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Systematic property risk:
Quantifying UK property betas 1983-2005

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Abstract

The increased frequency in reporting UK property performance figures, coupled with the acceptance of the IPD database as the market standard, has enabled property to be analysed on a comparable level with other more frequently traded assets. The most widely utilised theory for pricing financial assets, the Capital Asset Pricing Model (CAPM), gives market (systematic) risk, beta, centre stage. This paper seeks to measure the level of systematic risk (beta) across various property types, market conditions and investment holding periods. This paper extends the authors' previous work on investment holding periods and how excess returns (alpha) relate to those holding periods. We draw on the uniquely constructed *IPD/Gerald Eve transactions database*, containing over 20,000 properties over the period 1983-2005.

This research allows us to confirm our initial findings that properties held over longer periods perform in line with overall market performance. One implication of this is that over the long-term performance may be no different from an index tracking approach.

1. Introduction

The relationship between market performance and holding periods lends itself to strategic and tactical asset allocation decision making. Market returns are a major focus of most forecasting models and so understanding how the market conditions asset performance will assist in improving stock selection and picking winners.

In order to reach robust conclusions about individual property performance over a range of holding periods, the analysis requires a large number of transactions. In the UK this has become less of an issue as the Investment Property Databank (IPD) now have a considerable back history of performance statistics based on the holdings of institutions and an ever increasing number of property companies. With the unique *transactions* database of properties purchased between 1983 and 2005, these performance issues can be addressed in detail. The analysis in this paper is based on actual transactions prices, that is, purchase and sales prices, net of costs.

At last year's ERES conference (12th ERES conference in Dublin, June 2005), the authors reported some initial findings on investment holding periods for UK office properties. This was followed by a presentation at the IPF/IPD Conference at Brighton in November 2005, which extended the analysis to cover retail and industrial properties. To summarise some of the findings:

- properties in the sample were held, on average, for around five years
- the range of investment returns was far greater for properties traded in the first few years after purchase
- investment performance was more closely aligned to the market over longer holding periods
- excess holding period returns (alphas) were approximately evenly distributed with an investor having as much chance of selecting a property which under-performed as of picking a winner

Knowledge of holding periods and their related characteristics is important when constructing investment portfolios. How long an investor intends to hold an asset has a direct relationship with an investor's objectives. Different investors will have contrasting investment horizons and this will impact directly on their risk/return objectives. Portfolios based on Markowitz efficient allocations require knowledge of assets' variance and co-variances structures, measures of which should be consistent with investment horizons. An understanding of what constitutes an appropriate holding period will define the length of period over which the variance and co-variances measures are required.

In this paper, these themes are explored further, looking at the range of investment performance of individual assets across the five major property types – shops, shopping centres, retail warehouses, offices and industrial. Performance is scaled to the relevant holding period to ensure all numbers are comparable.

The corresponding (matching holding period) performance of the five property type benchmarks is discussed. The link between asset and benchmark performance and relationship between the two is examined in greater depth. Betas have been calculated for all assets relative to the property type benchmarks over the relevant holding period. This quantifies the level of systematic risk for an individual asset and gives an indication as to whether beta is useful in accounting for property performance. The relationship between holding periods, beta and investment performance is assessed. Some initial results quantifying the relationship between holding periods and investment performance are then presented. The paper concludes by outlining the direction of on-going research.

2. Literature review

Previously reported results of property investment performance in the UK, typically in portfolio application studies, work at highly aggregated levels for example, at sector (use-type) or spatially aggregated levels such as region or town/city level. In this study findings are reported at the *individual* property level. Two previous studies of particular note at the individual property level are those undertaken by Collett, Lizieri and Ward (2003) for the UK and by Fisher and Young (2000) for the US.

An analysis of performance based on actual transactions prices is likely to provide a more accurate assessment of property performance, in both absolute and in relative terms against other asset classes. Published property performance figures, which are largely reliant on valuations, will be subject to a so-called ‘smoothing bias’ that may lead to unreliable estimates of return and volatility. There is an extensive literature looking into the consequences of smoothing, for example, Geltner (1991), Geltner (1993), Brown & Matysiak (1998), Brown & Matysiak (2000), Geltner et al (2003) and Booth & Marcato (2003). It is also well understood that the use of valuation measures understates the volatility of property and can lead to erroneous inferences of risk-adjusted performance measures, showing property to have high risk-adjusted returns. Using transactions prices avoids these problems.

The length of an ‘appropriate’ holding period is an important consideration when evaluating property investment. It may be that the liability profile defines the holding period. Furthermore, the holding period provides a reference point for a suitable benchmark with a given maturity date. For real estate, the holding period is typically believed to be longer than that for other asset categories due to illiquidity, transaction costs and ‘the institutional characteristics of real estate as an investment asset’ (Collett et al, 2003).

In the literature, there is little in the way of formal evidence regarding holding periods. In a US study, Farragher and Kleiman (1996) analyse survey data and report that investment holding periods vary widely. Nineteen per cent of insurance companies, REIT, and pension fund respondents indicated they use a holding period of five years or less and 8% reported using seven years. As for longer-term holding periods, 70% reported using a 10-year holding period and 3% a 15 year holding period. The average period reported by Collet et al (2003) in the UK was eight years.

Fisher and Young (2000) report results on an analysis of US property data. They employ the National Council of Real Estate Investment Fiduciaries (NCREIF) database over the period 1980-1998, which consisted of some 2,200 sales. Results are reported for absolute return profiles over different holding periods and they find a ‘trumpet-shaped’ pattern, where the longer the holding period the more similar are individual average returns, being in the range 10%-12%. The convergence in returns is accounted for by the reduction in the impact of unsystematic risk factors over time. In the Fisher and Young study the impact of specific factors is very pronounced over short holding periods where there is considerable skew towards low or negative returns. Fisher and Young are unable to account for ‘the impetus for a sale’, noting that this is an ‘open series of questions worthy of further study’. However, they conjecture that properties that have a poor prospects of achieving anticipated return expectations are likey to be sold and the capital redeployed. As always in investment decisions, opportunity cost becomes the prime consideration.

Fisher and Young (2000) in profiling earlier research on holding periods note that interest in this question has 'ebbed and flowed…commensurate with the federal income tax environment'. However, as there are no tax implications for depreciation in holding property, the tax factor was unlikely to have been a consideration for holding periods in their data.

Collet et al (2003) employ the Cox proportional hazards regression model, where the probability of a sale after a number of years after the year of purchase is obtained. This framework can incorporate explanatory variables that can lead to an understanding of what factors condition sales. Using data provided by the Investment Property Databank, their analysis covers some 5,700 properties and extends over the period 1981-1998. Collet et al (2003) note that holding periods are typically longer than 'claimed' by investors, exhibiting differences between property types and over time. The median holding period at the end of their analysis period is seven years. Holding periods had fallen from twelve years in the early 1980s to eight years in the late 1990s. They also note that given the high transactions costs involved in property dealings, property is unlikely to be held for short periods as the costs are effectively amortised over a longer period compared with other asset categories.

What has conditioned the various holding periods? The types of factors associated with the length of actual holding periods include property type, market conditions, and transaction costs, according to Collett et all (2003) and Fisher and Young (2000). Collet et al (2003) also suggest that properties are unlikely to be sold when a loss on purchase results.

3. Data

As previously discussed, investors need to be able to analyse the characteristics of individual properties when considering holding periods. In accordance with our detailed specification, IPD has created a database on our behalf, but which still remains within IPD's strict confidentiality rules. This database was first established in 2005 and has been updated to record all performance records of properties purchases from 1983 to December 2005. The database continues to be updated on an annual basis.

The analysis reported in this paper covers in excess of 21,000 properties purchased between 1983 and 2005. The following properties were eliminated from the study:

- properties with an incomplete data series over the holding period
- properties held for six months or less and not representative of 'ordinary' transactions
- 'extreme' properties in the raw sample, which may have been affected by incomplete data or illogical chain-linked measures

The breakdown of properties used in the study is outlined in Table 1. No allowance on the net sale receipts has been made for inflation.

Table 1: Number and value of properties by property type

	Shops	Shopping centres	Retail warehouses	Offices	Industrial	Total
Sold properties	5349	241	987	3577	2313	**12467**
Net sale receipts £bn	£10,718	£6,911	£10,241	£25,147	£9,312	**£62,329**

The final number of 'clean' properties in the database was 12,467 sold properties. Property records held in the December and March valued IPD databases were also included, enabling the capture investor types valuing to alternative year-ends.

The Gerald Eve IPD database is separated into descriptive (spot) and performance (chain linked) measures. The former includes capital values, net investment, monthly status (used to define development properties), initial yields and equivalent yields. The latter performance measures include total return, capital growth, income return, rental value growth, yield impact and income growth. The database also contains such identifiers as investor type, lot size, regional markets for each of the sub sectors of offices, retail and industrial, thereby profiling individual properties in some detail. This year saw the addition of standard deviations of monthly returns for each asset and matching benchmark total return and capital growth all property and five sector benchmarks. This has enabled the calculation of the individual correlations between each property and both the all-property benchmark and property type benchmark. Individual betas were also computed, again relative to the all-property and defined sector benchmarks.

4. Excess holding period returns

To calculate investment performance on a comparable basis for each asset, individual total property returns have been calculated for every month the property was held from purchase to sale. An index from these monthly returns was then obtained for each property and the holding period incorporated as shown in Fig 1:

Fig 1

$$AHPRpi = \left(ITRpi \wedge \left(\frac{1}{HP} \right) - 1 \right) * 100$$

where AHPRpi = annualised holding period total return of property i
ITRpi = index of total return of property i from purchase to sale
HP = holding period in months

Comparable measures for the IPD All-Fund Universe over each relevant holding period were then obtained. Also calculated were comparable figures for the five major property types of shops, shopping centres, retail warehouses, offices and industrial property, allowing the benchmarking of each asset against its relevant property type. Taking the market return from the holding period leaves the excess holding period return, shown in Fig 2:

Fig 2

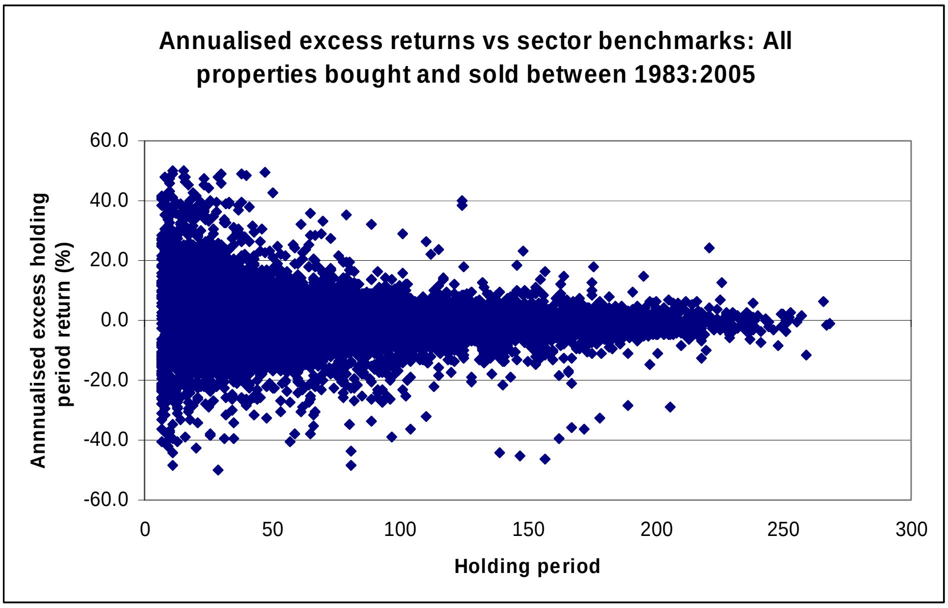
$$AEHPRpi = \left(ITRpi \wedge \left(\frac{1}{HP} \right) - 1 \right) - \left(ITRbm \wedge \left(\frac{1}{HP} \right) - 1 \right) * 100$$

where AEHPRpi = annualised excess holding period total return of property i
ITRpi = index of total return of property i from purchase to sale
ITRbm = index of total return of benchmark from purchase to sale of property i
HP = holding period in months

A positive number indicates out-performance (or 'winners') and negative returns under-performance (or 'losers'). This is described as 'excess performance' or alpha.

The shape of excess returns by holding period is illustrated for individual assets in Fig.3. The five property types were all benchmarked against their equivalents. The familiar 'trumpet' pattern was observed for every property type analysed, with a higher range of performance, both positive and negative, observed for properties with shorter holding periods. (These results were presented to the IPD/IPF conference in November and whilst they have been updated to incorporate more recent transactions, they will not be commented upon further here.)

Fig 3 - Excess total returns of assets vs property type benchmarks



5. Looking behind the benchmark returns

The market, or benchmark return over the relevant holding period is now examined in greater detail. This should enable a greater understanding of the composition of the aggregated benchmark returns, against which investment performance is measured.

Fig.4 contains a further four scatter diagrams that vividly describe the range of benchmark returns by holding period (the shopping centre graph was excluded as, although the results in terms of the shape of performance relative to holding period were similar, the small number of properties do not provide an interesting profile). Summary statistics illustrating the range of benchmark investment performance in relation to the holding period are presented in Table.2 for all five sectors

Fig 4 - Benchmark holding period total returns

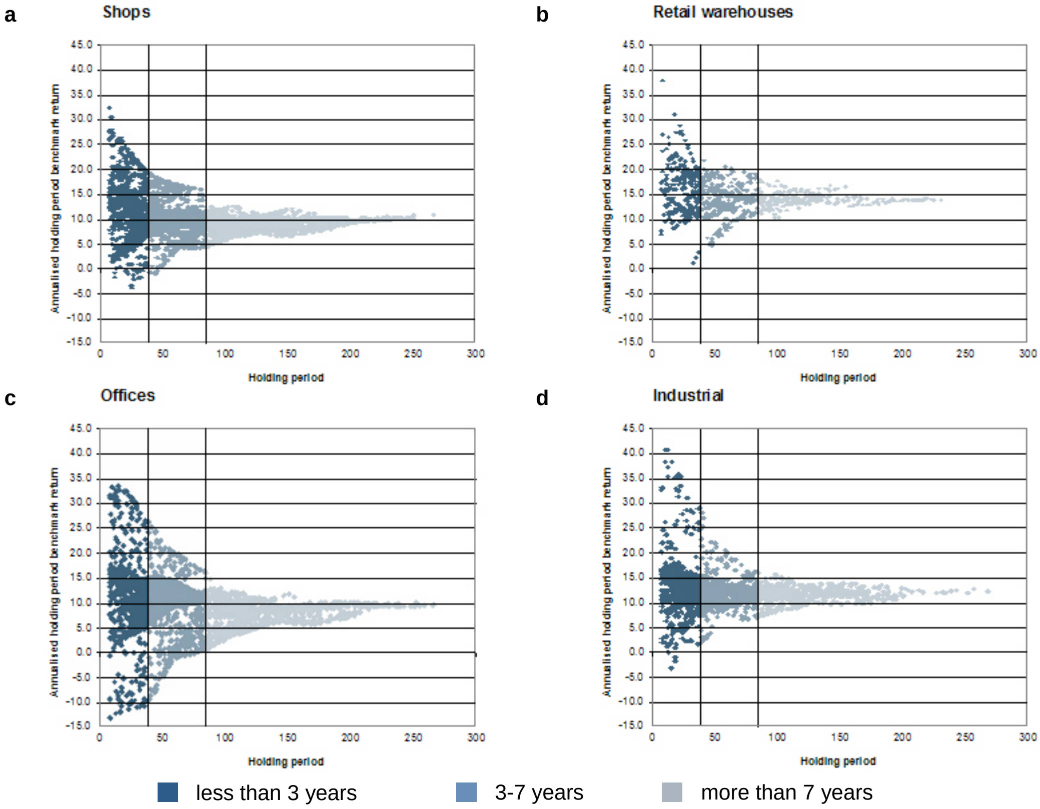


Table 2 - Annualised holding period returns for sector benchmarks

Holding period	Less than 1 year	1-2 years	2-3 years	3-4 years	4-5 years	5-6 years	6-7 years	7-8 years	8-9 years	9-10 years	10-11 years	11-12 years	12-13 years	13-14 years	14-15 years	>15 years
Shops																
Upper Quartile	15.0	15.9	13.6	11.9	11.5	10.9	10.6	10.3	10.1	10.1	10.3	9.9	10.0	10.2	10.3	10.4
Median	12.3	12.6	11.5	9.7	9.6	9.7	9.4	9.4	9.4	9.4	9.4	9.6	9.9	10.1	9.9	10.0
Lower Quartile	8.9	5.6	6.8	8.0	9.0	9.1	8.6	8.4	8.5	8.5	8.7	8.8	8.8	9.1	8.8	9.6
Standard Deviation	6.5	6.3	5.3	3.7	3.4	2.7	2.1	1.7	1.5	1.2	1.1	1.1	1.3	1.0	0.9	0.5
Shopping Centres																
Upper Quartile	15.3	16.5	12.6	14.6	12.6	13.2	12.2	12.6	11.3	11.5	10.7	8.9	9.4	-	9.8	9.9
Median	12.9	14.0	7.7	11.0	9.9	11.7	11.8	11.3	8.1	7.8	8.2	8.7	9.2	-	9.6	9.5
Lower Quartile	12.9	10.2	7.0	9.0	9.5	11.0	6.9	9.0	7.7	7.3	7.8	8.3	8.6	-	9.6	9.4
Standard Deviation	2.4	4.4	3.9	2.9	4.6	3.2	3.1	1.9	2.1	2.2	1.6	0.5	0.7	-	0.1	0.4
Retail Warehouses																
Upper Quartile	18.9	20.3	18.9	17.9	16.0	15.2	15.6	14.8	14.7	15.2	14.8	15.4	16.2	14.4	13.6	14.1
Median	16.4	16.2	15.8	15.5	14.1	14.7	14.2	13.8	14.1	14.2	14.1	14.6	14.1	14.0	13.5	13.9
Lower Quartile	11.1	13.0	12.0	12.3	12.3	12.5	12.0	12.8	13.5	13.6	13.8	14.0	13.7	13.2	13.1	13.7
Standard Deviation	8.8	5.1	4.3	3.6	3.3	2.6	2.5	1.7	1.5	1.0	0.8	0.9	1.4	0.7	0.4	0.2
Offices																
Upper Quartile	17.0	15.9	14.2	12.8	12.3	11.5	11.4	10.9	10.4	9.4	9.0	8.6	8.7	9.1	9.3	9.5
Median	14.8	12.8	11.4	9.3	9.5	10.0	10.5	9.6	7.8	7.8	8.0	8.2	8.2	8.5	9.0	9.1
Lower Quartile	6.8	6.9	6.4	7.2	8.2	9.1	6.2	4.1	4.5	5.5	5.6	6.6	7.7	6.9	7.3	8.6
Standard Deviation	9.6	8.7	7.5	6.2	5.6	4.4	4.0	3.9	3.1	2.4	2.0	1.3	1.1	1.2	1.3	1.0
Industrial																
Upper Quartile	16.1	15.7	15.0	13.5	13.0	12.8	13.2	12.8	13.3	12.3	12.9	12.7	13.3	12.5	12.0	12.4
Median	12.6	13.7	12.5	11.2	11.7	12.3	12.6	11.7	12.6	11.3	11.9	12.1	12.4	12.2	11.4	11.8
Lower Quartile	10.5	10.4	10.0	9.7	10.7	11.2	11.2	10.8	11.2	10.2	11.3	11.4	11.6	11.2	10.7	11.1
Standard Deviation	6.5	6.8	4.5	4.1	2.5	1.8	1.9	1.8	1.9	1.4	1.2	0.9	1.1	1.1	1.0	0.8

Major features arising from this analysis include:

- benchmark returns mimic the patterns recorded by individual assets in recording a far greater range of investment performance for properties traded within a few years after purchase. Investors have to be aware of short-term market volatility when they make tactical adjustments
- the scale of return volatility is much smaller than with individual assets as the impact of weighted aggregation removes the extremes of individual asset performance
- over lengthy holding periods the range of investment returns narrows significantly with standard deviations dropping to practically zero in most instances
- the long term median returns, therefore, represent ‘the market return’ over the longer term taking account of market swings and cycles which have a far greater impact in the shorter term – investors should bear this in mind when setting asset allocation strategies
- the well-known hierarchy of investment performance is in evidence as retail warehouses delivered the strongest median returns, averaging around 14% over longer holding periods – a high level of sustained performance
- offices are the poorest performing assets over the longer term – this should be noted as that market is currently attracting substantial amounts of money and perceived as the top-performing sector in the short to medium term.

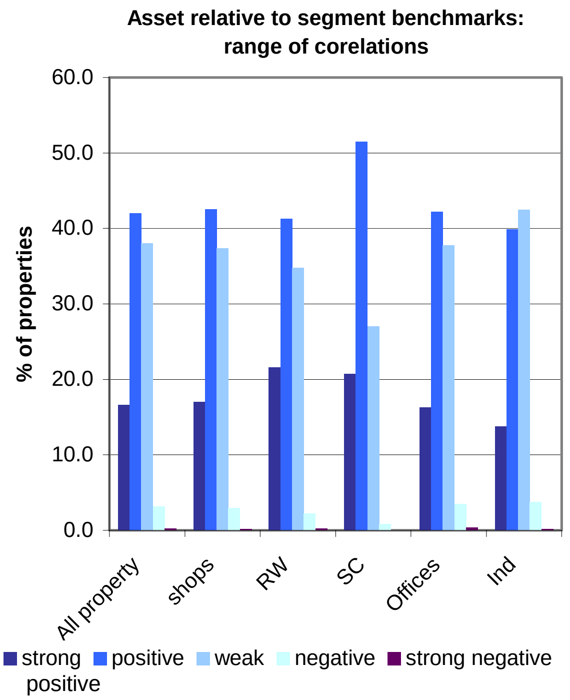
It should also be noted that the range and variability of short-term performance should encourage the fledgling derivatives markets across the sectors, as volatility is clearly greater in the short term.

6. Correlation profiles of sold properties

Benchmark returns, therefore, have a similar holding period profile as individual assets. The next stage is to analyse the strength of the relationship between the two sets of returns. The efficient construction of portfolios (maximising return for a given level of risk) requires taking into account of correlations between assets or the relationship between assets and the market, if a single factor framework is used.

Correlations were calculated by comparing the movement of individual asset monthly returns with the corresponding benchmark returns. This enables analysis of the range of correlations to determine whether market performance is indeed a driver of individual asset returns. Fig 5 illustrates the range of correlations between individual assets and the five property segment benchmarks. The results are displayed as a proportion of the total number of properties in each category.

Fig 5 - Distribution of correlations



Correlation	Description
1.0 - 0.7	Strong
0.7 - 0.3	Positive
0.3 - -0.3	Weak
-0.3 - -0.7	Negative
-0.7 - -1.0	Strong negative

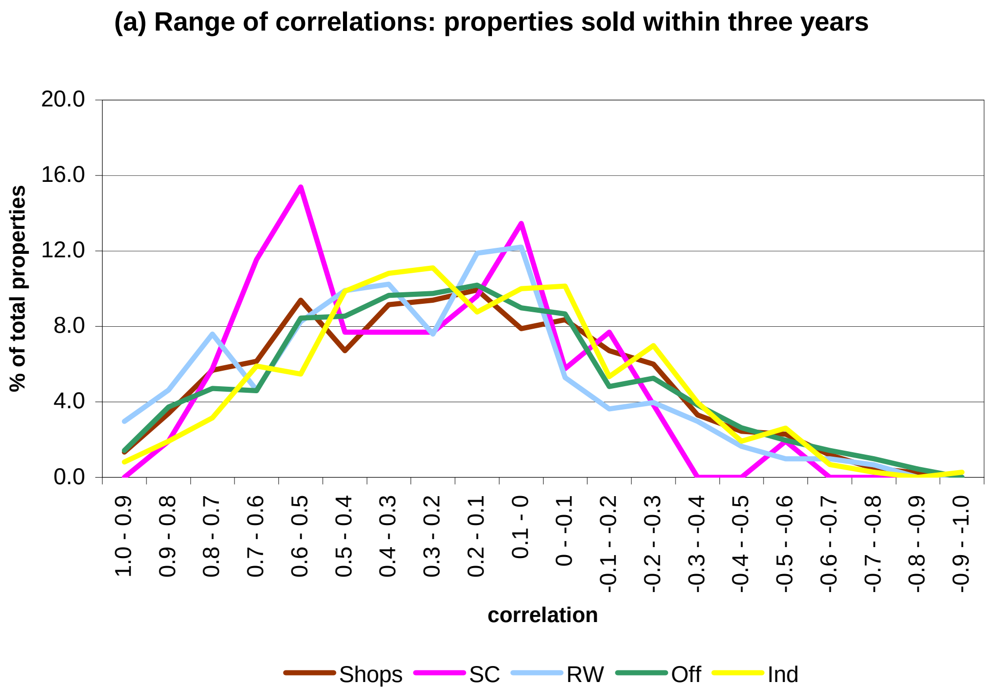
The major points to note are that around 15%-20% of properties for every sector have a strong relationship with the benchmark and move very strongly in line with the market. Over 40% of assets have significant positive correlation with the benchmark (between 0.7 and 0.3). However, a large proportion of assets, almost 50% in the case of industrial properties, have a weak relationship with the performance of the benchmark. As managers measure their performance against the market, they must bear this in mind as they construct portfolios.

Is this a feature of the whole market or is there a common theme behind the 'noise' within individual asset performance? The correlations are next broken down into three separate lengths of holding period, namely less than three years, three to seven years and over seven years. The results are displayed in Table.3 and summarised graphically for trades within three years and greater than seven years in Fig.6.

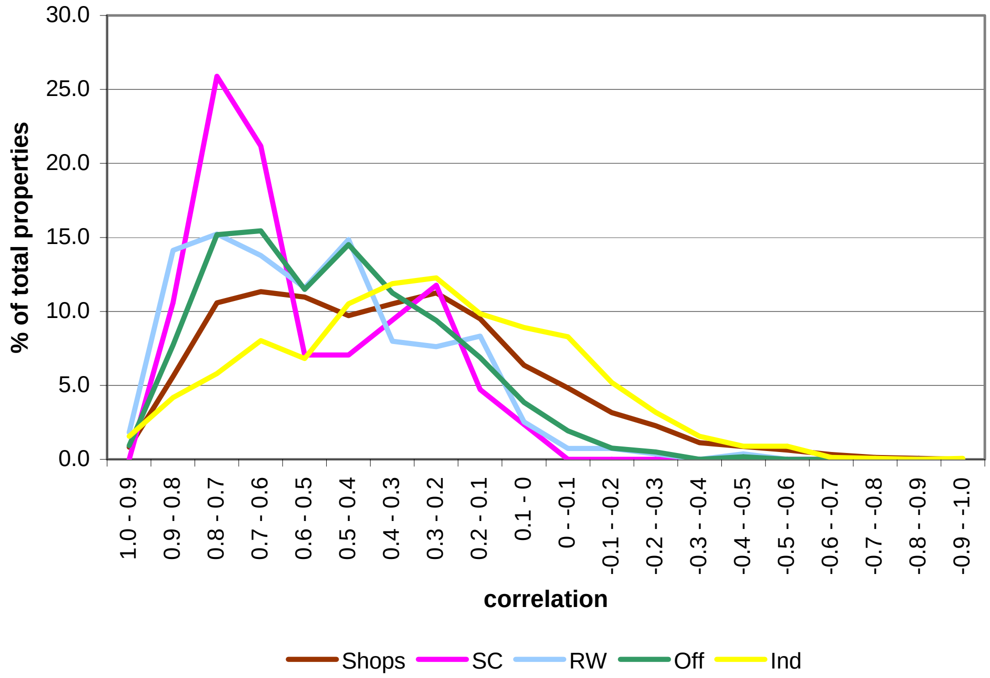
Table 3 - Proportions of correlation by segment and holding period

	Shops	SC	RW	Off	Ind
Traded within 3 years					
Strong positive	10.4	7.7	15.2	9.9	5.9
positive	31.4	42.3	33.0	31.2	32.1
weak	48.3	48.1	44.6	47.6	52.3
negative	9.2	1.9	6.6	9.9	9.2
strong negative	0.7	0.0	0.7	1.4	0.5
Traded between 3 and 7 years					
Strong positive	13.7	14.4	19.9	14.1	14.3
positive	36.4	61.5	42.6	40.4	39.6
weak	45.1	23.1	37.3	43.3	44.2
negative	4.6	1.0	0.2	2.2	1.9
strong negative	0.3	0.0	0.0	0.0	0.0
Traded after 7 years					
Strong positive	17.0	36.5	31.2	23.8	11.5
positive	42.5	44.7	48.2	52.7	37.2
weak	37.4	18.8	20.3	23.3	47.7
negative	2.9	0.0	0.4	0.2	3.4
strong negative	0.2	0.0	0.0	0.0	0.1

Fig 6 - Range of correlations – short and long holds



(b) Range of correlations: properties sold after seven years



The preceding analysis shows that:

- for properties traded within three years, almost 50% (and slightly more in the case of industrials) have a weak correlation with the market. This highlights the level of asset specific risk investors take on when buying individual properties for short periods of time.
- the pattern changes for properties held over longer periods of time, in this instance, over seven years. With the curious exception of industrial properties, the other four sectors have a far greater proportion of properties with positive, indeed strongly positive correlations with the market. This is clearly visible in Fig 6(a), which has a far greater proportion of properties to the left hand side of the chart.
- shopping centres and retail warehouses have the greatest proportion of properties with strong positive correlations, reflecting the lower level of volatility across individual asset performance in those two sectors.

6. Beta profiles of sold properties

As there appears to be a relationship between the market performance, individual asset performance and holding period, we next calculate the Betas for individual assets relative to the market, according to the standard formula:

Fig 7

$$\beta pi = \frac{\operatorname{cov} pibm}{\operatorname{var} bm}$$

where $\beta\ pi$ *= Beta of property i*

$\operatorname{cov} pibm$ *= covariance of property i total returns with benchmark total returns*

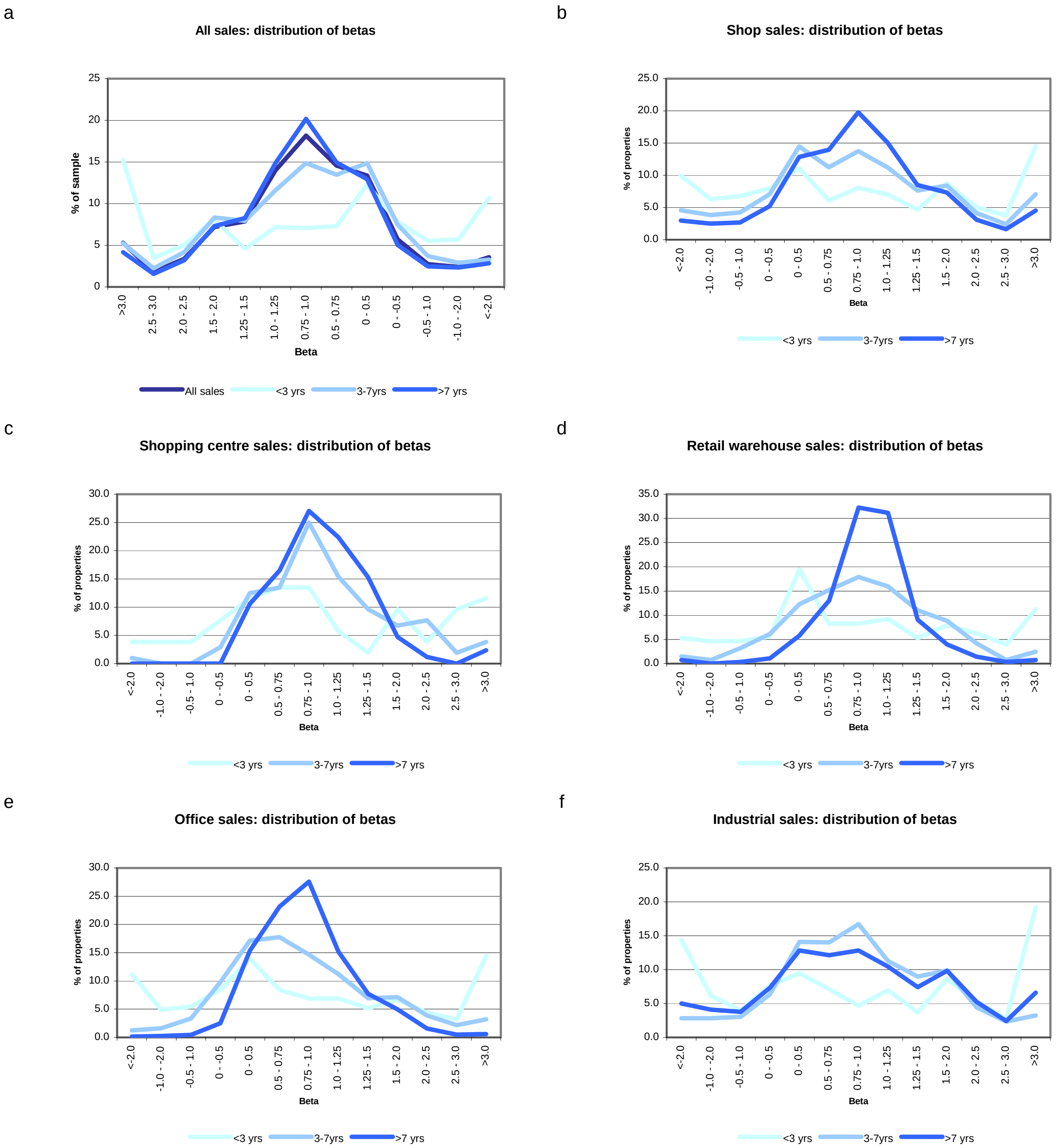
$\operatorname{var} bm$ *= variance of benchmark total returns*

This equation lies at the heart of the Capital Asset Pricing Model, which, along with several offshoots and refinements, has driven portfolio analysis over the last forty years or so. The calculated Beta of an individual asset, applied to the forecast market return and added to a defined risk-free rate enables the calculation a hurdle return rate, and be used to identify mis-pricing in property values. Several issues need to be borne in mind however, on top of the well known and often quoted criticisms of CAPM, including:

- the fact that monthly total returns are based on appraisals, therefore there is a valuation smoothing effect which will dampen the statistical volatility of investment returns for both individual assets and, to a lesser extent, the market
- whilst correlations for properties held over the longer term appear significant and relatively stable, the relationship, as we have already outlined for properties traded within the first three years, is often weak with individual returns bearing little or no resemblance to the market

Fig 8 illustrates the distribution of betas split into three separate holding periods and displayed for all assets combined and the five separate property types:

Fig 8 - Distribution of betas by holding period groupings



The spread of Betas changes markedly when analysed in conjunction with the holding period. There is a far greater concentration of properties around 1.0, more in line with other asset classes, for properties traded over longer holding periods. Retail warehouses and offices, in particular, display this pattern, reflecting, again, the noise inherent in early trading and the movement towards the market average over the longer term.

One point to note is that industrial properties have no real concentration of assets around a Beta of 1.0, even over the longer holding period. This reflects the low correlations described earlier and indicates the high level of asset-specific risk in that sector.

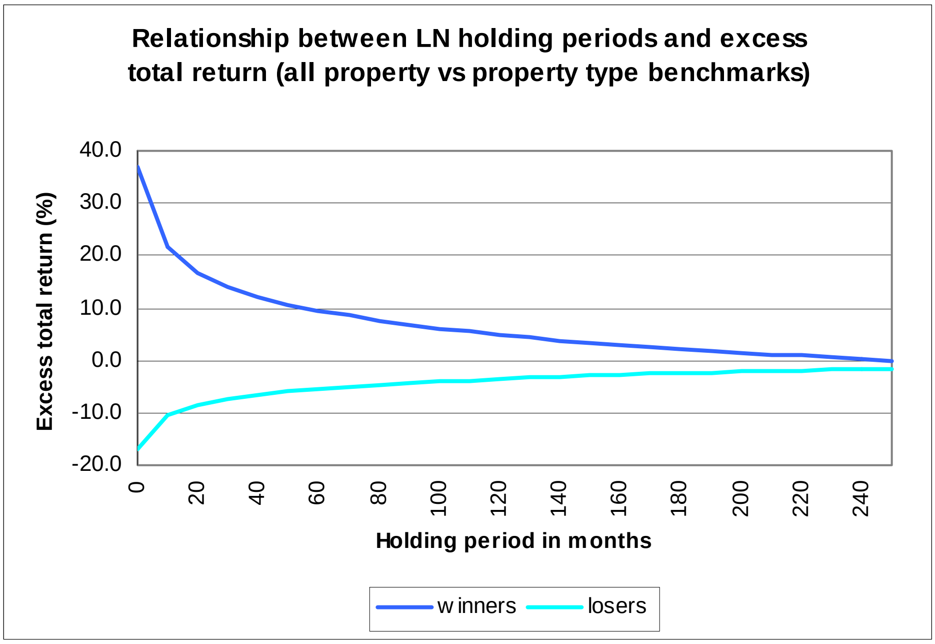
7. Some initial results

Our analysis shows that there is likely to be some relationship between an individual asset's performance relative to the market and the investment holding period. The shape of investment returns is consistent across all property types, illustrated in Figure 4. A basic linear relationship between excess return and the log of the holding period is estimated, the results shown in Table 4 and illustrated in Fig 9.

Table 4 - Linear relationship between holding periods (logged) and excess returns

	Positive excess total returns (winners)	Negative excess total returns (losers)
Standard retail		
Number of observations	1929	3347
Constant	28.24668	-17.13953
LN of holding period	-5.489469	2.81559
Adjusted R-squared	0.1592	0.137
Shopping centres		
Number of observations	105	129
Constant	30.3385	-9.077731
LN of holding period	-5.694767	0.7868187
Adjusted R-squared	0.1495	0.0053
Retail Warehouses		
Number of observations	406	547
Constant	21.42098	-17.50745
LN of holding period	-4.050666	3.190778
Adjusted R-squared	0.1378	0.1781
Offices		
Number of observations	1675	1819
Constant	37.57693	-17.54595
LN of holding period	-7.331522	2.836973
Adjusted R-squared	0.1674	0.1031
Industrial		
Number of observations	1081	1194
Constant	43.61407	-18.05488
LN of holding period	-9.176593	3.243387
Adjusted R-squared	0.2366	0.141
All property		
Number of observations	5196	7036
Constant	33.73283	-16.99005
LN of holding period	-6.676552	2.807286
Adjusted R-squared	0.1722	0.1235

Fig 9 – Estimated relationship between excess total return and log of holding period (all property vs property type benchmarks)



Points to note from this analysis include:

- With the exception of retail warehouses, there is a consistent asymmetry in the relationship between holding periods and both positive and negative returns. For positive excess returns (winners), the positive constant is higher and the negative slope fairly steep. This indicates that the level of out-performance available over short holding periods is very strong with a fairly rapid trend to mean reversion.
- This contrasts with negative excess returns where the level of under-performance over short term holding periods is lower in absolute terms, reflected in the smaller negative constants. However, the positive slope towards zero excess returns (mean-reversion) has a gentler gradient than the corresponding negative slope recorded for positive excess returns.
- The strength of the relationship is limited across the major property types with only industrial properties recording adjusted R^{2}'s over 0.2.
- The relationship, with the exception of retail warehouses, is stronger for positive excess returns rather than negative excess returns.
- The relationship between investment performance and holding periods for shopping centres, particularly negative excess returns, is the weakest, reflecting the lack of data in that sector

These numbers reflect, at a very basic level, the asymmetries in the relationship between holding periods and investment performance relative to the market.

It is well established in the literature that Beta varies with changing economic conditions (see, for example: Alexander and Chervany (1980), Brooks et al (1992) and Ferson and Schadt (1996)). However, there is no consensus on the definition or methodology with which to capture the behaviour of these economic conditions. A frequently applied model of the relationship between Beta risk and market conditions is the so-called dual-Beta market model. In this two-regime model, the economy is divided into two phases based on the upward (bull) or downward (bear) direction of stock market movement. Researchers typically use a market index to relate this to a critical threshold value and thereby divide the market into “up” and “down” periods. Consideration of other factors, such as market conditions under which properties are bought and sold, accounting for excess performance is the subject of ongoing work.

8. Conclusions and further research

Benchmark returns mimic the patterns recorded by individual assets in recording a far greater range of investment performance for properties traded within a few years after purchase. Investors have to be aware of short-term market volatility when they make tactical adjustments.

There is a much stronger correlation between individual asset returns and market performance over longer holding periods. This is reflected in the distribution of individual correlations and beta values.

The shape of investment returns for all property types and all benchmarks is related to the holding period. On-going research is pulling these threads together with a view of identifying a framework which captures the dynamics of this relationship. This will reflect the non-linearities inherent in the excess return performance profiles previously reported. In this regard, the market conditions under which the purchase and sales transaction took place are likely to be important.

The questions being addressed include:

- Is Beta different in different market environments?
- What characteristics differentiate winners from losers?

Examples of possible definitions of market conditions include:

Bottom: investment performance in any year is below both the average return for the previous two years and the average return for the subsequent two years.

Falling: investment performance in any year is below the average return for the previous two years and above the average return for the subsequent two years.

Rising: investment performance in any year is above the average return for the previous two years but below the average return for the subsequent two years.

Top: investment performance in any year is above the average return for the previous two years and exceeds the average return for the subsequent two years.

Market conditions could also be identified relative to the returns on other assets, most notably the risk-free rate. This also reflects the opportunity cost associated with the buying, holding and selling of property at any given time.

Identification of market environments will help to account for Beta values, showing a market risk factor to be dynamic over a range of market conditions.

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