIONAL TRUST

The Depreciation Research Team:
Andrew Baum*, Mark Callender+, Neil Crosby*, Steven Devaney+, Victoria Law* and Clara Westlake+

* The University of Reading Business School
\+ Investment Property Databank Ltd

Contents

Chapter One: The Measurement of Depreciation

Vicki Law and Neil Crosby

Contents

DEPRECIATION IN COMMERCIAL PROPERTY MARKETS
CHAPTER 1: THE MEASUREMENT OF DEPRECIATION

1. Introduction

1.1 Introduction to the research

This research project examines depreciation of commercial real estate investment. Depreciation continues to be an important issue for property investors owing to its effect on returns and the pricing of real estate assets. The aims of the project are:

- To provide an appropriate methodological framework for the measurement of depreciation.
- To clarify how depreciation affects market indices and benchmarks, and outline the model benchmark to use in the measurement process.
- To measure rates of depreciation for different segments of the UK commercial property market, examining rental and capital values, and capital expenditure.
- To examine wider issues for the property industry arising from this topic – in particular, the importance of considering depreciation in the development of a UK REIT-style vehicle.

Understanding the concept and measurement of depreciation is a necessary foundation to determining a framework for the calculation of depreciation rates. The research therefore commences with an examination of the approach to the measurement of depreciation undertaken in previous studies and utilises the critical appraisal of these various approaches to develop a best practice approach to the measurement of depreciation. This is the subject of Chapter One. Chapter Two addresses the related issue of benchmarks. Having established the framework for the measurement of depreciation, Chapter Three then provides an empirical analysis of the Investment Property Databank over two time periods; 19 years from 1984 to 2003 and 10 years from 1993 to 2003. Chapter Four examines issues for real estate vehicles and, in particular, the implications of depreciation for income retention, an important topic given the prospective introduction of a UK REIT. The final chapter, Chapter Five, summarises the research findings and identifies their implications and where these fit into asset management and appraisal practice, as well as identifying areas of further research.

This project is concerned with examining and measuring depreciation, and does not address the related concept of obsolescence. The distinction between depreciation and obsolescence is drawn by Baum (1991) establishing obsolescence as a 'cause' of depreciation, and depreciation as the 'effect'. This project does not examine the causes of depreciation but raises this as an area of further research.

Depreciation itself is defined as:

> "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).

However, as discussed in Chapter Two, the lack of a perfect available benchmark to meet this definition required that this definition be relaxed. In effect, individual depreciation rates calculated by this research may include some element of location influence where the quality of the location has changed trough time relative to the prime location in each micro location. Even the relaxed working definition of "The decline in the value of a property relative to a new building in the same location" was not actually achievable. The following discussion on measurement and the benchmark discussion in Chapter Two informs the precise nature of the depreciation rates calculated for this research but also provides the framework for the critical examination of previous work in this field.

An additional factor crucial in understanding and interpreting rates of depreciation is the amount of expenditure on a property through maintenance, improvement and refurbishment. Expenditure occurs through both capital and revenue resources, the impact of which may maintain value, improve value, or offset some causes of depreciation. The relationship between levels of expenditure and rates of depreciation requires further research beyond this study. However, some analysis and discussion of capital expenditure levels occurs in Chapter Three alongside the corresponding depreciation results.

1.2 Structure of the Chapter

The measurement of depreciation has previously been addressed by Law (2004) and this work forms the basis of this chapter which aims to identify the best practice approach to depreciation measurement.

Section two of this chapter summarises the UK depreciation studies that have produced rates of depreciation. Understanding the rates produced to date and identifying the variables within the measurement process help to inform the best practice approach to measuring depreciation.

Section three of this chapter examines the variables related to the calculation for the measurement of depreciation. Key methodological decisions are reviewed, such as the decision to adopt a cross sectional or longitudinal approach and how rates should be calculated and aggregated.

Section four examines the variables related to the control of the dataset from which depreciation is measured.

Section five identifies the best practice approach to the measurement of depreciation.

The final section summarises the main points of this chapter.

2. Methods of Depreciation Measurement to Date

Rates of rental value depreciation have been produced by seven UK property investment studies. These studies have calculated a range of rates from a range of data sources over a range of time periods. The results of these studies are generally presented as consistent and comparable despite further investigation showing the incomparability of the different measurement methods and different data controls adopted.

Table 1 below presents the seven main UK depreciation studies that have produced rates of rental depreciation (these are office depreciation rates, as this is the only sector that is examined by all the studies);

Table 1 Summary of UK Depreciation Studies

Depreciation Study	Type of Measurement	Original Time Period	Rental Depreciation Rate (offices) (% pa)
CALUS (1986)	Cross sectional	1985	3.3%
JLW (1987)	Cross sectional (Regression)	1986	2.7%
Baum (1991)	Cross sectional	1986	0.92%
Baum (1991)	Longitudinal	1980-1986	0.78%
Barras and Clark (1996)	Cross Sectional	Average1981, 1985, 1993	1.0%
Barras and Clark 1996)	Longitudinal	1981-1993	1.2%
Baum (1997)	Cross sectional	1996	2.2%
Baum (1997)	Longitudinal	1986-1996	2.0%
CEM (1999)	Longitudinal	1984-1995	3.02%
CEM (1999)	Longitudinal (Regression)	1984-1995	3.0%
Turner (2001)	Cross sectional	1999	2.45%

Table 1 shows that the depreciation studies cover a time period from 1980 to 1999, producing a range of rental depreciation rates from 0.78% p.a, to 3.3% p.a., from both cross sectional and longitudinal approaches. The differences between the rates are driven by the dataset from which the depreciation is measured, and the time period of the measurement. However, the differences between the rates have been shown by Law (2004) to be driven by additional factors. The depreciation rates differ further by the calculation applied (the analytical framework) and the controls placed on the dataset (data control). Further, the depreciation rates differ by the benchmark used, this is explored in Chapter Two.

Some of the studies in Table 1 have also produced rates of capital value depreciation (CALUS (1986), Baum (1991, 1997) and Barras and Clark (1996)). The use of hypothetical data by CALUS and Baum allowed the estimation of capital values from rental values and yields that controlled for variables such as age, location, lease characteristics, and lot size. The resulting ‘capital value depreciation’ results were therefore unaffected by these factors that are usually found in both capital values and yields and do not represent depreciation. Both CALUS (1986) and Baum (1997) caution against the measurement of capital value depreciation due to the variety of impacts on yields that cannot be attributed to pure depreciation.

In contrast, the Barras and Clark (1996) study used actual data, and employed the same method of measurement as used for their measurement of rental value depreciation. Therefore the Barras and Clark capital value depreciation rates incorporate all factors that influence capital shift, of which one is depreciation.

A method that is suitable for the measurement of rental value depreciation can also reliably be used to measure change in capital values, however the rate of change in capital value cannot be termed ‘depreciation’ due to inclusion of additional factors. The remainder of this chapter focuses on the development of a measurement method that accurately captures rental value depreciation – its application to capital values is logical but for the reasons discussed earlier does not represent solely depreciation and is termed capital shift for the remainder of this research.

3. Analytical Framework of the Measurement of Depreciation

The measurement of depreciation requires a rational analytical framework. In previous studies differences in methodology and calculation represent different approaches towards the concept and timing of depreciation. In Table 1, the depreciation rates determined by the various UK based studies have been calculated by both cross sectional and longitudinal measurement. In addition to this distinction the methods of measurement used by the studies differ because of;

- the use of geometric averaging or regression analysis,
- the use of a growth or decline rate,
- the calculation function used, and
- the form of aggregating properties in a sample.

3.1 Cross Sectional or Longitudinal Measurement

The seven studies employ a mixture of six cross sectional methods and five longitudinal methods of measurement. Longitudinal studies collect data over time allowing change in the variables on which data are collected to be observed. In contrast, for a cross section, data are collected at one point in time. Different cross sections can be compared, but this differs from a longitudinal study in that the datasets for each cross section will not be the same sample (CEM, 1999).

Cross sectional analysis has been used by depreciation studies in order to isolate age as an explanatory variable of depreciation. The analysis of buildings of different ages at the same point in time facilitates the assumption that the depreciation measured can be attributed to age differences. However, as depreciation is not solely caused by age, the use of a cross sectional measurement only produces a rate representing the value difference between two properties of two different ages. This is further compromised by the value differences in the differently aged properties being due to cohort differences rather than age itself (i.e. differences caused by the characteristics of a 1960's building in comparison to a 1970's building). Further, a variety of age categorisations used to construct a cross section produces different depreciation rates due to the average values of different age bands, and the different number of years over which depreciation is measured. This introduces a variable into the calculation that without full provision of the breakdown of the cross section leads to difficulty in the interpretation of the results.

A cross sectional approach can also be distorted should the point in time chosen for the cross section be unrepresentative of the market. Any sudden obsolescence would also affect the result if the cross section were taken just before or after a technological advance that impacted on property. Further problems with a cross section study are the reduced validity of the analysis, as depreciation is not tested over time, difficulties in isolating site factors, and difficulties in examining expenditure (Baum 1991).

Alternatively, a longitudinal approach to measuring depreciation allows the relative change in value between an asset/group of assets and a suitable benchmark to be measured. A longitudinal study can be grouped by age in order to address any age related questions, but the overall rate is not affected by the choice of age groupings. A longitudinal approach, like cross sectional measurement, is restricted by the time period of the analysis, however the ability to measure over time allows this influence to be controlled and examined.

Cross sectional analysis can be a useful tool in examining causes of depreciation such as the ability to isolate age as the driver of value differences. Cross sectional measurement is particularly powerful when repeated annually providing panel data, which addresses the drawback of an isolated time period. However, such an approach is intensive with its greatest value lying in the examination of cause and pattern of depreciation. In the measurement of actual depreciation experienced by an individual asset longitudinal measurement, with its ability to measure relative change in an asset or group of assets, is preferred.

3.2 *Averaging or regression analysis*

In addition to the difference between measuring depreciation cross sectionally and longitudinally, the studies differ in their use of either geometric averaging or regression analysis. The two studies using regression analysis to measure depreciation are JLW (1987) and CEM (1999). The method that both studies have used is Ordinary Least Squares (OLS) regression which measures the line of best fit between two datasets i.e. rental value and age. The coefficient of the line produced by the analysis is the gradient of the line of best fit (β), and it is this that is used by both studies to 'estimate' depreciation.

The measurement of depreciation is the measurement of a relative rate of change, the OLS regression method estimates a depreciation rate by providing a formula from which one variable (e.g. rental value) can be estimated from another variable (e.g. age). Depreciation estimates are the coefficient in this formula, however this is an estimation of depreciation rather than a measurement of the relative rate of change experienced between sample and benchmark. The use of regression analysis is a powerful tool in examining the relationships between value change and drivers of that change (e.g. age, cycle, building quality), and further in estimating future depreciation rates from the identified causes of depreciation. However the examination of causes and forecasting of depreciation is not within the scope of this study and for the purposes of measuring actual depreciation experienced to date an averaging technique is preferred.

3.3 The Use of Growth or Decline Rates

In order to calculate a depreciation rate, the rate of change between two rent points is measured. This rate of change calculation has been undertaken as a geometric average on both a growth and decline basis.

The rate of change calculation should be able to calculate the rate of growth between values when values are rising, and the rate of decline between values when values are falling. Crucially, the rate of change should also reflect the timing of the rate of change. A young property changes to an older property, therefore the observation of the rate of change should also be the amount the older property has grown or declined by, (e.g. a property's value changes from £100 to £90, the value change is 10%), and not how much the older property needs to grow (or decline) by in order to reach the level of a new property (e.g. a property's value changes from £100 to £90, the value change is 11.1%). In order to achieve the ability to measure the rate of decline between a new property and a five year old property, a rate of decline must be employed.

3.4 Calculation Function

Depreciation, when measured longitudinally, is calculated from two inputs, the rate of change in a sample of properties, and the rate of change in a benchmark. There are therefore three issues in the calculation of depreciation;

- the measurement of the inputs into the depreciation calculation,
- the depreciation calculation itself, and
- the choice of benchmark (Chapter Two).

The measurement of the inputs into the depreciation calculation i.e. the rate of change in the sample and the rate of change in the benchmark should be measured with the use of a decline rate measurement (see section 3.3).

The calculation then used to determine depreciation from the sample properties and the benchmark can take three forms, using an additive, multiplicative or division function. The three elements in the calculation are a rate of depreciation, a rate of change in the sample, and a rate of change in the benchmark. Three possibilities arise;

1. $a = G - d$ (additive function) [1]
2. $a = (1+G)*(1-d) -1$ (multiplicative function) [2]
3. $a = (1+G) / (1+d) -1$ (division function) [3]

where a = sample growth rate, G = benchmark growth rate, and d = depreciation rate[1].

All three relationships have been used in the property literature, and in fact relate not only to the calculation of depreciation via longitudinal measurement, but also the application of cross sectionally derived depreciation to determine a net of depreciation growth rate[2].

[1] Rearranging for depreciation these relationships become;
1. $d = G - a$ (additive)
1. $d = 1- ((1+a) / (1+G))$ (multiplicative)
1. $d = ((1+G) / (1+a)) -1$ (division)

[2] The second and third relationships correspond to those presented by Blandon and Ward (1978) and CALUS (1986) respectively. The second relationship is also consistent with the approach taken by CEM (1999). The first relationship is that seen in the deconstruction of the initial yield (Baum and Macgregor, 1992), and is the longitudinal measurement approach used by Baum (1991, 1997) and Barras and Clark (1996).

The additive function does not measure the relative change between the two rates and for this reason is not used. The division function is consistent with measuring the relative difference between growth rates, and for this reason treats depreciation as a growth rate. This is illustrated within the division formula [3] by the application of the function (1+d). As discussed in section 3.3 a rate of decline approach is consistent with depreciation therefore the division approach is not used.

The multiplicative function is consistent with measuring the relative change between rent levels, and treats depreciation as a rate of decline. This is illustrated within the multiplicative formula [2] by the application of the function (1-d) in contrast to the growth approach that occurs when using (1+d).

3.5 Sample Aggregation

Finally, the depreciation rates produced by the studies in Table 1 have differed in their aggregation of individual properties into a sample. Aggregation has occurred in two ways, by measuring the change in average values (all cross sectional methods, Barras and Clark 1996, Baum 1997), and by measuring the average change in values (Baum 1991, CEM 1999).

Measuring the change in average values involves calculating the average value of the sample at the start point in the analysis, and the average value at the end point of analysis. The rate of change ('a' in the above formulae) is then measured between these two averages. This is consistent with measuring change in value levels, and is consistent with value weighting.

Alternatively, measuring the average change in values involves measuring the rate of change in each property over the analysis period and averaging these rates of change. This is consistent with measuring change in rates rather than change in levels, and is consistent with equal weighting.

Aggregating properties in a sample by value weighting allows the depreciation experienced within a sample to be measured, the depreciation rate produced measures the relative decline in the value of the properties, and accounts for the difference between a decline of for example 2% on a property of value £100 and a decline of 2% on a property of value £1000. In order to capture actual depreciation, the depreciation rate needs to be sensitive to the amount of depreciation experienced. Crucially, this can only be achieved through value weighting aggregation of multiple properties. Further, a value weighted depreciation calculation is internally consistent, allowing the calculation to be deconstructed and analysed for the impact of internal components such as the implication of measuring the sample value change by growth rate or decline rate.

Table 2 below summarises the differences between each study's measurement approach (an X denotes the study adopting a particular approach).

Table 2 Measurement Methods Applied by UK Depreciation Studies

Method	**CALUS (1986)**	**JLW (1987)**	**Baum (1991)**	**Barras and Clark (1996)**	**Baum (1997)**	**CEM (1999)**	**Turner (2001)**	**IPF (2005)**
Analysis								
Cross sectional	X	X	X	X	X		X	
Longitudinal			X	X	X	X		X
Averaging	X		X	X	X	X	X	X
Regression		X				X		
Aggregation		N/a						
Average Rent (value weighting)	X		X (cross section)	X	X		X	X
Average Growth (equal weighting)			X (longitudinal)			X		
Growth or Decline Rate		N/a						
Growth	X				X (longitudinal)			
Decline			X (cross section assumed)	X (assumed)	X (cross section assumed)	X	X (cross section assumed)	X
Longitudinal Calculation	N/a	N/a					N/a	
Absolute			X	X	X			
Relative						X		X

4. Data Control Issues

The measurement of depreciation in the UK studies is data intensive and as such has involved a number of assumptions with many studies making different assumptions. The results obtained from the various studies will reflect the both the restrictions of the data and these varying assumptions and need to be viewed in that light. Data control techniques range through the use of hypothetical or actual properties, homogeneity of data, the treatment of refurbishments, and the application of an age cut off date. .

4.1 Hypothetical v Actual Data

The UK property depreciation studies have used a mixture of hypothetical and actual data from which to produce depreciation rates. Of the seven studies producing depreciation rates, CALUS (1986) and Baum (1991, 1997) have used hypothetical data, while the remainder used actual data. The term actual data is used to mean Market Rental Value (MRV) data obtained from databases collecting valuation data on actual properties over time.

The actual data used in depreciation studies has been obtained from three sources, Barras and Clark (1996), CEM (1999), and Turner (2001) have used the IPD database, JLW (1987) used an in-house database, and Baum (1997) used the APR (Applied Property Research) stock database (valued hypothetically by a panel of valuers) and IPD. It is recognised that such databases are valuation based and as such do not reflect actual prices in the market, this argument also holds for hypothetical buildings. However, using such valuation based data will produce results much more representative of the market than those of an artificial data base of hypothetical buildings (Barras and Clark 1996). The use of a valuation database provides valuations over time, facilitating a longitudinal study, and these valuations are representative of market movements over time.

4.2 Homogeneity of Data

In addition to the question of the source of the data, studies have varied in the way in which they have dealt with the dataset. Homogeneity of data has been seen as desirable by the studies in order to ensure comparability between properties, arriving at a 'representative' depreciation rate.

Baum (1991, 1997), JLW (1987) and Barras and Clark (1996) all achieved homogeneity of location by choosing the defined location of the City of London for their office analysis. Further adjustments were made by Baum (1991, 1997) to ensure that site was not influential on the data.

The CALUS (1986) and CEM (1999) studies covered various locations. The CALUS (1986) properties were hypothetical buildings of similar locations, the data were therefore homogenous. CEM (1999) used locational quality indicators to account for local site variations and used only those where there was no change in locational quality for the main analysis.

Other factors such as size and tenure were controlled for by those that took the hypothetical approach, in order to isolate age, tenure, and building quality factors.

4.3 Refurbishment

The refurbishment of an asset has been recognised as an issue in the measurement of depreciation by all of the UK property literature and six of the seven studies make some adjustment for refurbished properties. Studies have varied as to whether they include refurbished properties[3], and whether included refurbishments are aged from their construction date or date of refurbishment.

Different qualifications for a refurbishment have also been used by different studies. Studies have defined a refurbishment through the amount of capital expenditure spent on a property in any one year, as a percentage of its capital value in that year. The percentage rule applied has ranged from 5% (CEM, 1999) to 25% (JLW 1987, Turner 2001)[4].

---

[3] Turner's study (2001) did not differentiate between original and refurbished buildings but his research did show a link between retained income on an asset (inferring greater expenditure on the asset) and lower depreciation. This relationship between ongoing expenditure and lower depreciation does not necessarily hold with the relationship between refurbishment and depreciation. The relationship between retained income and depreciation is explored further in Chapter Four.

[4] A 10% rule was used by Barras and Clark (1996), and a 15% rule by Baum (1991, 1997).

The issue of refurbished properties therefore introduces further areas of variability between depreciation rates, first in the treatment of refurbished properties (relating to their inclusion or exclusion, and the age assigned to the properties), and second in the classification of a refurbishment.

4.4 Age Cut Off Point

The question of age has been raised in section 4.3 where some studies (JLW 1987, Baum 1991, 1997, Turner 2001) have included refurbished properties within their dataset but have reclassified the age of the refurbished properties from their date of refurbishment and not their date of construction. This practice of adjusting the age profile of the properties in a dataset extends to applying a cut off point for properties deemed to be too old to be representative of a depreciation profile (Baum 1991, 1997, Barras and Clark 1996, Turner 2001). This practice differs between studies, a building age of 35 years is applied by Baum (1991, 1997) a construction date of 1945 applied by Barras and Clark (1996) and a construction date of 1960 applied by Turner (2001). Barras and Clark (1996) and Turner (2001) go on to exclude properties prior to their cut off point, Baum (1991, 1997) reassigns the age of older properties to 35 years.

This one data control issue raises three variations in the treatment of age, the inclusion of all properties, the exclusion of some properties with further variation in the chosen cut off point, and finally the reassignment of the age of properties, again with further variability in the chosen cut off point.

The data control issues highlighted relate to managing and cleaning a data source prior to measuring depreciation. Such issues are relevant when using data to find a representative depreciation rate to apply to analysis. However, if the measurement of depreciation is to be undertaken on a portfolio of properties to understand how they have performed regardless of age profile etc. then such data management is not necessary. The data control issues of the treatment of refurbished properties and the age of properties need further research to provide insight into the best practice approach to manipulating datasets with the removal or reclassification of properties.

Table 3 below summarises the differences between each study's approach to data control (an X denotes the study adopting a particular approach).

Table 3 Data Constraints Applied by UK Depreciation Studies

Variable	CALUS (1986)	JLW (1987)	Baum (1991)	Barras and Clark (1996)	Baum (1997)	CEM (1999)	Turner (2001)	IPF (2005)
Data								
Hypothetical	X		X		X			
Actual		X		X	X	X	X	X
Age	N/a							
All				X (cross section)		X		X
Reassignment			35 years		35 years			
Exclusion		X		Pre 1945 (longitudinal)			Pre 1960	
Location								
London			X	X	X		X	
Non London		X						
Both	X					X		X
Smoothing			X		X			
Refurbishments	N/a							
Reassignment		X	X		X		X	
Exclusion				X		X		
Classification (%cv)		25%	15%	10%	15%	5%	25%	No classification, all included except redevelopments

5. The Best Practice Approach to Measuring Depreciation

In order to measure the depreciation experienced in a dataset no adjustments to the data are required. Subsets of a sample can be measured in order to isolate a particular location, age profile or expenditure level, however this is defined simply by a categorisation of the sample and not by a definition of depreciation.

The measurement of depreciation (as opposed to the control of the dataset) does need to be assessed for the best practice approach to ensure that depreciation and not simply ‘change’ is measured (as previously stated, when measuring capital value it is ‘change’ that is measured due to the inclusion of yield impacts additional to depreciation). Section 3 identified five variables in the measurement of depreciation (excluding the issue of benchmark);

- the use of cross section or longitudinal analysis,
- the use of averaging and regression analysis,
- the use of growth and decline rates,
- the calculation function used, and
- the aggregation of a sample.

Section 3.1 concluded that in order to measure depreciation in an asset, rather than age driven value change, longitudinal measurement should be used. Section 3.2 concluded that in order to measure depreciation, rather than estimate depreciation from the relationship between two variables, averaging techniques must be used. Section 3.3 concluded that in order for the correct direction of value change to be measured i.e. from a new property to an older property, a rate of decline must be used. Section 3.4 concluded that for a relative measurement that is consistent with treating depreciation as a rate of decline, a multiplicative function must be used. Finally, section 3.5 concluded that in order for the depreciation rate of a sample of properties to represent the actual depreciation experienced, the aggregation of properties into a sample must be consistent with value weighting.

In short, as a result of assessing the variables in a depreciation calculation, depreciation is determined to be;

- a longitudinal measurement,

- a geometric averaging calculation,
- a decline rate,
- a relative and multiplicative function, and
- on a value weighted basis.

The formula for measuring depreciation that is consistent with these characteristics is;

$$d = 1 - \{[\Sigma R^{s}_{t2}/\Sigma R^{s}_{t1}]^{(1/(t2-t1))} / [\Sigma R^{b}_{t2}/\Sigma R^{b}_{t1}]^{(1/(t2-t1))}\} \qquad [4]$$

R^s = sample rental value, R^b = benchmark rental value

This preferred method of measurement produces a positive rate when the rate represents depreciation, and a negative rate when the rate represents appreciation. This is both consistent with general convention for the presentation of depreciation rates, and the formula is consistent with the concept of depreciation as a decline rate (1-d).

Application of this formula to capital value would provide a rate of 'capital shift' that includes depreciation but that also includes other factors that impact on value such as risk and lease characteristics. However, it is a useful measure in that it is a consistent approach with rental value depreciation and does not suffer from issues such as the incorrect use of growth rates, or implied growth rates through the use of a division function. Capital shift includes an element of rental depreciation and the two rates should not be added together.

The Measurement of Depreciation: Summary

- *Examining the measurement of depreciation rates within the existing studies highlights many areas of variation in approach to the data being measured and the method of measurement.*

- *The depreciation rates produced by the studies differ due to the use of different datasets and different timing of analyses, however these two factors do not solely drive the differences between depreciation rates. The differences can be categorised by those factors which relate to the data being measured and those which relate to the measurement calculation.*

- *Those which relate to the data being measured are as follows;*
  - *the use of actual or hypothetical data,*
  - *the treatment of location both macro and micro,*
  - *the treatment of refurbishments, and*
  - *the treatment of age.*

- *Those which relate to the measurement calculation are as follows;*
  - *the use of cross section or longitudinal analysis,*
  - *the use of averaging and regression analysis,*
  - *the use of growth and decline rates,*
  - *the calculation function used,*
  - *the aggregation of a sample, and*
  - *the use and choice of a benchmark (Chapter Two).*

- *The best practice approach to measuring depreciation is suggested to be a longitudinal, geometric average using a multiplicative function decline measurement, consistent with value weighting. This approach is consistent with rates of rental value depreciation when applied to rental values, and rates of capital shift when applied to capital values.*

- *The theory of the best practice approach to the measurement of depreciation has been established through this chapter. However, in order to complete the discussion of the measurement framework, the issue of* *benchmarking the rates of value change in actual properties against the value change in the hypothetical new property in the location needs to be addressed and this is the subject of Chapter Two.*

Chapter Two : Benchmarks and Depreciation

Vicki Law, Steven Devaney and Neil Crosby

Contents

DEPRECIATION IN COMMERCIAL PROPERTY MARKETS
CHAPTER 2: BENCHMARKS AND DEPRECIATION

1 Introduction

1.1 Objectives

Chapter one concluded that for the depreciation in a property or sample of properties to be measured, the sample of properties must be measured against a benchmark. In previous depreciation studies the benchmark used to measure depreciation has received little attention and as a result a variety of benchmarks have been applied. The role of a benchmark in the measurement of depreciation has been addressed by Law (2004) and this work forms the basis of this chapter assessing the most appropriate benchmark for the measurement of depreciation.

The following sets of research questions are addressed in this chapter;

1) What is the ideal benchmark for the measurement of depreciation rates?
2) What is the pattern of ageing in the IPD market and segment benchmarks? If there are variations through time, what are the implications?
3) Is depreciation present in these benchmarks and, if so, how would this affect the measurement of depreciation rates from them? Are benchmarks that use hypothetical observations of rents and values to be preferred for this task?
4) Which of the available prime or market measures are the most appropriate benchmark for measuring depreciation?

1.2 Structure of the Chapter

Before addressing these research questions, the role of benchmarking in the measurement of depreciation requires further exploration to identify the issues relevant in assessing the most appropriate benchmark.

Section two of this chapter reviews the benchmarks that have been used in the measurement of depreciation.

Section three of this chapter draws on the results of section two to identify the characteristics of the ideal benchmark for the measurement of depreciation and discusses the potential available benchmarks identifying the IPD data and the CBRE Rent and Yield Monitor (CBRERYM) as the key sources from which to assess the most appropriate benchmark.

Section four assesses the available indices for their appropriateness as a benchmark for the measurement of depreciation by examining the incidence of depreciation within the indices.

Section five identifies the CBRERYM series as the most appropriate available index for the measurement of depreciation, and explores its characteristics to enable full understanding of the index as a depreciation benchmark.

Section six discusses further issues with regard to benchmarks for capital value shift. In the absence of a suitable capital value index, a benchmark needs to be estimated from rent and yield series when using CBRE or other hypothetical data.

Section seven provides a summary of the main findings of this chapter.

2 The Use of Benchmarks in the Measurement of Depreciation

Chapter one identified seven key studies in UK property investment literature that have measured and produced rates of (rental) depreciation. These seven studies used eight different methods of measurement, the measurement approaches have been examined in chapter one. The studies also differed in the choice of a benchmark from which to measure depreciation.

2.1 The Reasons for the Choice of Benchmark

In these depreciation studies, the reasoning behind the choice of different benchmarks within each study is rarely commented upon. The choice of benchmark is either not addressed or is based on the definition of depreciation that is used by each study. Some of the studies have defined depreciation as a fall off in value from the “market” these studies sought a “market” benchmark from which to measure depreciation; those that have defined depreciation as a fall off in value from a “prime” property have sought a “prime” property benchmark. Market benchmarks and prime benchmarks therefore need defining.

Despite the lack of consensus on the choice and application of a benchmark in the measurement of depreciation, the UK property investment literature is consistent in its use of a relative calculation, ensuring that the measurement of depreciation does not simply occur by the change in value of the property itself. The measurement of depreciation is clearly presented as requiring a benchmark, but the issues around the choice of that benchmark appear to have been largely ignored.

The most detailed discussion in the general property investment literature on an appropriate benchmark is provided by Hoesli and MacGregor (2000). Having decided that a benchmark for the measurement of depreciation is required, they describe this benchmark as ‘an equivalent new property’ (Hoesli and MacGregor, 2000, p154). The discussion of what comprises an ‘equivalent new property’ leads them to conclude that the benchmark must have the characteristics that match the subject property. These characteristics are identified as the same sub market, the same type of property, and the same specification as the subject property. They note that an equivalently specified new property is unlikely to exist due to the changes in construction design and fashion that occur over time. But they also note that, should such a property exist, the resultant depreciation rate would not contain a measure of obsolescence. A measure of obsolescence can only be attained by the differences in the specification of a subject property and that of the specification of a modern property.

Therefore the use of a benchmark that does not keep pace with technological change will not produce fully depreciated rates as obsolescence, which is an important part of the depreciation experienced by the property, will not be measured. An appropriate benchmark requires the ongoing capture of changes in technology and building specification, with this capture occurring as accurately and as timely as is possible. A benchmark that only periodically adjusts its specification will produce more distorted depreciation rates than a continually updated benchmark (assuming the changes are recognised quickly), resulting in depreciation rates that may be correct over time but may misrepresent the timing of change. The study of depreciation over long time periods is therefore essential if the timing of technological change is not to dominate the results.

Hoesli and MacGregor (2000) suggest an equivalent new property as the appropriate benchmark, noting its limitation in the absence of obsolescence and the lack of available data. They conclude that the most suitable and available benchmark would be a prime property in the same sub market.

In contrast to Hoesli and MacGregor, the studies actually producing depreciation rates pay little consideration to the question of benchmark but apply a range of different approaches.

A distinction was drawn in chapter one between measuring depreciation in rental values and measuring change in capital values. A further distinction between measurement using rental and capital values arises when examining benchmarks. A number of rental value benchmarks have been used from which to measure rental value depreciation, and these are discussed in the following sections. However the only available possible benchmark for capital values is IPD capital value data, which has been used by both Barras and Clark (1996) and Baum (1997). The use of the IPD dataset in this project as the sample dataset precludes it from also being used as a benchmark, further the IPD represents ‘market’ information and depreciation has been defined in chapter one as relative to a prime benchmark[1]. The use of IPD indices also holds specific problems that are discussed in section 4. The lack of alternative capital value benchmark is discussed in section 6.

The rental value benchmarks used by the studies are now examined, this is followed by a discussion of the issues arising from benchmarking capital values.

[1] This is a working definition used for this chapter and is not the full definition of depreciation (see chapter one).

2.2 The Benchmarks used by Depreciation Studies

Table 1 sets out the range of benchmarks applied by the different depreciation studies (as reviewed in chapter one).

Table 1 - Benchmarks Used in the Measurement of Depreciation

Study	Cross Section Benchmark	Longitudinal Benchmark	Description	Classification
CALUS (1986)	A younger age group of properties in the sample.	-	The data sample was divided into age groups with the overall depreciation rate calculated between the youngest and oldest categories. Interim measures occurred between one age group and the immediately younger age group.	**Internal** to the sample dataset
JLW (1987)	JLW 50 Centres	-	JLW 50 Centres index (now JLL) is a prime index comprised by adjusting recent transactions information to equate to a prime level.	**Prime** index. **External** to the sample dataset
Baum (1991)	A younger age group of properties in the sample.	The top rent in the sample of properties	Cross sectional - As CALUS (1986) Longitudinal - The top rent in the sample at the first measurement point, and the top rent in the sample at the second measurement point.	Cross sectional - **internal** to the sample dataset Longitudinal - **prime** (as defined by author) and **internal** to the sample dataset
Barras and Clark (1996)	A younger age group of properties in the sample.	IPD City offices rental value index	Cross sectional - As CALUS (1986) Longitudinal - City office rental values provided by IPD with the exclusion of refurbishments and properties built prior to 1945.	Cross sectional - **Internal** to the sample dataset Longitudinal - **market** index and **external** to the sample dataset
Baum (1997)	A younger age group of properties in the sample.	IPD City offices rental value index	Cross sectional - AS CALUS (1986) Longitudinal - IPD City office rental value index.	Cross sectional - **Internal** to the sample dataset Longitudinal - **market** index and **external** to the sample dataset
CEM (1999)	-	CBHP Rent and Yield Monitor (data provided at rent point level)	CBHP Rent and Yield Monitor is a prime index comprised from hypothetical prime properties set in prime locations.	**Prime** index. **External** to the sample dataset
Turner (2001)	A younger age group of properties in the sample.	-	As CALUS (1986)	**Internal** to the sample dataset

Two general approaches have been used for the selection of benchmarks. First, the use of a property index that is external from the sample dataset, introducing the choice between a market index and a prime index. Second, the use of the sample dataset itself to derive the benchmark. This has been achieved either through the age grouping of the sample dataset using a younger/the youngest age category as the benchmark, or by extracting the top rent in the sample at the analysis points and applying the top rents as the 'prime' benchmark.

Therefore the use of a benchmark in the measurement of depreciation can be categorised in two ways. First, the benchmarks can be classified as external benchmarks (from a source separate from the dataset being measured) or internal benchmarks (i.e. from the dataset being measured). This categorisation tends to correspond to the type of measurement used to measure depreciation, external benchmarking is generally applied with the use of longitudinal measurement and internal benchmarking applied with the use of cross sectional measurement (see Table 1).

The second categorisation is specific to the use of external benchmarking and relates to the choice of property index. The benchmarks fall into the categories of prime (JLW 50 Centres, CBRERYM) and market (IPD) benchmarks. These three indices have been used by depreciation studies to date (see Table 1), but are not the only available indices. Other main indices include the JLL Property Index and the CBRE Monthly Index as market indices and the Cushman and Wakefield Healey and Baker Marketbeat and Colliers CRE In-town Retail rent map as prime indices.

The characteristics of prime and market indices as benchmarks are set out below.

2.2.1 Prime Benchmarks

A prime benchmark assumes that the properties in the benchmark index are free of depreciation. The properties must represent movement in values in a location rather than in individual properties and should therefore represent the value of a new building in a specific location. Prime benchmarks tend to be indices of continually new properties (updated for appropriate changes to the specification), and for that reason are also usually based on hypothetical properties and the 100% location within the area they represent. This ensures that no depreciation is evident within the benchmark, and the use of such a benchmark in the measurement of depreciation ensures that obsolescence is incorporated within the measurement.

The disadvantage of this approach is that the individual properties may be measured against an inappropriate benchmark; for example, a non-prime location may be compared against a benchmark that assumes a prime location. Relative site appreciation as well as depreciation will therefore be included within the depreciation measure. An individual property could be assumed to be suffering very little depreciation if situated in an improving location relative to the benchmark location.

Additionally, not all prime indices are made up of hypothetical locations and new properties, some prime indices take the most modern building in a location (rather than the 100% location) as the benchmark, and some properties within a prime index may be 'modern' rather than new (where a new property is inappropriate to the location). Further, as a prime index is not necessarily the top performing sector of the market it does not automatically provide a benchmark against performance.

In choosing a benchmark, depreciation studies need to be careful to ensure that the benchmark reflects the location and the sectors of the properties in the sample. The application of a prime benchmark then also introduces a third category (i.e. location, sector, and prime) but one that does not ensure consistency with the sample. This means that the prime series may not provide a true depreciation rate but one that, in general, may overstate depreciation.

2.2.2 Market Benchmarks

The market benchmark used in depreciation studies has universally been sourced from IPD data, involving the aggregation of data on actual properties. Two approaches to the IPD data have been used. The first study to employ an IPD 'market' benchmark was Barras and Clark (1996) where the data was provided for the benchmark in terms of rental value and was adjusted for the age and refurbishment status specified by Barras and Clark. The market benchmark used, according to Barras and Clark (1996), did not age over the analysis period due to the changing set of properties which exited and entered the benchmark over the analysis period. Therefore, the ability to compare an ageing sample to a non-ageing market benchmark enabled the measurement of depreciation rates.

The second study to use IPD data as the depreciation benchmark, Baum (1997), applied the rental value index without adjustment for age or refurbishment. Therefore the choice of the market benchmark brings with it a decision on the profile of properties included within the benchmark.

A market benchmark is comprised of properties of varying ages and varying quality in terms of both location and construction. Therefore the use of a market benchmark allows properties in a sample to be compared to a common benchmark i.e. that they are all part of the market. However, although this approach allows all properties to be measured against an appropriate comparison, a market benchmark is not comprised of continually new property and it is therefore questionable as to whether this produces a measure of depreciation or simply a performance measure against another depreciating sample. A key question is whether the IPD rental value index is constructed from the movement in value of ageing properties, and therefore includes depreciation, or is constructed from a changing set of properties that are not ageing or depreciating.

2.3 Summary

In summary, benchmarks that have been used in the measurement of depreciation can be categorised as internal benchmarks and external benchmarks. Further, external benchmarks can be categorised as prime benchmarks and market benchmarks.

Prime benchmarks, comprising continually new properties to modern specifications, do not include depreciation and allow the impact of obsolescence to be captured.

The existence of depreciation in market indices and not in prime hypothetical indices is noted by Morrell (1991) in his study of property indices. He believes that market benchmarks, comprised of actual properties, would be expected to incorporate depreciation. This may not be true due to the changing sample of properties through time, which may have the same effect as the hypothetical renewal and improvement in specification through time in the prime indices. This is explored further in Section 4 of this chapter.

The same question is raised for internal benchmarks as they are drawn from the depreciating sample dataset. However, they may also not depreciate as properties within specific age bands change over time.

This exploration of benchmarks appears to raise questions concerning all of the different possibilities and these are explored further within the context of the model benchmark.

3 The Model Benchmark

The characteristics of the possible types of benchmark allow the model benchmark to be identified. For the measurement of depreciation, the benchmark needs to be in the same time period as the sample, ruling out a previous measure of the same property. The property should be measured against a benchmark that is an appropriate comparison and this rules out the use of a prime benchmark. Further, it should not be measured against a benchmark of depreciating properties, possibly ruling out any of the market benchmarks. It should also incorporate the building standards of the day, ruling out a valuation as new of the existing property with its own specification.

Therefore the model benchmark is identified as a hypothetical new property on the same site as the subject property built to the modern specification suitable for that site and that location.

In the absence of this benchmark, available indices should be examined for their suitability in light of the characteristics of the model benchmark.

The model benchmark has three key characteristics;

- Specification as new, rather than to match the specification of the existing property. This ensures that obsolescence is captured.
- In the absence of site specific data, the index should have sufficient coverage and disaggregation to match the location of the property to the benchmark in as much detail as possible, and
- The benchmark itself should not contain depreciation.

As discussed in Section 2.2 there are a variety of choices of index for both a market benchmark and a prime benchmark. These choices can immediately be narrowed down by considering the coverage and available detail in each category of market and prime indices.

The three main market indices are the IPD index, the CBRE Monthly index (CBREM), and the JLL UK Property Index. Both CBREM and JLL UK are based on actual properties, many of which are within IPD and therefore the two indices may well be, in effect, subsets of the IPD index, with the IPD index providing the greatest coverage.

The three main prime indices are the CBRERYM, the JLL 50 Centres index and the Cushman and Wakefield Healey and Baker Marketbeat. Additionally for Retail, there is the Colliers CRE In-town Retail rent map, but its coverage of only one sector precludes its use.

The greatest coverage is provided by the CBRERYM and given the importance of the ability to match specific properties with a benchmark that is close to the location, this is the over-riding issue in the choice between the three hypothetical prime indices[2].

Therefore, of the two categories of external benchmarks, the IPD index and the CBRERYM provide the greatest coverage meeting one of the requirements of the model benchmark. The requirement of the model benchmark to match the specification of a new property in the location of the subject property, means a benchmark has to include non-prime locations and non-prime specifications. Neither the market indices, comprising various ages of properties, nor prime indices, comprising only prime properties and prime locations, meet this requirement. However, in the circumstances of a prime sample of properties the CBRERYM will provide an approximation of the model benchmark for this criterion.

Finally, the last criterion requires that there is no depreciation within the benchmark. In order for depreciation to be measured in a sample of properties it is essential that depreciation is not contained within the benchmark used in the measurement. Depreciation within the benchmark would result in a measure of performance between two depreciating samples. The prime property benchmarks do not contain depreciation but some depreciation may be captured by both internal and external market benchmarks.

This can be explored further in two ways; by examining the age profile of the index and by investigating how the index is calculated.

[2] It necessitates a disaggregation of the index into individual rent points and this has been agreed with the kind permission of CBRE for this project.

4 Depreciation in the Benchmark

Depreciation occurs within a benchmark when the benchmark is comprised of depreciating properties. This can occur in two ways.

First, by the age profile of the index changing over time as transactions within the index occur (‘*inter period’ ageing*).

Second, depreciation can occur if the sample is held constant throughout the measurement period even if the properties change from one measurement period to another. In this case, the sample will age over the held measurement period and this is termed *‘intra period’ ageing*.

4.1 ‘Inter Period’ Ageing

The issue of ageing within the IPD indices has been addressed by two depreciation studies using IPD for a depreciation benchmark, Barras and Clark (1996) and Baum (1997). Both studies used the IPD annual rental value index for the City of London office market, however the two studies took differing views on the age profile of this index.

The first study to use the IPD index as a benchmark was Barras and Clark (1996) who used the index at 1981 and 1993. Barras and Clark noted that ‘rejuvenation’ of the portfolio resulted in an average age in the index being maintained of about 15 years. Therefore they concluded that the IPD index, like the prime indices, showed no ‘ageing’.

In Baum’s work (1997) two data samples were again used for longitudinal analysis, the IPD City office index was used for 1986 and 1996. Baum comments, “Bearing in mind that the average age of this sample had almost certainly increased … it should be borne in mind that the data will tend to exaggerate the like-for-like decline in market value and therefore tend to understate depreciation” (Baum, 1997, p13). Baum based his expectation that the IPD City Office index ages on his finding that his own 1996 sample of City Offices is on average 4.4 years older than his earlier 1986 sample.

Ageing within the IPD index was also examined by Law (2004). Law (2004) examined ageing in the index over the period of 1985 to 1995 and again over the period 1995 to 2002. The results showed the profile of the City of London offices to get younger over the time period of 1985 to 1995 in contrast to the ageing noted by Baum (1997) over the similar period of 1986 to 1996, and the stable age found by Barras and Clark (1996). The later period 1995 to 2002 showed an increasing age of 3.3 years. Examining the office regions as a whole the average age profile of the IPD rent index was found by Law to get younger by approximately 3 years over both time periods.

Differences between the findings of these three studies can be attributed to the different time periods examined, the different calculation methods applied (money weighted and time weighted indices) and the different constraints on the index i.e. the Barras and Clark IPD benchmark excluded the oldest, pre-war properties.

4.2 'Intra Period' Ageing

Intra period ageing within an index occurs when measurement takes place on a held sample over the measurement period, i.e. measuring the change in the same set of properties between the beginning of 2003 and the end of 2003 in contrast to measuring the change between the sample at the beginning of 2003 and a refreshed sample at the beginning of 2004 (where inter period ageing occurs). In this case, the measurement would be made on a sample 1 year older at the end of the period than at the beginning.

As the IPD indices are measured on held samples they suffer from intra period ageing (related to the length of the measurement period). At the beginning of the measurement period, the rental value is assessed. At the end of the measurement period, the rental value of the same properties is measured again and the growth rate calculated. Therefore, when the IPD was measured annually, the annual rental value growth was the growth rate of an ageing sample of properties. Transactions were added at the beginning of the new measurement period, the rental value of the new sample forming the new base of the calculation but the sample is then held again until the end of the period. The annual change is again the growth in the held sample, albeit a refreshed one.

However, since 2001, the IPD measures have been calculated on a monthly time-weighted basis allowing the inclusion of some, but not all transactions within the year. The annual time-weighted measures are achieved by compounding twelve monthly measures, and likewise a quarterly measure can be achieved by compounding three monthly measures. The use of twelve monthly measures allows activity within the databank such as purchases and sales to be incorporated, however this does not create a fully transacted index. Transactions are only included once two valuations are known e.g. where a property is bought in June and has monthly valuations, the property is now included in the annual measure between July and December. Assuming an even distribution of transactions across the year, the annual measures will include 92% of transactions occurring in monthly funds, 75% of transactions occurring in quarterly funds, and 50% of transactions occurring in biannually valued funds. The impact of the new time weighted data is that the measures from the data are neither fully transacted nor fully aged, and the age profile of the properties transacted will influence the individual measures. But regardless of any consistency in the age profile the actual measurement in each monthly period remains of the same sample at the beginning and end of the period, an ageing sample.

In the case of the CBRERYM, where the properties are continually new, constant updating should ensure that that no ageing occurs in the index. The theoretical lack of ageing in the CBRERYM in combination with its continually new and prime status ensures that no depreciation occurs within this benchmark.

4.3 Analysis of Intra and Inter Period Ageing

For this research, we have undertaken a more detailed examination of the ageing profile of the properties within the IPD index from 1981 to 2003. The analysis has been undertaken at an All Property and PAS segment level. Table 2, below, shows the All Property and selected PAS segment results, with a full set of tables in Appendix 1. The results illustrate how the ages of the properties in the databank in each year can fluctuate through time, with most segments appearing to be on an ageing trend.

Table 2 displays both the ‘intra period’ ageing between the start and end of each year (horizontally across the table), and the ‘inter period’ ageing (vertically down the table) as the full extent of each year’s refreshment is reflected in the index. In the majority of cases, the average age at the end of a year is older than that at the start of a year, often by a margin of at least 6 months. Only on a few occasions does the average age become younger. The change from money weighted measurement to time weighted measurement therefore only partially mitigates the ‘intra period’ ageing issue, replacing a mechanical one year ageing when returns were over an annual horizon. On average, the IPD indices age by 7.3 months from start to end of year, or 10.1 months when weighted by value.

A critical feature of a benchmark to be used for measuring depreciation is that it should be free from depreciation itself. Therefore, the important question for the IPD market benchmark concerns whether the rental value growth and capital value growth indices take into account the new properties or measure a static sample of ageing properties. It is clear from both index construction and the analysis of age profiles that the indices are measuring the growth of an ageing sample of properties.

Table 2 : Age Profile of the All Property IPD Sample and Retail (SE), Office (City) and Industrial (SE) Sub Samples[1] – 1981 to 2003

Year	Standard Retail : South Eastern		Offices : City		Industrial : South Eastern		All Property	
	Start	End	Start	End	Start	End	Start	End
1981	51.6	53.4	33.8	34.2	11.6	12.2	26.8	28.2
1982	52.7	53.4	32.9	34.3	11.1	11.9	27.0	28.3
1983	52.6	53.9	33.1	34.5	11.0	11.8	27.4	28.9
1984	53.8	55.3	31.8	32.3	10.7	11.5	27.5	28.9
1985	54.3	56.2	29.2	30.1	10.5	11.4	27.8	29.4
1986	54.8	56.6	26.3	27.0	11.1	11.8	28.9	30.4
1987	58.2	59.9	26.2	27.9	11.3	12.1	30.0	31.4
1988	59.4	60.6	24.8	25.9	11.4	12.5	30.7	31.9
1989	60.7	61.8	24.1	25.6	11.9	12.4	31.3	32.0
1990	60.8	61.9	25.6	26.2	12.0	12.9	30.6	31.4
1991	61.2	62.1	24.9	25.0	12.5	13.4	30.2	30.4
1992	62.1	62.8	23.5	22.9	13.0	14.1	29.4	29.7
1993	63.9	64.5	23.4	23.4	13.9	14.6	29.4	29.8
1994	63.8	64.6	24.1	24.7	14.0	14.7	29.2	29.9
1995	65.7	66.9	23.1	23.8	14.5	15.3	28.3	29.0
1996	67.3	68.8	23.2	23.7	14.6	15.3	28.4	28.9
1997	66.9	68.3	22.0	22.6	14.5	15.2	27.8	28.4
1998	66.4	67.2	23.4	24.4	14.9	15.7	27.7	28.6
1999	66.1	66.7	22.5	23.6	15.4	16.3	27.6	28.2
2000	65.1	66.1	25.1	26.3	15.7	16.4	27.1	27.3
2001	65.9	66.0	24.9	23.0	16.2	17.1	25.8	25.9
2002	66.4	70.9	21.7	21.6	17.1	18.2	25.0	25.9
2003	69.6	70.0	23.4	24.3	17.6	18.6	25.5	26.1

[1] Results for all PAS segments are in Appendix 1.

In summary, the construction and calculation methods employed by CBRERYM ensure that no depreciation is contained within the index. In contrast, the nature of the properties comprising the IPD indices, the age profile of the index over time, and the 'intra period' ageing introduced by the calculation used, result in IPD producing depreciating indices.

This result is further confirmed by analysis undertaken by Law (2004) finding significantly lower rental growth in the IPD indices when compared to the CBRERYM. The analysis undertaken concludes that IPD indices are not a suitable source for a benchmark for the measurement of depreciation. However, the analysis does not indicate that the CBRERYM is a model benchmark, but that in its disaggregated form, is the most appropriate of the available indices.

5 The Use of CBRERYM as a Benchmark in the Measurement of Depreciation

The CBRERYM has been identified as the most appropriate available index for use as a benchmark in the measurement of depreciation. The CBRERYM meets the requirement of the model benchmark in terms of the lack of depreciation contained within the index. In the absence of a site specific benchmark, the CBRERYM provides the greatest locational disaggregation, particularly within London. However, it should be noted that the provision of rent points has increased substantially through time and so one constraint to longer-term analysis is the use of rent points that are available at both the start and end of the period of analysis. In the absence of the model benchmark representing a new property in the specific location with an appropriate specification, the CBRERYM provides a consistently prime benchmark that tracks the development of the prime market and adjusts the specification of its prime definition accordingly. Therefore where a subject property is of prime specification the CBRERYM prime index can be used as a very useful benchmark for the measurement of depreciation.

However, two key issues remain over the use of the CBRERYM as a benchmark for the measurement of depreciation, the prime nature of the CBRERYM when used to measure depreciation from a sample including non-prime properties, and the comparability of the valuation basis of the CBRERYM and a sample dataset such as IPD.

5.1 CBRERYM Prime Specification

Where properties being measured for depreciation are not of prime specification or prime location, the CBRERYM does not match the requirements of the model benchmark and may overstate depreciation where the subject property was not built to a prime specification. An assessment of the changing prime specification used by the CBRERYM over time allows an understanding of both the changing definition of a prime property and how non-prime properties compare to the CBRERYM standard. Relative locational quality change is introduced which can lead to appreciation as well as depreciation relative to the 100% location and specification used by CBRERYM. This will be especially important for the assessment of high street shops. For example, in Nottingham City Centre during the early 1970s, the development of two major shopping centres shifted the 100% location from Long Row to Clumber Street and the Victoria Centre and a number of other streets changed their ranking significantly. CBRERYM changed its rent point in this location and any measurement of depreciation of individual properties may be affected by the locational change experienced in either direction relative to the rent point.

Further, an assessment of the changing nature of the prime specification in the CBRERYM identifies the ongoing incorporation of obsolescence within depreciation rates measured from the CBRERYM. A full assessment of the changing specification of the CBRERYM is beyond the scope of this study; however, the CBRERYM aims to represent the prime quality of buildings in terms of specification, to achieve this, CBRE adjust the definition of a prime building as the standards in construction change. Over the time period of the data for this study (1984 to 2003) the most noticeable change is the introduction of air-conditioning in offices. The CBRERYM in 1985 saw an adjustment of a number of rent points for the prominence of air-conditioning in particular locations, however the index of the time notes that the readjustment is backdated to different years depending on the prevalence of air-conditioning in the various locations i.e. in May 1985 the CBRERYM index had adjustments for Lombard Street, Moorgate, and Fenchurch Street back dated to May 1982, while other rent points such as Cheapside were readjusted as of May 1985. This example illustrates the ability of the CBRERYM to accurately adjust for prime specification at a detailed locational level at the appropriate time; however any depreciation rates based on, for example, Lombard Street in 1985 will pick up an adjustment that has actually been evident for three years prior but not incorporated into the index until later. The continually prime nature of the index is therefore not a smooth one and would potentially distort cross sectional measures occurring around the time of a readjustment.

Further examples of changes in the specification of the hypothetical properties comprising the index are the increase in the size of central London offices from 5,000sqft in 1993 to 5-10,000sqft in 1994. 1994 also saw the introduction of an allowance for car parking in the property specification. Other specifications that have seen change over time are the zone A frontage in the specification of high street shops, the size allowed for staff and storage accommodation, the size of industrial units, and details such as the eaves height of industrial units. Further, over time, the index has seen the introduction of new types of property, for example, Retail Warehouses.

These changes are essential in a benchmark for the measurement of depreciation in order that obsolescence is captured. Care should be taken, though, in the interpretation of resultant depreciation rates when measuring non-prime properties. The index should also be used in the knowledge that the specification of the index may change in a way that is not applicable to the properties in the sample and may therefore overstate depreciation (e.g. the closest CBRERYM rent point for a sample property may alter specification slightly ahead or behind the location of the sample property), the specification changes may also be 'lumpier' than expected causing potential distortion in the use of cross sectional analysis and the interpretation of single year results.

5.2 Valuation Bases

A further issue associated with the use of both the CBRERYM and IPD data is the valuation assumptions used on the actual properties in IPD and the hypothetical ones in CBRERYM. The issue of varying valuation assumptions in property data has been explored by Crosby and Murdoch (1994, 2001) and has been raised in relation to the measurement of depreciation by CEM (1999) and Law (2004).

The issue is more one of consistency through time rather than differences between the different valuation assumptions that can be used. The CBRERYM is comprised of hypothetical valuations controlled for specification and lease details and the valuations are consistently undertaken on a headline basis. This ensures that the basis of the valuation remains fairly constant through time and between properties within the index at any one time. However, the use of headline rent does cause some inconsistency through time as, dependent upon market state and market segment, there have been a wide range of incentives available at any one time. For example, rent-free periods on new lettings increased significantly in the early 1990s, reduced again in the late 1990s and early 2000s. Over 2002 and 2003, rent-free periods have emerged strongly again, particularly in the West End in 2002 and the City of London in 2003. (See Tables 3 and 4).

Table 3 – Average Rent Free Periods in Months – Main Sectors IPD 1992 – 1998 (Unweighted)

	1992	1993	1994	1995	1996	1997	1998
All Property	11.0	10.6	8.4	8.1	7.1	6.2	5.2
All Office	15.6	13.7	10.9	9.6	9.3	7.5	6.3
All Retail	9.4	9.5	7.3	7.1	6.1	5.7	5.0
All Industrial	10.8	9.8	7.8	8.5	6.3	5.4	4.6

Source : DETR (2000)

Table 4 : Average Rent Free Periods in Months – IPD PAS Segments 1997 – 2003 (Unweighted)

PAS Segment	1997	1998	1999	2000	2001	2002	2003/4
Standard Retails - South East	5.8	5.9	6.0	5.0	5.2	6.3	4.4
Standard Retails - Rest of UK	5.5	4.6	4.8	5.3	5.4	4.5	4.6
Shopping Centres	6.0	4.7	4.8	5.2	5.4	5.0	5.3
Retail Warehouses	4.7	4.9	5.6	4.1	4.7	4.8	4.6
Offices – City	10.1	6.0	7.1	5.7	3.8	6.3	9.3
Offices - West End	7.1	6.3	7.0	4.6	4.9	7.2	7.0
Offices - Rest of South East	6.7	5.9	5.7	5.2	6.4	6.1	6.7
Offices - Rest of UK	7.4	7.8	6.0	5.9	6.5	5.0	5.1
Industrials - South East	5.4	4.7	4.3	4.2	4.3	4.6	5.4
Industrials - Rest of UK	4.5	4.6	5.2	4.8	4.1	4.8	4.5
All Segments (excl other)	6.2	5.2	5.3	5.0	5.1	5.4	5.5

Source : IPD

The IPD index comprises data on actual properties of varying ages, condition and size and let on varying lease terms. IPD request that valuations should be in accordance with the RICS Red Book and the new Red Book (RICS, 2003) contains an amended definition of rental value. In the previous Red Book, the definition assumed standard lease terms for the property according to its characteristics and also that the effect of any rent free period or other incentives was discounted, thereby assuming that an effective rent was calculated. Crosby and Murdoch (2001) found that the majority of data providers to IPD were ignoring this directive. Some did follow the definition but many provided the rental value based on a headline rent on expected lease terms where the next rent change would occur at a lease expiry and on a provable rent review rent based on the provisions of the review clause when this was the next prospective rent change. As there is evidence from Crosby and Murdoch (2000) that different rents are determined dependent upon whether the rent is for a new lease, a renewal of an existing lease or at rent review, the basis of rental value within IPD is variable. However, perhaps their more important finding for this research is that the basis can change over time; for example, after the last rent review the basis can change from a provable effective rent to a new letting headline rent.

The 2003 change in definition has actually made the headline rent subject to actual lease terms acceptable within formal valuations, so now the varying rental valuation assumptions used by the various different providers of data to IPD can be defended within the context of the IPD request for adherence to the Red Book basis.

In summary, comparing a headline rent index (CBRERYM) with rental values within the IPD may have inconsistencies attached due to random changes from one basis to another within IPD. It could, especially over the short term, produce inconsistent and inaccurate depreciation rates. Over large samples these inconsistencies should be minimal but with smaller samples it may be an issue.

CEM (1999) and Law (2004) have addressed this issue in relation to the measurement of depreciation. They both concentrated on the question of the comparability between the CBRERYM as a headline benchmark and IPD as a sample of mixed valuation bases. Both studies found the relationship between valuations on an effective and headline basis not to be a significant factor in the measurement of depreciation. The CEM (1999) study found no significant difference between results including and excluding the properties valued on an effective basis. Law (2004) made an adjustment to the headline data from both CBRERYM and IPD to allow for the impact of rent-free periods finding no significant difference between the headline and effective data. Both studies concluded that the issue of valuation basis was not a strong influence on the measurement of depreciation, but both studies sounded a note of caution over the reliable capture of rental valuation information. However, this last point should be consistent between both indices as they are both valuation-based assessments of rental value.

6 A Benchmark for the Measurement of Capital Value Shift

Many of the issues raised in the above discussion are also relevant to the choice of benchmark for the measurement of capital depreciation. However, chapter one identified the concept of capital value shift as distinct from capital value depreciation due to the difficulties in extracting depreciation from other influences on changes in capital value. Therefore while the issues are the same it is important to discuss a capital value benchmark in terms of ‘shift’ and not ‘depreciation’. The index chosen should still meet the requirements of matching the site and specification of the sample properties and should not contain depreciation. The distinction of benchmarks as internal or external, market or prime and the related discussions continue to apply. However, the choice of an external, prime measure in CBRERYM does raise a significant practical issue for the measurement of capital value shift, which is not present in the measurement rental depreciation.

Nearly all published prime series report prime rents and yields for particular locations, but do not provide prime capital values. This means that capital value indices have to be produced synthetically from the two components (rent and yield). The production of a synthetic index raises a number of issues, for example such indices are not appropriate if the rent and yield are reported for slightly different locations, as depreciation could be obscured by a variety of micro-location changes. Rent and yield observations should also have been made with the same building specification in mind. This will not be the case for series that report ‘best achieved’ rents and yields drawing on data from different properties on different sites. However, the same location and specification behind rent and yield is possible in series that use hypothetical properties. This means that CBRERYM remains the most suitable index for use as a benchmark and so is adopted in this project for measuring both rental depreciation and capital value shift[3].

[3] The production of synthetic capital value indices used in this research is discussed further in chapter three.

Benchmarks and Depreciation: Summary

- *There has been a lack of discussion to date in the relevant literature on the choice of appropriate benchmarks for the measurement of depreciation.*
- *Studies to date have used five different benchmarks for the measurement of depreciation, with further variety in the construction of those benchmarks. Little justification has been given for the choice of benchmarks.*
- *Benchmarks can be categorised as internal (selected from within the sample of properties being studied) or external to the sample dataset.*
- *Internal benchmarks are derived from the depreciating sample and therefore include some depreciation.*
- *External benchmarks can be categorised as market benchmarks (data on actual properties) and prime benchmarks (data on hypothetical properties).*
- *Market benchmarks of rental value are measured using a held sample of properties. They therefore include depreciation as they comprise a sample which ages over the measuring period, regardless of the shortness of the measuring period.*
- *Prime (hypothetical) indices do not include depreciation. Further, the use of a continually prime index allows the resultant depreciation rate to account for obsolescence.*
- *The preferred benchmark for the measurement of depreciation has been identified as having three major characteristics;*
    - *Specification as new to an appropriate modern design (to include obsolescence)*

  - *In the absence of site specific data, the index should have sufficient coverage and disaggregation to match the location of the property to the benchmark in as much detail as possible, and*
  - *The benchmark should not contain depreciation.*

- *The CBRE Rent and Yield Monitor (CBRERYM) is identified as the most appropriate index in the absence of the preferred benchmark.*

- *The CBRERYM index should be used with some caution;*
  - *Where the sample comprises non-prime properties, the use of the CBRERYM index may overstate depreciation caused by specification differences and over or understate on account of relative location change between prime and non-prime locations.*
  - *The CBRERYM is comprised of headline valuations although analysis suggests that this is not a major issue.*
  - *The CBRERYM changes over time in specification, location of prime rent points, and in the boundaries of geographical aggregations. Samples that do not also adjust for the changing boundaries, or are in locations that are matched to a location in the CBRERYM where the specification and prime locations do not change at the same points in time, may produce slightly distorted results.*

- *In measuring capital shift, synthetic indices may need to be constructed from prime series to obtain benchmarks. This is more appropriate with prime measures that monitor hypothetical properties in locations and so CBRERYM remains the most appropriate benchmark in practice for measuring capital shift.*

Appendix 1: Age Profile of all the IPD PAS Segments – 1981 to 2003

Retail segments

Year[1]	Standard Retail : South Eastern		Standard Retail : Rest of UK		Shopping Centres		Retail Warehouses	
	Start	End	Start	End	Start	End	Start	End
1981	51.6	53.4	44.9	46.6	7.4	8.3	5.1	5.8
1982	52.7	53.4	45.1	46.1	8.3	9.1	5.0	5.3
1983	52.6	53.9	45.8	47.3	9.0	9.9	4.7	5.7
1984	53.8	55.3	47.4	47.9	9.2	10.3	4.8	5.6
1985	54.3	56.2	47.8	48.8	10.1	11.1	4.9	5.8
1986	54.8	56.6	48.9	50.1	10.6	11.5	5.4	6.1
1987	58.2	59.9	51.3	53.4	10.4	11.2	4.6	5.5
1988	59.4	60.6	54.1	55.1	10.8	11.9	4.7	5.4
1989	60.7	61.8	55.4	56.6	13.1	14.1	4.5	5.3
1990	60.8	61.9	55.3	56.3	13.4	14.7	4.5	5.4
1991	61.2	62.1	56.1	56.9	13.9	14.7	4.9	5.7
1992	62.1	62.8	56.1	56.9	14.1	15.1	5.7	6.6
1993	63.9	64.5	56.8	57.6	14.2	15.2	6.4	7.1
1994	63.8	64.6	57.0	57.8	14.7	15.6	6.7	7.5
1995	65.7	66.9	56.0	56.6	15.2	16.0	6.7	7.5
1996	67.3	68.8	56.1	57.0	15.9	16.5	6.9	7.5
1997	66.9	68.3	56.3	57.4	16.8	17.7	7.1	7.8
1998	66.4	67.2	55.5	55.3	17.6	18.4	7.2	8.0
1999	66.1	66.7	54.3	54.9	17.3	17.9	7.7	8.5
2000	65.1	66.1	54.3	54.3	15.8	16.4	8.4	9.1
2001	65.9	66.0	54.8	54.1	15.5	16.2	8.9	9.9
2002	66.4	70.9	52.9	54.1	15.1	16.3	9.5	12.0
2003	69.6	70.0	53.3	54.8	15.9	16.9	12.0	12.8

[1] The tables show the average age of all properties in a segment that have construction date data. The averages are weighted by capital values.

Appendix 1 continued

Office segments

Year[1]	Offices : City		Offices : Midtown/ West End		Offices : Rest of South Eastern		Offices : Rest of UK	
	Start	End	Start	End	Start	End	Start	End
1981	33.8	34.2	34.9	36.6	17.0	17.9	18.8	20.1
1982	32.9	34.3	35.2	37.3	16.6	17.3	19.9	21.0
1983	33.1	34.5	36.9	38.7	16.9	17.8	21.0	22.0
1984	31.8	32.3	37.7	39.6	15.6	16.5	22.3	23.4
1985	29.2	30.1	38.2	39.5	15.4	16.2	23.0	24.1
1986	26.3	27.0	41.9	43.3	15.5	16.4	24.5	25.8
1987	26.2	27.9	42.7	43.4	14.6	15.3	25.7	26.9
1988	24.8	25.9	43.9	44.9	14.2	15.2	26.9	28.7
1989	24.1	25.6	45.6	47.7	13.7	14.4	29.2	29.9
1990	25.6	26.2	46.5	47.3	13.9	15.0	28.8	29.5
1991	24.9	25.0	48.3	48.1	12.9	13.7	28.6	28.5
1992	23.5	22.9	49.5	49.3	12.5	13.3	28.3	28.3
1993	23.4	23.4	49.0	48.3	13.1	13.6	28.9	29.1
1994	24.1	24.7	47.9	49.5	12.9	13.4	27.9	28.4
1995	23.1	23.8	45.6	46.6	13.5	14.0	27.5	28.2
1996	23.2	23.7	48.6	49.3	13.6	14.1	27.4	27.4
1997	22.0	22.6	49.4	50.7	13.4	13.9	25.8	25.6
1998	23.4	24.4	51.4	52.2	13.2	13.8	23.1	23.5
1999	22.5	23.6	49.3	50.6	13.7	14.4	21.9	22.8
2000	25.1	26.3	47.8	48.6	13.2	13.9	21.7	21.6
2001	24.9	23.0	46.3	47.7	13.8	14.5	20.4	20.4
2002	21.7	21.6	46.0	47.1	14.2	15.2	19.0	19.9
2003	23.4	24.3	46.2	49.5	14.3	15.6	19.6	21.0

[1] The tables show the average age of all properties in a segment that have construction date data. The averages are weighted by capital values.

Appendix 1 continued

Industrial segments and all property

Year[1]	Industrials : South Eastern		Industrials : Rest of UK		All Property	
	Start	End	Start	End	Start	End
1981	11.6	12.2	8.5	9.4	26.8	28.2
1982	11.1	11.9	8.1	9.0	27.0	28.3
1983	11.0	11.8	8.5	9.3	27.4	28.9
1984	10.7	11.5	8.8	9.8	27.5	28.9
1985	10.5	11.4	9.8	10.8	27.8	29.4
1986	11.1	11.8	12.0	12.8	28.9	30.4
1987	11.3	12.1	12.8	13.7	30.0	31.4
1988	11.4	12.5	12.9	14.1	30.7	31.9
1989	11.9	12.4	13.3	13.9	31.3	32.0
1990	12.0	12.9	12.4	13.3	30.6	31.4
1991	12.5	13.4	13.6	14.5	30.2	30.4
1992	13.0	14.1	14.9	15.9	29.4	29.7
1993	13.9	14.6	15.1	15.7	29.4	29.8
1994	14.0	14.7	14.8	15.5	29.2	29.9
1995	14.5	15.3	14.2	15.6	28.3	29.0
1996	14.6	15.3	13.8	14.5	28.4	28.9
1997	14.5	15.2	13.4	14.2	27.8	28.4
1998	14.9	15.7	14.7	15.5	27.7	28.6
1999	15.4	16.3	14.8	15.8	27.6	28.2
2000	15.7	16.4	15.7	16.5	27.1	27.3
2001	16.2	17.1	15.3	17.2	25.8	25.9
2002	17.1	18.2	16.9	17.5	25.0	25.9
2003	17.6	18.6	17.2	17.5	25.5	26.1

[1] The tables show the average age of all properties in a segment that have construction date data. The averages are weighted by capital values.

Chapter Three: Rates of Rental Depreciation, Capital Shift and Capital Expenditure

Mark Callender and Steven Devaney

Contents

DEPRECIATION IN COMMERCIAL PROPERTY MARKETS
CHAPTER 3: RATES OF RENTAL DEPRECIATION, CAPITAL SHIFT AND CAPITAL EXPENDITURE

1. Introduction

The first two Chapters have laid out a best practice framework for measuring depreciation in commercial properties. This included discussion of the correct calculation to use and benchmark to measure against. In this Chapter, we take that framework and apply it to data on actual property investments. This is with the aim of producing depreciation rates for all the main segments of the UK commercial real estate market.

Information on depreciation continues to be important to the property investment industry. Estimates of depreciation form inputs into decision making models both at the individual asset level, as part of detailed appraisals, and for forecasting the performance of an asset or group of assets. Meanwhile, understanding depreciation and its magnitude can inform property management and trading decisions within a portfolio. It is information that is intricately related to the performance and pricing of property assets. The results should therefore be of interest, particularly as the last major study of depreciation covered only the period up to 1995 (CEM, 1999).

The principles outlined in the first two Chapters have been applied to both rental value and capital value data from the IPD databank. Rental depreciation rates were measured for 1984-2003 and 1993-2003, while capital rates were calculated for the 10 year period alone. However, any results will be for properties that have had expenditure over the periods in question. Therefore, they represent what could be termed 'managed depreciation' – the rate of depreciation after the impact of management activity. So rates of capital expenditure for the two periods were calculated as well, since without these, the picture of depreciation and its associated costs through time would be incomplete.

As suggested in Chapter 1, it could be argued that rental depreciation coupled with capital expenditure are the true measures of depreciation. Capital rates only represent the additional movement in yields over and above rental value changes, and yields imply future depreciation in the form of rental value change and capital expenditure. Given that they also imply other risks, capital results should be treated with some caution. For this reason, the capital results are labelled ‘capital shift’ rather than ‘capital depreciation’ throughout.

The structure of this Chapter is as follows. In section 2, the groundwork for the study is laid out, with a discussion of the samples, their characteristics and a number of issues surrounding application of the benchmark data. In addition, the use of long periods and held samples could mean that results reflect survivor bias, so this possibility is explored in detail. The results of the measurement exercise are then set out and discussed in section 3, looking at rental depreciation, capital shift and capital expenditure rates in turn. Conclusions are made in section 4.

2. Methodology and sample

The methodology used to produce the depreciation results in this paper has been set out in Chapters 1 and 2. The discussion here is predominantly about how that methodology was applied, along with information about the nature of the sample and benchmark used – critical for a proper understanding of the results. In Chapter 1, it was concluded that depreciation was:

- A relative concept
- A longitudinal measurement
- A decline rate
- A relative and multiplicative function, and
- On a value weighted basis

These factors demand that both a sample and benchmark be selected, that the sample be of properties held at both the start and end of the measurement period, that the computation of depreciation be consistent with the concept and principles set out, and that rates be calculated in terms of change in value, an important issue when aggregating individual results into rates for the different market segments.

Of the available potential benchmarks, Chapter 2 concluded that the individual data points forming the CBRE *Rent and Yield Monitor* (CBRERYM) series are closest to the model benchmark, although all the available data series have their limitations. We would like to take this opportunity to thank CB Richard Ellis for the provision of this data, without which the possibility and scope of this research would have been severely limited.

2.1 Sample construction

The first major decisions revolved around the length and timing of the measurement periods. A long term study was felt to be desirable, in order to span the market cycle and avoid starting or ending in any years where there may be significant distortion of the results by extreme market conditions. A long term sample is also desirable for any future investigation into depreciation shape and pattern. The drawback with this is that, over long horizons, the number of properties available for analysis diminishes and the potential for survivor bias to influence results becomes greater. Therefore, both a long and a medium term horizon were examined in this research.

The long term study covers the period 1984-2003 and is subsequently referred to as the 19 year study/sample. Although it might seem neater to examine a 20 year period, the choice of 1984 rather than 1983 as a start point is dictated by the availability of benchmark data. As also noted in CEM (1999), the number of locations in the CBRERYM prior to 1984 is small and so this would have had a big impact on the number of properties that could be used.

The medium term study covers the period 1993-2003 and is subsequently referred to as the 10 year study/sample. While this offers much bigger sample sizes, including the opportunity to start analysing retail warehouses, the start point of this period may pose some issues. While by 1993, it might be argued that the worst point of the market downturn had passed, it is still possible that the results for the more volatile segments such as offices are influenced by this starting point.

Once these measurement periods were determined, samples were constructed using properties that were held over the periods and which had capital value and ERV information for both the first and last year[1]. The use of held rather than traded properties does raise questions about whether the results are affected by survivor bias and so the nature of each sample is explored further in sections 2.3 and 2.4. The exception to using purely held samples was Shopping Centres, where some tracking through different ownerships within IPD did take place in order to gain large enough samples for examination. Throughout the study, these were analysed as a separate group and so any figures for all property exclude this segment.

2.2 Applying the benchmarks

After assembly of the samples, each property was matched to an appropriate rent and yield point from the CBRE data, the latter being required for the construction of a synthetic series to compare against capital values.

[1] Properties had to have an ERV and CV in both 1984 (or 1993) and 2003. In practice, whilst intervening values were not used, properties were only included that had a fairly complete set of data, so if there were more than three missing observations, properties were omitted.

The ideal benchmark for each property would involve having a rent and yield point at the same site as the property itself. However, there are no available data series with this level of detail and so, in using the CBRE data points, some 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 is made, a point also raised in Chapter 2. The principle adopted in this study was to only match buildings to benchmarks for their own area and not to benchmarks for neighbouring towns or suburbs. All location effects should therefore only reflect micro-location factors, such as a shift in the prime pitch, rather than centre or regional changes. At an aggregate level, it might be expected that these effects would cancel each other out.

Two further issues are raised by the coverage of CBRERYM through time. First, the number of locations in the dataset has varied over time, so only benchmarks with observations at the start and end of the period could be used. Second, the existence of a rent point at period start and end did not mean that there would also be a corresponding yield observation at those points. Table 1 shows the number of rent and yield points that were available for the different periods.

Table 1: CBRERYM Rent and yield points available for the measurement periods

	In existence at 1984 and 2003	In existence at 1993 and 2003
Rent points	805	706
Yield points	157	529
Y/R ratio	20%	75%

The yield series were important because of their role in the construction of capital benchmarks. It was noted in Chapter 2 that CBRERYM and many other prime series do not make capital value observations directly, requiring a synthetic series to be produced. These series were created in this case by dividing the CBRERYM ERV estimate (which assumes a rack-rented property) by the yield observation for each location. This was reasonably straightforward in the case of the 10 year sample, but not for the 19 year sample.

For the 10 year study, most of the sample locations had both a rent and a yield point, but where there was no yield point, a regional yield series was substituted in some cases[2]. Although this represented another step away from the ideal benchmark, it was not thought that this would have a big influence, with yields driven more by regional, segment and wider investment trends. In the case of the 19 year period, though, there were far fewer yield points and the research team were less confident about the capital results from this smaller sample. So the 19 year study proceeded to focus only on rental depreciation and capital expenditure. Meanwhile, for both samples, a local rent point was an absolute requirement without which a property would not be used.

Shopping Centres posed some unique implementation issues. The shop rent and yield points in CBRERYM relate to hypothetical unit shops. In the case of the rent points, the hypothetical unit is one located in the 100% prime trading pitch, which can be either inside or outside the Shopping Centre. There may be other factors that cause a unit rent within a centre to differ, but comparison may still be appropriate, as the benchmark allows an assessment of how the centre has fared through time relative to what the movement in top rents has been. On the other hand, there is a greater difference in the case of yields, which inhibits capital shift measurement. The benchmark yield will be for a standard shop in the location and not for a hypothetical shopping centre, so no capital shift comparison can be undertaken. Therefore, no capital measurement was attempted for this segment.

Finally, to apply the benchmark data, which was specified in rental values per square foot (and so also capital values per square foot once the synthetic capital series were created), figures were multiplied by the floor space of each corresponding property in the sample. This ensures both property and benchmark are appropriately weighted in the calculations to reflect the most valuable assets in each segment.

2.3 Characteristics of the 19 Year and 10 Year Samples

Table 2 shows the composition of the 19 year sample by market segment, adopting the classification used by IPD's Portfolio Analysis Service. The only difference from the IPD PAS classification is that the first two categories refer to standard shops and therefore exclude department stores, variety stores and supermarkets. To put the sample in context, its structure is compared with that of the IPD Universe at the end

[2] 77 properties (4.3%) of the 10 year sample of properties used regional yields.

of 2003, which in broad terms is a proxy for the UK property investment market. The fact that there were only 624 properties in the IPD at the end of 2003 which had been held continuously since 1984 suggests that property is not quite as illiquid as is sometimes supposed.

Table 2 Composition of the 19 Year Sample, End-2003

	Depreciation Sample			
	Number of Properties	**Capital Value £ million**	**% of Total Capital Value**	**IPD Universe % of Total Capital Value**
Std Shops – South East	183	879	16.3	7.6
Std Shops – Rest of UK	156	593	11.0	7.5
Shopping Centres [1]	35	1755	32.5	19.9
Retail Warehouses [2]	-	-	0.0	16.6
Offices – City	17	246	4.6	6.0
Offices – West End	77	769	14.3	7.5
Offices – South East	41	217	4.0	10.7
Offices – Rest of UK	30	157	2.9	5.6
Industrials – South East	75	523	9.7	9.1
Industrials – Rest UK	45	254	4.7	6.7
Other Property	-	-	0.0	3.0
All Property [1]	659	5,392	100.0	100.0

1. The shopping centre sample was assembled separately. Therefore, the all property results are based on the 624 properties in the other segments.
2. There were only 7 retail warehouses in the IPD that were held continuously from 1984-2003 by one investor.

Compared with the IPD Universe, the 19 year sample has a rather unusual structure. The requirement to focus on properties which have been held continuously by the same investor since 1984 effectively excludes new property types such as retail warehouses and means that the sample has a very high exposure to standard shops (i.e. high street shops) and West End offices, partly because these properties were numerous in portfolios in 1984 and partly, in the case of the West End, because of certain investors with very long holding periods.

Table 3 provides a corresponding breakdown of the 10 year sample. The more recent time frame enables a sample of retail warehouses to be assembled. In common with the 19 year sample, the 10 year sample is over-weight in the standard shop and West End office segments. Meanwhile, it is particularly underweight in Retail Warehouses relative to the IPD Universe as a whole.

Table 3 Composition of the 10 Year Sample, End-2003

	Depreciation Sample			
	Number of Properties	Capital Value £ million	% of Total Capital Value	IPD Universe % of Total Capital Value
Std Shops – South East	430	2,131	13.0	7.6
Std Shops – Rest of UK	423	1,757	10.7	7.5
Shopping Centres [1]	73	4,177	25.4	19.9
Retail Warehouses	54	1,008	6.1	16.6
Offices – City	75	1,094	6.7	6.0
Offices – West End	167	1,720	10.5	7.5
Offices – South East	203	1,790	10.9	10.7
Offices – Rest of UK	112	746	4.5	5.6
Industrials – South East	209	1,461	8.9	9.1
Industrials – Rest UK	124	531	3.2	6.7
Other Property	-	-	0.0	3.0
All Property [1]	1870	16,414	100.0	100.0

1. The shopping centre sample was assembled separately. Therefore, the all property results are based on the 1,797 properties in the other segments.

One implication of the composition of both 10 and 19 year samples is that the results measuring depreciation rates at the all property level need to be interpreted with care because they reflect a rather different mix of segments than the all inclusive IPD Universe.

2.4 Survivor Bias

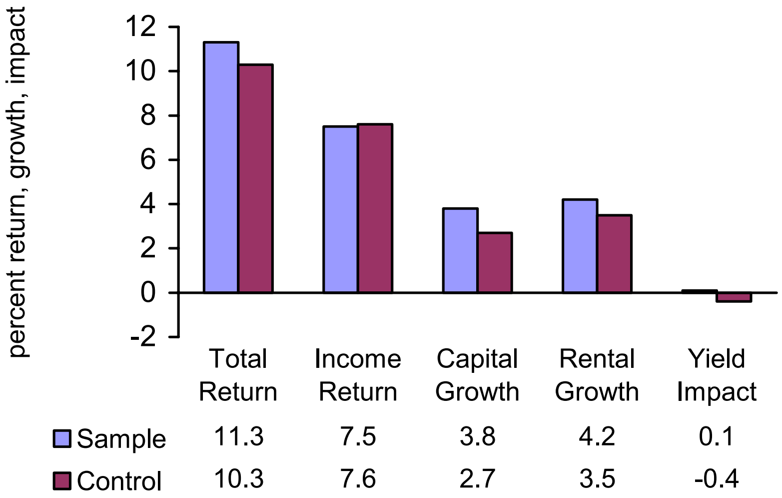
While a long-term measurement period is desirable in order to reduce the risk of the results being distorted by either the start year or end year, one danger is that the sample of properties with long histories may not be representative of the wider population. The results presented in this paper are potentially vulnerable to various types of survivor bias, some of which would affect any analysis of depreciation regardless of method and some of which are peculiar to IPD data.

- One potential distortion is that those buildings which become obsolete over a relatively short period and hence suffer extreme rates of depreciation, may be demolished and/or undergo major re-development. These extreme cases (often termed 'retirements') disappear from the data, particularly over a long measurement period, so that the results based on a surviving sample of properties understate depreciation.
- A second related source of survivor bias arises from the types of investors included in the IPD Databank and their willingness to hold and re-develop properties suffering obsolescence, compared with other investors outside the IPD. Although the dominance of insurance and pension funds within IPD has declined over the past 10 years and their appetite for active management appears to have increased, it is possible that the IPD sample understates depreciation across the whole population of properties because institutions have preferred to sell properties suffering from serious obsolescence, rather than take on the risk of re-developing them.
- Another possible source of survivor bias arises from the structure of the IPD Databank where the identity of a property is tied to its portfolio. While this separation by fund ensures confidentiality, the lack of a unique property identifier means that the histories of properties are broken when they are traded, even when the buyer and seller are both investors reporting to IPD. Thus the depreciation sample, with the exception of Shopping Centres, is only composed of properties which been held continuously by a single investor and there must be a concern that these retained properties have redeeming features that means their performance is unrepresentative of the wider population.

These survivor biases suggest that the rates of depreciation reported in section 3 will be under-estimates rather than over-estimates. It should be noted that the potential problem of survivor bias is not unique to a longitudinal methodology. For example, a cross-sectional analysis of the sample of the properties in IPD at the end of one particular year would also potentially be distorted by the disappearance of buildings which had been sold to investors outside the IPD because they had suffered from acute obsolescence.

Although it is not possible to adjust the research results for all these potential distortions, it is possible to examine the bias introduced by relying upon a sample of continuously held properties. Figure 1 compares the performance of the properties in the 19 year sample with a control sample composed of all buildings in the IPD built pre-1984, whether held or bought and sold. The control sample excludes shopping centres and retail warehouses. Setting a pre-1984 construction date limit means that the difference in performance compared with the depreciation sample is only due to properties being held continuously and is not picking-up any variations in performance between old and new properties.

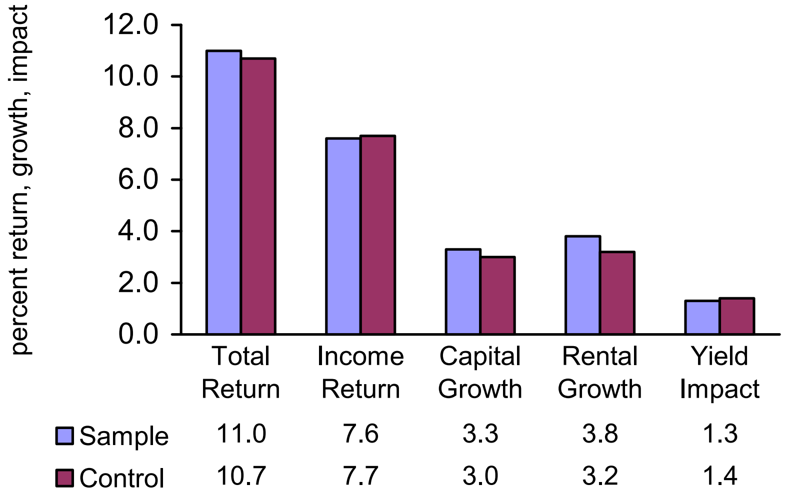
Figure 1: Performance of the 19 Year Sample vs Control Group, 1984-2003



Consistent with the expectation of survivor bias, the depreciation sample out-performed the control sample over the nineteen years to end-2003, suggesting that the properties retained by investors are not simply a random sample and that they have been kept, in part, because they have delivered superior returns. This out-performance reflected a mixture of slightly faster rental growth and a marginal fall in equivalent yields, whereas yields in the control sample rose slightly.

Figure 2 provides the corresponding analysis for the 10 year sample, comparing its performance with a control sample of properties built before 1993. The control sample again excludes shopping centres, but this time includes retail warehouses (see section 2.3).

Figure 2: Performance of the 10 Year Sample vs Control Group, 1993-2003



Again the depreciation sample has out-performed, indicating survivor bias. Interestingly, the margin is smaller than that over 19 years, possibly because investors have had less time to sort out the wheat from the chaff and dispose of poorer performing properties.

Yet although the comparisons in Figures 1 and 2 are intuitively appealing, the analysis at the all property level is of limited value, because the mix of segments in the depreciation samples is quite different from either the IPD Universe, or that of the control samples. A more meaningful test of survivor bias is to compare the performance of the study samples with the control samples at a segment level. The results of these tests are presented in Appendix 2. Broadly, they show a similar picture across each of the segments to the all property figures. Therefore, the bias is not simply a feature of segment mix.

Overall, the scale of survivor bias in the two depreciation samples is perhaps not as large as might be expected. This is particularly true for the 10 year sample where the difference in returns is just 30 basis points per year. However, the control samples will also reflect some of the IPD dataset biases. Therefore, any comparison or application of the results to other properties must have proper regard to differences between this dataset and the buildings under examination.

2.5 Summary of approach

A number of issues relating to the samples and measurement have been discussed in this section. Before proceeding to the results, it is therefore appropriate to set out a brief summary of what exactly is being measured and some major issues to be borne in mind when reviewing the results.

- The rental values of the sample properties at the start and end of each period were measured against the rental values of the corresponding benchmarks, using the following formula (discussed in more detail in Chapter 1):

  $d = 1 - \{[\sum R^s_{t2}/\sum R^s_{t1}]^{(1/(t2-t1))} / [\sum R^b_{t2}/\sum R^b_{t1}]^{(1/(t2-t1))}\}$

  R^s = sample rental value, R^b = benchmark rental value

- Benchmark rental values were the appropriate rent points from CBRERYM (in £ psf) multiplied by the floorspace of each property in question.

- The capital values of the sample properties at the start and end of each period were measured against synthetic capital value series, using the same formula. Synthetic series were created by dividing the CBRERYM rent point by the yield for the same location.

- As highlighted in Chapter 1, capital rates are not solely depreciation, but also contain other factors, such as lease effects and changing risk and growth expectations. These rates are termed 'capital shift' rather than 'depreciation'.

- The rate of capital expenditure (as a % per annum) for the sample properties was also calculated and this is discussed in more detail in section 3.6.

- The profile of the samples is somewhat different to that of the IPD Universe in general. The sample properties exhibit some survivor bias and the results may therefore understate depreciation.

The measurement method is illustrated with reference to a single property example in Appendix 1.

3. Depreciation Rates

3.1 Introduction

This section presents the main results of the research. Following this introduction:

- Section 3.2 shows the rates of rental depreciation for both the 10 and 19 year samples, broken down by sector and major segments of the property market.
- Section 3.3 compares the rates of rental depreciation on the 10 and 19 year samples and considers why they differ.
- Section 3.4 examines the spread of rates of rental depreciation across individual properties.
- Section 3.5 then applies the same method to try and measure rates of capital shift, which will incorporate both the rates of rental depreciation in section 3.2 and movements in valuation yields. As discussed in section 2.2, it has not been possible to produce capital figures for the 19 year sample.

Please note that because the rates of capital shift incorporate the rates of rental depreciation, it would be erroneous to add the two rates together.

It should also be noted that none of the rates have been adjusted for any capital expenditure on the properties over the 10 and 19 year periods. All the rates presented in sections 3.2-3.5 are post capital expenditure and effectively represent "managed" rates of depreciation. In order to understand underlying "market" levels of depreciation, it would be necessary to adjust the rental depreciation and capital shift rates using annual capital expenditure information. Therefore, in order to put the data in sections 3.2-3.5 in context:

- Section 3.6 details the annual rate of capital expenditure on the properties in the 10 and 19 year samples, broken down by sector and major segment. The figures measure the rate of irrecoverable capital expenditure by landlords. They do not reflect any additional repair and maintenance spending by tenants.

3.2 Rates of Rental Depreciation

Table 4 presents rates of rental depreciation for the main segments of the property market between 1984 and 2003 (column 5), as well as the rental growth recorded by the sample (column 4) and the rental growth of the appropriate CBRE rent points (column 3). Both the rental growth figures and the rates of depreciation are money weighted, but the depreciation figures are not simply the difference or ratio between the growth series due to the fact that they are calculated on a decline basis. The calculation procedure is explained in detail in Chapter 1.

The data in Table 4 is based on 641 properties. 18 properties were excluded from the headline rates on the grounds that they produced extreme rates larger than 5% per annum across the period (of either appreciation or depreciation). These outliers represent 2.7% of the total sample.

Table 4 Rental Depreciation Results for the 19 Year Sample, 1984-2003 % per year

1	2	3	4	5
	Number of Properties	**Rental Growth for CBRE Benchmark**	**Rental Growth for the Sample**	**Rate of Rental Depreciation [1 2]**
Standard Shop	330	6.0%	5.9%	**0.1%**
Office	158	4.7%	3.6%	**1.0%**
Industrial	118	5.2%	4.5%	**0.6%**
Std Shop – S. Eastern	176	6.3%	5.8%	**0.4%**
Std Shop – Rest of UK [4]	154	5.6%	5.9%	**-0.3%**
Shopping Centres [4]	35	6.5%	6.6%	**-0.1%**
Office – City	16	2.2%	1.2%	**1.0%**
Office - West End	74	5.7%	4.8%	**0.9%**
Office - South Eastern	38	4.0%	2.7%	**1.2%**
Office - Rest of UK	30	7.1%	5.3%	**1.7%**
Industrial – S. Eastern	74	5.1%	4.5%	**0.6%**
Industrial – Rest UK	44	5.4%	4.7%	**0.7%**
All Property [3]	606	5.7%	4.6%	**1.0%**

1. Please note that the figures for rental depreciation are time specific and that results for the last 19 years should not automatically be applied to projections into the future.
2. The figures for rental depreciation have not been adjusted for capital expenditure on properties – see section 3.6.

3. The figures at the all property level need to be treated with care because they exclude shopping centres and retail warehouses and the sample's segment composition is quite different from that of the IPD Universe.

4. Negative figures denote appreciation relative to the benchmarks.

The pattern at the three sector level presents few surprises. Shops emerge as having experienced the least rental depreciation, whilst offices exhibit the most. This is the same ranking across the sectors that was found in previous studies. Baum (1991) found that offices depreciate more than industrials, whilst CEM (1999) looked at all three sectors and found the same relative ranking. The rates here differ due to the use of different datasets, time periods and differences in methodology, issues that are fully discussed in Chapter 1.

The simple three sector pattern, though, masks considerable variation in depreciation rates across segments. Looking first at the retail segments, two of the segments actually show not depreciation but marginal appreciation (hence the negative sign), with the contrast between (depreciating) south east shops and (appreciating) rest of UK shops particularly striking. If the model benchmark – as set out in Chapter 2 – were available, then appreciation would be highly unlikely. In using the CBRERYM, however, some micro-location factors arising from minor differences between property location and rent point can come through into the aggregate figures[3]. Therefore, appreciation figures are possible, though it was expected that over large samples these effects would cancel out. In theory, because CBRERYM is a prime index, the results could also reflect a re-rating of secondary shops relative to prime, although it is not clear why this shift should apparently be more marked in the Rest of UK than in London and the South East.

The marginal rental appreciation of shopping centres is similarly surprising given that it is one of the segments which might be thought most vulnerable to obsolescence. This result may reflect survivor bias in that, while the shopping centre sample includes some traded assets, it still represents properties that have stayed within institutional ownership. Another factor is that, in many towns, the shopping centre is the dominant prime pitch, so that the centre's rental growth and the CBRERYM may often be identical. However, the low rate of rental depreciation on shopping centres must be seen in the context of relatively high rates of capital expenditure – see

[3] These micro-location effects are illustrated in Chapter 2 using the example of Nottingham city centre.

section 3.6, table 9. In short, the shopping centres within this sample have not been allowed to depreciate.

For offices, the City shows higher rental depreciation than the West End, although the difference is small and it should be noted that the City sample covers only 16 properties. The higher rate of rental depreciation in the City compared with the West End can probably be attributed to differences in occupier requirements. The City is dominated by major financial institutions with a preference for new prestigious offices with large trading floors, and their changing requirements have rendered many 1950s and 1960s offices obsolete. By contrast, the West End has a much more diverse occupier base and many of the smaller and medium-sized businesses located there have simpler space requirements which can be accommodated by both old or new buildings.

Yet, the 19 year results suggest that it is not City offices which have suffered the highest rate of rental depreciation over the long-term, but provincial offices and, in particular, offices in the Rest of the UK. The high rate of depreciation on Rest UK offices is not due to any single location and the 3% per year rate appears to have been fairly uniform across the "Big 6" cities and also between major cities and smaller settlements. One possible explanation for the higher rate in the Rest of the UK is that rental and capital values per square metre on new buildings are typically lower than in South East England. If it is assumed that building costs per square metre are broadly similar and that the lifetime of an office building is approximately the same, it follows that a provincial office will depreciate more than a comparable office in South East England and that the residual value (i.e. land value) will be lower.

Intriguingly, the same logic does not hold, however, in the industrial market even though it displays similar regional differential in rental and capital values per square metre as the office market. Instead, long-term rates of rental depreciation in the industrial sector appear to have been fairly uniform across the UK.

Table 5 presents rates of rental depreciation over the ten years to end-2003 (column 5). These results are based on 1,742 properties. 128 properties were excluded on the grounds that they produced extreme rates, larger than 5% per annum across the period (both appreciation and depreciation). The outliers represent 7.1% of the total sample.

Table 5 Rental Depreciation Results for the 10 Year Sample, 1993-2003 % per year

1	2	3	4	5
	Number of Properties	**Rental Growth for CBRE Benchmark**	**Rental Growth for the Sample**	**Rate of Rental Depreciation** [1 2]
Standard Shop	807	4.7%	4.4%	**0.3%**
Office	505	4.6%	3.8%	**0.8%**
Industrial	314	3.2%	2.7%	**0.5%**
Std Shop - S. Eastern	402	5.0%	4.9%	**0.2%**
Std Shop - Rest of UK	405	4.5%	3.9%	**0.5%**
Shopping Centres	73	4.1%	4.0%	**0.1%**
Retail Warehouses	43	8.8%	7.5%	**1.2%**
Office – City	65	3.6%	3.5%	**0.1%**
Office - West End	147	7.5%	6.4%	**1.1%**
Office - South Eastern	191	3.7%	2.9%	**0.7%**
Office - Rest of UK	102	3.5%	2.0%	**1.5%**
Industrial - S. Eastern	197	3.4%	3.0%	**0.3%**
Industrial - Rest UK	117	2.9%	1.8%	**1.1%**
All Property [3]	1669	4.7%	3.9%	**0.7%**

1. Please note that the figures for rental depreciation are time specific and that results for the last 10 years should not automatically be applied to projections into the future.
2. The figures for rental depreciation have not been adjusted for capital expenditure on properties – see section 3.6.
3. The figures at the all property level need to be treated with care because they exclude shopping centres and the sample's segment composition is quite different from that of the IPD Universe.

At the three sector level, the results for the 10 year sample show the same ranking as the 19 year results, with offices showing the greatest rental depreciation and shops the least. The rate of rental depreciation in the shop sector based on the 10 year sample is slightly faster than that shown by the 19 year analysis. Conversely, the rates of rental depreciation in the office and industrial segments are slightly lower. These differences are discussed at more length in section 3.3.

Looking in more detail at the retail sector, the appreciation found over the longer horizon disappears and the two shop segments both display similar rates of rental depreciation of 0.2-0.5% per year over the 10 years to end-2003. Shopping centres also show marginal rental depreciation, but this surprisingly low rate must be seen in the context of relatively high rates of capital expenditure – see section 3.6, table 9.

The retail warehouses included in the 10 year analysis suffered relatively high rates of rental depreciation of 1.2% per year. This perhaps surprising result can be explained by the age of the properties in this sample. By definition, the retail warehouses in the sample were all constructed prior to 1993 and before the emergence of a new class of prime fashion parks in the mid-1990's. So while they saw impressive rental growth of 7.5% per year, the prime rental growth series saw even faster capital growth of 8.8% per year overall. Therefore, the experience of the pre-1993 cohort of retail warehouses provides a cautionary tale that modern buildings in emerging segments can suffer rapid depreciation if they are superseded by a newer generation of buildings.

Turning to the office market, the 10 years rates of rental depreciation in the West End and Rest UK segments are fairly similar to those found over 19 years. By contrast, the rate of rental depreciation in the South East office market is lower at 0.7% per year, compared with 1.2% per year on the 19 year sample. However, it is the City office market which really accounts for the apparent slowdown at the national level, recording a rental depreciation rate of just 0.1% per year over the 10 years to end-2003. This result is a major anomaly and sits at odds with both the 19 year analysis of rental depreciation and the 10 year figures for capital shift in section 3.5, which suggests faster depreciation in the City than in the West End. One partial explanation is that over-renting was so prevalent in the City office market in the early 1990s that the ERVs on the sample properties had to some extent become academic and may have been artificially depressed at end-1993. Accordingly, the subsequent recovery in rental values on the 65 offices, at 3.5% per year over the ten years, would be exaggerated. However, this explanation cannot fully account for the lower rate of rental depreciation in the City compared with the West End, given that the West End was also heavily over-rented in the early 1990's. If ERVs were artificially low at the end of 1993, then the same bias should have also distorted the rental growth figures for the West End sample. Therefore, there is a possibility that the 10 year rental depreciation rates for both the City and West End are understated.

Finally, in the industrial market, the 10 year figures reveal a much high rate of rental depreciation in the Rest of the UK (1.1% per year), than in London and the South East (0.3% per year). This significant regional variation, which was absent in the 19 year figures, is consistent with the earlier idea that industrials (and offices) in the Rest UK should suffer higher rates of depreciation than similar properties in southern England. However, this difference does not persist in the capital shift results over the same period – see Table 8.

3.3 Comparing the 10 and 19 Year Rates of Rental Depreciation

At first sight, inconsistencies between the 10 and 19 year rates of rental depreciation might call in to question the reliability of the figures. There are, however, legitimate reasons why the rates should differ and which complicate a direct comparison of the 10 and 19 year results.

- First, the rate of rental depreciation may vary with the property cycle and level of new development and it is conceivable that the rate of depreciation in the violent boom and bust era of 1984-1993 was faster than in the more orderly era of 1993-2003.
- Second, the two samples cover different sets of properties, at different stages in their life-cycles. While the difference in sample sizes should not have a great effect, assuming both sets of properties are representative (and the 19 year sample is a subset of the 10 year sample), the fact that they have different age profiles could be relevant if the rate of depreciation is not constant and varies over the life of a property.

Ideally, a comparison of depreciation in two different periods would monitor the same sample of buildings and those buildings would enter the second period at the same age and in the same condition as they entered the first. Clearly this is not possible. However, it is possible to get some impression of the way that the rate of rental depreciation changed between the 1980s and 1990s, and of ageing effects, by examining the following sub-sets of the data:

1. Rental rates for the 9 years 1984-1993 calculated from the 19 year sample of properties
2. Rental rates for the 10 years 1993-2003 calculated from the 19 year sample
3. Rental rates for the 10 years 1993-2003 calculated from those properties that form part of the 10 year sample only (i.e. not held over the longer horizon).

This sample has a younger age profile than the 19 year sample because it includes developments built between 1984-1993.

Comparing subsets 1 and 2 shows the combined influences on rental depreciation of age (or life-cycle) and era using a single sample. Subset 3 then allows the individual effects of age and era to be studied further, although the success of this will depend on the degree to which the new sample is refreshed and whether it is similar in composition to the others. Comparing 1 and 3 should give an indication of changing depreciation in different eras, while 2 and 3 compares two samples with different age profiles in the same era. Together this information provides a starting point for future investigation of issues such as the influence of market cycles and of shape - do properties depreciate at a constant rate over their lifetime, or are they like cars and the rate varies significantly at different stages in their life-cycle?

Table 6 shows the results of these analyses at the three sector level. Not all properties in the 19 year sample had rent or benchmark observations in 1993, so sample size was slightly reduced. However, the remaining 580 properties produce similar full period depreciation rates to those for the whole sample that were shown in Table 4. Meanwhile, the "10 year only rates" are based on 1,120 properties.

Table 6: Rental depreciation rates for the three sub-sets

	1	2	3
	Rate of Rental Depreciation: 19 Year Sample 84-93	**Rate of Rental Depreciation: 19 Year Sample 93-03**	**Rate of Rental Depreciation: "10 Year Only" 93-03**
Standard Shop	-0.0%	0.3%	0.4%
Office	2.2%	0.4%	0.9%
Industrial	1.5%	0.4%	0.7%

These results show that rental depreciation on offices and industrials was much lower in the second half of the 19 year period. This appears to be due to a combination of both age and era. The large difference between the rates of subsets 1 and 3 points to depreciation having declined in the 1990s relative to the 1980s. Meanwhile, the further difference between subsets 2 and 3 suggests that older buildings depreciated more slowly in the 1990s than newer ones. However, there may be a generation effect too[4], which would influence age and era conclusions.

3.4 The Range in Rental Depreciation Across Individual Properties

Table 7 provides an indication of the range in rental depreciation across individual properties. In column 4, the median shows the middle rate of depreciation for each sector when all the individual rates are ranked. This is an un-weighted figure, so comparison with the headline figures in column 2 provides an indication of the influence of value on the results and whether higher or lower value property investments depreciate more. In columns 3 and 5, the upper and lower quartile figures give an idea of the spread in rates across individual properties. All the sample properties are included so that the quartiles reflect the entire distribution, including the extreme results.

Table 7: The Distribution of Individual Rates: Median and Inter-Quartile Figures at the Sector Level

1	2	3	4	5
	Sector Depreciation Rate	**Lower Quartile Individual Depreciation Rate**	**Median Individual Rate in Sample**	**Upper Quartile Individual Depreciation Rate**
10 year sample Rental Depreciation				
Standard Shop	0.3%	-0.9%	0.4%	1.7%
Office	0.8%	-0.3%	1.2%	2.7%
Industrial	0.5%	-0.4%	1.1%	2.3%
19 year sample Rental Depreciation				
Standard Shop	0.1%	-1.0%	0.2%	1.4%
Office	1.0%	0.3%	1.7%	2.7%
Industrial	0.6%	0.2%	1.0%	1.9%

The main finding to emerge from this analysis is that the median rates are larger than the sector depreciation rates in all but one case. This seems to indicate that smaller

[4] In other words, there may be something about the different types or designs of the buildings built in different eras that contributed to the differences as well.

value properties depreciate more than larger ones. Meanwhile, the spread of rates, as measured by the inter-quartile range, appears relatively uniform across the sectors. Offices show marginally more variation in rates, but probably not enough to be significant.

3.5 Rate of Capital Shift

Little research has been done in the past on capital depreciation in investment properties and Chapter 1 outlined some conceptual issues that may need to be addressed in this area. Nevertheless, in terms of calculation, the formula for measuring changes in sample rental values versus those of the benchmark can also be applied to capital values. Using this formula, figures for 'capital shift' can be computed, which as rates, include both the impact of rental depreciation and other factors, such as lease effects and changing risk and growth expectations, as mediated through property yields. This was carried out solely on the 10 year sample because of the practical difficulties in applying to the longer period, reviewed in section 2.2.

Table 8 presents rates of capital shift for the main segments of the property market between 1993 and 2003 (column 5), as well as the capital growth recorded by the sample properties (column 4) and the capital growth for the synthetic value indices constructed from the benchmark rent and yields (column 3). Once again, the capital growth figures and rates of change are money weighted.

The data is based on 1,752 properties. 45 properties were excluded on the grounds that they produced extreme rates, this time greater than 10% per annum across the period (both appreciation and depreciation). The outliers represent 2.5% of the total sample.

Table 8 Capital Shift Results for the 10 Year Sample, 1993-2003 % per year

1	2	3	4	5
	Number of Properties	**Capital Growth for CBRE Benchmark**	**Capital Growth for the Sample**	**Rate of Capital Shift [1 2]**
Standard Shop	837	5.2%	4.2%	**0.9%**
Office	538	5.5%	2.8%	**2.6%**
Industrial	325	5.6%	3.6%	**1.9%**
Std Shop – S. Eastern	421	5.6%	4.3%	**1.2%**
Std Shop - Rest of UK	416	4.9%	4.1%	**0.7%**
Shopping Centres[4]	-	-	-	**-**
Retail Warehouses	52	12.3%	10.4%	**1.7%**
Office – City	72	3.8%	0.0%	**3.6%**
Office – West End	160	7.9%	5.6%	**2.2%**
Office - South Eastern	198	4.9%	2.6%	**2.2%**
Office - Rest of UK	108	5.4%	2.2%	**3.0%**
Industrial – S. Eastern	204	5.8%	3.8%	**1.9%**
Industrial - Rest UK	121	4.9%	2.8%	**2.0%**
All Property [3]	1752	5.5%	3.8%	**1.6%**

1. Please note that the figures for capital shift are time specific and that results for the last 10 years should not automatically be applied to projections into the future.
2. The figures for capital shift have not been adjusted for capital expenditure – see section 3.6.
3. The figures at the all property level need to be treated with care because the sample's segment composition is quite different from that of the IPD Universe.
4. Capital shift for Shopping Centres could not be done as discussed earlier in section 2.2.

The capital shift rates show the combined effects of rental depreciation and of yields on the sample properties moving relative to yields on new prime buildings in the same location. As might be expected, the capital shift figures are consistently higher than the corresponding rental depreciation figures in Table 5 because yields on the sample properties have moved less favourably than prime yields. Part of the negative re-rating of yields on the sample properties may be because they have aged and expectations for future rental growth will have been downgraded and part may be due to reduced income security as the time until the next lease expiry shortens.

The capital shift series exhibit many of the same features as the 10 year rental depreciation series. The three sector ranking is the same and among the retail segments, retail warehouses show higher rates of capital shift than shops, whilst among the office segments, Rest UK offices have seen a greater shift than southern offices.

The major differences are in the series for City offices and industrials. Unlike the rental depreciation series, the capital shift figures for City offices accord with conventional wisdom, showing a significantly higher rate (3.6% per year) than for West End offices (2.2% per year). By implication, the negative re-rating of yields on the sample properties relative to prime yields has been much more aggressive in the City than in the West End. Conversely, the capital shift figures for the industrial market refuse to conform with expectations and the rate of capital shift in the Rest UK is only marginally greater than that in southern England.

3.6 Capital Expenditure by Landlords

Tables 4, 5 and 8 showed how the sample properties fared relative to benchmarks for new properties in their locations. These results do not provide a full picture of the impact of depreciation, though. They show rental depreciation and value movements for properties on which there had been capital expenditure over those periods. There are no instances of complete redevelopment, but there will be cases where works were undertaken to either improve or protect a building's rental and capital values. Therefore, the results reflect 'managed depreciation', as they show the percentage fall in value over time for properties where spending has absorbed at least some of the depreciation impact. The true cost of depreciation to the investor will include this expenditure.

For each property in the samples, figures for capital expenditure during the study years were available. At this point, it is important to define the expenditure that IPD records. Capital expenditure refers to spending by the owner/landlord that is non-recoverable. Any maintenance or improvement works carried out either by a tenant or by the landlord and then subsequently recovered through a service charge or payment is not recorded. As also discussed in Chapter 4, this is likely to mean that the true cost of maintaining the properties is understated, while any impending costs being created by depreciation will not yet be reflected. Unlike Chapter 4, the analysis below does not include revenue expenditure, though, which predominately relates to management fees and ground rents.

Total capital expenditure over a period was summed within each sector/segment and divided by the total of all the annual capital values of the buildings in that same sector/segment. This produces a money weighted annual percentage, showing what proportion of value was spent on average each year. These rates are displayed in Table 9.

Table 9 Capital Expenditure Rates for the 19 year and 10 year samples, (% per year)

1	2	3
	Capital Expenditure on 19 year sample (% p.a)	**Capital Expenditure on 10 year sample (% p.a)**
Standard Shop	0.6%	0.5%
Office	1.0%	0.9%
Industrial	0.8%	0.4%
Std Shop – S. Eastern	0.5%	0.4%
Std Shop - Rest of UK	0.6%	0.5%
Shopping Centres	2.2%	2.4%
Retail Warehouses	-	0.8%
Office – City	0.9%	1.1%
Office – West End	1.3%	1.1%
Office – South Eastern	0.7%	0.7%
Office – Rest of UK	0.8%	0.7%
Industrial – S. Eastern	0.7%	0.4%
Industrial - Rest UK	0.9%	0.3%
All Property [2]	0.8%	0.7%

1. Please note that the figures are time specific and that results should not automatically be applied to projections into the future.
2. The figures at the all property level need to be treated with care because the sample's segment composition is quite different from that of the IPD Universe. Like the other all property figures, they do not include shopping centres in their calculation.

This table shows that, in addition to having the highest depreciation rates, the office samples attracted the most spending of the three sectors. The segment results show that even the office rates are dwarfed by the figures for shopping centres, though. The rental depreciation figures in Tables 4 and 5 suggested superficially that shopping centres suffered less depreciation than other types of property. However, when taken together with the capital expenditure rates, a different picture emerges.

The results suggest that those shopping centres that have been retained in portfolios have not been allowed to depreciate by their owners, but this has come at a cost, with a high level of expenditure needed to maintain the attractiveness and rental values of the centres as time has passed.

These overall rates do not show the patterns of expenditure in the properties. Some of the properties may have had regular injections of capital from their owners, while others may have had a large amount of spending all at once. The pattern of capital expenditure, together with the pattern of depreciation, are subjects beyond the scope of this study. However, some indication of the frequency of major refurbishments is useful for understanding the figures above and so a distribution of the individual rates of expenditure is provided in Figure 3 below. No complete redevelopments were included in the samples at all.

Figure 3: Distribution of Individual Capital Expenditure Rates in the 10 year and 19 year samples

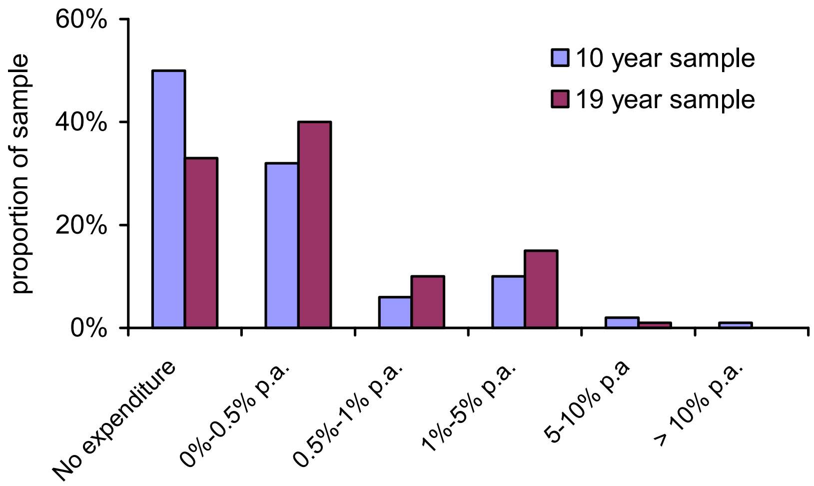


Figure 3 shows that, within both 10 and 19 year samples, there were a considerable number of properties that recorded no capital expenditure at all (although there may have been spending by the tenants that IPD cannot track). More properties received at least some expenditure over the longer term horizon (67% compared to 50%), but within the 10 year sample there were more outliers, this probably due to there being less years for the impact of a large spend in individual buildings to be spread over.

4. Conclusions

This Chapter has applied the framework for depreciation measurement set out in Chapters 1 and 2 to data on actual property investments. Rental depreciation rates and rates of capital expenditure have been calculated for the periods 1984 to 2003 and 1993 to 2003, and changes in capital values relative to a benchmark of new values have also been measured for the latter period.

The results show an unsurprising pattern at the three sector level. Offices showed the greatest depreciation, while shops recorded the least. At the segment level, though, interesting findings emerge, such as the high rate of depreciation in retail warehouses, where early generation investments were rapidly superseded in a fast evolving sector. However, an important point made in this Chapter is that all these rates are effectively ‘managed depreciation’, i.e. the depreciation recorded after the impact of expenditure and management activity. Therefore, the calculated capital expenditure rates provide an important further piece of information and point to the true cost of property depreciation through time.

The research team believes that the results have been produced using the most rigorous approach to measurement yet adopted. Nevertheless, they should be treated with caution. The need to use held samples of properties introduces an element of survivor bias, while the use of IPD as a dataset may introduce some more. There are also limitations in the extent of capital expenditure that IPD record. In using the figures, these practical limitations must be borne in mind. In addition, the findings may well be time specific and so should not automatically be re-applied as future estimates for appraisals or forecasts. Nevertheless, the dataset and results provide a rich basis for future research, from which exploration of shape, pattern and causes of depreciation can begin.

Rates of Rental Depreciation, Capital Shift and Capital Expenditure: Summary

- *This Chapter measured rates of rental depreciation, capital shift and capital expenditure for the UK property investment market using the best practice framework set out in Chapters 1 and 2.*
- *The data used in this study were rental values, capital values and capital expenditure figures for properties held through the periods 1984-2003 and 1993-2003 by a single investor.*
- *Benchmark data from the CBRE Rent and Yield Monitor (CBRERYM) was kindly provided by CBRE.*
- *The samples of properties differ in structure from the IPD Universe and show a small bias towards out performance, which must be borne in mind when using the results.*
- *Due to depreciation being only one yield impact (and hence driver of change in capital values), the capital results have been termed capital shift and not capital depreciation throughout.*
- *Rental depreciation rates for the 10 year sample showed Offices experiencing the most depreciation at 0.8% per annum, with Industrials recording 0.5% and Shops recording 0.3% depreciation per annum.*
- *The same sector differentials appear in the 19 year rental results and the 10 year capital shift rates.*
- *These figures do not show the full costs of depreciation: they reflect 'managed depreciation' on properties where expenditure has taken place. Capital expenditure rates also need to be taken into account.*
- *Offices showed the highest expenditure rates of the three sectors, while Shopping Centres showed the highest rate of all, with an average of 2.4% of value being spent each year.*
- *The distribution of individual rates seems to indicate that depreciation is lower on higher value property investments.*
- *An exploration of possible time and age effects showed depreciation to be lower in the 1990s than in the 1980s, though such analysis is complex and requires further research.*

Appendix 1: Measurement illustration using an example property

The following example illustrates the measurement method with respect to a single property. The property and benchmark below are imaginary, but in the actual study, the property inputs (rental values and capital values) come directly from the cashflow records supplied by IPD contributors.

Meanwhile, the CBRERYM series consist of rent and yield observations. Rent points (specified in ERV per square foot) are multiplied by the floorspace of sample properties to create rental benchmarks. Yield points are used to create capital benchmarks by capitalising the rental benchmarks.

Property:	Westlake Tower
Sector:	Office
Floorspace (sq ft):	10,000
Location:	Benchmark Street, London

Year	Rental values	Rent point series	Rental benchmark	Capital values	Rental benchmark	Yield point series	Capital benchmark
1993	235,000	26.50	265,000	3,135,000	265,000	7.00	3,785,714
1994	240,000	29.00	290,000	3,300,000	290,000	6.00	4,833,333
1995	240,000	29.00	290,000	3,350,000	290,000	5.75	5,043,478
1996	280,000	33.75	337,500	3,875,000	337,500	5.75	5,869,565
1997	310,000	40.75	407,500	4,125,000	407,500	5.75	7,086,957
1998	312,500	44.25	442,500	4,000,000	442,500	6.25	7,080,000
1999	305,000	45.00	450,000	4,000,000	450,000	6.15	7,317,073
2000	330,000	51.75	517,500	4,125,000	517,500	6.50	7,961,538
2001	340,000	53.75	537,500	4,125,000	537,500	7.00	7,678,571
2002	325,000	46.75	467,500	3,825,000	467,500	7.00	6,678,571
2003	285,000	38.50	385,000	3,450,000	385,000	6.50	5,923,077

Formula for single property:

$$d = 1 - \frac{[R_{t2}^{s} / R_{t1}^{s}]^{1/(t2-t1)}}{[R_{t2}^{b} / R_{t1}^{b}]^{1/(t2-t1)}} \qquad d = 1 - \frac{[CV_{t2}^{s} / CV_{t1}^{s}]^{1/(t2-t1)}}{[CV_{t2}^{b} / CV_{t1}^{b}]^{1/(t2-t1)}}$$

Calculation is therefore:

$$d = 1 - \frac{[285,000 / 235,000]^{1/10}}{[385,000 / 265,000]^{1/10}} \qquad d = 1 - \frac{[3,450,000 / 3,135,000]^{1/10}}{[5,923,077 / 3,785,714]^{1/10}}$$

Rates: **1.79% per annum** **3.46% per annum**

The measurement formula was discussed in detail in Chapter 1.

Appendix 1 continued

For calculating capital expenditure rates, only data from the sample properties is required. Capital values and expenditure amounts again come directly from cashflow records supplied by IPD contributors.

Property:	Westlake Tower
Sector:	Office
Floorspace (sq ft):	10,000
Location:	Benchmark Street, London

Capital values	Property expenditure	Rate in each year
3,135,000		0.00%
3,300,000	5,000	0.15%
3,350,000		0.00%
3,875,000	250,000	6.45%
4,125,000		0.00%
4,000,000		0.00%
4,000,000		0.00%
4,125,000	6,500	0.16%
4,125,000		0.00%
3,825,000		0.00%
3,450,000	4,000	0.12%

Formula for single property:

$$cex = \frac{\sum PEx}{\sum CV} \times 100$$

Calculation is therefore:

$$cex = \frac{302,700}{41,310,000} \times 100$$

Rate: **0.64% per annum**

Appendix 2: Survivorship bias extended comparison

Performance comparison of the depreciation samples and their respective control groups. These are presented as part of the testing for survivor bias. See section 2.4 for a full explanation.

Performance of the 19 Year Depreciation Sample and Control Group

	Total Return	Income Return	Capital Value Growth	Rental Value Growth[2]	Yield Impact
Depreciation Sample					
Std Shops – South East	11.6	6.3	5.2	5.6	-0.9
Std Shops – Rest of UK	10.9	6.2	4.7	5.9	0.4
Offices – City	7.8	7.8	0.0	0.7	1.7
Offices – West End	11.2	6.8	4.3	4.4	-1.2
Offices – South East	9.4	8.9	0.5	2.2	2.0
Offices – Rest of UK	12.3	9.0	3.3	5.0	1.2
Industrials – South East	14.4	9.6	4.8	4.5	-0.4
Industrials – Rest UK	14.8	10.2	4.7	4.4	-0.8
All Property [1]	11.3	7.5	3.8	4.2	0.1
Control Sample of Properties in IPD built pre-1984 [3]					
Std Shops – South East	10.2	6.3	3.8	4.8	-0.3
Std Shops – Rest of UK	10.4	6.4	4.0	5.0	-0.4
Offices – City	8.0	7.5	0.5	1.0	-1.2
Offices – West End	10.4	7.2	3.1	3.3	0.5
Offices – South East	8.3	8.5	-0.2	1.7	-1.7
Offices – Rest of UK	10.6	8.7	1.8	4.5	-1.9
Industrials – South East	13.4	9.5	4.0	3.9	0.7
Industrials – Rest UK	14.2	10.1	4.1	3.9	0.7
All Property [1]	10.3	7.6	2.7	3.5	-0.4

1. Both the depreciation sample and the control sample exclude shopping centres and retail warehouses. The figures at the all property level need to be treated with care because the segment composition of the sample is quite different from that of the control sample.
2. Rental growth figures for sample vary slightly from the results data as they are calculated from year on year estimates. The study only uses start and end observations and so is unaffected by missing ERV observations in intermediate years.
3. The control sample consists of all properties in the IPD built before 1984, including those only owned for only a few years.

Appendix 2 continued

Performance of the 10 Year Depreciation Sample and Control Group

	Total Return	Income Return	Capital Value Growth[2]	Rental Value Growth[2]	Yield Impact
Depreciation Sample					
Std Shops – South East	10.4	6.4	4.0	4.7	0.6
Std Shops – Rest of UK	9.9	6.4	3.6	3.9	0.5
Retail Warehouses	16.9	7.1	9.8	7.2	3.1
Offices – City	8.6	8.0	0.6	3.3	0.6
Offices – West End	11.7	7.4	4.3	6.1	1.9
Offices – South East	10.1	8.2	1.8	2.7	0.9
Offices – Rest of UK	9.9	8.6	1.4	1.8	1.0
Industrials – South East	12.7	9.2	3.5	3.1	2.1
Industrials – Rest UK	11.9	9.5	2.4	1.6	1.4
All Property [1]	11.0	7.6	3.3	3.8	1.3
Control Sample of Properties in IPD built pre-1984 [3]					
Std Shops – South East	10.1	6.7	3.4	3.7	0.9
Std Shops – Rest of UK	9.9	6.7	3.2	3.1	0.7
Retail Warehouses	15.4	7.2	8.2	6.3	3.0
Offices – City	8.3	7.6	0.7	3.2	0.1
Offices – West End	10.6	7.3	3.3	5.1	1.9
Offices – South East	9.3	8.4	0.9	1.7	0.4
Offices – Rest of UK	9.1	8.8	0.3	1.2	0.2
Industrials – South East	12.5	9.1	3.4	2.9	2.2
Industrials – Rest UK	11.2	9.1	2.1	1.5	1.7
All Property [1]	10.7	7.7	3.0	3.2	1.4

1. Both the depreciation sample and the control sample exclude shopping centres. The figures at the all property level need to be treated with care because the segment composition of the sample is quite different from that of the control sample.
2. Rental and capital growth figures for sample vary slightly from the results data as they are calculated from year on year estimates. The study only uses start and end observations and so is unaffected by missing ERV or CV observations in intermediate years.
3. The control sample consists of all properties in the IPD built before 1993, including those only owned for only a few years.

Chapter Four: Depreciation and Property Investment Vehicles

Andrew Baum and Steven Devaney

Contents

DEPRECIATION IN COMMERCIAL PROPERTY MARKETS
CHAPTER 4: DEPRECIATION AND PROPERTY INVESTMENT VEHICLES

1. Introduction

Previous studies of depreciation in the UK commercial property market have typically measured the impact of depreciation on the values of directly held properties. This literature was reviewed in Chapter 1. However, when property is held within a corporate structure, depreciation not only affects asset values, but it also affects the value of the holding entity. This is partly due to the usual effects of depreciation on rental income and capital value but also because of the following issues.

1. Depreciation is allowable as an expense that attracts relief on tax charged on income.
2. Depreciation is dealt with in the profit and loss account and balance sheet. This reduces profit and affects market analysts' measures of value and/or attractiveness.
3. Rules regarding the distribution of income may not take full account of annual depreciation in the portfolio.

For these reasons, this Chapter considers the accounting and structural issues for real estate vehicles relating to depreciation, which in turn influence the returns experienced by indirect investors in the property market. These issues are particularly important for vehicles that do not have full discretion over the use of income and profits, such as global REIT forms and, in particular, the proposed Property Investment Fund or PIF in the UK. Of special concern is whether the manager's ability to deal efficiently with depreciation is constrained by distribution rules or other operational restrictions laid down in return for tax transparency.

The relative practical impact of these issues depends on the financial extent of depreciation. This is likely to vary from market to market and from sector to sector depending on economics and institutional factors such as lease contracts. The results and insights from the other Chapters on depreciation in different market segments therefore contributes to our conclusions about managing depreciation within a REIT-type structure. Hence we also discuss the lease types and property types most at risk of a depreciation impact and place the issues for UK vehicles in this context.

The structure of this Chapter is as follows. The next section sets out why depreciation needs to be recognised and how it is dealt with through accounting and operational mechanisms. Section 3 then examines the particular issues surrounding depreciation, earnings and income distribution. Here, the Chapter draws on US experience and literature, but it also highlights key differences between the UK and US that must be given attention in the distribution debate. Section 4 considers the distribution issue further by examining the actual income and expenditure for a set of properties through time, discussing the findings in the light of the specific proposals for the UK PIF. Conclusions are then drawn in section 5.

2. The Treatment of Depreciation in a Property Vehicle

Both in the UK and across the world, there are many ways of investing in real estate. These include direct ownership, real estate lending, investing in unlisted vehicles such as limited partnerships and property unit trusts, and holding shares in listed or unlisted real estate companies. In this Chapter, the focus is on the latter of these options, with vehicles being those entities that hold properties and, in turn, allow indirect access to real estate markets for other investors. The range and sophistication of such vehicles has expanded enormously in the last few years and there are now many different types of structure[1]. Of particular interest here, though, are corporate vehicles such as property companies or the proposed UK Property Investment Funds or PIFs.

PIFs are seen as being the UK's equivalent to other quoted, tax-transparent vehicles that exist around the world, such as the Real Estate Investment Trust (REIT) in the United States or the recently created Societes d'Investissements Immobiliers Cotees (SIICs) in France. A consultation document released by the Treasury in March 2004 has outlined a draft framework for the PIF, including proposed rules on activities and income distribution (HM Treasury, 2004). The specific circumstances of the PIF are considered later in the Chapter, but in this section we note the reasons why depreciation needs to be recognised in this and other vehicles and its impact on accounting and assessment of corporate value. This forms an important background to the earnings and distribution issues examined in sections 3 and 4.

2.1 Why depreciation needs to be recognised

Economic depreciation affects the performance and value of real estate in a number of ways. Some of the impacts can be straightforward to tackle, for example, through regular expenditure, but others may necessitate more major action. Therefore, the managers and investors in a real estate vehicle need to recognise depreciation as something that both influences returns and necessitates management attention. The effects on both rental and capital values are important in this consideration as both have distinct, though interrelated, effects on asset and corporate value.

[1] A review of UK private property vehicles (PPVs) can be found in University of Reading and OPC (2001) while characteristics of European PPVs are surveyed in OPC and Deloitte & Touche (2003).

Rental depreciation creates the most basic effect on vehicle performance by reducing income received from properties through time. This can either be through actual falls in property rental values or through slower rental growth compared to benchmarks, which may make a vehicle perform less well than its competitors. Depending on the country and sector, lease structures may be able to protect the investor from rental depreciation to some extent, but eventually property rents will need to be adjusted either at rent reviews or re-letting. The implications of rental depreciation are that unless it is tackled through renewal of the property or portfolio, vehicle earnings growth will be affected, with knock-on impacts on dividends and equity valuation.

Addressing rental depreciation may require expenditure on properties, particularly for the purpose of re-letting. A certain amount of spending may be needed before a building can be re-let at all, while other repairs and improvements can be important in maintaining or improving rental value. Rates of capital expenditure for different segments of the property market were calculated in Chapter 3 as part of exploring the 'full' cost of depreciation. This spending will have an effect on dividends too, as income will be reduced. However, it is worth noting that the consequence for future earnings and dividends of not undertaking expenditure could be greater than the present cost.

Both these effects influence the capital values of vehicle assets, with rent and rental values being an important part of valuations. For the corporate structure, this will then feed through into company net asset value (NAV) and the importance that this has for the pricing of the vehicle by investors is explored in section 2.3. Here it is sufficient to note that declines in capital value should cause the value of a vehicle to fall one way or another, all else being equal. Capital values are also influenced by yield changes reflecting income and prospects for buildings in the future, and this also has implications for current and future NAV.

For instance, obsolescence is an issue that can manifest itself in both current rental values and the yields of properties. Functional obsolescence can make a building of less or no value to occupiers now (so reducing ERV) and cause future cashflows to be more uncertain (causing the yield to rise, as the property is more risky). Remedial action may require major capital expenditure. This and other types of obsolescence such as locational obsolescence, may even eliminate building value altogether. It is difficult for owners to plan for this, as compared to deterioration, obsolescence is often less predictable. The impact on vehicle NAV is potentially large, depending on the size of the holding entity.

So these relatively simple property level effects can have far-reaching implications for the vehicles that own properties and the indirect investors holding the shares or units. The size of the impact will depend on many factors: the size of the vehicle, the nature of the properties it owns, the particular causes of depreciation at any one time and a vehicle's structure and flexibility to deal with such risks. This last point is particularly significant for tax transparent vehicles, where distribution rules may constrain expenditure to combat depreciation, or where restrictions regarding holding periods may prevent declining properties from being traded out of the portfolio. Current and future earnings can be affected, as well as the realisable value of the asset base.

It can be seen that depreciation is a risk for both direct and indirect investors in real estate. Accounting mechanisms may mitigate or exaggerate the impact of depreciation within a corporate structure and these mechanisms are examined next.

2.2 Accounting framework

In accounts, depreciation is a method of reducing the book value of assets through time to reflect the potential distortion of profits caused by the consumption of capital assets which will need to be replaced. However, accounting methods for depreciation will not necessarily match the pattern of economic depreciation in an asset. This is particularly true in the case of properties, which can experience significant periods of appreciation and fluctuate in value according to market forces. Where building value is in decline, the land component and its redevelopment potential can cause values to rise, and it is by no means certain that the residual value of a property will be zero.

In the face of these complications, quite different ways of accounting for properties have arisen. The choice of depreciation treatment is determined by the reasons for which the properties are held – specifically, whether they are investment or operational assets. The difference between these is not always obvious: a retailer that owns rather than rents its stores may feel that its properties are both operational assets and investments. However, accounting standards attempt to provide some sort of distinction. For instance, International Accounting Standard (IAS) 40 defines investment properties in the following way:

> *Investment property is… held… to earn rentals or for capital appreciation or both, rather than for:*
>
> (a) *use in the production or supply of goods or services or for administrative purposes; or*
>
> (b) *sale in the ordinary course of business.*
>
> IAS 40, p12. IASC (2000).

Investment properties are therefore distinguished from operational properties. For the latter, the perspective adopted is one of capital consumption during use of the asset by the business and the depreciation charge reflects this rather than any value change. Investment properties, though, are held for gain rather than consumption and so are accounted for differently. The current and proposed accounting treatment for investment properties is now briefly reviewed.

Current treatment in UK – SSAP 19

In the UK, investment properties are accounted for in accordance with SSAP 19 (ICAEW, 1981)[2]. This requires them to be shown in the balance sheet at their current market value. The reported value is then changed each year to reflect movements in market value over that period. This means any effects of economic depreciation feed through to balance sheet values as they occur and no artificial allowances are imposed. However, the balance sheet only shows absolute changes in value, whereas in Chapter 1, depreciation was defined and recognised as a relative decline. Any relative decline from benchmark value may therefore be hidden and so must be recognised by shareholder assessment and through the equity value of the firm.

Since values reflect market changes and are not automatically lowered each year by an accounting method, no depreciation 'charge' is made in the profit and loss account. This means that there is no mechanical reduction of profits, but it also means that taxable real estate investment vehicles cannot take advantage of the potential tax shield created by the reduction in reported profits that the depreciation

[2] SSAP stands for Statement of Standard Accounting Practice.

allowance makes. So, if vehicle managers wish to retain profits for combating depreciation in the future, these reserves will be taxed.

Under SSAP 19, changes in value are not taken to the profit and loss account unless properties are sold and the gain or loss is realised[3]. However, this treatment does not mean that economic depreciation has no effect on profits. The discussion in section 2.1 above highlighted a variety of very real effects on vehicle income.

Changes on the horizon – IAS 40

The introduction of International Accounting Standards, which come into force for UK listed companies in 2005, could mean changes to this treatment. IAS 40, the relevant standard for investment property, gives real estate companies two options for investment property accounting (IASC, 2000). One of these – the fair value method – is similar to the current framework under SSAP 19, although instead of changes in value being reflected in reserves, the current proposal is that they should be recorded in the profit and loss account. The second option – the cost method – is similar to the approach used for operational property and will allow depreciation charges to be made in the profit and loss account.

The implication of this is that real estate vehicles could choose to have a depreciation allowance after all, which lowers accounting profits, but does not reduce cash flow and so shelters some income from taxation as a result. Some of the eventual impact of depreciation would be absorbed each year and the total impact would be spread out in the accounts through time. However, this treatment is less transparent, allowing neither absolute nor relative value changes to be observed. Hence, IAS 40 requires that, where the cost method is chosen, an estimate of fair value should also be disclosed. A summary of the different accounting treatments is presented in Table 1.

[3] The exception to this is if a loss in value is permanent, which is termed 'impairment'. This does have to be recognised in the profit and loss statement and so here a charge would be made.

Table 1: Accounting treatment of investment property under SSAP 19 and IAS 40

	SSAP 19	IAS 40	
		Fair value option	Cost option
Balance Sheet	Assets are recorded at market value and changes in the market values of properties are recognised. Recorded asset values alter from year to year and these changes are also reflected in a revaluation reserve.	Assets are recorded at fair (market) value and changes in the market values of properties are recognised. Recorded asset values alter from year to year, but these changes are taken to the P&L account and so impact on retained profits in the B/S.	Properties are recorded at their purchase cost and subsequently reduced in value over their estimated life. Depreciation charges taken to P&L.
Profit and Loss account	There is no depreciation charge to the P&L account and so no tax allowance.	There is no depreciation charge to the P&L account and so no tax allowance, but changes in the market values of properties are reflected and so increase or reduce profits as appropriate.	A depreciation charge is made which reduces taxable profits, but does not reduce available income. So some income is protected from tax.

2.3 Investors and analysis

The information above now needs to be considered in the light of its impact on the valuation and analysis of real estate vehicles. Economic depreciation and its impact on earnings and values should influence the pricing of a company by investors, as it affects the risk and returns of the entity. Meanwhile, the way that depreciation is recognised in the finances of the business will shape how investors and advisors set about its analysis.

For a number of real estate vehicles, their shares or units are priced with reference to NAV. For instance, NAV is currently the key measure by which UK listed property companies are judged, as well as a vital measure for the valuation of other vehicles such as unit trusts and limited partnerships. At present, property companies account for their investments under SSAP 19, recording their properties at market value. It is likely that they will choose to continue using market (fair) value under IAS 40 and so their financial statements will continue to reflect changes in capital values as they occur.

For the proposed tax-transparent PIF, though, it could be argued that if they have to distribute a large share of their income, it would be better to protect some income by using a cost treatment and utilising a depreciation allowance to shield cash flow. On the other hand, others might see a retreat from fair value accounting as a backward step. On this point, it is interesting to observe how tax transparent vehicles in other countries approach the issue. In Australia, for example, most Listed Property Trusts (LPTs) are expected to adopt fair value accounting (Psaltis and Fitzgerald, u.d.), but in the United States, REITs account for properties using a cost approach. Here, while REIT NAV is referred to by analysts[4], shares are priced in the same manner as other stocks, by reference to the future expected cashflows of the firm (Geltner and Miller, 2002).

In either case, depreciation will influence the value of a vehicle, whether through NAV, tax savings or the impact on expected earnings. An equally important issue is whether adequate provision has been made or action taken. Provision is of central interest in the next section, which looks at the case of vehicles without full discretion over use of their income.

[4] That is, estimated Net Asset Value assuming market values, not book NAV.

3. Earnings, Distribution and Depreciation

In section 2, it was argued that depreciation has a very important influence on the earnings of real estate vehicles and, hence, the funds available from which they can pay dividends to investors. This was shown to be true whether or not a vehicle was permitted or obliged to use an accounting charge, as depreciation will still influence rental income, values and expenses. Therefore, this section examines further the link between depreciation, earnings and dividends by examining real estate vehicles that do not have complete discretion over the use of earnings, but which are required to meet certain income distribution rules. Such vehicles are common, since distribution rules are a condition in many countries for real estate companies to qualify for tax transparency.

The section particularly concentrates on the experience of the US REIT, as one of the longest standing and most well researched tax transparent vehicles in existence. There is a large number of articles in the academic literature relating to REITs, as well as a growing literature on international indirect investment in general. However, it should be noted that a lot of this literature is focused on performance aspects, such as the diversification benefits of holding REIT shares, such focus being evident from published reviews of the field (e.g. Corgel *et al*, 1995, Worzala and Sirmans, 2003). Structural aspects, such as the depreciation provision, receive less attention despite their influence on returns and investor attractiveness. However, there are some US studies on distribution policy from which insights can be gained and these provide a link into the wider financial literature on dividends and earnings retention.

While comparisons with other jurisdictions can be helpful, it is also noted that such comparisons are not straightforward. The different accounting regime and practices of US REITs makes analysis of their distributions difficult, whilst structural differences between the US and UK property markets prohibit a simple translation of distribution rules from one to the other. Section 4, therefore, analyses data on UK investment properties to explore the income, expenditure and depreciation relationships further.

3.1 The US experience

The US is just one of many countries where the need to make provision in tax transparent vehicles for depreciation is recognised. When Real Estate Investment

Trusts were set up in 1960, a high compulsory income distribution level of 90% was set, later increased to 95%, but this distribution was to be made from net income. This is defined as income after expenses, interest and a depreciation allowance. This is of crucial importance. The use of net rather than gross income as the yardstick recognises two aspects of the depreciation issue in particular.

1) Real estate vehicles need the ability to retain some earnings through which reinvestment and renewal of the stock can be made.
2) In a particular year, a real estate owner can be faced with significant costs to repair and maintain buildings for existing or prospective occupiers.

Forcing managers to distribute from gross income could, in theory, lead to inadequate retention and losses being made in some years causing lumpy and volatile vehicle performance.

More recently, in the REIT Modernisation Act 1999, the compulsory distribution level was reduced back to 90% of net income. This gave REITs more flexibility and scope for tackling depreciation within their portfolios. The change did not appear to have a big impact on REIT values, although Howe and Jain (2004) found positive share price reactions to the Act as a whole. It is suggested that the reason for the limited impact this had is that the minimum payout requirement is not actually an effective constraint on operations.

In fact, as noted by Campbell and Sirmans (2002), the average payout by US REITs is often over 100% of accounting earnings. In other words, not only are dividends being paid in excess of the compulsory level, but some payouts are also above recorded net income, with the extra amount funded from the depreciation allowance. This is confirmed by the work of empirical studies such as Wang *et al* (1993) and Bradley *et al* (1998), with the former reporting an average payout ratio of 1.65 compared to an expected 0.95 if regulation were the only driver[5].

Before exploring why this might be, payout ratios for REITs in 2003 were examined to check whether these earlier findings were period-specific. Data on earnings per share (EPS) and dividends per share (DPS) in 2003 were extracted from DataStream

[5] Where payout ratio is the ratio of dividends to reported net income. Bradley et al (1998) do not have a comparable figure as they work with Funds From Operations (FFO) in their study, but they claim that payouts are twice the level required by the (then) 95% rule.

for as many REITs as possible listed in the NAREIT constituents list[6]. Payout ratios were then calculated for each firm and averaged across all REITs and for various segments of the REIT industry.

Of the 171 REITs listed by NAREIT at the end of December 2003, data on 150 of them was available. Of these, 36 did not record any earnings in 2003, while 5 were excluded as outliers. The average payout ratios for the remainder was 1.64, which means that on average, companies in the sector paid out 164% of their recorded net income, compared with a requirement to only distribute 90%. When only Equity REITs were considered, the average ratio rose to 1.74. This high proportion may be surprising, but the large accounting provisions for depreciation and amortization can create a large difference between reported net income and the net cash flow that a REIT has available.

Therefore, taking these figures at face value ignores a major reporting issue. The reporting of earnings for REITs is complex and the subject of much debate. In the REIT industry, it is recognised that the conventional accounting measure of net income (calculated using GAAP) is not a useful measure of profitability (Yungmann and Taube, 2001). Therefore, a number of other measures have been developed, such as Funds From Operations (FFO), Adjusted Funds From Operations (AFFO) and Funds Available for Distribution (FAD). While these different metrics appear to offer alternative ways of assessing distribution policies, there is a lack of consistency in how they are calculated between firms. In the absence of any uniform measures, it is difficult to assess how much of the actual income from properties is required for REITs to operate and how much can be paid out.

Furthermore, the reasons and motivations behind REIT dividend policies are not straightforward. Wang et al (1993) suggested several reasons for the higher payouts that they observed. One strand of argument was rooted in agency cost theory and stated that shareholders prefer managers to return cash flows rather than keep them within the company. Because of this, when future decisions such as whether to undertake a major refurbishment have to be taken, managers are forced to take their proposals to the capital markets because there are no retained funds. Therefore, greater monitoring of management by investors can take place. Bradley et al (1998),

[6] i.e. the list of Real Estate Investment Trusts that contribute to the NAREIT performance indices. These REITs are all publicly quoted and not private companies. This list is available at www.nareit.com

though, argued that their results supported a second strand of argument at the expense of these agency explanations: that of signalling. This is where managers use dividends to convey information about expected earnings, with higher payouts signalling more confidence in future cash flows. However, signalling only explains relative changes in dividend policy over the statutory limit.

These explanations may still suggest that even if depreciation was a major issue for US REITs, retention and provision within the vehicles is not, as the opportunity to retain untaxed income is not being used. So, in considering whether a UK tax transparent vehicle should have a depreciation allowance, whether by accounting or through a reduced distribution level, it is necessary to consider what differences there might be between the UK and US that may make such an allowance important.

3.2 Differences between UK and US

A key difference between the US and UK is in the nature of the leases granted in each country. The terms and conditions of leases granted by a vehicle will determine whether it or the tenant is responsible for repairs and maintenance. This, in turn, not only influences the pattern of income and expenditure, but potentially also the extent and amount of depreciation in the portfolio (Baum and Turner, 2004). In this section, US and UK leasing practices and their implications for depreciation and returns are therefore reviewed and some conclusions for retention in the UK are made.

For many years, the following lease terms were typical for prime property space in the UK. Leases were agreed for long periods, often 25 years, with five year rent review intervals and upward-only rent reviews as standard. In addition, repairing and insuring costs were passed on to tenants through full repairing and insuring (FRI) clauses. Although in recent years, leases have become shorter and opportunities to break have increased, these repairing and rent review provisions still predominate. In the US, leases are shorter on average[7] and more of the repairing obligations are borne by the landlord.

[7] Devaney *et al* (2004), show average US lease terms in 2002 to be 5.8, 5.0 and 3.6 years for the Retail, Office and Industrial sectors, compared to UK lengths in 2002 of 10, 6.9 and 7.2 years respectively (BPF/IPD, 2003). These are equal- rather than value-weighted averages as no US value-weighted figures were available to the authors.

This means that, in terms of tackling depreciation, there are more opportunities for the US owner to actively manage its buildings and more incentive to do so owing to the need to achieve re-lettings more often. In contrast, UK leases tend towards more passive management of the stock. Responsibility for regular maintenance to combat physical deterioration is passed over to the tenant, especially in single-let buildings, but there is no guarantee that the tenant will perform this in the same way and, often, obligations are discharged through the payment of a dilapidations charge at the end of the lease instead. While, in theory, this compensates the landlord for lost value, the impact of not performing work when necessary may mean more depreciation and cost overall.

More importantly from the perspective of this paper are the implications that this has for income returns on the vehicle. The different lease terms mean differences in the nature of the income received (see Kennedy, Haddock and Sauer, 2004). In the US, there is a wide difference between the gross income received and the net operating income (NOI) from which distributions are made. In the UK, gross income and NOI are very close together. However, the restrictions on tackling depreciation caused by the UK lease structure may mean that this small difference between gross income and NOI is artificial, with income returns being higher than they should be at the expense of capital return in the short term. An alternative angle offered by Baum and Turner (2004) is that under the shorter and more flexible (in this case, US) leases, more reinvestment in the stock is taking place, which suggests better total returns in the long run, though this is very difficult to prove empirically at present.

Therefore, where distribution rules force income to be paid out to shareholders, the income return effect in the UK could cause over-distribution in the short term by a UK tax transparent vehicle at the expense of its long-term capital value. This suggests that the US experience of an often-unused depreciation allowance does not mean that the UK can disregard such an allowance while maintaining a very similar distribution rate. Instead, leasing practices suggest that some provision for depreciation is essential if over-distribution is not to occur, a provision which vehicles can then choose whether to utilise or not.

4. Income and Expenditure in a Portfolio

The preceding sections lead us to some conclusions about the impact of depreciation on real estate vehicles. First, depreciation is a serious issue affecting profits and corporate value. Second, applying the experiences of other jurisdictions on this issue is not straightforward. Third, because of the nature of UK leases, there is a risk of over-distributing income, which could harm dealing with depreciation in the future. These conclusions highlight the practical importance of depreciation for vehicles and their investors, and the risks of not planning adequately for it within the structure of a vehicle such as the proposed PIF.

However, while the analysis so far has pointed away from an over-restrictive regime or approach that would inhibit managing depreciation, it has not yet attempted to answer the following question:

- How much income should vehicles distribute and how much income do they need to retain to undertake expenditure and combat depreciation?

Section 2 stated that accounting methods will not necessarily correspond with actual depreciation in property assets. Meanwhile, section 3 showed that institutional differences between the UK and other real estate markets prevents conventions elsewhere being transported or easily adjusted from outside. Therefore, this section approaches the question of distribution by using empirical evidence of UK property income and expenditure. In effect, we show what would have happened had a vehicle held a particular portfolio of properties and what surplus income it may have been able to pay out over a period of time.

4.1 The approach taken

For all properties within the IPD databank, records are held on the amount of income received by owners, the amount of regular expenditure paid out by owners, including the payment of management fees, and the amounts of any capital expenditure that takes place. Given the discussion in section 3.2, it is important to stress that work undertaken by tenants or reimbursed to investors through dilapidations payments or service charges is not recorded. However, as these are reimbursed, this should not affect the immediate earnings of the owner, though they can influence cash flow in the short term. The long term earnings implications of this are returned to in 4.3 below.

From these records, both the gross and net income for a group of properties can be calculated. The margin between the two can then be examined. This information lies at the heart of the issue raised above. Distribution can only be considered once the needs of the portfolio have been met. However, this is still only part of the picture, as although expenditure may alleviate depreciation it cannot eliminate it entirely. There is a well recorded difference between curable and incurable depreciation (Baum, 1994) and redevelopment or renewal of the stock may be required even if expenditure has been applied to the curable depreciation element.

The amount of net income may overstate the resources available to pay out to investors, but it gives a starting point for understanding how much minimum income is needed to combat depreciation. This is especially important for the PIF where the current suggestion for distribution is framed in terms of gross income. Whether this proposal allows enough income to be retained for expenditure to take place is something that can be tested with this dataset.

The 624 properties used for measuring 19 year deprecation rates in Chapter 3 were again selected as a sample. This held sample provides a long run of income and expenditure data and is spread across different property types and locations. The sample includes buildings of different ages as at the start of the analysis period. It therefore simulates a diversified portfolio held for 19 years. Using this sample has the advantage that not only are the income and expenditure known over that period, but information on the depreciation experienced is also available (It is important to note that the data does have certain limitations and these are discussed with the results in section 4.3 below). As well as producing overall results, testing was also segmented, so that insights into vehicles concentrating on particular property types can also be made.

For each year over the period 1984-2003, the total income for all the properties was computed, as well as two measures of net income. These were

"Net income"	=	Total income – Revenue expenditure
"Net cash flow"	=	Total income – (Revenue + capital expenditure)

Total income is mostly the rent receivable on the sample, although there are small amounts of other property related income and occasional instances of capital receipts, which have also been included. Expenditure is divided between “revenue” and “capital” expenditure. It is classified as revenue expenditure if the spending by the investor is for the regular management of the properties. It is classed as capital expenditure where funds are for the refurbishment or improvement of the property.

IPD also separately record “development” expenditure, where cash flows would be entered if any property had been redeveloped. However, while the measurement sample contains refurbishments, redevelopments were excluded. So the test reflects revenue and capital expenditure to combat curable depreciation, but not the complete replacement of buildings which may be needed to solve incurable factors. Therefore, the results, while indicating an upper bound for distributions, should not be taken as prescribing a distribution, as clearly this redevelopment activity would impact available income further.

4.2 Results of the analysis

The results of the income and expenditure investigation for all properties are shown below in Table 2, while tables for each main sector are shown in Appendix 1. The analysis shows that, for this sample, around 10% of the gross income in each year was used for revenue expenditure and this proportion remains fairly stable through time. In the case of capital expenditure, though, the proportion of income used varies quite significantly through time, accounting for around 5% in some years, but up to 30% in 1989. The average net cash flow, at 80% of gross income, is therefore much less stable with capital expenditure included.

Table 2 – Income and Expenditure for Portfolio of 624 Properties over period 1984-2003 (figures in millions)

Year	Total income	IPD defined revenue expenditure	Net income	as % of gross income	IPD defined capital expenditure	Net cash flow	as % of gross income
1984	91.3	7.5	83.7	92%	12.7	71.1	78%
1985	98.4	7.0	91.5	93%	17.3	74.2	75%
1986	103.4	6.6	96.8	94%	12.2	84.6	82%
1987	117.1	7.0	110.1	94%	13.9	96.3	82%
1988	131.5	7.8	123.7	94%	19.1	104.6	80%
1989	155.1	10.1	145.0	93%	47.4	97.6	63%
1990	181.7	14.1	167.5	92%	12.9	154.7	85%
1991	208.7	18.4	190.2	91%	15.4	174.8	84%
1992	216.6	22.0	194.6	90%	8.2	186.4	86%
1993	226.9	25.7	201.2	89%	7.6	193.6	85%
1994	227.4	23.5	203.9	90%	29.2	174.7	77%
1995	224.4	23.9	200.5	89%	41.0	159.5	71%
1996	232.3	22.3	210.0	90%	36.5	173.5	75%
1997	242.9	21.4	221.4	91%	13.4	208.0	86%
1998	236.0	23.6	212.5	90%	14.1	198.4	84%
1999	243.1	21.2	221.9	91%	28.5	193.4	80%
2000	250.4	19.8	230.6	92%	33.3	197.3	79%
2001	268.7	21.5	247.1	92%	36.6	210.6	78%
2002	280.7	25.9	254.8	91%	25.0	229.8	82%
2003	287.6	25.9	261.7	91%	17.5	244.2	85%

This has implications where there are distribution requirements from gross income. First, the requirement would need to be set so that both kinds of expenditure can occur or, otherwise, depreciation in the portfolio may be much more severe than that in other assets, and greater than the rates found in Chapter 3. Second, a set requirement of, say, 80% would still cause problems in some years and mean that vehicles have to delay expenditure from perhaps its most optimal period to a period where distribution limits will not be compromised. Third, where a vehicle is geared, changes in expenditure would have an even greater impact on net income volatility, placing property management and the distribution policy under further pressure.

In the PIF consultation, a distribution level of 90% of gross income was suggested. At this level, the PIF would have been able to finance the revenue expenditure, but then almost all remaining income would have been paid out, particularly in the later years of the period. This implies that the vehicle would have been able to manage the running costs of the portfolio, but would not have been able to undertake the capital expenditure necessary for reducing or limiting depreciation. This would then have implications for rental and capital values and hence the value of the vehicle itself. In fact, it could also have meant lower gross income as well, if lower rental values were transmitted through to rents at rent reviews.

The analysis includes properties from different segments of the property market. It is conceivable that the income and expenditure patterns in those segments may be very different. Therefore, the analysis was repeated for each of the main property types – Shops, Offices and Industrials. Table 3 displays the average gross-to-net margins for each segment, as well as the minimum and maximum of all the years.

Table 3 - Net Income as a Percentage of Gross Income: All Property and Sector Levels

	All Property	Shops	Offices	Industrials
Sample	624	339	165	120
Average	80%	81%	75%	86%
Minimum reduction	86%	90%	88%	95%
Maximum reduction	63%	67%	42%	66%

The results for the sectors support the findings for all property, although some differences between the types emerge. Offices stand out as needing most income to be spent on the properties, with net income never greater than 90% in any of the years of the period. Despite this higher rate of spending, the results in Chapter 3 showed that Offices experienced the highest rates of (post-expenditure) depreciation. This combination could have created great difficulties for any PIF-style vehicle holding Offices in this period.

4.3 Implications, limitations and conclusions

A distribution policy needs to allow a vehicle the ability and flexibility to undertake capital expenditure so that it can combat depreciation. However, the implications of this analysis are that a set distribution from gross income would cause difficulties, as the proportion of income available from the properties above varied widely from year to year. A net income distribution would allow more flexibility. Before taking these conclusions further, though, some limitations of the analysis need to be stated.

First, IPD do not record all expenditure that takes place on a property, but only that carried out by the landlord. The nature of many UK leases means that tenants have responsibility for at least some repair costs and the payment of these will not be reflected in the data. Nor will the reimbursement of landlords for work done on the tenant's behalf. This may mean that the amounts of expenditures understate the true running costs for the properties. If the landlord was bearing more maintenance responsibility, then it might be expected that rents would also be higher. Yet, in section 3.2, it was pointed out that the practical consequences of this arrangement may be that under-investment takes place in the long run. This would suggest that even more of gross income would be needed.

Second, the analysis only accounts for property-related costs and assumes that there is no gearing. Clearly, vehicles have additional costs and may be using debt finance, again suggesting that more of the gross income is needed before distributions can be made. Also, as noted above, where gearing is present, the volatility of net cash flows will be greater. So the analysis only establishes an ungeared base case, on top of which information about the structure and running of a vehicle needs to be taken into account.

Third, as the analysis refers to a held portfolio of properties, the potential influence of trading assets is not reflected. A vehicle may be able to improve its income and returns, and avoid large costs, by replacing and renewing its portfolio of properties. While this means that the possible benefit of new purchases does not show through in the figures above, this is counterbalanced by the fact that there are no retirements in the data either (buildings that may have had very bad performance, but which were sold out rather than held). It should be noted that proposals for a PIF envisage a long term holding vehicle, with possible restrictions on trading, so these assumptions may not be too problematic.

These limitations mean the exact numbers found should be treated with a degree of caution. They may also be specific to the time period and vintage of properties selected. Nevertheless, the analysis does suggest that an obligation to distribute 90% of gross income would seriously inhibit capital expenditure, which, in turn, could jeopardise the long-term value of the PIF vehicle and the quality and efficiency for occupiers of the assets retained within it. Many vehicles, particularly those focused on the office market, could be forced to frequently raise capital from investors to fund necessary refurbishment expenditure, which can dilute existing investors and distort returns.

5. Conclusions and lessons for the UK PIF structure

The theme running throughout this Chapter is that depreciation is an important issue for real estate vehicles and their investors. The influence on income and the value of the corporate asset base means that it is not simply the returns of direct investors in property that are affected by its impacts. A vehicle needs the ability and flexibility to combat depreciation where appropriate. This means having the freedom to act to undertake necessary works and the ability to use income flows to do so. A requirement to distribute a certain proportion of gross income could compromise this, particularly as the analysis in section 4 shows that the amount of income demanded by total expenditure fluctuates a lot from year to year.

The issue of income distribution is one of the key questions in the PIF consultation paper. In return for tax-transparent status, a high distribution requirement of 90% of gross income has been suggested, with no depreciation allowance in accounts, alongside a range of other restrictions on vehicle activity. While the US experience shows that REITs often do not use their provision for depreciation, institutional differences between the UK and US real estate markets make direct translation of this experience problematic. In particular, the nature of UK lease structures means a much greater risk of over-distribution of income in the short term, as reinvestment in the stock takes place much less frequently.

The analysis on the sample of properties in section 4 indicates that a very high gross distribution could stop reinvestment in the stock altogether, with all available funds being used to meet running costs. A high distribution from net income would allow a PIF to reinvest in the properties when required and also enable most income to be paid out in the years where spending is low. The PIF vehicle could then protect its asset and corporate value, as well as the quality and efficiency of the built stock, thus ensuring more chance of long term success.

Depreciation and vehicles: Summary

- *Depreciation not only affects asset values, but also the value of any holding entity, not least because of its potential impact on income and future profitability.*
- *This means that it is an issue for both direct and indirect investors in real estate, as it influences the performance of properties and funds.*
- *Changing rental values, expenditure and obsolescence all feed through into income and asset values and hence impact on a vehicle's balance sheet and profit and loss account.*
- *Accounting methods for depreciation may mitigate these impacts, but are generally unrelated to the pattern of actual depreciation in properties and should not affect fundamental assessments of value.*
- *The setting of an income distribution policy must take account of depreciation whether or not any formal allowance is granted.*
- *In the US, REITs often pay out much of their formal allowance, but the nature of the REIT industry and different structure of the US real estate market makes direct comparison difficult.*
- *The different nature of UK leases may mean that there is a risk of over-distribution of income, as they currently allow less scope for reinvestment in the property stock than their US counterparts.*
- *An examination of properties in the IPD UK databank showed that expenditure accounted for 20% of gross income on average. However, this varied widely over the period studied and is before vehicle related costs and gearing are taken into account.*
- *In the case of the PIF (with 90% distribution from gross suggested), this implies that not all expenditure could be undertaken, with implications for depreciation and the long-term value of the vehicle.*
- *A distribution from net income would allow much greater flexibility and the ability for depreciation to be dealt with.*

Appendix 1: Portfolio expenditure results by sector

Shop portfolio

Year	Total income	IPD defined revenue expenditure	Net income		IPD defined capital expenditure	Net cash flow	
1984	29.2	1.5	27.7	95%	3.4	24.4	83%
1985	27.6	2.0	25.6	93%	4.0	21.6	78%
1986	28.0	1.7	26.4	94%	6.1	20.3	72%
1987	33.4	1.9	31.5	94%	4.5	27.0	81%
1988	36.7	2.2	34.5	94%	9.2	25.3	69%
1989	46.1	3.7	42.4	92%	9.7	32.7	71%
1990	55.2	4.0	51.2	93%	3.4	47.8	87%
1991	62.0	4.3	57.8	93%	6.8	51.0	82%
1992	66.6	5.9	60.7	91%	4.6	56.1	84%
1993	68.3	6.2	62.0	91%	0.3	61.7	90%
1994	69.4	8.1	61.3	88%	3.6	57.7	83%
1995	70.5	8.8	61.7	88%	0.6	61.1	87%
1996	71.5	7.2	64.3	90%	1.8	62.5	87%
1997	72.4	6.3	66.0	91%	5.6	60.5	84%
1998	76.5	6.6	69.9	91%	9.1	60.8	79%
1999	79.4	6.3	73.1	92%	6.7	66.3	84%
2000	83.4	6.4	77.0	92%	21.3	55.7	67%
2001	88.5	7.5	81.0	92%	7.3	73.7	83%
2002	92.1	7.8	84.3	92%	10.4	73.8	80%
2003	94.7	7.6	87.1	92%	5.1	82.0	87%

Office portfolio

Year	Total income	IPD defined revenue expenditure	Net income		IPD defined capital expenditure	Net cash flow	
1984	39.0	4.2	34.8	89%	7.8	27.0	69%
1985	44.2	3.5	40.7	92%	12.1	28.6	65%
1986	46.9	3.6	43.3	92%	5.9	37.4	80%
1987	53.7	4.0	49.6	93%	8.5	41.2	77%
1988	62.0	4.1	57.9	93%	7.5	50.4	81%
1989	72.5	4.8	67.7	93%	36.9	30.8	42%
1990	85.0	8.2	76.8	90%	9.3	67.4	79%
1991	99.2	11.5	87.7	88%	7.4	80.2	81%
1992	100.3	11.7	88.7	88%	3.6	85.1	85%
1993	106.1	16.5	89.7	84%	6.0	83.6	79%
1994	104.7	12.3	92.4	88%	10.3	82.1	78%
1995	99.4	11.8	87.6	88%	39.4	48.3	49%
1996	104.5	10.6	94.0	90%	33.8	60.1	58%
1997	107.3	12.4	94.9	88%	3.2	91.7	85%
1998	103.7	13.4	90.3	87%	2.3	88.0	85%
1999	108.0	10.8	97.3	90%	11.1	86.1	80%
2000	109.9	10.0	99.9	91%	8.8	91.1	83%
2001	119.1	10.2	108.9	91%	12.2	96.7	81%
2002	123.1	13.1	110.0	89%	6.4	103.5	84%
2003	129.7	13.2	116.5	90%	2.9	113.6	88%

Appendix 1: Portfolio expenditure results by sector

Industrial portfolio

Year	Total income	IPD defined revenue expenditure	Net income		IPD defined capital expenditure	Net cash flow	
1984	23.0	1.9	21.2	92%	1.5	19.7	86%
1985	26.6	1.5	25.1	94%	1.2	24.0	90%
1986	28.5	1.3	27.2	95%	0.2	27.0	95%
1987	30.0	1.1	29.0	96%	0.9	28.1	94%
1988	32.8	1.5	31.3	95%	2.4	28.9	88%
1989	36.5	1.6	34.9	96%	0.8	34.1	93%
1990	41.5	1.9	39.6	96%	0.2	39.4	95%
1991	47.5	2.7	44.8	94%	1.2	43.5	92%
1992	49.7	4.4	45.3	91%	0.0	45.2	91%
1993	52.5	3.0	49.5	94%	1.3	48.2	92%
1994	53.3	3.1	50.2	94%	15.3	34.9	66%
1995	54.5	3.4	51.2	94%	1.1	50.1	92%
1996	56.3	4.5	51.8	92%	0.9	50.9	90%
1997	63.2	2.7	60.5	96%	4.6	55.8	88%
1998	55.8	3.6	52.3	94%	2.7	49.6	89%
1999	55.7	4.1	51.6	93%	10.7	40.9	73%
2000	57.1	3.4	53.7	94%	3.2	50.5	88%
2001	61.1	3.8	57.2	94%	17.0	40.2	66%
2002	65.5	5.0	60.5	92%	8.1	52.4	80%
2003	63.2	5.1	58.2	92%	9.6	48.6	77%

Chapter Five: Depreciation - Findings and Implications

Neil Crosby and Steven Devaney

Contents

DEPRECIATION IN COMMERCIAL PROPERTY MARKETS
CHAPTER 5: DEPRECIATION - FINDINGS AND IMPLICATIONS

1. Introduction

Real estate as an asset is affected by depreciation. Values will decline through time and individual assets will require expenditure and management. Estimates of depreciation form inputs into decision-making models both at the individual asset level (as part of detailed appraisals) and for forecasting the performance of a property or group of properties. It is, therefore, a topic that is intricately related to the performance and pricing of real estate investments.

This project has sought to improve understanding of how depreciation should be measured and to measure rates of depreciation for all the major segments of the UK property market. Specifically, the main aims of the project have been as follows:

- To provide an appropriate methodological framework for the measurement of depreciation.
- To clarify how depreciation affects market indices and benchmarks, and outline the model benchmark to use in the measurement process.
- To measure rates of depreciation for different segments of the UK commercial property market, examining rental and capital values, and capital expenditure.
- To examine wider issues for the property industry arising from this topic – in particular, the importance of considering depreciation in the development of a UK REIT-style vehicle.

Each of these aims has been addressed in Chapters 1 to 4 respectively. This Chapter summarises the findings of the others before discussing two further important questions. First, how should the rates and other information from this research be used in practice? Second, what further areas need to be explored in future depreciation research?

2. Summary of Results and Findings

2.1 The Measurement of Depreciation

The first Chapter in this report provides an appropriate methodological framework for the measurement of depreciation, based on work by Law (2004). There have been several previous studies of depreciation in the UK commercial property market, but these all vary in their measurement approach. Law showed that these differences contribute as much to the different findings as the datasets or era under examination. This means that results from these studies are not comparable – a variation in a depreciation rate found for offices, for instance, could be as much due to the calculation as to the time period or sub-market being analysed.

The various choices and steps involved in measuring depreciation were critically evaluated and the 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 to the 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.
- 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, relative by use of a multiplicative function, decline measurement, consistent with value weighting. The formula for measurement that is consistent with these characteristics is;

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

R^s = sample rental value, R^b = benchmark rental value

This formula can also be applied to capital values. However, the resultant rate would not solely represent capital value depreciation. Changes in the capital value of an asset are driven by factors such as lease characteristics and risk, in addition to depreciation. Therefore, the application of the above formula to capital values results in a rate termed 'capital shift' and not 'depreciation'.

2.2 Benchmarks and Depreciation

Depreciation was defined in the first Chapter as a relative concept. It should therefore be measured *relative* to an appropriate benchmark. However, there are a number of different benchmarks available and different types of benchmark have been used by studies in the past. This Chapter, again based on work by Law (2004), explores which are appropriate by first setting out what the model benchmark would be. In practice, the model benchmark is not available, so the characteristics of available series were then assessed against the model to see which were most suitable for this purpose. The key findings 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 to match the location of the property 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.
- Market benchmarks of rental or capital values are measured using held samples of properties. They therefore include depreciation as they comprise a sample that ages over the measuring period, regardless of the shortness of that period.
- Prime indices constructed on a hypothetical rather than 'top rent' basis do not include depreciation. 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 the sample is comprised of non-prime properties may overstate depreciation.
- Of the available series, the CBRE *Rent and Yield Monitor* (CBRERYM) was identified as the most appropriate benchmark in the absence of the model benchmark. Data on individual locations that comprise the published series was kindly provided by CBRE for this research.
- For measuring capital shift, the use of a prime benchmark may require synthetic series to be constructed from rent and yield data.

2.3 Rates of rental depreciation, capital shift and capital expenditure

With a methodological framework in place, the aim of the third Chapter was to measure rates of rental depreciation, capital shift and capital expenditure for all main segments of the UK commercial real estate market. Such information is important as it relates to the performance and pricing of properties and its application is considered further in this summary Chapter. All rates could be measured over a 10 year period, but for a longer, 19 year period, only the rental and expenditure rates could be calculated. The Chapter begins by discussing a number of important issues surrounding the application of the methodology to IPD data. The key points arising here were as follows:

- A longitudinal approach required data on properties held throughout the periods by a single investor.
- Properties then had to matched to an appropriate CBRE location in order for their rental and capital values to be benchmarked.

- The resulting samples were 1,870 properties for the 10 year period and 659 properties for the 19 year period.
- These differ in structure from the IPD Universe and show a small bias towards out performance, which must be borne in mind when using the results.

The rental results at a sector level are shown in Table 1, below.

Table 1: Rental Depreciation Rates over the periods 1984-2003 and 1993-2003 (% per year)

1	2	3
	Rate of Rental Depreciation: 19 Year Sample 84-93 [1]	**Rate of Rental Depreciation: 10 Year Sample 93-03** [1]
Standard Shop	0.1%	0.3%
Office	1.0%	0.8%
Industrial	0.6%	0.5%
All Property [2]	1.0%	0.7%

1. Please note that the figures for depreciation are time specific and that results should not automatically be applied to projections into the future.
2. The figures at the all property level need to be treated with care because the sample's segment composition is quite different from that of the IPD Universe.

- Rental depreciation rates at the three sector level displayed an expected pattern of offices having the most depreciation and standard shops the least.
- Segment rates were fairly consistent with this pattern, the only puzzling figures being those for City Offices, which showed lower rental depreciation, but greater decline in capital values than the other office segments over 1993-2003.
- Retail Warehouses showed high levels of rental depreciation compared to other segments (1.2%). This was not surprising once the generation of assets in the sample was considered. The results provide a cautionary tale for early investors into a newly emerging market.
- An exploration of possible time and age effects showed rental depreciation to be lower in the 1990s than the 1980s, though such analysis is complex and requires further research into how these factors can be accurately separated.

To properly understand the rates of rental depreciation and capital shift, two further things need to be considered. First, these two numbers are not additive in any way, because capital shift will include rental depreciation within it. Second, these rates are calculated from a sample where capital expenditure also took place during the period. This means that they do not reflect the full cost of depreciation, but instead show 'managed depreciation', as the expenditure may have arrested or slowed depreciation in values, but is itself a cost of having held the properties through time.

Therefore, average rates of capital expenditure must also be calculated alongside the other information for a more complete picture of depreciation through time. Table 2 shows the average rates at a three sector level in the two samples used.

Table 2: Capital Expenditure Rates over the periods 1984-2003 and 1993-2003 (% per year)

1	2	3
	Rate of Capital Expenditure: 19 Year Sample 84-93 [1]	**Rate of Capital Expenditure: 10 Year Sample 93-03** [1]
Standard Shop	0.6%	0.5%
Office	1.0%	0.9%
Industrial	0.8%	0.4%
All Property [2]	0.8%	0.7%

1. Please note that the figures for expenditure are time specific and that results should not automatically be applied to projections into the future.
2. The figures at the all property level need to be treated with care because the sample's segment composition is quite different from that of the IPD Universe.

2.4 Depreciation and Property Investment Vehicles

Previous research into depreciation has concentrated on the effects on direct real estate investment. However, it is also an issue for indirect investors that hold shares or units in real estate vehicles. This is because depreciation can affect both the value of the holding entity and the income that is available for distribution. Exactly how it affects these depends not only on the assets themselves, but also the way that a vehicle accounts, manages and provides for depreciation within its structure.

- Depreciation and expenditure affect both the current and future earnings levels of a vehicle, which in turn impact on dividends and company valuation.
- The key issue for vehicles is having flexibility to retain income and take action to tackle depreciation where necessary.

After reviewing accounting and structural issues, the Chapter focuses in particular on income distribution. Making sure that depreciation is properly provided for is of critical importance in vehicles whose actions and use of funds are constrained. This is typically the case for tax-transparent vehicles such as the US REIT or the proposed PIF in the UK, for which a distribution level of 90% of gross income had been suggested (HM Treasury, 2004).

- The setting of an income distribution policy must take account of depreciation whether or not any formal allowance is granted.
- In the US, REITs often pay out much of their formal allowance, but the nature of the REIT industry and different structure of the US real estate market makes direct comparison difficult.
- US leases allow more ongoing reinvestment in the property stock, with such expenditure being allowable before distributions are set. While this may mean lower income returns in the short-run, over time depreciation *may* be less.
- UK lease structures, on the other hand, may lead to over-distribution of income in earlier years if provision for depreciation cannot be made.
- To explore the UK situation further, income and expenditure data for properties in the 19 year sample was examined. Expenditure accounted for 20% of gross income on average, but this varied widely over the period studied and is before vehicle related costs and gearing are taken into account.
- The results overstate the income that could be paid out because expenditure cannot prevent all types of depreciation and major redevelopment activity is not reflected in the sample.
- Even as a base case, though, it implies that in the case of the PIF proposals, not all expenditure could be undertaken, with implications for depreciation and the long-term value of the vehicle.
- A distribution from net income would allow much greater flexibility and the ability for depreciation to be dealt with.

3. The Use of Depreciation Rates

The results of this research are important for a number of reasons. Property has to compete with other assets in the multi asset portfolio and the case for property must take account of both financial and asset based issues. 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. 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 initial income yield plus cash flow growth. Models which ignore the impact of depreciation on cash flow growth will overstating the potential returns. Analysis of the past rates of depreciation do not provide evidence of future rates but, as with all performance measurement indicators, form a basis for assessment of future rates. Knowledge of the actual impact on returns of depreciation therefore informs the asset allocation decision.

Pricing models are also based on projected target rates of return, projected growth rates and income yield. Projected growth rates are in turn usually based on analysis of past rates related to the economic drivers for the sub market segment being assessed. 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 not subject to depreciation and therefore all appraisal models need to reconcile the growth in the location with the growth in the actual building. Redevelopment occurs when the increasing gap between rents based on actual buildings in the location and the hypothetical new building 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 reduces cash flow and requires treatment within cash flow models. Increased knowledge of these items reduces the uncertainty surrounding cash flow estimates at both portfolio and individual level, contributing to managing that risk.

The application of the two rates of growth is dependent upon the source of the data. Forecasts of rental value which are based on actual rents through time would require the forecast to be increased by the depreciation rate to obtain location growth. Forecasts based on prime hypothetical indices need adjusting downwards by the depreciation rate to identify actual growth in the property being assessed. Some proprietary cash flow programs appear to have single growth rates and cannot be used to rationally model the impact of refurbishment, redevelopment and other capital expenditure on acquisition, sale, and lease management.

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.

4. Areas for further research

So far the project has focused on identifying the correct methods and benchmarks and producing results for the major UK market segments. In addition, the same framework and samples could be used to investigate a number of other issues.

First, the calculation of depreciation has been undertaken by assessing the average annual rates from the start and end points of the longitudinal analysis. The approach has therefore only identified long-term average depreciation rates. Depreciation is unlikely to be a constant rate over the life-time of an asset, though, and therefore a major research question is the shape of depreciation. Do properties depreciate most in the first few years post-completion or does depreciation accelerate as the building gets older? Other related questions are the age that a property filters out of the prime into the secondary category and the age at which depreciation ceases to be an issue.

The approach adopted in this study was longitudinal which does indicate the behaviour of depreciation through time. An alternative approach is cross sectional which would measure the effect of age on depreciation. The longitudinal approach was preferred conceptually to measure depreciation through time and it was more easily managed within the resources of this project. However, the longitudinal approach can create difficulties of sample size when intermediate annual results are required. For example, for both 10 and 19 year samples, benchmark and rent observations were not available for every year of the period being studied. But, in order to investigate pattern, a full set of annual or periodic results are required. Cross sectional analysis could therefore be usefully undertaken to help identify patterns of depreciation.

A second set of analyses involves segmentation of the results in various ways other than by main property sector and by IPD's (PAS) Portfolio Analysis Segments. Other analyses may be based on issues such as building size; for example, larger properties may be less susceptible because they offer greater flexibility, being capable of accommodating both large and small occupiers. But major companies who occupy large prestigious buildings may be more concerned by changes in aesthetic taste than smaller companies who aren't out to impress. Other segmentation could be by lease structure; for instance, are shorter leases more likely to be associated with lower depreciation in rent but higher capital expenditure than long leases? Are lease renewals more likely in buildings with low depreciation rates?

A third set of questions lie within the cyclical nature of depreciation. How does the rate of depreciation vary with the property cycle? Does it accelerate during booms as the design of new developments responds more quickly to changing occupier requirements and prime rents soar? Or does the rate of depreciation fall as demand spills over from prime buildings into those of lower quality? The 19-year sample could be used to compile depreciation rates for the different phases of the rental cycle.

A fourth group of questions relates to international comparisons. Having established a method of research, can comparisons be made by adopting similar approaches with other countries? Even in countries where individual data is available, though, appropriate benchmarks may not exist.

A fifth set of issues for further research are the causes of depreciation. Building obsolescence (both functional and physical) has been identified as a major cause of depreciation in value, but this research has also identified relative site quality change to the benchmark as being an issue for the rates found in this research. In addition to locational issues, the research has not identified the impact of the physical causes of depreciation and this remains a significant area for future analysis.

Finally, within the UK studies, the impact of depreciation on capital value shift has proved difficult to identify and capital expenditure has rarely been addressed. This project has produced some preliminary figures, but the analysis has not been developed beyond this initial stage. Capital value change is based on yield change and these rates are subject to many influences that are not depreciation related. They also only represent future expectations of both rental value change and redevelopment or refurbishment options and so it could be argued that they are captured more accurately in rental depreciation and capital expenditure. Therefore, the results for capital value change should be treated with the utmost caution and require much further analysis.

Capital expenditure ranges from small regular irrecoverable items, which may reduce rental depreciation, to major refurbishments and redevelopments which change the nature of the physical asset and can eliminate physical obsolescence entirely by replacing with a new building. Given the definition used for depreciation in this research, this should return the property to the benchmark. The research has only scratched the surface of this issue by estimating average amounts based on capital values. Properties subject to major refurbishment or redevelopment were excluded and so the whole spectrum of the effect of capital expenditure has not yet been examined.

The research agenda into depreciation of investment properties is therefore extensive, but the research team would isolate the pattern of depreciation as being one of the more important and challenging issues.

5. Conclusions

This research project has aimed to extend the understanding of investment property depreciation in a number of areas. It has focused particularly on how depreciation should be measured rather than causes (of which obsolescence is one) or the pattern of depreciation (owing to different causes or market states). The definition of depreciation that formed the basis for this investigation was 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).

In practice, though, this definition had to be relaxed given the constraints of data and benchmarks available – described in Chapters Two and Three

The opening chapter discussed the different methods of calculating depreciation, which can have a major effect on the rates obtained – as important as differences in the time period and dataset selected. Only by understanding the differences in approach can the various options be evaluated and a best practice approach recommended. Chapter Two then set out the attributes of a model benchmark for the measurement process, against which available benchmarks can be critically assessed.

In Chapter Three, these principles were then applied to property data in the IPD databanks, using a prime benchmark supplied by CBRE. This led to the production of rates of rental depreciation, capital shift and capital expenditure for ten major segments of the UK commercial property market, including previously unexamined segments of shopping centres and retail warehouses. The discussion of depreciation was then extended in Chapter Four to its impacts on indirect investors in property, through analysis of the effects on real estate vehicles.

In exploring these areas, several other issues have been highlighted that have received little attention in the past. One of these is the centrality of capital expenditure to a proper understanding of depreciation, since measured rates of depreciation will always be post-expenditure and so not reflecting the full costs of holding a property through time. A second is whether there is a distinct concept of capital ‘depreciation’ beyond those of rental depreciation and the expenditure to protect or create new income streams for the future. It is important that these two issues in particular are explored in future research as part of wider examinations of cause, pattern, cycle and sub-markets.

In future, there will also be a need to update the depreciation information. Yet, although the rates here cover the period up to 2003, it should be remembered that no matter how recent they currently are, they should not be directly entered into appraisals, forecasts or other models without consideration for the individual circumstances of the asset and what depreciation it is likely to experience in the future. This can most clearly be seen through reference to the results for retail warehouses, where the rates in this report related to a particular generation of these assets. Just as past performance will not necessarily be a guide to future performance, nor can past depreciation show what future depreciation will be.

References

HM Treasury. (2004). *Promoting more flexible investment in property: a consultation.* March 2004. London: HM Treasury.

Law, V. (2004). *The Definition and Measurement of Rental Depreciation in Investment Property*. Unpublished PhD dissertation. University of Reading.

References

Barras, R., and Clark, P. (1996). Obsolescence and Performance in the Central London Office Market. *Journal of Property Valuation and Investment*. 14 (4), 63-78.

Baum, A. (1991). *Property Investment Depreciation and Obsolescence*. London: Routledge.

Baum, A. (1994). Quality and Property Performance. *Journal of Property Valuation and Investment*. 12 (1), 31-46.

Baum, A. (1997). *Trophy or Tombstone? A Decade of Depreciation in the Central London Office Market*. London: Lambert Smith Hampton and HRES.

Baum, A., and MacGregor, B. D. (1992). The Initial Yield Revealed: Explicit Valuations and the Future of Property Investment. *Journal of Property Valuation and Investment*. 10, 709-726.

Baum, A., and Turner, N. (2004). Retention Rates, Reinvestment and Depreciation in European Office Markets. *Journal of Property Investment and Finance*. 22 (3), 214-235.

Blandon, P. R., and Ward, C.W.R. (1978). Expectations in the Property Market. *The Investment Analyst*. 52, 24-30.

BPF / IPD. (2003). *BPF IPD Annual Lease Review*. London: British Property Federation.

Bradley, M., Capozza, D. R., and Seguin, P. J. (1998). Dividend Policy and Cash-flow Uncertainty. *Real Estate Economics*. 26 (4), 555-580.

CALUS. (1986). *Depreciation of Commercial Property*. Reading: College of Estate Management.

Campbell, R., and Sirmans, C. (2002). Policy implications of structural options in the development of Real Estate Investment Trusts in Europe: lessons from the American experience. *Journal of Property Investment and Finance*. 20 (4), 388-405.

CEM. (1999). *The Dynamics and Measurement of Commercial Property Depreciation in the UK*. Reading: College of Estate Management.

Corgel, J. B., McIntosh, W., and Ott, S. H. (1995). Real Estate Investment Trusts: A Review of the Financial Economics Literature. *Journal of Real Estate Literature*. 3 (1), 13-43.

Crosby, N., and Murdoch, S. (1994). Capital Value Implications of Rent Free Periods. *Journal of Property Valuation and Investment.* 12 (2), p51-60.

Crosby, N., and Murdoch, S. (2000). The Influence of Procedure on Rent Determination in the Commercial property market of England and Wales. *Journal of Property Valuation and Investment.* 18 (4), p420-44.

Crosby, N., and Murdoch, S. (2001). Basis of Rental Value for Performance Measurement Systems. *Journal of Property Research.* 18 (2), 123-139.

DETR. (2000). *Monitoring the Code of Practice for Commercial Leases*. London: HMSO.

Devaney, S. P., Lee, S. L., and Young, M. S. (2004). *Serial Persistence in Individual Real Estate Returns in the UK*. Paper presented at the 20th Annual Meeting of the American Real Estate Society, Captiva Island, Florida. April 2004.

Geltner, D., and Miller, N. (2002). *Commercial Real Estate Analysis and Investments*. Cincinnati: South-Western College Publishing Co.

HM Treasury. (2004). *Promoting more flexible investment in property: a consulation*. March 2004. London: HM Treasury.

Hoesli, M., and MacGregor, B. D. (2000). *Property Investment Principles and Practice of Portfolio Management*. London: Longman.

Howe, J. S., and Jain, R. (2004). The REIT Modernisation act of 1999. *Journal of Real Estate Finance and Economics*. 28 (4), 369-388.

IASC. (2000). *International Accounting Standard IAS 40: Investment Property*. London: International Accounting Standards Committee. April 2000.

ICAEW. (1981). *Statement of Standard Accounting Practice No 19: Accounting for Investment Properties*. London: Institute of Chartered Accountants in England and Wales.

JLW. (1987). *Obsolescence: The Financial Impact of Property Performance*. London: Jones Lang Wootton.

Kennedy, P., Haddock, M., and Sauer, A. (2004). *European capitalisation rates – towards a consistent approach*. Paper presented at the PREA conference, Los Angeles, October 2004.

Law, V. (2004). *The Definition and Measurement of Rental Depreciation in Investment Property*. Unpublished PhD dissertation. University of Reading.

Morrell, G. D. (1991). Property Performance Analysis and Performance Indices: A Review. *Journal of Property Research.* 8, 29-57.

OPC and Deloitte & Touche. (2003). *European Private Property Vehicles: Taking Stock*. March 2003. Reading: Oxford Property Consultants.

Psaltis, E. and R. Fitzgerald. (Undated). *Reporting issues for Property Trusts*. Melbourne: Property Investment Research. http://www.pir.com.au/papers [accessed 21.4.2004].

RICS. (2003). *RICS Appraisal and Valuation Manual (Red Book).* London: Royal Institution of Chartered Surveyors.

Turner, N. (2001). *Property is not Microsoft*. IPD/GPR European Strategies Conference. Wiesbaden.

University of Reading and OPC. (2001). *Liquidity and private property vehicles: where next?* A Report for Invesco Real Estate Advisers, Grosvenor and the Investment Property Forum Educational Trust. October 2001. University of Reading.

Wang, K., Erickson, J., and Gau, G. W. (1993). Dividend Policies and Dividend Announcement Effects. *Journal of the American Real Estate and Urban Economics Association*. 21 (2), 185-201.

Worzala, E., and Sirmans, C. F. (2003). Investing in International Real Estate Stocks: A Review of the Literature. *Urban Studies*. 40 (5-6), 1115-1149.

Yungmann, G., and Taube, D. (2001). FFO – Earnings or Cash Flow? *Real Estate Portfolio*. NAREIT. May/June 2001.