IPF Research Programme

Long-term Value Methodologies in Commercial Real Estate Lending

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SUMMARY REPORT

This research was commissioned by the IPF Research Programme **2015 – 2018**

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This Programme supports the IPF's wider goals of enhancing the understanding and efficiency of property as an investment. The initiative provides the UK property investment market with the ability to deliver substantial, objective and high-quality analysis on a structured basis. It encourages the whole industry to engage with other financial markets, the wider business community and government on a range of complementary issues.

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Long-term Value Methodologies in Commercial Real Estate Lending

Report

A Report for the Investment Property Forum
by the University of Cambridge and the University of Reading

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Glossary

Average model
This provides an estimate of long-term value based on simple averages of the underlying real estate measure (rent, yield, values). For example, if the yield across five periods is 5.0, 4.0, 7.0, 8.0 and 6.5 the average is 6.1.

Econometric estimate
An estimate of a particular variable (e.g. rent) using a statistical method to derive this estimate based on data for independent variables (underlying drivers), e.g. demand and supply, believed to explain the movements in that particular variable.

Econometric with trends (w/trends)
This refers to using the statistical relationships identified in deriving the econometric estimate but instead of using the actual data for the independent variables using trend estimates of these variables.

Equilibrium (rents or capital values)
This is the estimate of the rent or values that appears to be consistent with the variables or underlying drivers believed to explain the movements in rent or values.

Ex-ante model/ex-ante cap-rate
Ex-ante means that this is based on a set of assumptions rather than historical statistical relationships. For cap rates or yields this approach requires assumptions about the required returns of investors and long run rental growth expectations.

Log linear trend
This is an estimated trend derived by taking the log of the variable(s). Taking the log of a number means that if it growing at a constant (trend) growth rate this leads to the same change at the start of a period as at the end. For illustration, an index of economic activity increases from 50 to 51 over a year, the economy has grown by 2% and the difference in the index is 1, whilst a few decades later the index increases from 100 to 102 in a year, again growing by 2% but now a difference of 2. By taking the log of this index the difference in the early years is 0.2 (3.912 to 3.932) the same as in the later years (4.605 to 4.625).

Market clearing rent
This is the rent at which the demand for space is equal to the supply of space.

Past trend-based model
A model that uses trends from the past.

Pro-cyclical
An economic quantity or variable that is positively correlated with the overall state of the economy or with some other aggregate measure of activity or value (e.g. real estate values) is said to be pro-cyclical.

Parsimonious
the simplest model/theory with the least assumptions and variables but with greatest explanatory power.

‘Real’ rental value
Real is after adjustment for general price inflation. For example, if nominal rents increase from £50 to £100 whilst the general price index increases from 100 to 200, rents will be unchanged in real terms (rents have doubled but prices in the wider economy have also doubled).

Regression model/regressing

A set of statistical processes for estimating the relationships between a dependent variable (e.g. rent) and one or more independent variables (e.g. demand and supply).

Simple time trend

This is a trend estimated using time only.

Sustainable rental values (and models)

This is an estimate of the rent that is sustainable given a model of how rents grow over time e.g. the rent consistent with the levels of demand and supply.

Trend-based estimate

This is an estimate derived by applying simply time trends.

Trend-input approaches

This refers to using the statistical relationships identified in deriving the econometric estimate but instead of using the actual data for the independent variables using trend estimates of these variables as the inputs to estimate the variable e.g. rent.

Objectives and Introduction

The Property Industry Alliance 2014 report, *A Vision for Real Estate Finance in the UK*, made recommendations for reducing the risk of damage to the financial system from a future commercial real estate crash[1]. One of the seven major recommendations of the report was to: "Use long-term value measures for risk management: For CRE lenders subject to regulatory capital rules, loan-to-value (LTV) based capital requirements should be linked to a long-term measure of collateral value".

Following on from the Vision report, a long-term value working group was established and, on a pro-bono basis, produced a report in 2017, *Long-term value methodologies and real estate lending,* (the 2017 Report[1]). The original discussion around the long-term value recommendation of the Vision Report was to try and identify a long-term valuation model at the property specific level that would meet risk management objectives. The 2017 Report concentrated on valuation models set out within valuation standards and a simple long-term trend model that was already being used in practice. This research reviews and builds on the 2017 Report and develops the analysis of the existing models and investigate alternative methods for assessing long-term value, along with other measures that may indicate when the probability and scale of potential falls in commercial real estate values is high. The difficulties of producing a long-term valuation model for specific properties were highlighted in the 2017 Report and the current long-term value research focus has shifted away from the individual property to markets and sectors.

There have been three major episodes of falling UK commercial real estate prices in the past 50 years: 1973-1975, 1990-1992 and 2007-2009. The drivers of these three downturns were different; this is an important context for this research. The first two saw a combination of high interest rates and other factors leading to a sharp downturn in occupier demand at the same time as new supply was increasing, culminating in a rapid reversal in real rental growth with a subsequent effect on capitalisation rates and overall real capital growth. The 2007-2009 downturn was predominantly driven by the investment market, with yields being pushed lower during the boom and then moving substantially higher through the downturn, whilst rental growth remained modest, leading to falls in capital value. These cycles reflect both changes in expectations about rental growth and changes to the pricing of future rental income. The approach taken in this research mirrors this by attempting to identify whether measures of long-term 'sustainable' rent and capitalisation rate can be determined, which can be combined to produce measures of long-term 'sustainable' capital values.

The specific objectives for the current project were to:

i. Review the findings of the Phase 1 report (the 2017 Report), including the choice of methods, and, potentially, identify other methods and indicators to determine periods when the probability and scale of potential future falls in value is high.

ii. Expand the analysis of the two main long-term valuation methodologies suggested in the 2017 Report to disaggregate components and review alternative inputs to the models;

iii. Test the original and refined models in terms of statistical significance, timeliness of advance warnings, relationship with fundamental drivers and at different levels of disaggregation.

[1] Available at: www.ipf.org.uk/industry-involvement/vision-for-real-estate-finance.html

As the project developed several key issues had to be tackled, which led to additional objectives, notably:

i. To compare different property market indices and identify the extent to which different measures of rent and capital value performance move together.

ii. To explore the extent to which leverage leads in real estate market cycles in the UK (along with analysis of other leading indicators).

This report summarises the research and key findings. The full report is designed to be read as one integrated report but can also be read as a series of individual papers:

- A review of the 2017 Report and the issues arising in terms of concepts and key issues
- A comparison of property indices
- Long-term sustainable rents
- Long-term sustainable capital valuation measures and cap rates
- Leverage and leading indicators of potential downturns

It was recognised at the outset that, given the complexity of the underlying relationships, data issues and structural shifts (changes in the relationships between the real estate market and underlying drivers), robust identification of long-term value is challenging. There will remain a substantial degree of uncertainty about what represents a 'sustainable' long-term value and multiple measures may be appropriate. As some have described it, "there is no magic bullet". However, as this report demonstrates, there are a number of measures which highlight when risks might be elevated. These could play a useful role for all stakeholders in real estate lending and investment.

Review of the Phase 1 Research and 2017 Report on Long-term Valuation Methodologies

The 2017 Report attempted to identify a mechanism by which existing reliance on pro-cyclical market values to underpin lending decisions is replaced (or assisted) by a cyclically neutral long-term valuation of real estate markets. That report examined three alternative approaches to the market value approach used in the UK and many other jurisdictions to underpin secured lending and highlighted two of these as potentially viable:

- Investment Value (IV) and
- Adjusted Market Value (AMV)

Investment value (IV) is a standard discounted cash flow approach. The application tested in the 2017 Report and used to inform the Bank of England Financial Stability Report since 2015 used a five-year cashflow based on the time horizon for commercially-produced forecasts of rents. Current rents and the forecasts provided an estimate of the income. A trend-based exit capitalisation rate (using a 15-year rolling average) divided into the expected rental level at the end of the period derived an exit value. The discount rate was based on the redemption yield from 10-year government bonds and an additional fixed risk premium.

Adjusted Market Value (AMV) is a past trend-based model. This used the capital value index of the UK Investment Property Databank (now MSCI UK Real Estate Index), adjusted for inflation, to identify a long-term trend for real capital values. This trend, it was suggested, was a proxy for the sustainable capital value and, hence, deviations from this trend could indicate the extent of under or over-pricing.

The 2017 Report represented a valuable contribution to the debate about property cycles, pro-cyclical investment and lending and the risks from sudden market corrections. Those involved were aware of the limitations of the work. It highlighted the differences between an occupier market downturn where rental value falls precede changes in capitalisation rates, as occurred in 1990 in the UK, against a financial (asset) market crash where capitalisation rates increase before rents fall, as occurred in the Global Financial Crisis (GFC).

It presented a model (AMV) that implicitly assumes that all drivers of real estate value (demand, supply, rents and yields) revert back to a long-term real trend and a model (IV) in which a number of the drivers are specifically estimated, some of which are assumed to revert back to trend whilst others (such as risk free rates) are not.

While both models had some success in predicting the subsequent major downturns in good time, the review of Phase 1 identified flaws in both approaches, which prevented any definitive conclusions and resulted in suggestions for further research. The AMV model identified what appeared to be over-pricing in the run up to both the 1990 and 2007 downturns. The IV model predicted the 2007 downturn but did not do very well with the 1990 downturn. These results raised questions concerning the prediction of the rental value component of an IV model and whether a measure of sustainable or equilibrium rent is needed for such models, which has been a major component of the current research.

The AMV model's success in predicting both downturns was encouraging. However, the model is a simple trend model which, for all the benefits of simplicity and low data requirements is insensitive to any long-term changes in the fundamentals that may affect values and cannot pick up any structural changes beyond those reflected in historical trends. Examples of structural changes include a significant shift in real interest rates, markets that improve relatively over time, such as London mid-town offices, or property types that suffer a significant change, such as the UK high street retail market at the present time. AMV models would suggest London mid-town offices are over-valued and high street retail is under-valued based on long term trends. AMV is not the only model where the past is used. The extent to which all the elements that underpin value are assumed to revert to long-run fundamentals is an issue with which the current research has had to grapple.

The review of the 2017 Report and further analysis of the problems raised a number of important conceptual and methodological issues for this phase of the research. These suggested that, where possible, the approaches to long-term value should:

- Have an economic logic (can recognise a change in the underlying drivers) – for example, a fall in real interest rates should normally be reflected in lower cap rates (and lower required returns) for real estate.
- Recognise that past trends and coefficients are sensitive to the estimation window (time frame of the trend data) and the impact of what period is chosen to estimate relationships or trends needs to be explored. Long-term trends based on 'anchored' windows will tend to be more stable than those based on 'rolling' windows but 'anchored' windows will be more insensitive to structural changes[2].
- Avoid the use of pro-cyclical market rents or rental forecasts – whilst underlying demand and supply may support higher rental levels in the upswing of a cycle, any estimates or methodology for long-term value should try to avoid projecting forward the short-term momentum that occurs in rental cycles. This appears to be the problem with the IV model in 1990. Approaches to sustainable rent that are based on relationships between the overall economy and supply are likely to provide a more robust outcome.
- Be aware of the potential impact of compositional changes: the coverage of the market by the different data providers has changed over time with a reduction in London office coverage as a result of increased ownership by international investors.
- Be tested for robustness in a way that recognises the limitations of the data and that there have been only two major downturns in the past 40 years. It should be noted that the study is not looking for an approach that accurately tracks the market but, rather, for something that sends a powerful signal when the market is over-valued or prone to correction.

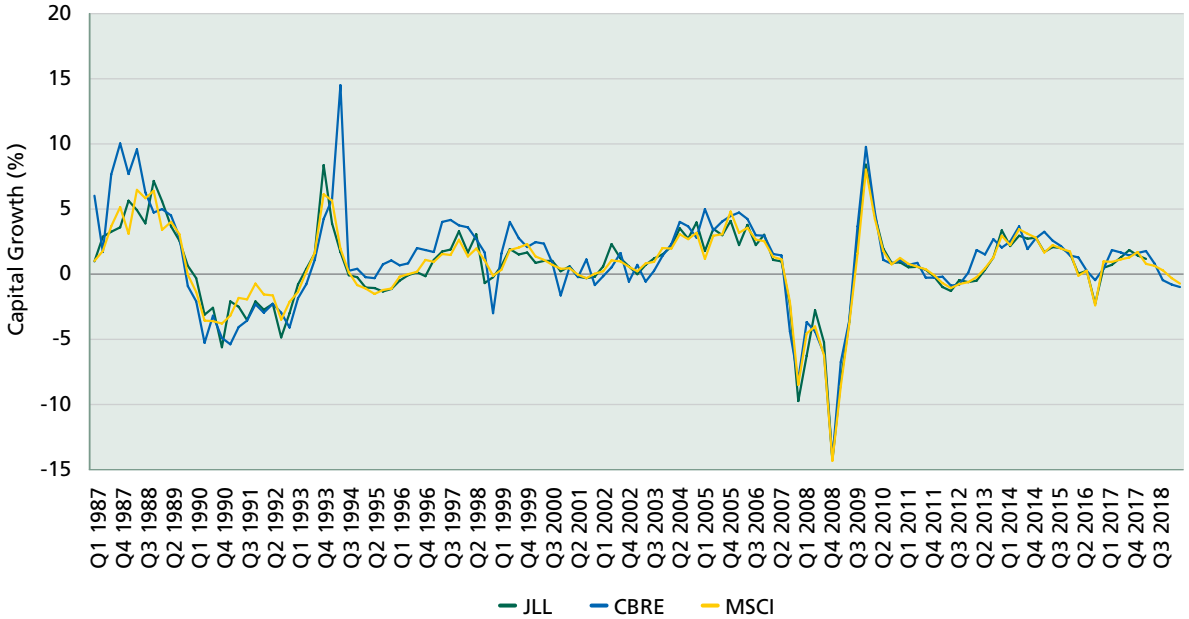
[2] Anchored windows are where all the observations from a time series are used to identify the trend and the number of observations increases as the time series lengthens. For a rolling window, when data for the latest time point is incorporated, the observation for the earliest time point is removed so that there are always the same number of observations for each window.

Data Challenges and Constraints

For the current research, data challenges are substantial. Given the absence of consistent data for the 1960s, rigorously testing models for the 1973-1975 downturn is not feasible. This only leaves two major downturns with which to assess quantitatively whether different approaches would have worked in signalling real estate market corrections. In addition, data on the supply and demand drivers of rents are not available for all sectors or all years, while the available property rent and yield data represent a sample of the wider real estate investment market with potential bias issues. Considerable effort has gone into addressing some of these data issues, notably the provision of new floorspace (stock) estimates. It is hoped that the Government will recognise that having high quality, timely information on these variables has a role to play in ensuring financial stability. Considerable resources were employed by the research team to develop new indicators of the stock of real estate over the long term.

Commercial real estate value, rent and yield data are produced by a number of organisations. For this research, data from the MSCI UK Real Estate Indexes (MSCI), the JLL UK Property Index (JLL) and the CBRE Rent and Yield Monitor (CBRE are used). MSCI and JLL indexes are based on valuations of actual properties within the investment portfolios of large professional investors, while the CBRE data is based on valuations of hypothetical properties in selected locations. The start date for the MSCI indexes is 1980 Q4 at an annual frequency and 1986 Q4 a at quarterly frequency (when using quarterly observations derived from their monthly index). The start of the JLL indexes is 1967 Q2 at an annual frequency and 1977 Q2 at a quarterly frequency, while the CBRE series start at 1972 Q3 and are quarterly throughout. Capital value movements in the JLL and MSCI All Property series are very similar (see Figure 1). Movements in the CBRE All Property series are also similar, but the stronger growth in values in this series reflects the fact that they are location-based rather than property-based indicators and so do not reflect any building-related depreciation. A thorough review of the different property market data series used is provided within a separate Working Paper appended to the full report. Analysis for this research has been undertaken using all three datasets, which has eliminated any danger of the results being skewed by reliance on a single dataset.

Figure 1: MSCI, JLL and CBRE All Property Quarterly Capital Value Growth



Sustainable Rental Values and Implied Market Corrections

The 2017 Report highlighted the need to identify a measure of sustainable rental value to contrast with market rental value. At an aggregate level, this represents the level of rent that a market segment can support given long-term economic fundamentals and not that which might prevail currently.

To identify sustainable rental values, several approaches are possible. One potential approach is simply to use the past trend in real rental values (effectively the AMV approach). However, there are other approaches to understanding sustainable rental value. The concept of equilibrium rental value has been developed as the market clearing rent at any particular point in time, given demand and supply conditions in occupier markets. This equilibrium rent can be estimated from an econometric model based on long-run demand and supply conditions. This research develops such a model for the UK commercial real estate market, which can be examined alongside alternative approaches based on market averages and trends.

Modelling is undertaken using real rental value indexes from the three data providers, MSCI, JLL and CBRE. Real rental values, adjusted to remove the effect that inflation has on prices over time, are used so that the impact of changes in demand and supply on rents (whether explicit or through their effect on trends) can be discerned more clearly. However, results from the models are then converted back into nominal terms for presentation purposes. The approaches used to model sustainable rental values are as follows:

1. **Average value for real rent:** This is simply the arithmetic average of all the real rental values over a period. This would only have validity if equilibrium levels of supply and demand produce constant long-term real rents. In fact, it should be noted that real rental values have fallen over the last 50 years and since the beginning of the datasets used in this project[3].

2. **Trend value for real rent:** This fits a simple time trend through the real rental value series over a given period (akin to the AMV approach). The approach involves regressing real rental values (in log form so that the compound growth rate in rental values is stable) on to a time trend and predicting a sustainable real rental value using the coefficients obtained from that estimation. ('Trend based estimate' in Figure 2). This echoes the approach taken to modelling capital values in the AMV model and, hence, suffers from the same issues around the potential for structural breaks in relationships through time. It implicitly assumes both that the drivers of rents change in line with a long-run trend and that there is stability in the relationships between rents and their drivers.

3. **Predicted value from an econometric model:** Given the desire to have a model that has an underlying economic logic, more sophisticated equilibrium rent models have been tested, which require additional demand and supply side data. After much consideration and exploring alternatives, real UK gross domestic product is used as the demand proxy for the office and industrial sector, while household consumption is used for the retail sector. These series enable a consistent and parsimonious version of the model to be estimated for every time window. ('Econometric' in Figure 2). The supply-side data for the econometric models have been generated by the research team. The model estimates a long-run relationship between real rental values and measures of demand and supply. Coefficients from this model and values of the independent variables can be used to predict sustainable rent in the period of interest.

[3] A finding replicated in many long-term rental value research studies from around the world.

4. **Predicted value from an econometric model using trend-based inputs:** The long-run equilibrium rent model estimates the level of real rent that should clear the market given the levels of demand and supply at different times. However, it does not indicate whether demand or supply are, themselves, in equilibrium at that point. It is possible that either one or both input variables are not at their sustainable, long-term level in any given period. In that case, as an alternative to using the fitted value from the regression model, a value can be estimated using independently determined figures for the inputs. For instance, one could take trend values for the demand and supply variables and use these with the model coefficients to predict a sustainable real rental value for each period. (Econometric w/trends in Figure 2)

The econometric models allow changes to economic fundamentals to influence sustainable real rental value and do not assume that sustainable real rental value takes a constant value or follows a constant trend.

The assumption of a constant real rental value has been found to be untenable, so results for the first approach are not presented, with comparison focusing on the outputs from approaches 2 to 4 above.

For each approach, the actual rental value can be compared to the estimate of sustainable rental value, with the ratio of actual to sustainable rental values expected to revert to one. The extent to which real rental values have deviated from their sustainable level indicates the correction required to restore the ratio to one. The time horizon for such a correction is unknown and assumes no further significant market events in that period. In this report, a five-year horizon is used to examine the ability of the measurements of sustainable rent to predict subsequent market movements over the medium term – that time horizon reflecting the typical term to maturity of commercial real estate debt.

Anchored and rolling windows are tested to gauge which might be most effective in estimating sustainable rental values. Anchored windows maximise the available observations, but they may be problematic if structural breaks lead to shifts in the long-term trend or economic relationships between real rent and other variables. Rolling windows do not eliminate this issue, but allow measurements of sustainable rent to adapt more easily to changes in the nature of the market through time. The trade-off is that not all available information is used, and relevant older data might be discarded in the process. A minimum window length is required in both cases and 15-year windows are adopted. Given the need for 15 years of data, estimates of sustainable rents could be made from 1995 Q4 for MSCI, 1982 Q2 for JLL and 1987 Q3 for CBRE datasets. The JLL and CBRE datasets, crucially for this project, enable study of the cycle in commercial real estate values of the late 1980s and early 1990s in addition to that associated with the Global Financial Crisis.

The key results are the estimates of sustainable rental value from each approach and the implied market correction based on the difference between the actual rental index value and the sustainable rental value in each case. These estimates are conducted at the national All Property level and for the office, retail and industrial sectors. The results using JLL series are shown here (up to the latest date available at the time of writing, Q1 2018) since these results cover both of the two last major downturns. Further results using JLL, MSCI and CBRE series are provided in the main report. Different colours in each chart identify the time series of sustainable rental values generated by individual methods, while actual index values are green.

Figure 2: Sustainable Rental Value Estimates at an All Property Level (JLL Index)

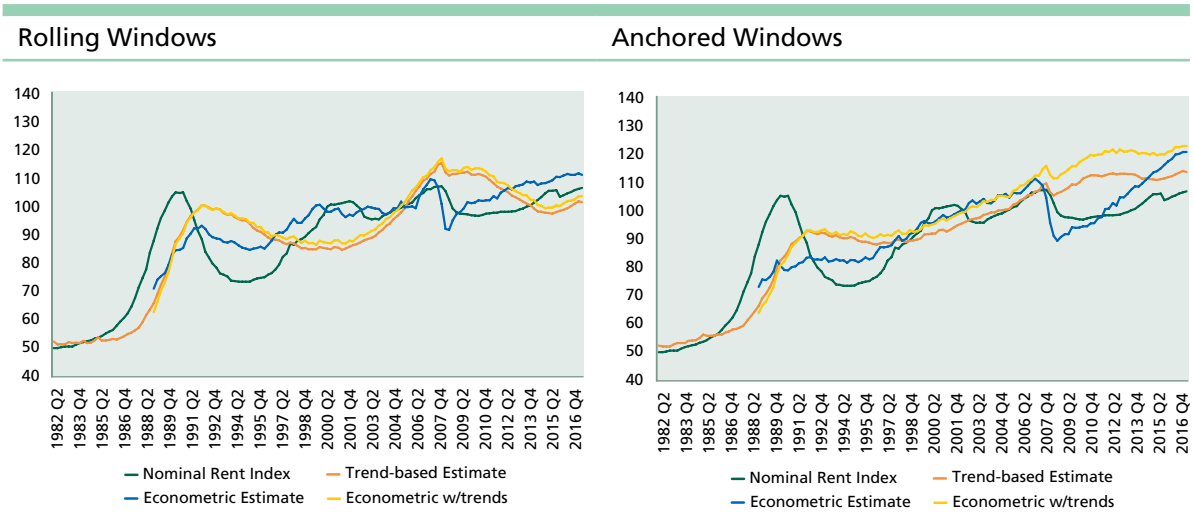
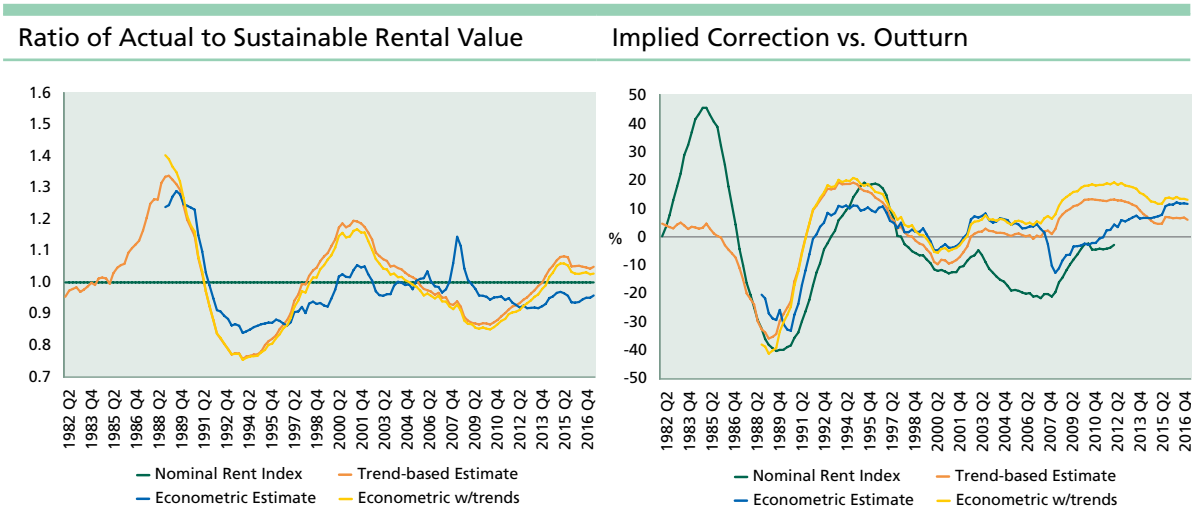


Figure 2 shows the sustainable rent estimates at an All Property level (for the econometric model, this is based on combining the sector outputs). It identifies the market rental value and the three different estimates of sustainable rent. Both the values of and movements in sustainable rental values differ from market rental values over time as tracked by the nominal rent index, but this is to be expected if deviations from fundamental or sustainable levels of value are a feature of commercial real estate markets. Both the trend and econometric models produce sustainable rental value estimates that sometimes exceed and sometimes fall beneath the actual rental value index. The conventional econometric approach produces estimates that appear to shadow the rental value index more closely, but all the methods indicate periods where rental values are either above or below their sustainable levels.

In real terms, the largest cycle in rental values is that of the late 1980s and early 1990s. For this period, both the trend-based and econometric approaches seem to generate sustainable rental values that follow the boom upwards and then follow the slump downwards, this being more marked when using rolling windows (as expected since significant movements at the end of the series affect the rolling window more than the anchored window outputs). The greatest disagreement between the different methods occurs in the wake of the GFC. Here, the trend-based and trend-input approaches produce sustainable rental values that fall only slightly in 2008-2009 and then stay some way above actual rental values for a considerable period. In contrast, output from the conventional econometric approach suggests that sustainable rental values decline considerably (reflecting the weakness in demand) at the same time as actual rents fell. Whether the market corrections implied by these divergences correspond with subsequent market performance is then explored. The econometric model, using actual demand and supply indicators rather than trends in those indicators, is the only model that captures some of the weakness in occupier markets and rents in the immediate post-GFC period.

Figure 3: Implied Corrections in Rental Values (Using Rolling Windows) vs. Subsequent Five-year Outturn (JLL Index)



The left-hand side of Figure 3 uses ratios when actual rental values are above or below sustainable rental values, so indicating a potential correction more clearly. For example, in Q1 1989, a year before the end of the 1980s boom, the actual rental index is 1.34 times the sustainable rent estimate from the simple trend model (suggesting that the rental market is 34% over-priced), 1.24 times greater than the estimate from the econometric model (24% over-priced) and 1.4 times the estimate from the econometric model with trend-based inputs (40% over-priced). So, sustainable rent estimates identify the 1990 downturn, unlike the market rent and forecasting models used in the IV approach in the 2017 Report.

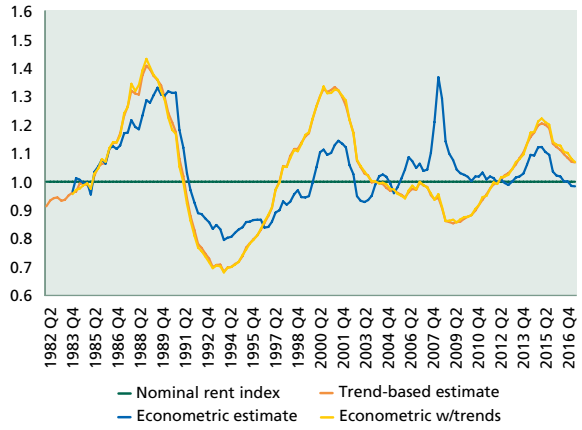
The right-hand side of Figure 3 shows the implied correction in rents charted against realised real rental growth over the subsequent five-year period as a percentage correction. Within the next 5 years following Q1, 1989, real rents did indeed fall by around 40%, broadly in line with the implied correction. However, more recently the models have not performed so well. Looking at Q1 2013, the implied correction suggests real rents should have risen by 6.5% over the next five years according to the trend-based model, 7.9% according to the standard econometric model and 8.6% according to the econometric model with trend-based inputs. The actual growth rate achieved in real terms between Q1 2013 and Q1 2018 was -2.9%.

Overall, the charts show that the implied corrections from the different models correspond well with the realised fall in real rents in the early 1990s. The trend model and the econometric trend model also predict the correction in rental values in the early 2000s. However, all the models struggle to predict the downturn in rents in the wake of the GFC. This is because the downturn followed this crisis, which put pressure on the economy and on rents. In the run-up to the crisis, rents were not particularly high in relation to demand and supply drivers or long-run trends. Consequently, no models based on any of these drivers or indicators could have predicted a rental downturn.

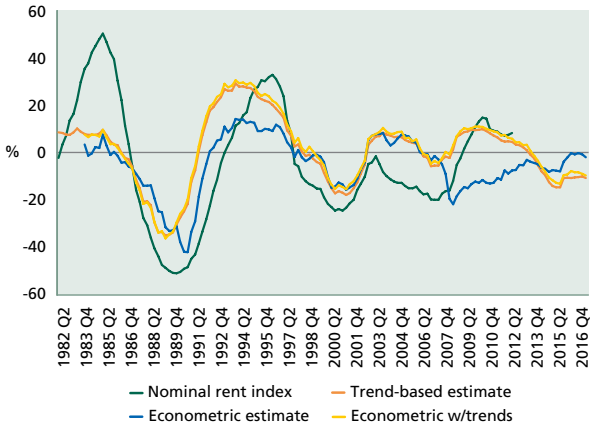
Figure 4 shows sector level results for the ratio between actual and sustainable rental values, and the correction in rental values implied by divergences from sustainable rent measurements. The office and industrial sector results are similar to the All Property results, but the retail sector has been less cyclical over the period studied and exhibits a divergence between sustainable rental values and the actual index in the latter part of the period. This reflects the structural changes affecting this sector, emphasising the prior point about the insensitivity of trend models to such changes. All models that are calibrated on historical data will have difficulty estimating sustainable rental values and potential market adjustments in the presence of structural change, but econometric models offer some scope for adaptation if the drivers of changes are known and measurable.

Figure 4: Implied Corrections (Using Rolling Windows) vs. Subsequent Outturn (by Sector, JLL Data)

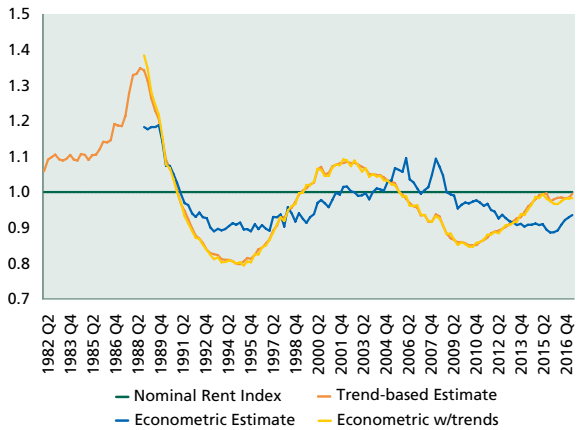
Office - Ratio of Actual to Sustainable Rental Values



Office - Implied Correction vs. Outturn



Retail - Ratio of Actual to Sustainable Rental Values



Retail - Implied Correction vs. Outturn

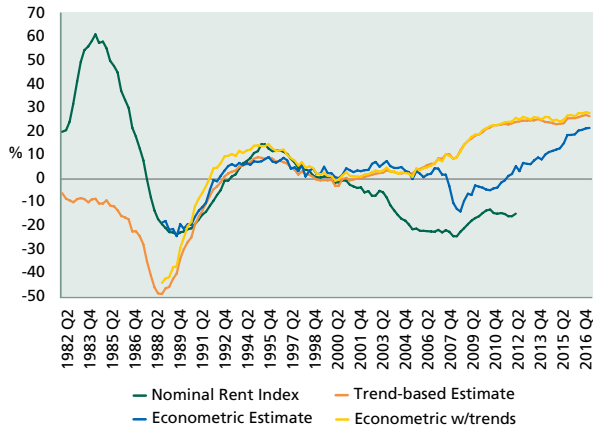
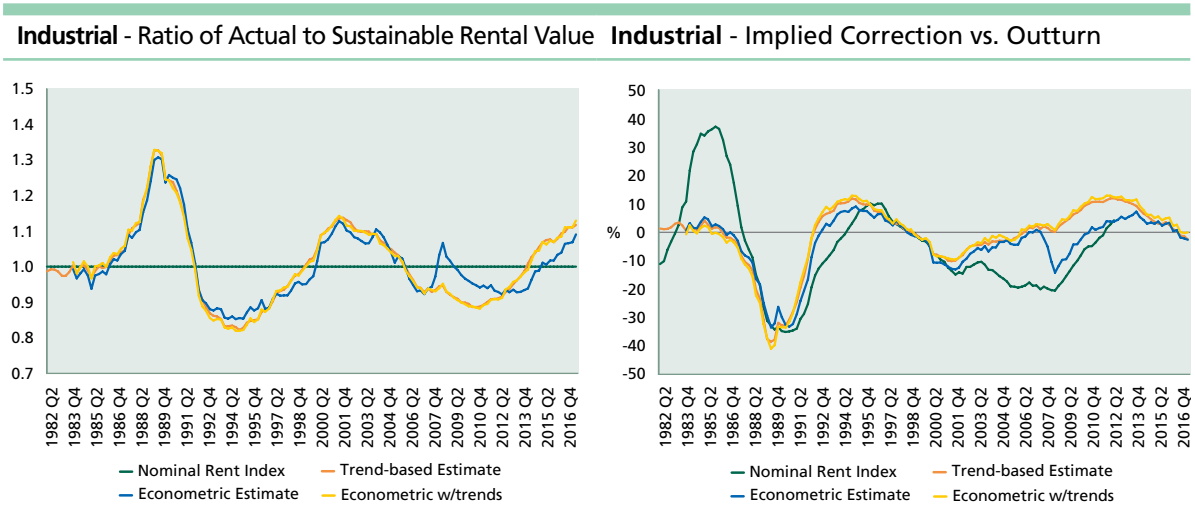


Figure 4: Implied Corrections (Using Rolling Windows) vs. Subsequent Outturn (by Sector, JLL Data) (Cont'd.)



Further testing distinguishes whether the differences between the approaches tested are statistically significant. This testing is set out in the relevant section of the full report. The tests are mixed in terms of which model produces the most robust predictions, but the results are generally most favourable towards the conventional econometric approach (approach 3) as a predictor of medium-term adjustments in real estate occupier markets.

Measures of sustainable rental value are useful for monitoring real estate market conditions. However, sustainable rental value measures cannot predict all real estate market corrections, as some do not have their origin within occupier markets. Therefore, they should be used in conjunction with the monitoring of pricing in commercial real estate markets and as an input to models of sustainable capital values. An examination of capitalisation rates (yields) is considered next.

Sustainable Capitalisation Rates and Implied Market Corrections

The capital value of real estate investment markets is driven by the level of rent and the capitalisation rate (or yield). Consequently, if the sustainable cap rate and sustainable rent can both be estimated these can be combined to derive an estimate of a sustainable capital value.

As outlined in the literature set out in the main report, it is important that any long-term value approach attempts as far as possible to look through cycles, to ignore the impact of sentiment, credit conditions and other cyclical factors in diverting cap rates from long-run fundamentals. A range of approaches to cap rate analysis have been explored. These approaches mirror the approaches taken to modelling sustainable rents[4]. These are:

- Averages – these are based on estimating averages based on the past data of capitalisation rates and can be applied both to cap rates and to gaps between cap rates and risk-free rates;
- Trends – these are based on estimating trends based on the past data of capitalisation rates and can be applied to cap rates and to gaps between cap rates and risk-free rates;
- An econometric model of capitalisation rates – this reflects the impact of movement in bond yields and rental growth expectations (as noted in the literature, rental growth tends to be less important than changes in discount rates; rental growth models suggest rental growth expectations are driven by the recent past)[5]; and
- An ex-ante model of capitalisation rates – this uses a set of assumptions about long-run growth, risk premia and discount rates, which are assumed to change over time and relate to the over-arching economic context.

The ex-ante model is based on the concept that, in equilibrium, expected returns should equal required returns. Required returns reflect the risk free rate and the risk premium. Expected returns are a function of the yield and net growth expectations. Hence, the sustainable yield reflects the risk free rate plus the risk premium less long-run net rental growth expectations. This requires assumptions about the risk premium and growth expectations. Real rental growth expectations are assumed to have fallen over time in the retail and, to a lesser extent, office sectors reflecting occupier trends and the influence of technology. The risk premium is expected to have increased over time as a result of increases in Stamp Duty Land Tax, reduced lease length and reduced lease certainty (Company Voluntary Arrangements, or CVAs, etc.), which have made real estate more equity like and less bond like. In aggregate, it is assumed these changes have increased risk premia across different sectors from 3-3.5% to 4.7-5.5%.

The use of simple averages for cap rates has more potential than for rents and is included in the results. The trend model lacks economic logic as it is unlikely that capitalisation rates would be on a persistent upward or downward long-term trend (beyond that induced by any secular trend in interest rates). The results for the trend model suggest that it does not work well and so it is excluded from the results presented in Figure 5.

[4] As with rents, both anchored and rolling window estimation has been used

[5] A range of models were explored using both nominal and index-linked gilts and using different models of rental growth expectation formation – the preferred model uses index-linked gilts and a 4-quarter moving average of quarterly real rental growth.

Figure 5: Sustainable Cap Rate and JLL All Property Cap Rate

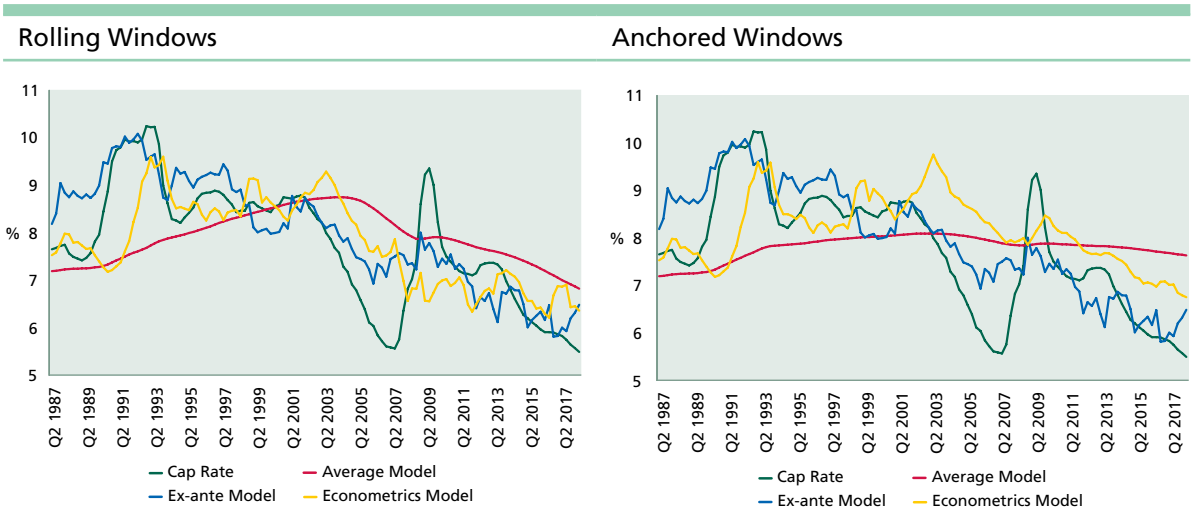


Figure 5 illustrates sustainable cap rates estimated using the JLL All Property data. The results indicate that actual capitalisation rates were well below all measures of sustainable cap rate prior to the 2007-2009 downturn indicating there was overheating in commercial property capital markets prior to the GFC. In the late 1980s, actual and sustainable cap rates were far closer, indicating that the investment market was not showing clear signs of over-heating (other than as a result of rental levels sitting above their sustainable levels) in the run-up to the 1990 downturn, again confirming the distinction in the drivers of these two downturns.

Figure 6: Implied Corrections in All Property Cap Rates (Using Rolling Windows and JLL Data)

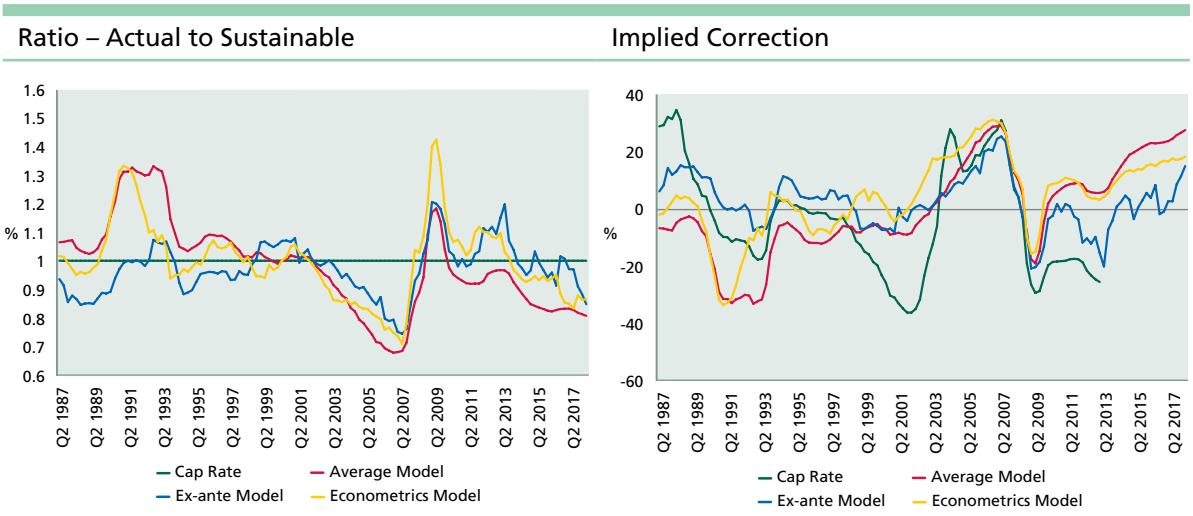


Figure 6 shows the ratios of actual to sustainable cap rates (a ratio significantly below one can be seen as an indicator of potential over-valuation) and the implied corrections if cap rates move back to sustainable levels compared with the actual corrections that took place within the next five years.

These are the change in yield expressed as a % change. So, for example, if the actual yield is 6% and the sustainable yield estimate is 7.2% the implied correction is 20%, as this would get the actual yield back up to the sustainable yield.

In the run up to the GFC these models were indicating a ratio of well below one and a large implied correction in cap rates. The actual corrections correlate closely with these predictions. However, Figure 6 shows that the sustainable cap rate model does not capture the reversal in the early 1990s well, reflecting that this was driven by occupier rather than investment markets.

Figure 7: Implied Corrections (Using Rolling Windows) vs. Subsequent Outturn (by Sector, JLL Data)

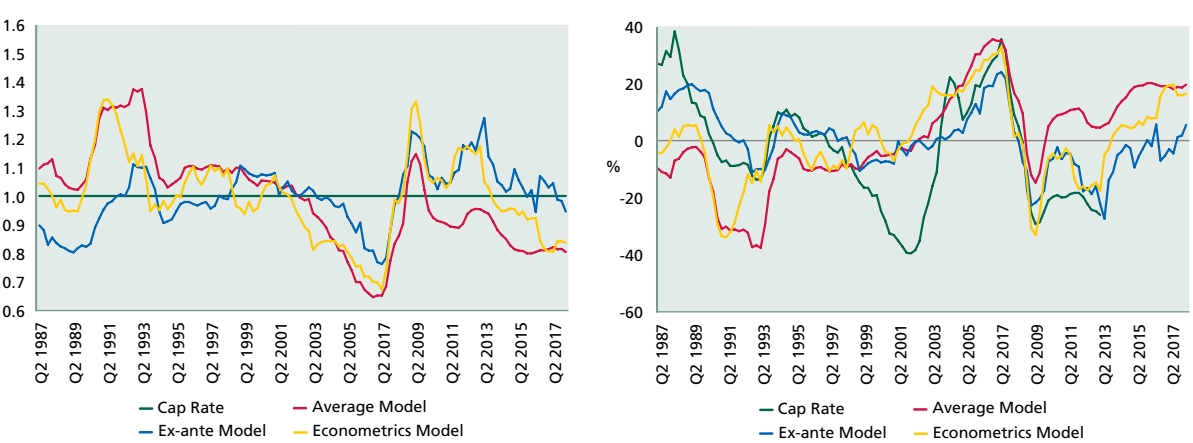
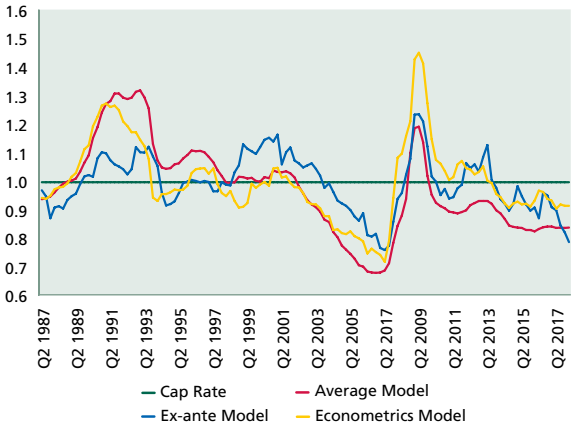
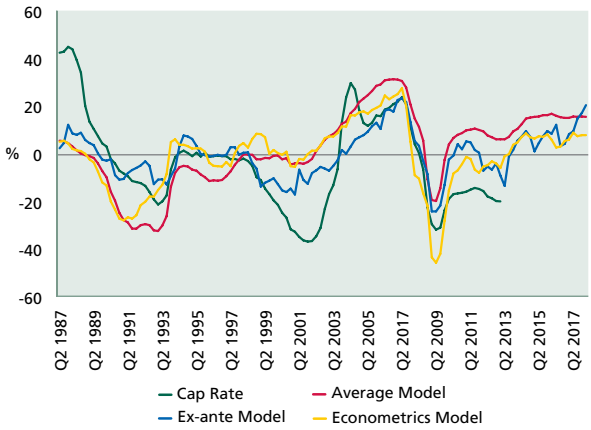


Figure 7: Implied Corrections (Using Rolling Windows) vs. Subsequent Outturn (by Sector, JLL Data) (Cont'd.)

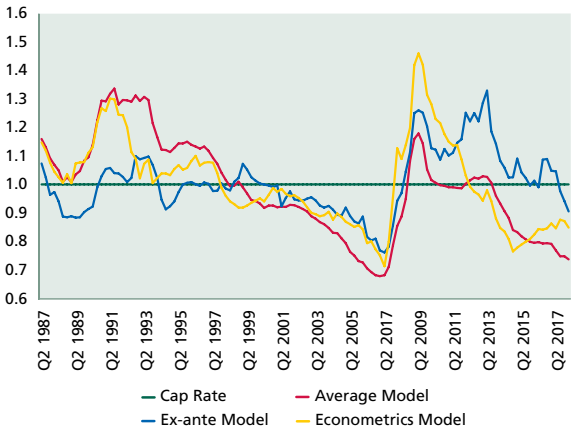
Retail - Ratio of Actual to Sustainable Cap Rate



Retail - Implied Correction vs. Outturn



Industrial - Ratio of Actual to Sustainable Cap Rate



Industrial - Implied Correction vs. Outturn

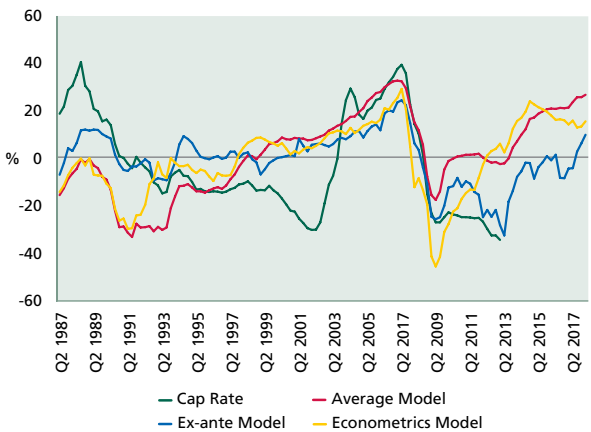


Figure 7 sets out the individual sector results. The results show that the pattern for all three sectors is similar to the pattern for the All Property analysis, with early indications of a cap rate issue prior to the GFC.

Statistical analysis of the implied corrections from all three datasets set out in the main report provide conflicting results about which approach is most robust. All models indicate that yields were below sustainable levels prior to GFC and, hence, that there was a substantial risk of market correction. Given that a key desirable characteristic of models is that they should integrate economic logic, the econometric and ex-ante methods are preferred to averages and trend models for cap rates.

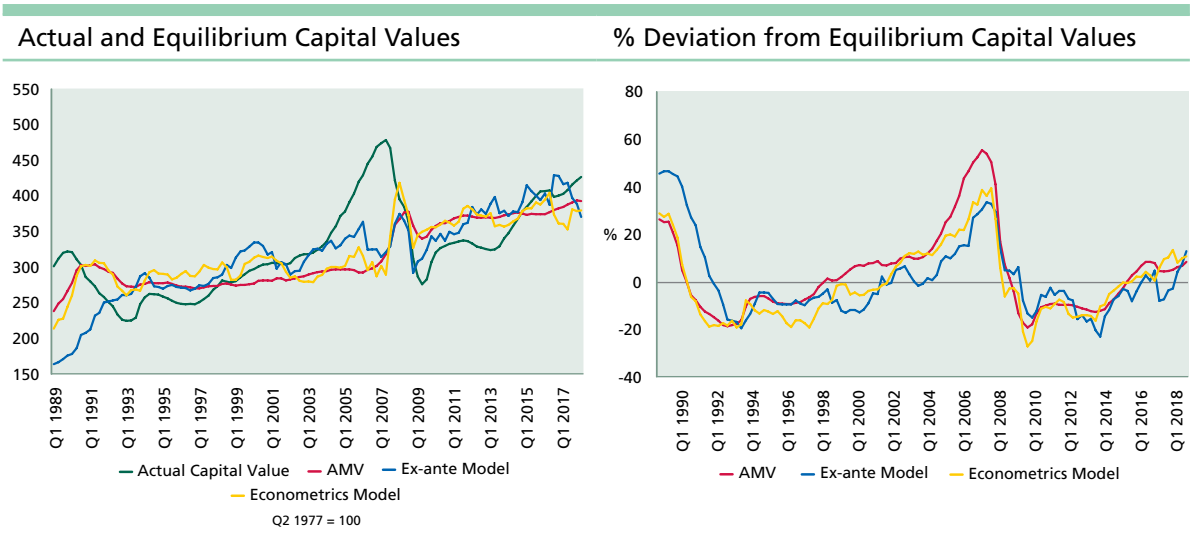
Sustainable Capital Values and Implied Market Corrections

Thus far, the two main drivers of value, rent and yield, have been modelled separately. The results have shown that the rental analysis picks up the 1990 crash clearly, but not the 2007 crash, but the cap rate analysis has the reverse results. One approach to monitoring the risk of a downturn is to look at occupier and investment markets separately. Alternatively, these two key drivers of value can be integrated into a single metric of sustainable capital value made up of sustainable rents and sustainable yields.

For rents, the econometric model performs best, whereas for cap rates it is less clear which approach is best. In addition, the econometric rent model requires data that are, in some instances, not produced in a timely manner and trend analysis may be necessary to fill gaps. Consequently, the approaches that appear to have the most potential to derive measures of equilibrium or sustainable long-term capital values are:

- A trend-based model - the AMV approach, although subject to the concerns noted above;
- Econometric model for equilibrium rent and an econometric model for cap rate; and
- Econometric model for equilibrium rent and an ex-ante cap rate.

Figure 8: Capital Value Results at All Property Level (JLL Data)



The left-hand side of Figure 8 illustrates the actual capital values against equilibrium capital values estimated from the various models. The right-hand side illustrates the percentage deviation of the actual capital value from the estimated equilibrium capital values. Consequently, if the actual capital value is above the sustainable value as it was in 1989 and 2005-2007 this is shown as a positive number in the right-hand diagram, indicating over-valuation.

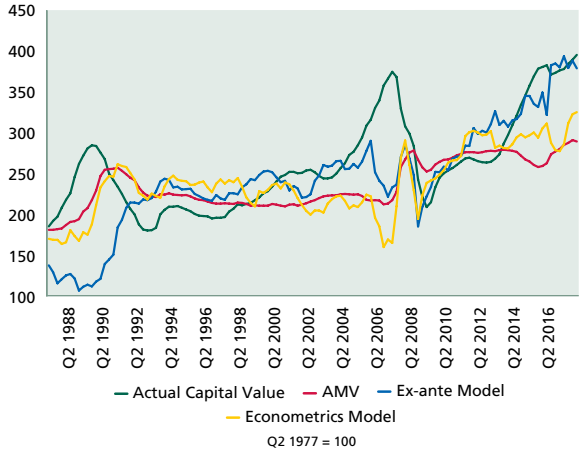
Figure 8 shows that all three approaches appear to work well in the sense that when values are substantially above estimates of long-term equilibrium value, these are associated with a substantial correction in the two subsequent 'correction' periods[6] (1990-92 and 2007-9).

[6] The authors repeat the caveat that, with just two major downturns in the analysis period, it is unwise to overstate the significance of the results.

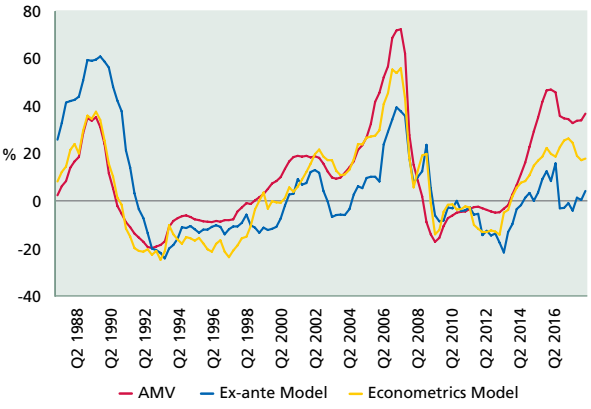
Figure 9 shows the results at sector level. The sector results are also generally good, working well for the office and industrial sectors, and for the retail sector before the 2007-2009 downturn. However, both the trend and the econometric cap rate model give only a weak signal before the early 1990s downturn for the retail sector. As noted earlier, these models are generally based on past relationships and so inevitably will struggle to cope with major structural changes, such as that currently experienced in the retail sector. Re-estimation of sustainable rents to allow for the greater impact of online sales and CVAs, etc. may help to adjust for this once more data becomes available.

Figure 9: Capital Value Results (by Sector, JLL Data)

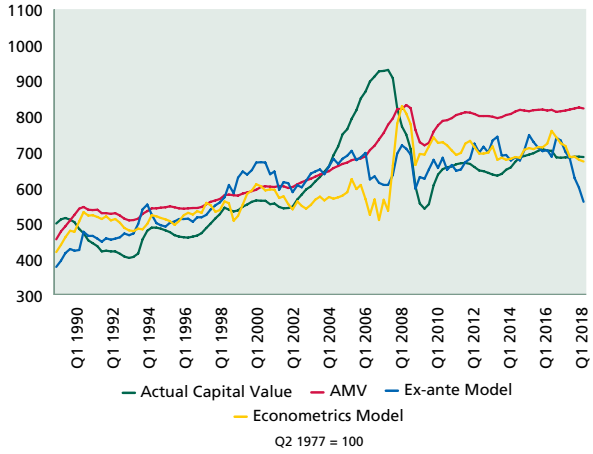
Office - Actual and Equilibrium Capital Values



Office - % Deviation from Equilibrium Capital Values



Retail - Actual and Equilibrium Capital Values



Retail -% Deviation from Equilibrium Capital Values

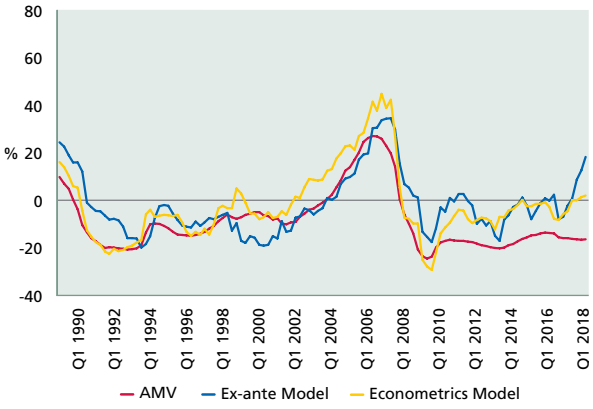
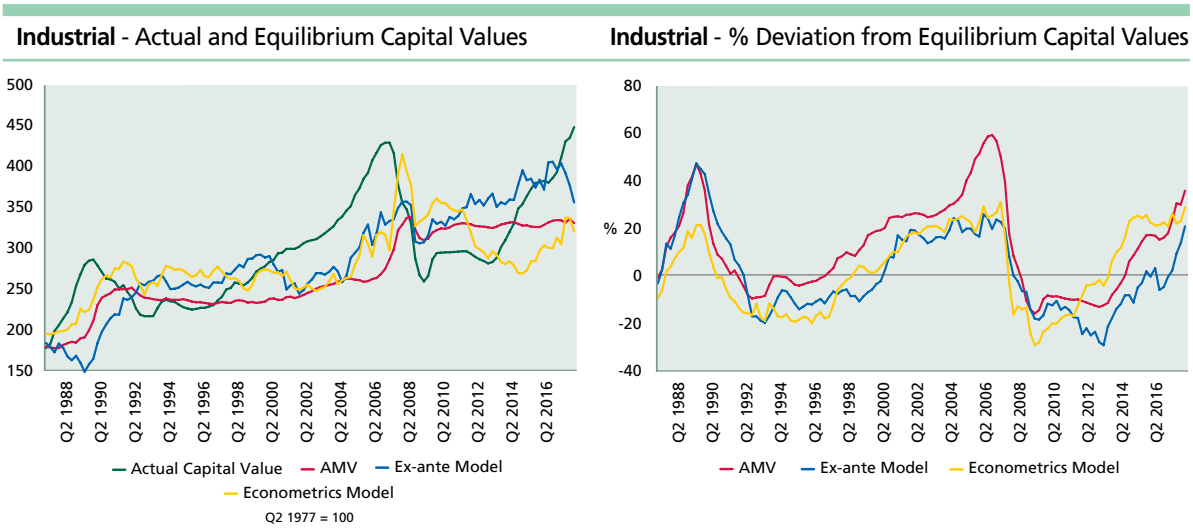


Figure 9: Capital Value Results (by Sector, JLL Data) (Cont'd.)



In summary, approaches that build on an underlying economic logic in determining 'sustainable' rental values, yields and capital values appear to have some measure of success in indicating likely market corrections, and overcome the critique of the AMV approach that it has no underpinning economic basis. However, none of the models identify all of the cyclical changes and the results are less robust at sector level than aggregate market level. Furthermore, there is no real objective way of determining what level of deviation of price from sustainable value constitutes a warning signal, nor do the models predict the magnitude or precise timing of any correction. As a result, such measures may be best used as one of a number of indicators that real estate values may be at heightened risk of a significant fall.

Leverage and Other Potential Indicators of Over-Heated Markets

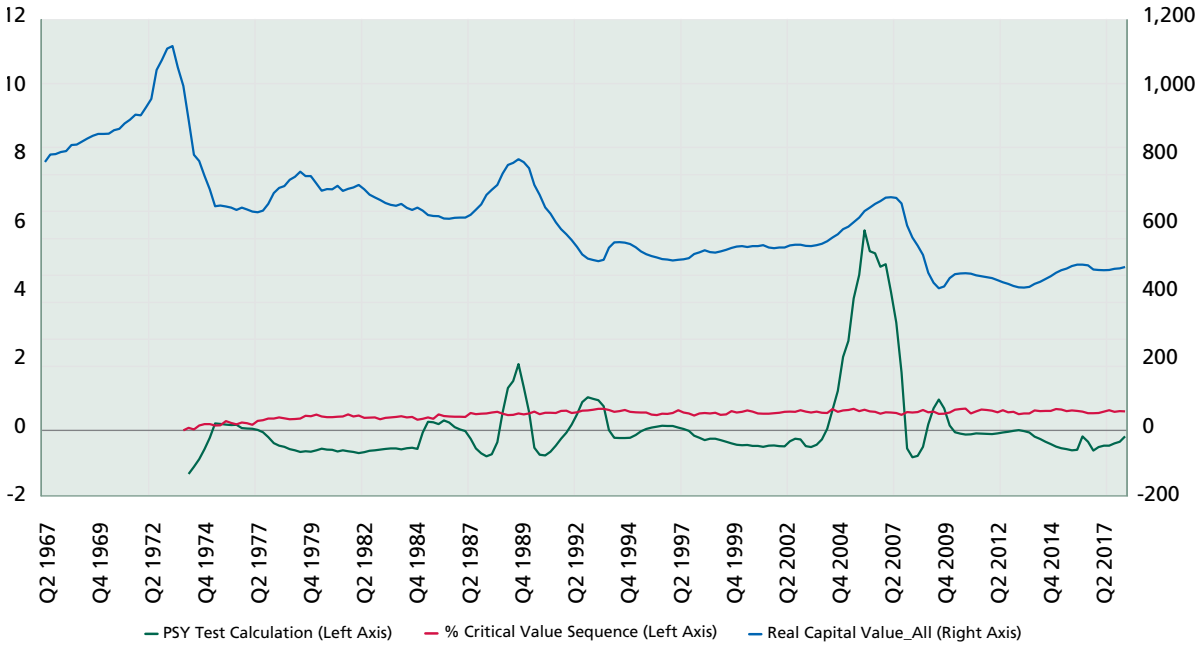
This study has also investigated whether there are other indicators that might indicate future substantial falls (or increases) in values. The role of leverage in particular is investigated and its impact on both the upward and downward phases of market cycles. In the upward phase, rising prices lead to few defaults and it has been argued that increased competition amongst lenders can lead to the erosion of underwriting standards, relaxation of covenants and, critically, higher LTVs. This, in turn, leads to increasing leverage ratios and enables optimistic investors to push prices higher. Analysis of leverage highlights the sharp build-up of debt in the run up to the GFC, the increase in debt at the end of the 1980s and the influence of debt on the 1970s cycle. The relationship between lending to commercial real estate and capital values is dynamic and bidirectional. It appears that lending lags increases in capital values. As a result, it is not well suited to being an early indicator of a downturn. However, in the period before the two major market corrections for which there is data, a build-up of real estate debt is observed, both in aggregate and in relation to past patterns of lending, such that 'excess' debt is related to, and may exacerbate, subsequent price falls – a negative relationship. This suggests that lending and leverage levels may be a useful warning signal for market participants, alongside the other indicators discussed in this report: real increases in lending, increases in commercial real estate's share of overall lending and evidence of higher leverage in the sector should be viewed with concern.

Examining whether listed real estate markets provide useful information about the future direction of private markets, the conclusion is that discounts and premia to NAV are not a reliable indicator – the premia evident in early 2007 suggested that those invested in listed real estate expected underlying value growth to remain robust. It is possible that using the implied real income growth in pricing of listed real estate securities and comparison of this with long-run averages might provide some form of warning indicator but at this stage it is not possible to test this. There is some evidence that listed real estate prices lead private prices, but the lead-lag relationship is not long and much is explained by valuation smoothing in the private indices.

There is some international evidence that sentiment indicators do have a positive relationship with subsequent price movements but more substantial work is required before they could be included as a valuable forward indicator of price corrections. This is because most sentiment measures carry, embedded within them, market fundamentals; and, typically, the signals that are given tend to be relatively short-run. Nonetheless, research in the US which embed within them a concept of sustainable or equilibrium value, suggest that looking at sentiment may be useful in reviewing evidence on market fundamentals.

The literature on asset price bubbles suggests a number of approaches to identify whether a market might be significantly over-valued; the most appropriate of which may be the Phillips, Shi and Yu (PSY) method. This and other methods have been tested. The results for All Property real capital values are shown in Figure 10. Whenever the green line (test statistics) breaks the red line (critical value), it shows a potential bubble or period of significant over-valuation. At an All Property level, the tests successfully indicate a potential downturn in advance of the property crises of 1990 and 2007. The results at a sector level are also generally good for Offices and Retail. However, to reiterate, as there are only two major crises in the study period some caution is needed. Testing the method in other markets suggests that the method is not always reliable — providing warning before downturns but also some false signals. Further, the method is not necessarily robust in the presence of a structural break.

Figure 10: All Property – PSY Test (JLL Data)



Summary, Findings and Conclusions

Following on from the 2014 Property Industry Alliance *Vision for Real Estate Finance in the UK*, which highlighted the need to complement market valuations for secured lending with a long-term valuation, the PIA Long-Term Value Working Group produced a report in 2017 (Phase 1). Between the Vision report in 2014 and the Phase 1 report in 2017, the focus shifted from individual valuations to market segments. The 2017 Report identified two possible approaches, an application of a cash flow approach (IV) or a simple time trend model (AMV). IV appeared to have difficulties with the rent component and this research has taken that issue forward through detailed analysis of rental markets. The AMV model performed well in Phase 1 in identifying the two most recent downturns but the lack of an economic framework or market context raised significant concerns about its use. This study has extended the research for the 2017 Report and explored whether there is an approach to identifying longer-term fundamental value that can be used as a reference point for lending-related decisions. This includes models that incorporate information on the fundamental economic drivers of rents and capitalisation rates. It has also reviewed a range of potential indicators that may signal the market has an increased risk of a downturn.

The research has been constrained by data availability, both of property market data and data on the demand and supply drivers of occupier and investment markets. The study has managed to fill some of these gaps, notably real estate stock (supply) estimates and it has reviewed and compared a number of property market data sources. All approaches to estimating fundamental value are constrained by data and any conclusions are subject to the caveat that there have been only three major downturns in the last 50 years and only two in the period for which there is enough data to be able to test different approaches and models.

The study has analysed real estate occupier markets and explored a range of approaches to estimating sustainable long-term real rental values. However, sustainable rental value measures cannot predict all real estate market corrections, as some have their origin within investment rather than occupier markets. The models examined were generally successful in identifying downturns in real rental values in the 1990s and early 2000s, but they were less successful at predicting the rental downturn that followed the GFC. There is evidence of a late reaction to this downturn in the econometric model, with other approaches struggling to identify it at all. The GFC downturn was not driven by occupier markets in the same way as earlier cycles and so this is not surprising. Therefore, sustainable rental value measures should be used in conjunction with the monitoring of pricing in commercial real estate markets, and as an input to models of sustainable capital values. **Overall, econometric modelling is the preferred approach to measuring sustainable rental values, but improvements to input data (or a method to estimate these) are required to implement this approach on an ongoing basis, particularly for data on the property stock.**

Models of capitalisation rates have also been explored to see if sustainable capitalisation rates can be identified. The models tested generally identify that yields (cap rates) were below sustainable levels well ahead of the GFC. **The preferred model for cap rates, given the desire for economic logic, is the econometric approach but the ex-ante cap rate is helpful as a framework for exploring the impact of changes in fundamentals on sustainable cap rates.**

It is helpful to look at rents and capitalisation rates separately to identify risks in both occupier and asset markets. However, the basic capital valuation model is rent divided by cap rate and measures of the sustainable cap rate and a sustainable rent model can therefore be brought together to derive estimates of sustainable or longer-run equilibrium capital values. These equilibrium values can be compared with actual values to examine if they provide early warning of a potential correction.

These approaches work well in that a movement of real values substantially above estimates of long-term equilibrium value are associated with a substantial correction in subsequent periods - all these approaches successfully predict the two property crises in 1990-1992 and 2007-2009. The sector results are also generally good, working well for the office and industrial sectors, and for the retail sector before the 2007-2009 downturn but both the trend and the econometric cap rate model give only a weak signal before the early 1990s downturn for the retail sector. **The preferred capital value model is based on the econometric estimation of sustainable rents and the econometric estimation of sustainable cap rates. The econometric sustainable rent and ex-ante cap rate approach is also useful.**

All models will struggle in the face of major structural changes to real estate markets that may lead to a move to a new equilibrium, such as the retail sector appears to be experiencing currently. Re-estimation of sustainable rents to allow for the greater impact of online sales and CVAs, etc. may help to adjust for this once more data becomes available. However, it will be hard to back test whether adaptations are effective.

The AMV approach indicated over-valuation ahead of the two major downturns and has a simplicity that is attractive. However, it has not performed as well as other techniques in tests, does not allow for the breakdown between rent and cap rate and, above all, has no economic context or logic. It is insensitive to changes in key drivers of value like occupier demand and interest rates. The econometric and ex-ante models can respond to changing market conditions and be improved as new data becomes available. This research has focussed on providing a defensible and adaptable methodology to underpin the development of long-run valuation indicators for a broad range of stakeholders and so has had to investigate models that are capable of maintaining credibility in that context.

This research has examined other indicators of over and under-pricing that are not related directly to valuations. Leverage is not a good leading indicator but plays a powerful role in cycles and hence **real increases in lending, increases in commercial real estate's share of overall lending and evidence of higher leverage in the sector should be viewed with some concern.**

Technical analysis of real capital value performance, based on **the PSY method, also appears useful as a leading indicator of downturns** whilst recognising that this will not always be reliable.

This study has not been aimed at estimating whether the market is over-heated in 2019, nor addressing the issues of how structural change should be reflected in estimates going forward. However, Table 1 provides estimates for the various approaches as at end March 2019, the last date for which full estimates of supply and, hence, sustainable rents are available. Negative numbers suggest a possible undervaluation while positive numbers suggest a possible over-valuation.

Table 1: Indicators at End March 2019 (MSCI Data)

	All Property	Office	Retail	Industrial
Rent v Sustainable Rent – Rolling	-2%	-1%	-5%	12%
Capital Value - AMV	5%	25%	-14%	39%
Capital Value - Econometric – Rolling	13%	12%	3%	37%
Capital Value - Ex-ante – Rolling	13%	-2%	20%	23%

The rent indicator suggests that, in aggregate, occupier markets are not over-heated and the indicators do not suggest real estate is substantially over-valued but, as noted, this is subject to no structural changes having a substantial adverse impact on investor or occupier demand (or supply). The ex-ante approach includes some assumptions around long-run growth and risk and consequently has different results for the retail sector from econometric and AMV approaches. The ex-ante approach was suggesting risks of further significant value falls in the retail sector at the end of March 2019 whilst the AMV approach was suggesting Retail was undervalued. In the industrial sector, there also appear to be heightened risks of some correction with actual values above sustainable values (the technical indicator (PSY) also suggests risks are elevated). Again, to reiterate this is based on past relationships and the econometric and AMV approaches do not take account of any positive structural changes affecting the industrial sector, from an investor or occupier perspective.

The focus of this study has been to look at history to explore methodologies for determining long-term value in real estate markets and what appear to be useful indicators for identifying when the risk of a significant correction is high. The final conclusions relate to how this research might be used in the future.

First, **rents and assumptions about rental growth** are important to all real estate investment issues, not just real estate lending risk management. Greater discussion of the extent to which rental levels reflect market fundamentals may improve both estimates of sustainable rents and rental growth assumptions (forecasts).

Second, understanding **cap rates (yields)**, the other component of capital value, is also critically important and a model that considers wider investment drivers provides a better basis for that understanding than a simple trend. Again, this has wider implications and applications than risk management of real estate lending. Combining rents and cap rates enables a composite long-term value indicator to be produced.

Third, the research has examined **other indicators** not based in real estate valuation methods. These can provide useful additional context. Monitoring of leverage to check whether there is significant growth in real terms, an increase in the share of commercial real estate lending in the total or generally higher leverage (higher LTV lending) could all be useful in identifying risks in real estate lending markets. Monitoring of technical indicators of bubble risks (PSY) could also provide some valuable additional information. However, possibly the most important consideration, given the extent to which the models use relationships from the past, is to closely monitor markets for structural change and try to model the effects of this change with the intention of developing the methods accordingly so that the affected markets are not misread.

The indicators as constructed in this report have been examined at virtually the highest level; i.e. All Property and the three main segments. They therefore give a high-level view of over and under-pricing. With improved data availability, more disaggregation could be employed but the models are quite data demanding. The variation in performance of sub-markets and individual buildings in particular suggest caution is needed in applying the models, or the conclusions from the sector models, at a more disaggregated level without recognising the many factors that increase variation at this more disaggregated level.

This report has identified and evaluated different models to provide evidence for a subsequent discussion about how long-term valuations can be incorporated into practice.

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