Serial Persistence in Individual Real Estate Returns in the UK

by

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Page 1 Footnote: The views of the authors do not necessarily represent the views of their organisations. All individual property data was processed at IPD to protect investor confidentiality.

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Abstract

Persistence of property returns is a topic of perennial interest to fund managers as it suggests that choosing those properties that will perform well in the future is as simple as looking at those that performed well in the past. This paper extends earlier studies in US, Australian, and UK real estate markets in two ways. First, this study applies the same methodology originally used in Young and Graff (1996) making the results directly comparable with those in the US and Australian markets. Second, this study uses a much larger database covering all commercial property data available in the Investment Property Databank (IPD) for the years 1981 to 2002 – as many as 216,758 individual property returns. While the performance results of this study mimic the US and Australian results of greater persistence in the extreme first and fourth quartiles, they also evidence persistence in the moderate second and third quartiles, a notable departure from previous studies. Likewise patterns across property type, location, time, and holding period are remarkably similar, leading to the conjecture that behaviors in the practice of institutional-grade commercial real estate investment management are themselves deeply rooted and persistent and perhaps influenced for good or ill by agency effects.

1. Introduction

The persistence of property returns is a topic of particular interest to real estate fund managers as it suggests that choosing those properties that will perform well in the future is as simple as looking at those that performed well in the past. Consequently, much effort has been expended to determine if such a rule exists in the real estate market. Serial persistence in real estate returns has been examined in the private markets in the US (Young and Graff, 1996, 1997), Australia (Graff, Harrington and Young, 1999) and the UK (Lee and Ward, 2001). Studies have also examined the serial persistence of publicly-traded (REIT) real estate (Graff and Young, 1998). The approach adopted for testing for persistence was much the same in each case. For each time period, the total returns of each property or REIT was calculated and the cross-sectional returns ranked into quartiles. If the performance of real estate returns through time is independent, the use of quartile ranks implies that there is a only a 25% probability of a property remaining in the same quartile return rank from one period to the next. A significant departure from the 25% theoretical probability can therefore be considered an indicator of serial dependence in performance.

This paper extends prior studies in two ways. First, this study applies the same methodology as originally used in Young and Graff (1996) making the results directly comparable with those in the US and Australian property markets. Second, this study uses a much longer and larger database than in previous studies. The data cover commercial property returns available in the Investment Property

Databank (IPD) for the years 1981 to 2002 – as many as 216,758 return observations and 30,000 individual property time-series returns. Hence, this should provide a strong statement on the issue of persistence in individual real estate returns.

As institutional investors expand their options for investment opportunities to a global arena, it is helpful to have an understanding of the behavioral characteristics of assets that might be purchased individually or in portfolios. If there are characteristic performance differences among assets in different countries, these differences might lead to differences in portfolio strategies for the global investor. However, if there are similarities among investment characteristics, then investors could realize efficiencies by extending effective strategies in the home country to foreign soil.

2. Previous Studies

The analysis for the US direct institutional=grade real estate market (Young and Graff, 1996, 1997) used annual returns from the NCREIF database, over the period 1978 to 1994. The study was based on the return performance of fifty Metropolitan Statistical Areas (MSA) that had at least one occurrence of two consecutive years of data, the total number of MSAs ranging from eight in 1978 to forty-four in 1991. The data was also decomposed into five property types; Office, Retail, Warehouse, R&D and Apartments. The results for the five property types indicated that for the two extreme quartiles, the highest and lowest ranks, serial persistence was demonstrated with almost complete certainty from one year to the next. However, the persistence tended to fade beyond this, except for Apartments where serial persistence was extended to runs of two and three years. For the combined data, serial persistence was exhibited for one, two, three, four and five years, indicating that private real estate returns exhibit persistence for some considerable time. In contrast, little or no significant serial persistence was found for the second and third quartiles, except for Warehouses over one year and the combined data for one- and two- years runs. In other words, persistence is exhibited at the extremes of performance, the best and the worst properties, in any one year but not by properties around the median.

Graff *et al* (1999) applied the same approach to the Australian direct institutional-grade property market using annual data over the period from 1985 to 1997 from the Property Council of Australia database. The data decomposed into three property types: Office, Retail and Industrial. The results of the analysis showed that serial persistence was exhibited by Office and Retail property at the extreme quartiles (the first and fourth) and for the median quartiles (second and third combined), but that Industrial properties exhibited serial independence in all categories. In addition, there was a qualitative difference in the Office data between CBD and non-CBD properties. In particular, the Office data in the CBD locations exhibited serial persistence in all quartiles, but no serial persistence was found for the non-CBD data, while the combined data exhibited statistical significance in all quartiles. In other words, superior performance is generally followed by continued superior performance and inferior performance by continued inferior performance.

Lee and Ward (2001) tested the persistence in performance of private real estate returns in the UK between 1981 and 1996 applying the same quartile ranking method used in previous studies. However, the authors then used a Markov Chain approach that allowed the estimation of several parameters of interest not readily available from the binomial approach of Young and Graff (1996, 1997). The sample data consisted of the total returns on properties in three types, Retail, Office, and Industrial property, in various local authority districts (essentially towns) in the UK, to give a total of 392 asset possibilities. The authors found that the observed persistence in performance of real estate returns in other countries was confirmed and appeared to be fairly stable between 1981 and 1996. Second, the persistence did not appear to be driven by volatility, and was robust across sectors, regions, and unaffected by size variations.

The authors also tested a number of trading strategies and concluded that real estate investors would be better off, in terms of higher returns coupled with a lower turnover rate, by purchasing properties identified as the best in one period and only selling those that fall below the median in the next, rather than concentrating investment in properties from the first quartile. Such a strategy outperformed a random approach and one that assumed absolute persistence in returns, even after transaction costs. The evidence suggested two important rules-of-thumb for property fund managers who wish to maximize performance: (1) avoid properties with below average performance and (2) invest in properties in the upper quartile of performance in one year as they have a higher-than-average chance of achieving above average returns next year. In other words, a fund manager would be advised to stay with the best and avoid the worst.

Finally, using monthly, quarterly, and annual data over the ten-year period from January 1987 to December 1996, Graff and Young (1997) find that the results for publicly-traded REITs are somewhat different. In particular, the data showed a variety of conclusions depending on the sample frequency. For the annual data, like the results for the private real estate market, persistence was observed at the two extremes (i.e., combined first and fourth quartiles) while the two moderate quartiles (i.e., combined second and third quartiles) were statistically insignificant from the theoretical 25% probability. In contrast, the quarterly data showed a lack of serial persistence in the extreme and the moderate quartiles. The monthly returns displayed yet different results, with the extreme quartiles showing negative persistence. That is, a REIT in the fourth and especially the first quartile have less than a 25% chance of being in that quartile in the subsequent period. The negative persistence was more pronounced for large-capitalization REITs than for small-capitalization REITs.

3. Data

Data on institutional-grade real estate assets in the UK are collected by Investment Property Databank (IPD), a commercial organisation that provides independent performance measurement and benchmarking services to property investors. Their databases are comprised of individual property data provided by contributing investors that include insurance companies, pension funds,

and publicly-listed property companies. There were 232 funds contributing to the UK database at the end of 2002, giving information on over 11,400 properties with an aggregate value of £102 billion. It is estimated that this is equivalent to 75% of the total property investments held by UK institutions and listed property companies (IPD, 2003).

The data used in this study are annual total returns for individual properties over the period 1981 to 2002. Data on both historic and currently held properties were used, so as many as 30,000 property records were utilised in the analysis. Returns for a property were only used for those years where it was a standing investment, i.e., held in an investor portfolio and not traded or subject to development or significant improvement expenditure. Furthermore, a property needed at least two consecutive periods as a standing investment for the persistence test to be performed. Returns for transaction periods are therefore not included and where a transaction is made between two funds in the database; the returns under the new fund's ownership are recorded as a separate observation.

As in previous studies, disaggregation into property types was performed. Properties that did not belong to one of the three main property types (Office, Retail, or Industrial) were excluded from the analysis. It is worth noting that, unlike in the US, Residential / Apartment properties do not form a significant part of most institutional portfolios. The data were also disaggregated into three super-geographical regions (London, Rest of South East, and the Rest of the UK). Figure 1 shows the number of samples for all properties and for disaggregations by property type and region. The total number of return observations over the twenty-two-year period was 216,758. By quartile rank over the entire period, 54,206 sample returns fell into the first quartile, 54,188 into the second quartile, 54,188 into the third quartile, and 54,176 into the fourth quartile.

4. Methodology and Confidence Interval Estimation

The methodology in this study is as follows: for each annual sample period, individual property returns are grouped into quartiles and the quartile rank is recorded.[1] Successful persistence is then defined as a property staying in the same quartile rank in the subsequent annual period, and unsuccessful persistence as the property appearing in a different quartile rank in the subsequent annual period. Because the returns are grouped into quartiles, the theoretical probability of repetitive quartile rankings is 25%, if consecutive quartile rankings for each property are serially independent, the typical assumption made by researchers. Accordingly, statistically significant departures from 25% among sample persistence statistics are deemed evidence that asset returns are not serially independent.

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[1] While more fine-grained divisions such as deciles might have been used, quartile divisions are the minimum necessary to distinguish differences in a distribution of returns that may be skewed. Furthermore, the quartile divisions allow comparability with earlier work in the US and Australia.

Within each quartile group, the incidence of serial runs of uniform quartile rank were examined. The test statistic is the sample incidence of successful persistence (i.e., the observed rate at which a repetitive quartile rank occurs in the period immediately subsequent to a run of identical quartile rankings over one, two, three, or four sample periods). The persistence counting procedure is identical to that used in previous studies in the US and Australia noted above and the actual counting technique is described more fully in the Appendix of Graff, Harrington, and Young (1999).

To determine whether quartile performance is serially dependent, confidence intervals for the binomial distribution were calculated under the assumption that the probability of repeating quartile performance is 25%. As with the counting procedure, a complete explanation of confidence interval estimation is available in prior publications. See Young and Graff (1996), for example.

5. Tests and Results

Figure 1 shows the number of samples arranged by year, by three property types, and by three distinct regions. The performance persistence results are shown in tabular and graphical form on the next seven exhibits, described more fully as follows.

As shown in Figure 2, Panel A, performance persistence is statistically significant in the cross-sectional distribution of the full set of IPD property returns for the years 1981 to 2002. Statistically significant performance persistence is found in each quartile following runs of 1 year, 2 years, 3 years, and , 4 years. Combining the first and fourth quartiles into an extreme-quartile group and combining the second and third quartiles into a moderate-quartile group, we find that there is statistically significant persistence in the extreme-quartile group following runs of 1 through 4 years, and that there is somewhat lesser statistically significant persistence in the moderate-quartile group following runs of 4 years, while statistically significant persistence following a runs of 1 through 3 years is the same as in the extreme-quartile group.

In this panel and in all subsequent panels, statistical significance is similar if not identical across all quartiles, across most runs of 1 through 4 years, and across extreme-quartile and moderate-quartile aggregations. What is particularly striking, however, is the quantitative differences between the extreme- and moderate quartiles in all cases without exception.

When we disaggregate properties by type, patterns of return persistence are nearly identical to the aggregate. Panels B, C, and D of Figure 2 show persistence results of Office, Retail and Industrial property groupings respectively. Comparing these results to the aggregate results in Panel A, we find that the quartile serial persistence across runs of 1 to 4 years is statistically similar to those of Panel A. The relatively minor although notable difference is evident in the extreme- versus moderate-quartile groupings where strong serial persistence is evident across runs of 1 to 4 years for all three property types for the extreme-quartile groupings, but trails off as runs increase in length.

Panels E, F, and G of Figure 2 show persistence results for London, Rest of South East, and the Rest of the UK regional groupings. Once again, irrespective of region, the patterns mimic those

observed in the all property aggregates and the property type groupings. The same quantitative and qualitative differences between the extreme-quartile and moderate-quartile groupings are virtually indistinguishable from the results shown in Panels A through D. Data were not available to determine whether the property type distributions across the regional groupings were identical, but we suspect that they are not, especially with regard to the Rest of the UK grouping. If this conjecture is correct, the similarities of patterns across property type and region appears to be a fundamental or intrinsic characteristic of the commercial real estate market rather than a function of its property type or regional distinction.

Figure 3 depicts graphically the results of Figure 2 for runs of 1 year. Horizontal bars on the graphs indicate the percent of successes and the vertical bars indicate the 95% confidence intervals. Additionally, the data for all properties and property type and regional groupings have been split into three time periods: the full 1981 to 2002 period, the more recent 1992 to 2002 period, and the earlier 1981 to 1991 period. The vertical axes of the graphs within a single type grouping are identical to facilitate comparisons over different time periods.

Figure 3 shows quite clearly the degree to which persistence in the extreme quartiles differs from persistence in the moderate quartiles in nearly all groupings. Across quartiles, there is a tendency for somewhat greater persistence in the fourth quartile, the quartile with poorest relative performance, for all properties, Office, Retail (except in the 1981 to 1991 period), South East, and Rest of UK (except in the 1981 to 1991 period). Industrial properties across the entire 1981 to 2002 and especially across the 1992 to 2002 periods exhibit the greatest departure from the patterns observed for other groupings. Particularly notable is the 1992 to 2002 pattern for Industrial properties, where the performance persistence declines progressively from the first to the fourth quartile.

In the aggregate and in all groupings except Industrial, performance persistence in the moderate quartiles is less pronounced in the 1992 to 2002 period than in the earlier 1981 to 1991 period.

Figure 4 shows results for four different groups of holding periods: 2 to 5 years, 6 to 10 years, 11 to 15 years, and 16 to 20 years. As in Figure 2, these results are computed for persistence runs from 1 to 4 years duration. The results for all four holding period clusters are similar to those reported in Figure 2, namely more persistence in the extreme quartiles than in the moderate quartiles extending to runs of 1 to 4 years. While persistence does not appear to vary materially across holding, the pronounced fourth quartile persistence across all four holding period groupings is a notable departure from performance persistence in the other three quartiles.

It seems odd that investors or their managers would hold on to properties that exhibited repeatedly poor relative performance for upwards of twenty years of ownership. Graphical depictions of the Figure 4 tables for runs of 1 year are shown in Figure 5, which makes the exceptional fourth quartile performance most evident.

It could be argued that there should be a difference in persistence in “Up” and “Down” markets. Up markets are characterized by all sectors and regions showing good, but divergent performance. In

other words, although all sectors are achieving good capital gains, some are showing dramatic performance while others are only doing reasonably well. In contrast, in a downturn, there tends to be a convergence in performance, all of it bad, so all sectors show equally poor returns. This suggests that in an Up market there is likely to be even stronger levels of persistence in the first and fourth quartiles than in the Down market. Therefore, the data was classified into Up and Down markets to test this proposition. An Up market is defined as those years showing a positive deviation from the long-term trend in the IPD Annual Index, while Down markets are those years with a negative deviation. Up markets include the calendar years 1986 to 1989 and 1996 to 2002, while Down markets include the 1981 to 1985 and 1990 to 1995 periods. Given the relatively short periods for these cycles, the persistence data for runs of more than 1 or 2 years diminish in explanatory power and as such they were excluded from the analysis.

Figure 6 shows the serial persistence results for all properties (Panels A and B) and for Office properties (Panels C and D) in Up and Down markets. The patterns that by now are becoming familiar hold, namely that the extreme-quartiles are more persistent than the moderate quartiles in the aggregate and in the Office group during Up markets. Furthermore, there is little to distinguish Up and Down market persistence patterns for the aggregate of all properties and even the magnitudes of the quartile persistence figures are nearly identical in the first and fourth quartiles. The Up and Down market persistence pattern of Office properties differ a bit, most notably in the first quartile in Down markets that are quite low, relatively speaking, and in the fourth quartile in Down markets that are quite high. Figure 7, which shows graphically the 1-year persistence results from Figure 6, makes these contrasting patterns most evident.

Figure 8 combines persistence results from Young and Graff (1996) involving US NCREIF data, from Graff, Harrington, and Young (1999) involving Property Council of Australia (PCA) data, and the present study, all for runs of 1 year in the aggregate and by the three property types. Although time periods differ and the sample sizes produce substantially different confidence intervals, similarities among commercial property persistence results are evident from these graphs. In particular, the greater persistence in the first and fourth quartiles versus the second and third quartiles is similar across all three national data sets. Office properties have a similar cross-national pattern, although somewhat more muted in the first quartile persistence and generally more pronounced in the fourth quartile results.

US results for Retail properties and Australian results for Industrial properties are more dissimilar than for like-property results for the other countries. In particular, the US Retail property results have especially high first quartile persistence while especially low fourth quartile persistence. Australian Industrial property results are especially low for first quartile persistence and notably low for fourth quartile persistence as well. These exceptions are discussed in the prior research and need not be elaborated upon here except to say that there are or can be trends or circumstances of attention paid to particular property types, in particular, time periods that can lead to possibly atypical patterns

or performance behavior. The "fads" discussed in the next section are likely contributors to these seemingly anomalous results.

6. Possible Sources of Persistence

A number of reasons might be advanced to explain the greater persistence in the UK compared with that in the US and Australia. First, more individual property valuations in the UK may be conducted internally rather externally. In other words, the organisation produces valuations that portray the performance of the properties in the best light and tries to maintain this as long as possible, leading to serial persistence in individual property returns. A second but related argument might be that even where valuations are conducted by an external valuer, undue pressure is brought to bear to produce figures that benefit the organisation, again leading to serial persistence.

Third, even if the external valuation firms do not come under pressure to produce a favourable report, the use of comparable evidence in arriving at a valuation itself may induce serial persistence in property returns. The argument is that the comparables used to arrive at a current estimate of price are themselves based on knowledge of previous valuations from similar properties and that this tendency to recycle valuations has the effect of incorporating knowledge of previous prices in the current return, leading to serial persistence.

Grossman and Stiglitz (1976) assert that, due to the paucity of data from market prices, a thin market will display uniformity of investor beliefs about asset prices, which in the real estate context leads to fads for a particular property type or region. This uniformity of belief may itself lead to persistence in real estate returns, especially if the number of firms undertaking the external valuations is so few that the market evidence is averaged out and thereby constrains the variability in valuation (Graff and Webb, 1997).

Finally, lease term variations across property types may also account for differences in persistence. As terms lengthen, for example, property economics may take on a more bond-like character where annual valuations and the returns derived from them become synchronized with interest rates or capitalization rates, in real estate parlance. Each of these arguments is examined in turn.

6.1 Agency Effects, Internal and External

The valuations used by IPD in their UK annual index are based on valuations of the individual properties in portfolios by external rather than internal valuers. An External Valuer is defined in the RICS Red Book as "…a valuer who…has no significant financial linkages with the client either as a director or employee," (Royal Institution of Chartered Surveyors, 2003: G1). External Valuers, therefore, should produce valuations that are more impartial and which do not put the organisation in

the most favourable light. This would imply that the first argument cannot account for the greater serial persistence observed in UK property returns.

The Carsberg Report (Royal Institution of Chartered Surveyors, 2002), though, notes that the fee-earning relationship that exists between the valuer and client may threaten an External Valuer's objectivity. It states that "close personal relationships…could lead to insufficient questioning of factors affecting the valuation" (p.21) and "in any relationship involving payment of a fee, particularly where repeat business is possible, the objectivity and independence of the service provider may be at risk." (p.22).

In particular, a study by Baum et al (2000) on the valuation process in the UK raised concerns about what are known as 'draft valuation meetings' at which the valuer produces preliminary figures for discussion with the client prior to producing the final valuation. Such meetings could provide the client with an opportunity to influence the outcome of the valuations to the benefit of the organisation. Baum et al (2000: 40) reported that client influence "…does occur and valuations can be influenced by clients." However, they noted that such influence is short-lived and could be counter productive. Indeed, they found that any short-term pressure to push valuations upward was not evident over the long term "as valuations would be forced to recover the position over future periods" Baum et al (2000: 6).

It would seem, therefore, that any influence on external valuers is unlikely to account for the greater persistence found in annual returns to real estate in the UK compared with the US and Australia, despite the issues noted above, especially for runs of greater than 1 year or perhaps 2 years.

6.2 Anchoring

The argument that the valuation procedures used to derive price can account for the large amount of persistence in real estate returns is often discussed. Valuers in the UK typically use comparable evidence to estimate price (Crosby, 1990). Quan and Quigley (1989, 1991) argue that if valuers use comparable evidence to derive price, the optimum strategy is to use a weighted average of the previous value and the most recent market evidence, although the authors supply no empirical evidence to support the conjecture. The smooth nature of real estate returns, therefore, arises from the relative uncertainly of the variability of movements in the market in general and that of the property being valued (Brown and Matysiak, 2000). In addition, since 1990, there has been a significant increase in the incidence of valuers being sued for negligence (Crosby et al, 1998), the only defence to which is that the valuer followed 'correct' procedures and hierarchies of evidence in arriving at their valuation. The greater the uncertainly in current market sentiment, the less likely it is to be used, all of which leads valuers to see the previous valuation as the only hard evidence. Consequently, it is rational for valuers to put more weight on knowledge of the previous valuation

and less weight on more nebulous current market sentiment that cannot be proved, Quan and Quigley (1989, 1991).

Diaz (1990a, 1990b, and 1997) and Diaz and Wolverton (1998) have shown that valuers inadequately adjust from their previous appraisal in performing current valuations, a process known as 'anchoring.' Thus, the estimate of the current price of the property is biased towards the initial starting figure of the previous valuation and so will give rise to serial persistence in returns. However, there is no evidence to suggest that valuers in the UK anchor more to previous valuations than their counterparts in the US or Australia. In other words, anchoring alone is unlikely to account for the greater persistence in real estate returns in the UK relative to that in the US and Australia.

Even if anchoring is found to be an important source of persistence, there are relatively simple and inexpensive solutions that managers could take to alleviate the problem. In particular, Graff and Young (1999) recommend switching or rotating valuers on a more frequent basis.

6.3 Number and Dispersion of Independent Valuers

When using current market evidence within the valuation process, a noticeable difference can be seen between the US and UK. In the US market, Graff and Webb (1997) observe that knowledge is locally-based and under the control of a small handful of local firms. Thus, the market sentiment of one locality is likely to be ironed out among this small number of firms leading to a uniformity of belief as to the prospects for properties in that locality. This has the effect of clients with property in that area updating their portfolios based on the same market data that constrains variation in values, leading to persistence in returns. In particular, this may explain why the properties in the fourth quartile show greatest level of persistence, as it may be these properties that require the strongest amount of market evidence to shift the valuer away from the previous valuation.

Institutions may develop fads for certain property types and locations, a process that will continue for a long time until the evidence is so overwhelming that the particular property type or location loses its charm. In other words, the persistence in real estate returns can be explained by the faddish behavior on the part of investors and the control of market data in the hands of only a few firms. However, these phenomena will be limited across the US because appraisal firms in the US are more disperse than in the UK. Thus, although there may be a "house view" of certain property types and regions by firms, this is likely to be limited to that individual firm. Any uniformity of belief about a particular region is therefore unlikely to permeate across all investor portfolios with property in that region, thereby reducing the amount of cross serial correlation in returns across the US and mitigating the level of serial persistence in real estate returns.

In contrast, in the UK, the number of firms undertaking the majority of external valuations is very small and they are national in size. For instance, the Carsberg Report (Royal Institution of Chartered Surveyors, 2002: 14) observed that, as of December 2000, 64.7% by capital value of the properties in the IPD Annual Index were valued by five firms, and 37.7% by three firms. For the

smaller IPD Monthly Index, the corresponding figures (as of November 2001) were 79.6% by the top five valuation firms and 62.4% by the top three firms. Anecdotal evidence also suggests that the top firms meet informally on a regular basis to 'pool' their market knowledge. Thus, the 'house view' of one firm, which itself is a distillation of market sentiment from its own valuers for each property type and region, could be further refined across all valuation firms, leading to a uniform market view displaying little variation.

Thus, when undertaking an external valuation for one client, the valuation firm not only incorporates knowledge of the previous valuation of the individual property, but it will also use the market view for all properties of a similar type from across the UK. Such a process is likely to lead to serial persistence in the returns of individual properties for one client and induce cross serial correlation in similar properties for all clients, inadvertently leading to even greater persistence across individual properties in the UK compared with the US. However, the extent to which this explains the greater serial persistence found in UK properties is not known and deserving of future research.

6.4 Lease Terms

Lease term variations across property types may also account for differences in persistence. As terms lengthen, for example, property economics may take on a more bond-like character where annual valuations and the returns derived from them become synchronized with capitalization rates.

Although the data shown in Figure 9 should be viewed as preliminary, unrefined and perhaps incomplete, they are nonetheless indicative of the differences in lease terms by property type between the UK and the US. For example, taking the simple averages of the lease terms by property type in Panel A, the IPD data, and contrasting them with the 2000 to 2004 averages in Panel B, the RREEF data, it can be seen that the UK (IPD) average Office lease terms are about 7.9 years versus the US (RREEF) average Office lease terms of about 4.6 years. Similarly, UK average Retail lease terms are about 11.1 years versus a US average of about 5.7 years, and the UK average Industrial lease terms are about 7.9 years versus a US average of about 3.4 years.

If these relative differences in average lease terms are found to be valid, then it is reasonable to believe that considerably more of the total value estimate of UK properties is comprised of current rather than future leases compared to the composition of the total value estimate of US properties. Because there is less uniformity of opinion about future market rents, this difference may account for the greater observed persistence of UK properties relative to US properties across the board.

7. Conclusions

This study has examined persistence in relative investment return performance for UK institutional-grade commercial property during the twenty-two-year interval 1981 through 2002. Annual returns

data was also divided into three property type subgroups: Office, Retail, and Industrial, and by three regions; London, the South East, and the Rest of the UK.

The empirical persistence results in this study demonstrate that total returns from properties within the IPD database between 1981 and 2002 exhibit serial dependence across all four quartiles of relative returns for all properties aggregated, as well as across each of the three property types and regions. These results contrast markedly from results of similar studies of institutional-grade commercial property returns in the US and Australia, where persistence tended to be statistically significant in the extreme first and fourth quartiles, but statistically independent in the moderate second and third quartiles.

While the statistical differences among UK, US, and Australian property return quartiles exist, the UK pattern of generally more persistence in the extreme quartiles than in the middle quartiles is qualitatively similar to both the US and Australia. This leads to suspicion that the general commercial real estate risk profile among the three countries is of the same general character and that the differences, notably evident in the middle quartiles, result from agency or behavioral aspects of the management of the real estate investment management business.[2]

These conclusions are at odds with the prevailing finance theory-based assumption about real estate risk, and appear to call into question current beliefs about statistically-derived risk proxies and Modern Portfolio Theory-based portfolio construction applications for real estate. In particular, if MPT or the Efficient Markets Hypothesis are appropriate models for equity real estate, these findings of performance persistence in extreme returns and qualitative differences in performance persistence across property types and geographical regions or countries should not be observed. In general, the results of this and prior similar studies leads to the conclusion that research based upon models that presume serial independence within real estate returns are unlikely to be reliable or suitable for real estate investors.

That persistence in extreme or moderate quartiles is qualitatively different depending upon property type, location, or time period argues strongly against the existence of linear multifactor market models of UK commercial real estate. Unless researchers can demonstrate the existence of a class of linear multifactor models based on financial and real economic input variables that generate

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[2] Institutional-grade commercial real estate return distributions are remarkably similar across the UK, US, and Australian markets. In all these countries, cross-sectional annual returns were found to be distinctly non-normal. Real estate investment risk is heteroscedastic, but the Characteristic Exponent "alpha" of the investment risk function is nearly constant across time although differences among property types are evident. In particular, the Characteristic Exponent, which for Gaussian normal distributions has a value of 2.000, has been estimated to be 1.448 (0.004 standard error) in the UK, 1.434 (0.011 standard error) in the US, and 1.477 (0.038 standard error) in Australia. See Young and Graff (1995); Young (2005); Graff, Harrington, and Young (1997); and Young, Lee, and Devaney (2005) for empirical support and analysis far to lengthy to consider here.

persistence in the variety of ways as this study has shown, we must conclude that linear multifactor models are as inapplicable in the case of UK commercial real estate as they are in the US and Australia.

To identify the economic forces and mechanisms that produce the results observed in this study, agency-related concepts and behavioral finance models should provide fertile fields for future research. Additionally, extensions of this research and a better understanding of the forces that give rise to the patterns observed may likely lead to rewarding operational prescriptions such as programs of systematically identifying and culling underperforming assets from portfolios in order to improve overall portfolio performance.

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Figure 1
Number of Return Observations by Year, Property Type, and Region in the IPD Database for Properties with at Least Two Observations, 1981 to 2002

Year	All	Retail	Office	Industrial	London	SooothEast	RestofUK
1981	8,990	4,572	2,746	1,672	2,930	2,247	3,813
1982	9,953	4,993	3,047	1,913	3,199	2,531	4,223
1983	9,958	4,909	3,102	1,947	3,119	2,581	4,258
1984	10,173	5,036	3,167	1,970	3,087	2,697	4,389
1985	10,307	5,168	3,221	1,918	3,029	2,811	4,467
1986	10,529	5,337	3,303	1,889	2,990	2,980	4,559
1987	10,130	5,319	3,117	1,694	2,794	2,901	4,435
1988	9,837	5,339	2,949	1,549	2,661	2,952	4,224
1989	9,967	5,465	2,971	1,531	2,643	3,106	4,218
1990	10,328	5,591	3,108	1,629	2,641	3,286	4,401
1991	10,652	5,680	3,268	1,704	2,627	3,482	4,543
1992	10,955	5,777	3,318	1,860	2,641	3,640	4,674
1993	10,623	5,578	3,218	1,827	2,539	3,513	4,571
1994	10,383	5,503	3,099	1,781	2,469	3,353	4,561
1995	11,393	6,093	3,337	1,963	2,515	3,697	5,181
1996	10,960	5,938	3,148	1,874	2,363	3,537	5,060
1997	10,100	5,539	2,796	1,765	2,175	3,190	4,735
1998	9,905	5,459	2,618	1,828	2,135	3,067	4,703
1999	9,163	4,996	2,407	1,760	2,077	2,771	4,315
2000	8,421	4,523	2,197	1,701	1,937	2,540	3,944
2001	7,546	3,665	2,107	1,774	1,771	2,329	3,446
2002	6,485	3,047	1,839	1,599	1,589	1,998	2,898
Totals	216,758	113,527	64,083	39,148	55,931	65,209	95,618

Figure 2
Annual Return Persistence, 1981 to 2002

Panel A: **All Properties**

Length of Run	No. of Samples	No. of Successes	% of Successes	95% Conf. Interval	Length of Run	No. of Samples	No. of Successes	% of Successes	95% Conf. Interval
1st Quartile:					2nd Quartile:				
1	46,871	16,118	34.4 ***	(24.6,25.4)	1	47,388	13,619	28.7 ***	(24.6,25.4)
2	13,795	5,430	39.4 ***	(24.3,25.7)	2	11,764	3,617	30.7 ***	(24.2,25.8)
3	4,698	1,974	42.0 ***	(23.8,26.2)	3	3,139	980	31.2 ***	(23.5,26.5)
4	1,717	713	41.5 ***	(23.0,27.1)	4	864	261	30.2 *	(22.2,27.9)
4th Quartile:					3rd Quartile:				
1	45,261	16,819	37.2 ***	(24.6,25.4)	1	47,238	13,222	28.0 ***	(24.6,25.4)
2	13,371	5,359	40.1 ***	(24.3,25.7)	2	11,302	3,296	29.2 ***	(24.2,25.8)
3	4,199	1,682	40.1 ***	(23.7,26.3)	3	2,835	854	30.1 ***	(23.4,26.6)
4	1,258	500	39.7 ***	(22.6,27.4)	4	717	224	31.2 *	(21.9,28.2)
1st & 4th Combined Quartiles:					2nd & 3rd Combined Quartiles:				
1	92,132	32,937	35.7 ***	(24.7,25.3)	1	94,626	26,841	28.4 ***	(24.7,25.3)
2	27,166	10,789	39.7 ***	(24.5,25.5)	2	23,066	6,913	30.0 ***	(24.4,25.6)
3	8,897	3,656	41.1 ***	(24.1,25.8)	3	5,974	1,834	30.7 ***	(23.9,26.1)
4	2,975	1,213	40.8 ***	(23.5,26.6)	4	1,581	485	30.7 **	(22.9,27.2)

Panel B: **Office Properties**

Length of Run	No. of Samples	No. of Successes	% of Successes	95% Conf. Interval	Length of Run	No. of Samples	No. of Successes	% of Successes	95% Conf. Interval
1st Quartile:					2nd Quartile:				
1	12,907	4,307	33.4 ***	(24.3,25.8)	1	13,198	3,643	27.6 ***	(24.3,25.7)
2	3,648	1,364	37.4 ***	(23.6,26.4)	2	3,162	915	28.9 **	(23.5,26.5)
3	1,156	473	40.9 ***	(22.5,27.5)	3	792	244	30.8 *	(22.0,28.1)
4	408	172	42.2 ***	(20.9,29.3)	4	214	56	26.2	(19.4,31.0)
4th Quartile:					3rd Quartile:				
1	15,146	6,342	41.9 ***	(24.3,25.7)	1	13,909	3,886	27.9 ***	(24.3,25.7)
2	5,089	2,232	43.9 ***	(23.8,26.2)	2	3,350	1,003	29.9 ***	(23.5,26.5)
3	1,788	759	42.9 ***	(23.0,27.0)	3	869	253	29.1 *	(22.2,27.9)
4	579	244	42.1 ***	(21.6,28.6)	4	214	63	29.4	(19.4,31.0)
1st & 4th Combined Quartiles:					2nd & 3rd Combined Quartiles:				
1	28,053	10,649	38.0 ***	(24.5,25.5)	1	27,107	7,529	27.8 ***	(24.5,25.5)
2	8,737	3,596	41.2 ***	(24.1,25.9)	2	6,512	1,918	29.5 ***	(24.0,26.1)
3	2,944	1,232	41.8 ***	(23.5,26.6)	3	1,661	497	29.9 **	(22.9,27.1)
4	987	416	42.1 ***	(22.3,27.8)	4	428	117	27.8	(21.0,29.2)

Figure 2 (continued)
Annual Return Persistence, 1981 to 2002

Panel C: **Retail Properties**

Length of Run	No. of Samples	No. of Successes	% of Successes	95% Conf. Interval	Length of Run	No. of Samples	No. of Successes	% of Successes	95% Conf. Interval
1st Quartile:					2nd Quartile:				
1	24,828	8,359	33.7 ***	(24.5,25.5)	1	24,754	6,972	28.2 ***	(24.5,25.5)
2	7,216	2,826	39.2 ***	(24.0,26.0)	2	6,122	1,879	30.7 ***	(23.9,26.1)
3	2,493	1,058	42.4 ***	(23.3,26.7)	3	1,676	512	30.5 **	(23.0,27.1)
4	929	386	41.6 ***	(22.3,27.8)	4	461	192	28.9	(21.2,29.1)
4th Quartile:					3rd Quartile:				
1	23,172	8,016	34.6 ***	(24.4,25.6)	1	25,496	7,224	28.3 ***	(24.5,25.5)
2	6,237	2,301	36.9 ***	(23.9,26.0)	2	6,206	1,815	29.2 ***	(23.9,26.1)
3	1,733	660	38.1 **	(23.0,27.1)	3	1,559	487	31.2 ***	(22.9,27.2)
4	472	192	40.7 ***	(21.2,29.0)	4	411	135	32.8 *	(20.9,29.3)
1st & 4th Combined Quartiles:					2nd & 3rd Combined Quartiles:				
1	48,000	16,375	34.1 ***	(24.6,25.4)	1	50,250	14,196	28.3 ***	(24.6,25.4)
2	13,453	5,127	38.1 ***	(24.3,25.7)	2	12,328	3,694	30.0 ***	(24.2,25.8)
3	4,226	1,718	40.7 ***	(23.8,26.3)	3	3,235	999	30.90 ***	(23.5,26.5)
4	1,401	578	41.3 ***	(22.8,27.3)	4	872	268	30.7 *	(22.2,27.9)

Panel D: **Industrial Properties**

Length of Run	No. of Samples	No. of Successes	% of Successes	95% Conf. Interval	Length of Run	No. of Samples	No. of Successes	% of Successes	95% Conf. Interval
1st Quartile:					2nd Quartile:				
1	9,136	3,452	37.8 ***	(24.1,25.9)	1	9,436	3,004	31.8 ***	(24.1,25.9)
2	2,931	1,240	42.3 ***	(23.4,26.6)	2	2,480	823	33.2 ***	(23.3,26.7)
3	1,049	443	42.2 ***	(22.4,27.7)	3	671	224	33.4 **	(21.8,28.4)
4	380	155	40.8 ***	(20.8,29.5)	4	189	72	38.1 **	(19.1,31.4)
4th Quartile:					3rd Quartile:				
1	6,943	2,461	35.4 ***	(24.0,26.0)	1	7,833	2,112	27.0 **	(24.0,26.0)
2	2,045	826	40.4 ***	(23.1,26.9)	2	1,746	478	27.4 *	(23.0,27.1)
3	678	263	38.8 ***	(21.8,28.3)	3	407	114	28.0	(20.9,29.3)
4	207	64	30.9	(19.3,31.1)	4	92	26	28.3	(16.7,34.4)
1st & 4th Combined Quartiles:					2nd & 3rd Combined Quartiles:				
1	16,079	5,913	36.8 ***	(24.3,25.7)	1	17,269	5,116	29.6 ***	(24.4,25.6)
2	4,976	2,066	41.5 ***	(23.8,26.2)	2	4,226	1,301	30.8 ***	(23.7,26.3)
3	1,727	706	40.9 ***	(23.0,27.1)	3	1,078	338	31.4 **	(22.5,27.6)
4	587	219	37.3 ***	(21.6,28.6)	4	281	98	34.9 *	(20.1,30.2)

Figure 2 (continued)
Annual Return Persistence, 1981 to 2002

Panel E: **London**

Length of Run	No. of Samples	No. of Successes	% of Successes	95% Conf. Interval	Length of Run	No. of Samples	No. of Successes	% of Successes	95% Conf. Interval
1st Quartile:					2nd Quartile:				
1	13,426	5,097	38.0 ***	(24.3,25.7)	1	11,825	3,341	28.3 ***	(24.5,25.5)
2	4,342	1,811	41.7 ***	(23.7,26.3)	2	2,913	869	29.8 ***	(23.4,26.6)
3	1,541	681	44.2 ***	(22.9,27.2)	3	760	233	30.7 *	(22.0,28.1)
4	588	259	44.0 ***	(21.6,28.6)	4	209	61	29.2	(19.4,31.1)
4th Quartile:					3rd Quartile:				
1	11,788	4,620	39.2 ***	(24.2,25.8)	1	11,273	2,995	26.6 *	(24.2,25.8)
2	3,778	1,589	42.1 ***	(23.6,26.4)	2	2,607	744	28.5 **	(23.4,26.7)
3	1,281	528	41.2 ***	(22.7,27.4)	3	655	215	32.8 **	(21.8,28.4)
4	401	154	38.4 ***	(20.9,29.4)	4	183	56	30.6	(19.0,31.5)
1st & 4th Combined Quartiles:					2nd & 3rd Combined Quartiles:				
1	25,214	9,717	38.5 ***	(24.5,25.5)	1	23,098	6,336	27.4 ***	(24.4,25.6)
2	8,120	3,400	41.9 ***	(24.1,25.9)	2	5,520	1,613	29.2 ***	(23.9,26.2)
3	2,822	1,209	42.8 ***	(23.4,26.6)	3	1,415	448	31.7 ***	(22.8,27.3)
4	989	413	41.8 ***	(22.4,27.7)	4	392	117	29.8 *	(20.8,29.4)

Panel F: **South East**

Length of Run	No. of Samples	No. of Successes	% of Successes	95% Conf. Interval	Length of Run	No. of Samples	No. of Successes	% of Successes	95% Conf. Interval
1st Quartile:					2nd Quartile:				
1	12,847	3,998	31.1 ***	(24.3,25.8)	1	14,517	4,138	28.5 ***	(24.3,25.7)
2	3,395	1,268	37.3 ***	(23.6,26.5)	2	3,590	1,097	30.6 ***	(23.6,26.4)
3	1,088	433	39.8 ***	(22.5,27.6)	3	951	292	30.7 **	(22.3,27.8)
4	376	144	38.3 ***	(20.8,29.5)	4	254	82	32.3 *	(19.9,30.5)
4th Quartile:					3rd Quartile:				
1	13,945	5,130	36.8 ***	(24.3,25.7)	1	14,887	4,285	28.8 ***	(24.3,25.7)
2	4,041	1,550	38.4 ***	(23.7,26.3)	2	3,633	1,082	29.8 ***	(23.6,26.4)
3	1,220	454	37.2 ***	(22.6,27.5)	3	925	267	28.9 **	(22.3,27.8)
4	338	129	38.2 ***	(20.5,29.8)	4	219	66	30.1	(19.5,31.0)
1st & 4th Combined Quartiles:					2nd & 3rd Combined Quartiles:				
1	26,792	9,128	34.1 ***	(24.5,25.5)	1	29,404	8,423	28.6 ***	(24.5,25.5)
2	7,436	2,818	37.9 ***	(24.0,26.0)	2	7,223	2,179	30.2 ***	(24.0,26.0)
3	2,308	887	38.4 ***	(23.3,26.8)	3	1,876	559	29.8 **	(23.1,27.0)
4	714	273	38.2 ***	(21.9,28.2)	4	473	148	31.3 *	(21.2,29.0)

Figure 2 (continued)
Annual Return Persistence, 1981 to 2002

Panel G: **Rest of United Kingdom**

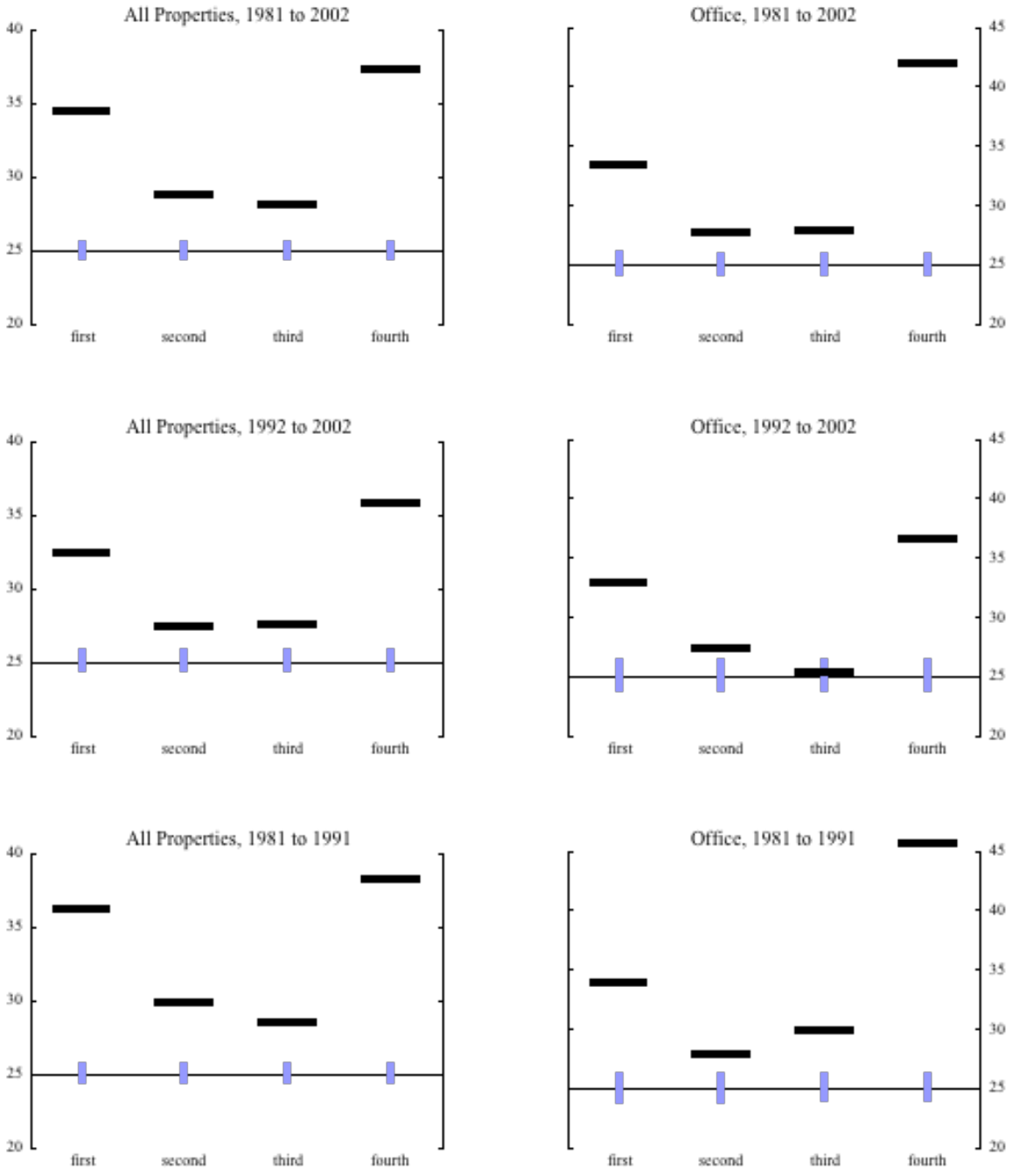
Length of Run	No. of Samples	No. of Successes	% of Successes	95% Conf. Interval	Length of Run	No. of Samples	No. of Successes	% of Successes	95% Conf. Interval
1st Quartile:					2nd Quartile:				
1	20,598	7,023	34.1 ***	(24.4,25.6)	1	21,046	6,140	29.2 ***	(24.4,25.6)
2	6,058	2,351	38.8 ***	(23.9,26.1)	2	5,261	1,651	31.4 ***	(23.8,26.2)
3	2,069	860	41.6 ***	(23.2,26.9)	3	1,428	455	31.9 ***	(22.8,27.3)
4	753	310	41.2 ***	(22.0,28.2)	4	401	118	29.4 *	(20.9,29.4)
4th Quartile:					3rd Quartile:				
1	19,528	7,069	36.2 ***	(24.4,25.6)	1	21,078	5,942	28.2 ***	(24.4,25.6)
2	5,552	2,220	40.0 ***	(23.9,26.1)	2	5,062	1,470	29.0 ***	(23.8,26.2)
3	1,698	700	41.2 ***	(23.0,27.1)	3	1,255	372	29.6 *	(22.6,27.4)
4	519	217	41.8 ***	(21.4,28.8)	4	315	102	32.4 *	(20.4,29.9)
1st & 4th Combined Quartiles:					2nd & 3rd Combined Quartiles:				
1	40,126	14,092	35.1 ***	(24.6,25.4)	1	42,124	12,082	28.7 ***	(24.6,25.4)
2	11,610	4,571	39.4 ***	(24.2,25.8)	2	10,323	3,121	30.2 ***	(24.2,25.8)
3	3,767	1,560	41.4 ***	(23.6,26.4)	3	2,683	827	30.8 ***	(23.4,26.7)
4	1,272	527	41.4 ***	(22.7,27.4)	4	716	220	30.7 *	(21.9,28.2)

* Null hypothesis rejected at the 5% level of significance
* * Null hypothesis rejected at the 0.01% level of significance
* * * Null hypothesis rejected at the 0.00001% level of significance

Figure 3

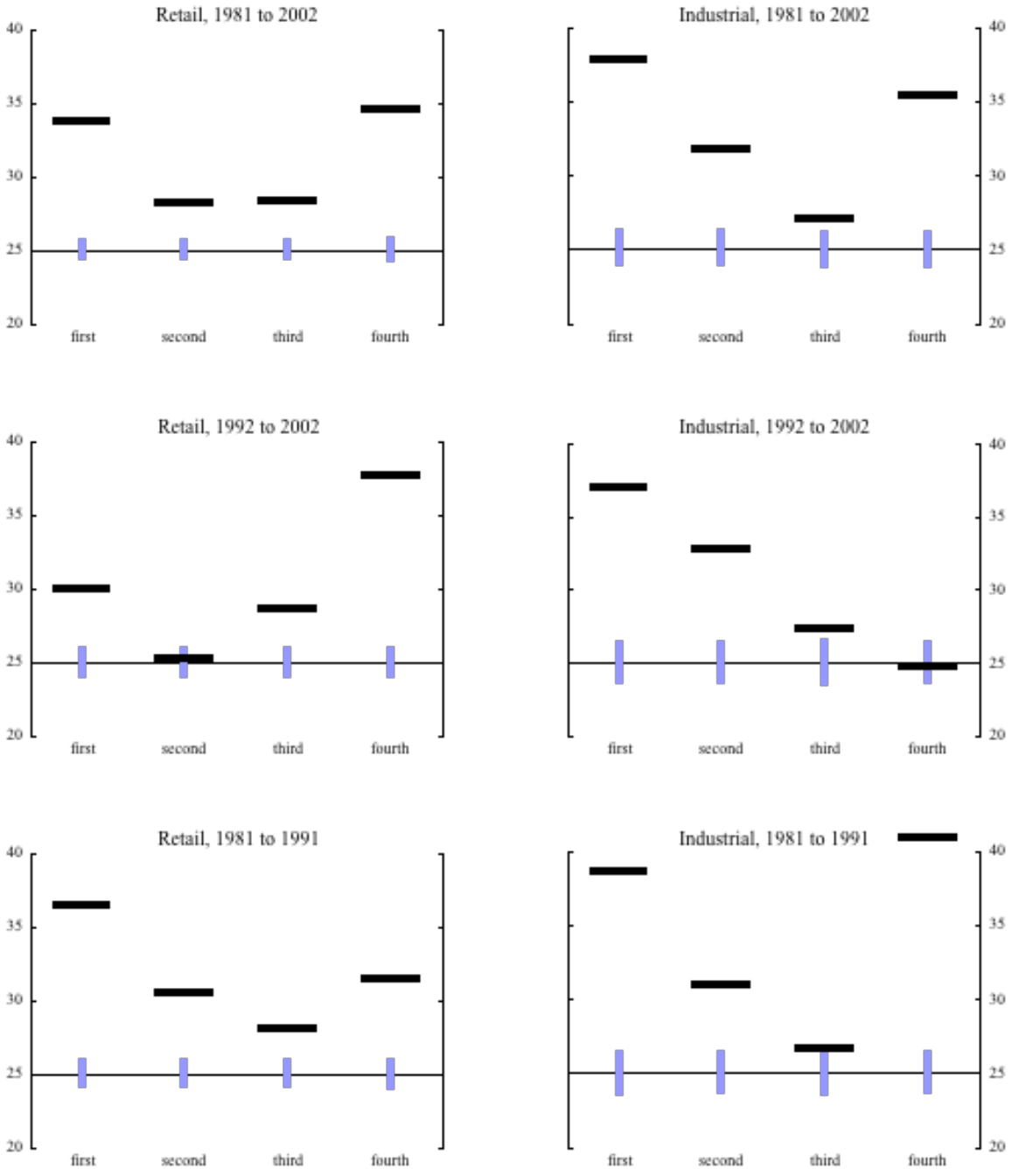
Quartile Performance Persistence in the IPD Database

All Properties & Office Properties



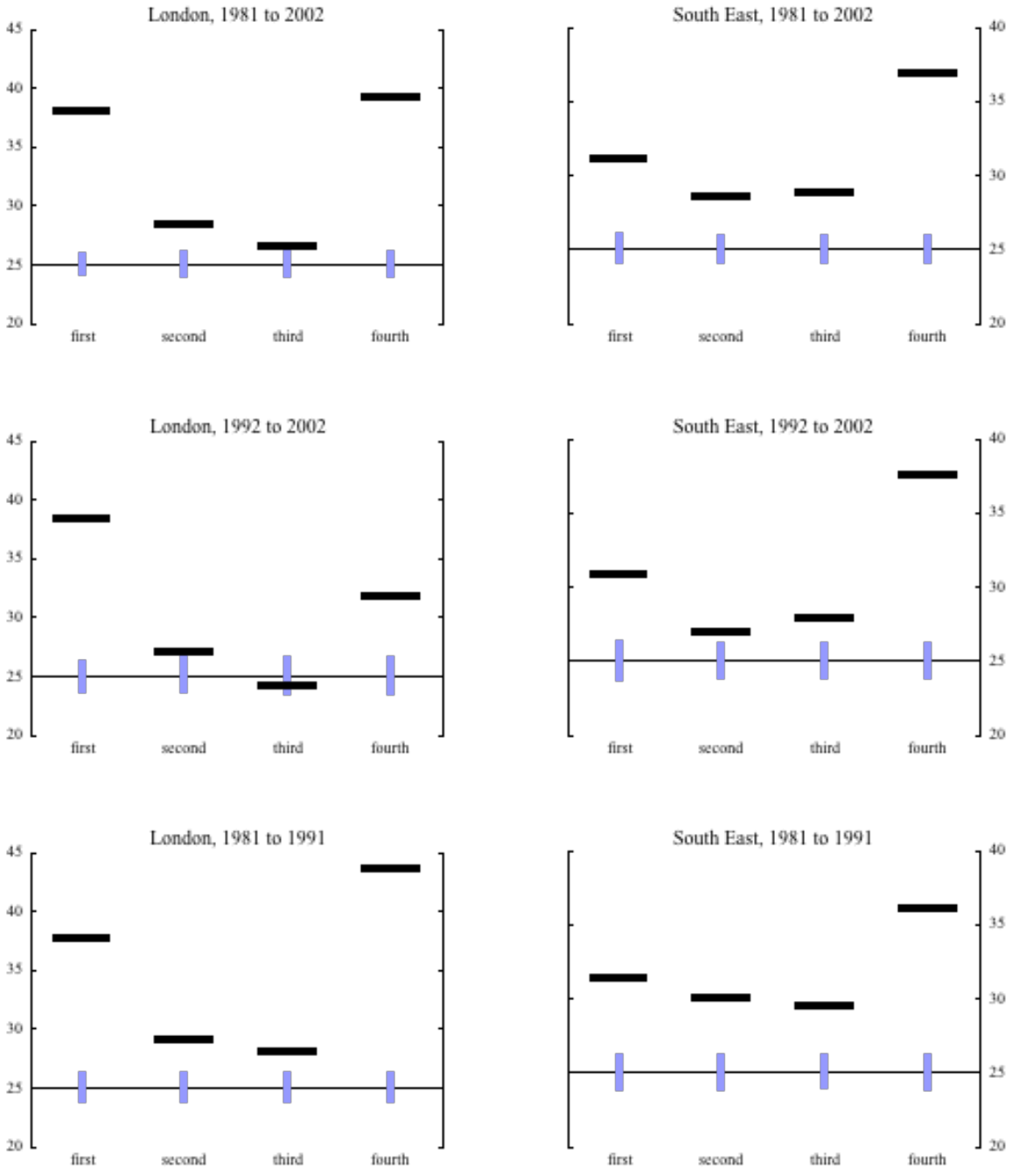
Note: Vertical bars represent the 95% confidence intervals while horizontal bars represent the persistence results.

Figure 3 (continued)
Quartile Performance Persistence in the IPD Database
Retail and Industrial Properties



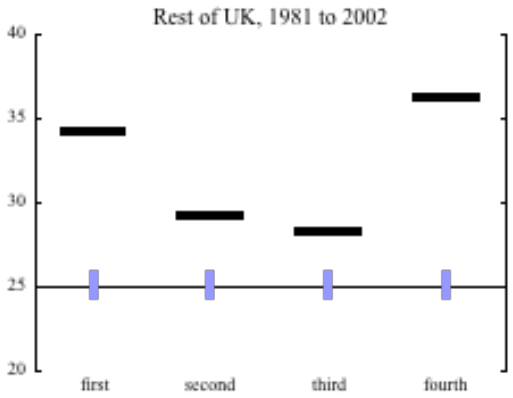
Note: Vertical bars represent the 95% confidence intervals while horizontal bars represent the persistence results.

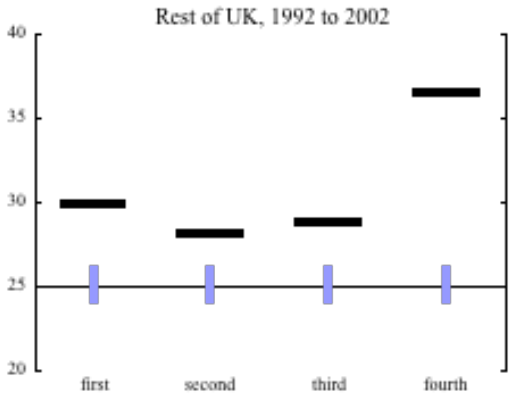
Figure 3 (continued)
Quartile Performance Persistence in the IPD Database
London and South East

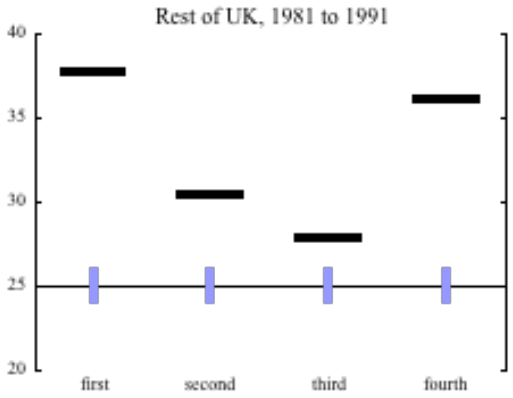


Note: Vertical bars represent the 95% confidence intervals while horizontal bars represent the persistence results.

Figure 3 (continued)
Quartile Performance Persistence in the IPD Database
Rest of United Kingdom







Note: Vertical bars represent the 95% confidence intervals while horizontal bars represent the persistence results.

Figure 4
Annual Return Persistence for Various Holding Periods

Panel A: **2- to 5-year Holding Period**

Length of Run	No. of Samples	No. of Successes	% of Successes	95% Conf. Interval	Length of Run	No. of Samples	No. of Successes	% of Successes	95% Conf. Interval
1st Quartile:					2nd Quartile:				
1	3,865	1,158	30.0 ***	(23.6,26.4)	1	4,450	1,190	26.7 *	(23.7,26.3)
2	642	217	33.8 **	(21.7,28.4)	2	707	192	27.2	(21.9,28.3)
3	88	31	35.2 *	(16.5,34.6)	3	88	24	27.3	(16.5,34.6)
4	11	4	36.4	(4.0,55.1)	4	11	2	18.2	(4.0,55.1)
4th Quartile:					3rd Quartile:				
1	4,804	2,041	42.5 ***	(23.8,26.2)	1	4,755	1,437	30.2 ***	(23.8,26.2)
2	1,068	483	45.2 ***	(22.4,27.6)	2	833	251	30.1 *	(22.1,28.0)
3	211	81	38.4 **	(19.4,31.1)	3	127	50	39.4 *	(17.9,32.9)
4	28	10	35.7	(10.7,42.8)	4	24	9	37.5	(9.8,44.4)
1st & 4th Combined Quartiles:					2nd & 3rd Combined Quartiles:				
1	8,669	3,399	36.9 ***	(24.1,25.9)	1	9,205	2,627	28.5 ***	(24.1,25.9)
2	1,710	700	40.9 ***	(23.0,27.1)	2	1,540	443	28.8 *	(22.9,27.2)
3	299	112	37.5 **	(20.3,30.1)	3	215	74	34.4 *	(19.4,31.0)
4	39	14	35.9	(12.7,39.9)	4	35	11	31.4	(12.1,40.8)

Panel B: **6- to 10-year Holding Period**

Length of Run	No. of Samples	No. of Successes	% of Successes	95% Conf. Interval	Length of Run	No. of Samples	No. of Successes	% of Successes	95% Conf. Interval
1st Quartile:					2nd Quartile:				
1	7,109	2,137	30.1 ***	(24.0,26.0)	1	8,164	2,325	28.5 ***	(24.1,25.9)
2	1,819	650	35.7 ***	(23.0,27.0)	2	2,048	637	31.1 ***	(23.1,26.9)
3	530	206	38.9 ***	(21.4,28.8)	3	560	166	29.6 *	(21.5,28.7)
4	163	67	41.1 **	(18.7,32.0)	4	142	37	26.1	(18.2,32.5)
4th Quartile:					3rd Quartile:				
1	8,154	3,145	38.6 ***	(24.1,25.9)	1	8,694	2,515	28.9 ***	(24.1,25.9)
2	2,527	1,057	41.8 ***	(23.3,26.7)	2	2,199	666	30.3 ***	(23.2,26.8)
3	811	356	43.9 ***	(22.1,28.0)	3	573	172	30.0 *	(21.5,28.6)
4	244	109	44.7 ***	(19.8,30.6)	4	138	45	32.6 *	(18.1,32.6)
1st & 4th Combined Quartiles:					2nd & 3rd Combined Quartiles:				
1	15,263	5,282	34.6 ***	(24.3,25.7)	1	16,858	4,840	28.7 ***	(24.3,25.7)
2	4,346	1,707	39.3 ***	(23.7,26.3)	2	4,247	1,303	30.7 ***	(23.7,26.3)
3	1,341	562	41.9 ***	(22.7,27.4)	3	1,133	338	29.8 *	(22.5,27.6)
4	407	176	43.2 ***	(20.9,29.3)	4	280	82	29.3	(20.1,30.3)

Figure 4 (continued)
Annual Return Persistence for Various Holding Periods

Panel C: **11-- to 15-year Holding Period**

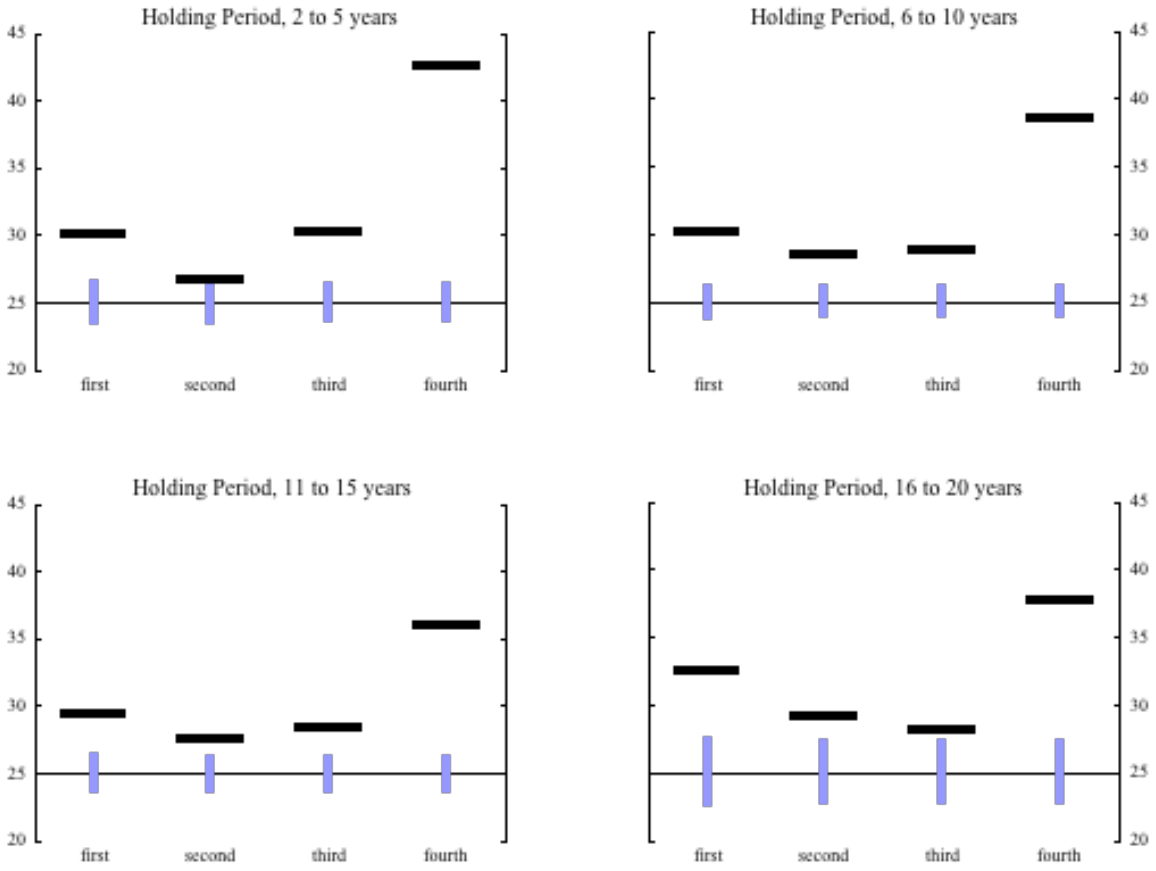
Length of Run	No. of Samples	No. of Successes	% of Successes	95% Conf. Interval	Length of Run	No. of Samples	No. of Successes	% of Successes	95% Conf. Interval
1st Quartile:					2nd Quartile:				
1	5,032	1,477	29.4 ***	(23.8,26.2)	1	5,656	1,562	27.6 **	(23.9,26.1)
2	1,333	461	34.6 ***	(22.8,27.2)	2	1,453	398	27.4 *	(22.8,27.3)
3	411	158	38.4 ***	(21.2,29.1)	3	363	95	26.2	(20.7,29.6)
4	140	46	32.9 *	(18.6,32.1)	4	88	23	26.1	(16.5,34.6)
4th Quartile:					3rd Quartile:				
1	5,885	2,117	36.0 ***	(23.9,26.1)	1	6,147	1738	28.3 ***	(23.9,26.1)
2	1,846	665	36.0 ***	(23.2,26.9)	2	1,619	482	29.8 **	(22.9,27.1)
3	544	183	33.6 **	(21.8,28.4)	3	443	142	32.1 *	(21.1,29.1)
4	138	50	36.2 *	(19.0,31.5)	4	126	44	34.9 *	(17.8,33.0)
1st & 4th Combined Quartiles:					2nd & 3rd Combined Quartiles:				
1	10,917	3,594	32.9 ***	(24.2,25.8)	1	11,803	3,300	28.0 ***	(24.2,25.8)
2	3,179	1,126	35.4 ***	(23.6,26.4)	2	3,072	880	28.6 **	(23.5,26.5)
3	544	341	35.7 ***	(22.5,27.6)	3	806	237	29.4 *	(22.1,28.1)
4	138	96	34.5 *	(20.6,29.7)	4	214	67	31.3 *	(19.4,31.0)

Panel D: 1**6- to 20-year Holding Period**

Length of Run	No. of Samples	No. of Successes	% of Successes	95% Conf. Interval	Length of Run	No. of Samples	No. of Successes	% of Successes	95% Conf. Interval
1st Quartile:					2nd Quartile:				
1	1,401	455	32.5 ***	(22.8,27.3)	1	1,540	449	29.2 *	(22.9,27.2)
2	417	150	36.0 **	(21.0,29.3)	2	420	126	30.0 *	(21.0,29.3)
3	135	54	40.0 **	(18.1,32.7)	3	118	37	31.4	(17.6,33.2)
4	46	17	37.0	(13.6,38.6)	4	35	12	34.3	(12.1,40.8)
4th Quartile:					3rd Quartile:				
1	1,598	603	37.7 ***	(22.9,27.2)	1	1,679	474	28.2 *	(23.0,27.1)
2	552	221	40.0 ***	(21.5,28.7)	2	447	122	27.3	(21.1,29.1)
3	196	74	37.8 **	(19.2,31.3)	3	117	25	21.4	(17.6,33.3)
4	65	22	33.8	(15.2,36.3)	4	24	4	16.7	(9.8,44.4)
1st & 4th Combined Quartiles:					2nd & 3rd Combined Quartiles:				
1	2,999	1,058	35.3 ***	(23.5,26.6)	1	3,219	923	28.7 **	(23.5,26.5)
2	969	371	38.3 ***	(22.3,27.8)	2	867	248	28.6 *	(22.2,27.9)
3	331	128	38.7 ***	(20.5,29.8)	3	235	62	26.4	(19.7,30.7)
4	111	39	35.1 *	(17.4,33.5)	4	59	16	27.1	(14.8,36.9)

* Null hypothesis rejected at the 5% level of significance
* * Null hypothesis rejected at the 0.01% level of significance
* * * Null hypothesis rejected at the 0.00001% level of significance

Figure 5
Quartile Performance Persistence in the IPD Database
Various Holding Periods from 2 to 20 years



Note: Vertical bars represent the 95% confidence intervals while horizontal bars represent the persistence results.

Figure 6
Annual Return Persistence in Up and Down Markets

Panel A: **All Properties in Up Markets**
1986 to 1989 and 1996 to 2002

Length of Run	No. of Samples	No. of Successes	% of Successes	95% Conf. Interval	Length of Run	No. of Samples	No. of Successes	% of Successes	95% Conf. Interval
1st Quartile:					2nd Quartile:				
1	20,701	7,108	34.3 ***	(24.4,25.6)	1	20,911	5,690	27.2 ***	(23.9,26.1)
2	4,911	1,760	35.8 ***	(24.0,26.0)	2	3,910	1,140	29.2 ***	(23.7,26.4)
3	1,181	462	39.1 ***	(23.0,27.1)	3	721	190	27.2	(21.9,28.2)
4	296	121	40.9 ***	(21.2,29.1)	4	105	24	22.9	(17.2,33.8)
4th Quartile:					3rd Quartile:				
1	19,592	7,168	36.6 ***	(24.4,25.6)	1	20,754	5,656	27.3 ***	(24.4,25.6)
2	4,457	1,613	36.2 ***	(24.0,26.0)	2	3,804	1,082	28.4 **	(23.6,26.4)
3	963	337	35.0 ***	(22.9,27.1)	3	689	181	26.3	(21.8,28.3)
4	175	61	34.9 *	(20.5,29.8)	4	96	23	24.0	(16.9,34.2)
1st & 4th Combined Quartiles:					2nd & 3rd Combined Quartiles:				
1	40,293	14,276	35.4 ***	(24.2,25.8)	1	41,665	11,346	27.2 ***	(24.6,25.4)
2	9,368	3,373	36.0 ***	(23.6,26.4)	2	7,714	2,222	28.8 ***	(24.0,26.0)
3	2,144	799	37.3 ***	(22.5,27.6)	3	1,410	377	26.7	(22.8,27.3)
4	471	182	38.6 ***	(20.6,29.7)	4	201	47	23.4	(19.3,31.2)

Panel B: **All Properties in Down Markets**
1981 to 1985 and 1990 to 1995

Length of Run	No. of Samples	No. of Successes	% of Successes	95% Conf. Interval	Length of Run	No. of Samples	No. of Successes	% of Successes	95% Conf. Interval
1st Quartile:					2nd Quartile:				
1	26,170	9,010	34.4 ***	(24.5,25.5)	1	26,477	7,929	29.9 ***	(24.5,25.5)
2	6,580	2,827	43.0 ***	(24.0,26.1)	2	5,977	2,004	35.5 ***	(23.9,26.1)
3	2,003	952	47.5 ***	(23.1,26.9)	3	1,415	528	37.3 ***	(22.8,27.3)
4	615	320	52.0 ***	(21.7,28.5)	4	321	130	40.5 ***	(20.4,29.9)
4th Quartile:					3rd Quartile:				
1	25,669	9,651	37.6 ***	(24.5,25.5)	1	26,484	26,484	28.6 ***	(24.5,25.5)
2	6,913	3,080	44.6 ***	(24.0,26.0)	2	5,650	7,566	30.8 ***	(23.9,26.1)
3	2,131	964	45.2 ***	(23.2,26.9)	3	1,257	1,738	32.2 ***	(22.6,27.4)
4	579	263	45.4 ***	(21.6,28.6)	4	258	95	36.8 *	(19.9,30.5)
1st & 4th Combined Quartiles:					2nd & 3rd Combined Quartiles:				
1	51,839	18,661	36.0 ***	(24.6,25.4)	1	52,961	15,495	29.3 ***	(24.6,25.4)
2	13,493	5,907	43.8 ***	(24.3,25.7)	2	11,627	3,742	32.2 ***	(24.2,25.8)
3	4,134	1,916	46.3 ***	(23.7,26.3)	3	2,672	933	34.9 ***	(23.4,26.7)
4	579	583	48.8 ***	(22.6,27.5)	4	579	225	38.9 ***	(21.6,28.6)

Figure 6 (continued)
Annual Return Persistence in Up and Down Markets

Panel C: **Office Properties in Up Markets**
1986 to 1989 and 1996 to 2002

Length of Run	No. of Samples	No. of Successes	% of Successes	95% Conf. Interval	Length of Run	No. of Samples	No. of Successes	% of Successes	95% Conf. Interval
1st Quartile:					2nd Quartile:				
1	6,510	2,494	38.3 ***	(24.0,26.1)	1	6,026	1,679	27.9 **	(23.9,26.1)
2	1,761	662	37.6 ***	(23.0,27.1)	2	1,152	321	27.9 *	(22.5,27.5)
3	442	175	39.6 ***	(21.1,29.1)	3	199	52	26.1	(19.2,31.3)
4	117	44	37.6	(17.6,33.3)	4	26	6	23.1	(10.3,43.6)
4th Quartile:					3rd Quartile:				
1	5,095	1,812	35.6 ***	(23.8,26.2)	1	5,559	1,382	24.9	(23.9,26.1)
2	1,065	316	29.7 *	(22.4,27.6)	2	904	239	26.4	(22.2,27.9)
3	190	44	23.2	(19.1,31.4)	3	148	37	30.4	(18.4,32.3)
4	23	10	43.5	(9.5,44.9)	4	18	4	22.2	(7.8,47.8)
1st & 4th Combined Quartiles:					2nd & 3rd Combined Quartiles:				
1	11,605	4,306	37.1 ***	(24.2,25.8)	1	11,585	3,061	26.4 *	(24.2,25.8)
2	2,826	978	34.6 ***	(23.4,26.6)	2	2,056	560	27.2 *	(23.2,26.9)
3	632	219	34.7 ***	(21.7,28.5)	3	347	89	28.0	(20.6,29.7)
4	140	54	38.6 *	(18.2,32.5)	4	44	10	22.7	(13.3,38.9)

Panel D: **Office Properties in Down Markets**
1981 to 1985 and 1990 to 1995

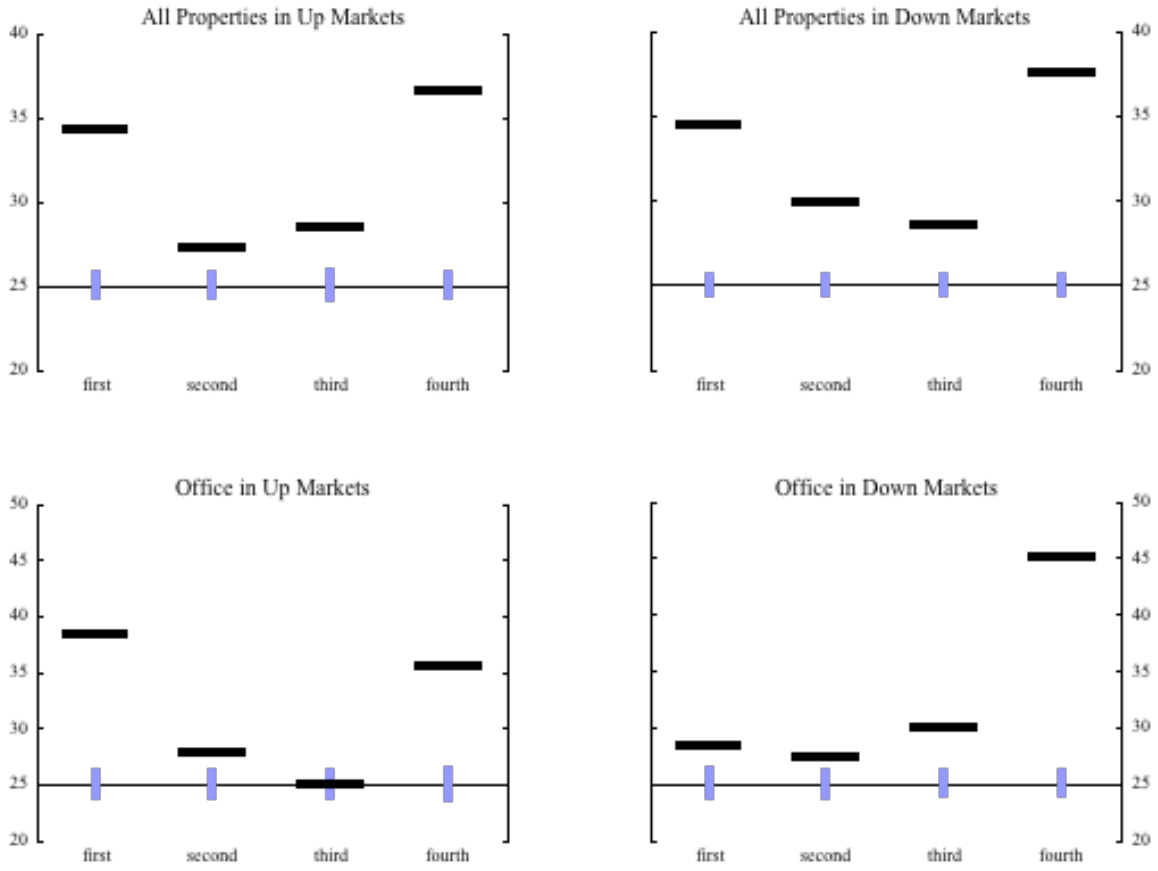
Length of Run	No. of Samples	No. of Successes	% of Successes	95% Conf. Interval	Length of Run	No. of Samples	No. of Successes	% of Successes	95% Conf. Interval
1st Quartile:					2nd Quartile:				
1	6,397	1,813	28.3 ***	(23.9,26.1)	1	7,172	1,964	27.4 **	(24.0,26.0)
2	1,222	465	38.1 ***	(22.6,27.5)	2	1,477	488	33.0 ***	(22.8,27.2)
3	302	141	46.7 ***	(20.3,30.0)	3	339	135	39.8 ***	(20.5,29.8)
4	84	47	56.0 ***	(16.3,34.9)	4	87	30	34.5	(16.9,34.7)
4th Quartile:					3rd Quartile:				
1	10,051	4,530	45.1 ***	(24.2,25.9)	1	8,350	2,504	30.0 ***	(24.1,25.9)
2	3,311	1,604	48.4 ***	(23.5,26.5)	2	1,936	631	32.6 ***	(23.1,27.0)
3	1,114	227	46.9 ***	(22.5,27.6)	3	466	151	32.4 *	(21.2,29.0)
4	312	152	48.7 ***	(20.4,30.0)	4	97	29	29.9	(16.9,34.1)
1st & 4th Combined Quartiles:					2nd & 3rd Combined Quartiles:				
1	16,448	6,343	38.6 ***	(24.3,25.7)	1	15,522	4,468	28.8 ***	(24.3,25.7)
2	4,533	2,069	45.6 ***	(23.8,26.3)	2	3,413	1,119	32.8 ***	(23.6,26.5)
3	1,416	368	46.8 ***	(22.8,27.3)	3	805	286	35.5 ***	(22.1,28.1)
4	396	199	50.3 ***	(20.9,29.4)	4	184	59	32.1 *	(19.0,31.5)

* Null hypothesis rejected at the 5% level of significance
* * Null hypothesis rejected at the 0.01% level of significance
* * * Null hypothesis rejected at the 0.00001% level of significance

Figure 7

Quartile Performance Persistence in the IPD Database

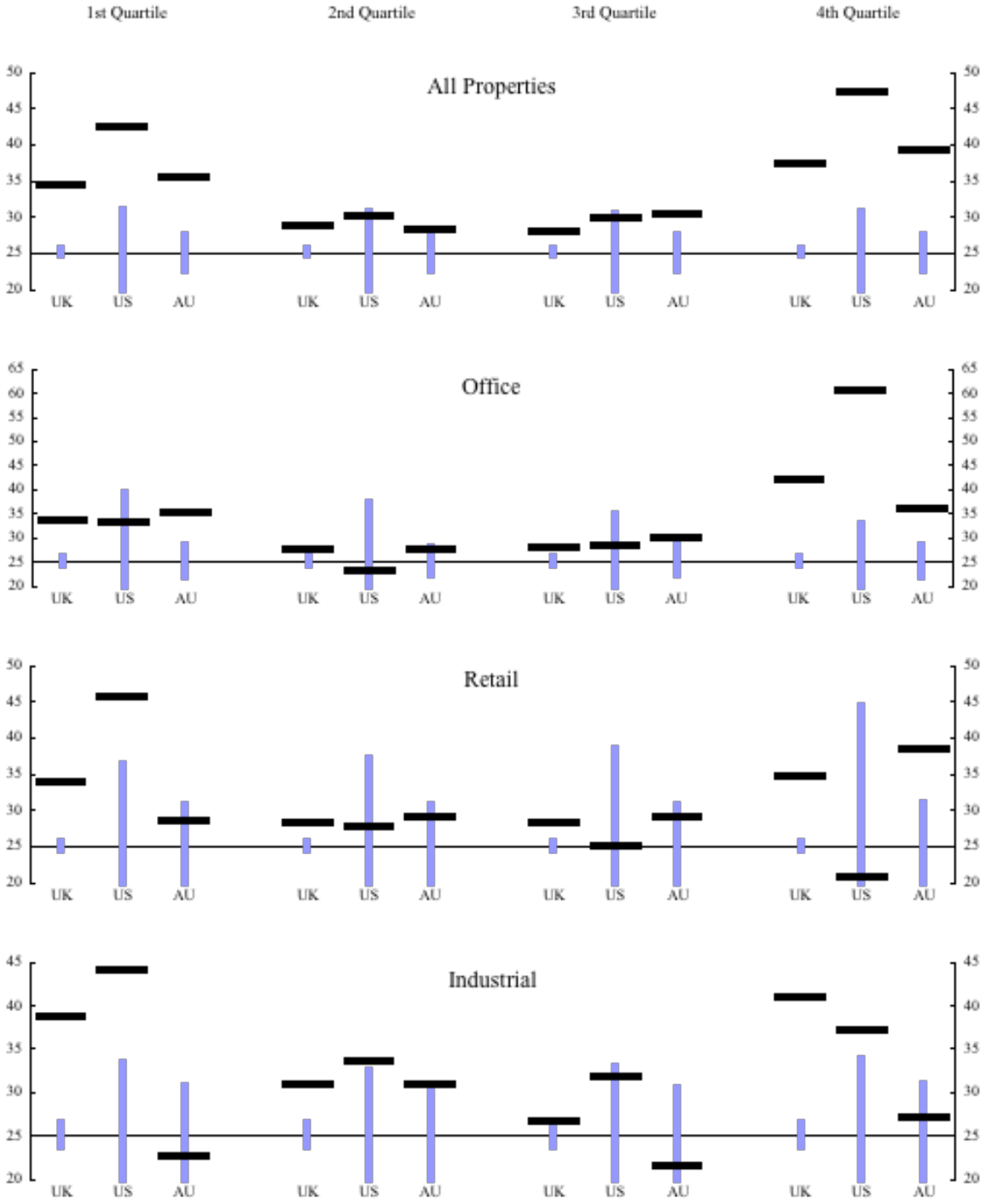
In Up (1986 to 1989 and 1996 to 2002) and Down Markets (1981 to 1985 and 1990 to 1995)



Note: Vertical bars represent the 95% confidence intervals while horizontal bars represent the persistence results.

Figure 8

Persistence by Quartile for All Properties, Office, Retail, and Industrial
in the United Kingdom, the United States, and Australia



Note: Vertical bars represent the 95% confidence intervals while horizontal bars represent the persistence results.

Figure 9

Panel A: **Lease Terms Equally Weighted within IPD Database by Starting Year**

Property Type	Year	Average Term in Years	Median Term in Years	Number of Leases *
Office	2002	6.9		946
	2001	8.5		3,786
	2000	8.5		2,775
	1999	7.8		1,565
Retail	2002	10.0		2,052
	2001	11.1		7,464
	2000	10.8		6,604
	1999	12.3		4,169
Industrial	2002	7.2		714
	2001	8.5		2,594
	2000	7.2		1,887
	1999	8.6		1,092

Panel B: **Lease Terms Equally Weighted within RREEF-Managed Portfolios by Starting Year**

Property Type	Year	Average Term in Years	Median Term in Years	Number of Leases **
Office	2004	4.5	4.0	184
	2003	4.1	3.3	679
	2002	5.0	5.0	190
	2001	5.2	5.0	150
	2000	6.6	5.1	164
	2000-04	4.6	4.59	1,367
Retail	2004	4.6	5.0	84
	2003	5.8	5.0	224
	2002	5.8	5.0	83
	2001	6.0	5.1	41
	2000	6.4	5.0	56
	2000-04	5.7	5.0	488
Industrial	2004	3.0	3.0	723
	2003	3.0	3.0	2,201
	2002	3.6	3.0	723
	2001	4.5	4.4	449
	2000	5.4	5.0	395
	2000-04	3.4	3.0	4,491

* The number of leases in the IPD database are for groups of years as follows 2002-03, 1999-2001, 1996-98, and 1993-95. The median term column is intentionally left blank but included to be consistent with Panel B.

** The number of leases in the RREEF-managed portfolios reflect the leases written in the calendar years shown.