Long-term Value Methodologies in Commercial Real Estate Lending

JULY 2020

MAJOR REPORT APPENDICES

Long-term Value Methodologies in Commercial Real Estate Lending: Appendices

Appendices

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Long-term Value Methodologies in Commercial Real Estate Lending: Appendices

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APPENDIX A: REVIEW OF 2017 REPORT

1. Introduction

The researchers' proposal allowed for a "critical review of the Part I research [which] will involve detailed exploration of the underlying economic basis for the models proposed (drawing on economic and financial theory and empirical work); [and] a review of the analysis that led to the conclusions both in terms of method and robustness of findings". This Appendix sets out the initial findings in relation to that exercise.

The project commenced with a series of interviews with those involved in the 2017 Report[1] (also known as Phase 1 of the research) to understand the origins, processes and rationale behind the work and subsequent Report[2]. In parallel, the models, exploring the data, calculations, testing procedures and matching those to the conclusions set out in the report. The authors are grateful to those involved in the Phase I research both for openness in discussing the project and for making data and analyses available, which greatly eased this task. This appraisal was set in the context of a wider consideration of models used in other markets as an early-warning or leading indicator of market corrections – the review of other approaches is reported elsewhere. This paper focusses, respectively, on the findings of the interviews and appraisal of the models.

2. Interviews with the Phase I Participants

As part of the review of Phase I, the Research Team conducted detailed interviews with participants in the earlier project. In depth, semi-structured interviews covered the following topics:

- *Aims* - The original aims of the research, whether this remit was maintained and whether the focus was on a long term valuation indicator or a cyclical indicator;
- *Models* - How the choice of valuation methods/models to be tested was made - why were some included and others excluded?
- *Testing* - What drove the decisions around the testing framework for the models, the indicators of success and differentiation? What work was done to specify and review the testing framework and choices of markets made?
- *Outcomes* - What were the preferred model(s) and what was the rationale for the choice?
- *Criticisms of models* - What were the strengths and weaknesses of the models examined?
- *Usage* - How did participants envisage the model(s) being used, at what level of disaggregation and for what purpose?
- *Other issues* and recommendations for the Phase II research.

While the responses have contributed to the overall evaluation of Phase I, in this section the authors set out and summarise the findings from the interviews.

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[1] Long-term value methodologies and real estate lending, Property Industry Alliance (2017).
[2] Given Neil Crosby's involvement in Phase 1, the interviews and analyses were conducted solely by the Cambridge members of the research team.

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2.1. Aims and Origins

There was strong consensus that Phase I emerged from the Vision for Real Estate Finance report, with the aim of providing a measure that indicated where property was within the cycle and that flagged risks of falls in prices, with a recognition that lending based on a loan to market value basis brought dangers if prices contained irrational/exuberant elements as might occur towards the top of a price cycle. Respondents did not, unprompted, talk about under-valuation: the focus was very much on the risk of falls, with most noting the impact on lending and non-performing loans (there was little mention of investment decisions, relative to lending decisions, for example). It was emphasised in a number of interviews that there was a strong view that this measure of long-term value should not be seen as a substitute for market value, but rather as a signal for financial decision-making and policy. There seemed some tension over the concept of 'value' and concern from some that market value (as currently defined) had to be preserved and defended and that the work was not intended to undermine existing valuation metrics[2].

For most of the respondents, the principal aim was for a high-level indicator – at aggregate market level or, at most, at very broad sector/geography disaggregation – that would have the effect of reducing the amount of lending at the top of the cycle, whether from regulatory pressures or tighter underwriting – such that there was less vulnerability to sharp falls in value breaching loan to value covenants. For this to occur, the warning indicator would need to be robust and widely accepted. A number of those interviewed expressed some concerns over the 'long-term value' label although there was general agreement that it was intended to identify any gap between prices and some underlying 'fundamental' or 'sustainable' value and, by implication, to point to the risks of an impending correction. From the interviews, there was no real sense that the long-term value concept should be directly used for individual deal analysis, whether for investment or lending purposes, nor even of a need for greater granularity than a broad sector/segment analysis. Thus, the focus seemed to be on developing an indicator or indicators that were at market or portfolio level, rather than on individual asset risk.

2.2. Model Selection

From the interviews, it seemed that the models analysed were closely aligned to existing valuation models (with the possible exception of AMV). The investment value approach was perhaps obvious as a counterpoint to market value and has been well used to try to highlight discrepancies between prices in the market and 'rational' pricing based on a set of assumptions about cashflow and required returns. Mortgage lending value has frequently been cited as a more stable base for loan underwriting and was again seen as an obvious model to test. These two valuation-based metrics were augmented by the AMV approach, as an attempt to identify some form of long term trend and deviations from that trend. There was less clarity amongst respondents as to where AMV had come from, beyond a general feeling of a need to supplement the valuation models. A number of those interviewed noted that there was opportunity to advance other models but that no other suggestions had been forthcoming.

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[2] To an extent, the flagging of a gap between market value and long-term value and a signal of future price corrections does question market value and/or the rationality of market pricing that market value is capturing.

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There was a general awareness of the limitations restricting the analysis to the three models. There seemed little explicit grounding in broader finance, economic and statistical literature that provides the theoretical underpinning of value models, cycle analysis or bubble detection. However, it was also noted that data limitations act as a major constraint on application of models and that metrics employed have to be sufficiently simple or parsimonious to cope with low frequency, short time series data. This provides a more substantial constraint on more granular analysis and disaggregation. The models analysed implicitly draw on equilibrium concepts but this did not seem to have been fully explored or critiqued. It was also noted that timescale and the pro bono nature of the inputs provided an additional constraint and, to some extent, the models reflected the skill sets and interests of those engaged in phase one.

There was also, from the interviews, a sense that the published report might have overstated the performance of the models – notably AMV and, to an extent, IV. There was a general recognition that the long-run trend model(s) would need to be adjusted to account for structural and secular shifts in, for example, demographics, technology of work, and interest rate/return structures. If demographic change, for example, led to a structural fall in discount rates/required returns, then this could lead to a one-off structural shift in values, which should not be mistaken for a long-term trend.

2.3. Testing Procedures

Most of those interviewed indicated that they felt model testing was basic and ad hoc, constrained by time scale, resources and technical expertise. Since the three models reviewed were tested, in large measure, by the group member developing the model, there were some inconsistencies in the procedures used. The broad aim of the testing process seemed clear: did the models provide warning signals of market corrections (again, from the interviews there seemed little concern about testing for periods of undervaluation)? This was captured in two ways: was the deviation between market value and model value clear and expanding before a correction; and did a deviation of a particular percentage value indicate a high probability of a fall over a subsequent period.

AMV was more amenable to testing in that it was estimated over a longer time period and at a higher frequency than IV (see below for further commentary on this). Data and required inputs made it largely infeasible to test IV (and MLV) over the 1973 cycle, for example and testing of those models was annual rather than quarterly. There was some difference of views here: some saw the testing as rigorous, but the majority expressed much more unease about the procedures used, which were seen as informal and ad hoc. There were strong reservations expressed about data robustness (particularly over longer time periods with composition changes) and a view that without some formal model of why deviation was occurring, it was hard to argue that the models would have strong explanatory power beyond the analysis period. Testing issues are discussed further in the next section.

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2.4. Outcomes, Preferred Models and Rationale

While the published report clearly favours AMV (not least in that the deviations prefigure the 1990 correction, while IV as implemented misses it, since much of the rise and subsequent fall in prices was driven by the rent cycle), the position of those interviewed was much more nuanced and divided. Some favoured AMV as simple but effective. Others were substantially more critical of its narrow focus and of the univariate compound growth nature of the underlying value index, which ignores any shifts in risk free rates, risk premia, institutional market structures and structural economic change. Some of these elements are present in the IV model as developed in the project, but the model relied on market rents (which may be away from equilibrium values) and on short-run rental forecasts (which may be both inaccurate and pro-cyclical) along with an assumed, if modelled, exit yield. AMV supporters saw these as fatal; those favouring IV-based models saw them as areas for improvement. None of those interviewed sought to rehabilitate MLV, which was not seen as fit for purpose (other than in providing reassurance for bond markets).

There were sharp differences of views regarding model sophistication: one group arguing that simplicity and accessibility were vital if the models were to gain traction and acceptability in the real estate industry, another suggesting that comparatively unsophisticated models without a clear underlying economic logic would not be accepted across the wider financial and regulatory community, undermining their effectiveness. While the report strongly favoured use of AMV, those interviewed tended to suggest that models should be used in parallel, recognising the strengths and weaknesses of the differing approaches.

2.5. Model Critiques

Those interviewed were asked to set out their views on the shortcomings of the models explored in phase one. Discussion very much focussed on IV and AMV. In relation to MLV, it was noted that it does not address full cycle issues and undervaluation and that there are substantial issues in apportioning value between land and building components but, in general, it was simply dismissed as not fit for purpose (despite its usage in other markets). It was noted that there was a strong theoretical rationale to the land/building apportionment as real economic growth was captured via densification rather than by rent or value per unit area. That the IV model used failed to 'predict' the 1990 correction was seen as a major flaw, by comparison to AMV's apparent greater success.

For both AMV and IV, data issues were seen as particularly problematic. AMV relies on splicing data series (particularly those versions that use the IPD long run series and, even more so, the Scott data), with compositional changes not really accounted for and with segmentation data unavailable for earlier periods. It was noted that sources other than IPD-MSCI might provide insights here but there were widely expressed concerns about the reliability of the early data (casting some doubt on the strength of the findings) and on the impact of composition changes in the more recent period. For IV as implemented, ERV was taken as a given but could be away from fundamental values (as in the run up to 1990) pointing to the need for some sort of sustainable or equilibrium rent enhancement. Moreover, the reported rents need to be corrected for time varying rental incentive packages. A number of those interviewed bemoaned the lack of a robust effective rent series for the UK.

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Most concern, however, related to the use of rental growth forecasts to estimate the rent at the end of the five year 'holding period' – if these were unreliable (and if rental forecasts were pro-cyclical) then the model might be insensitive to corrections. There was a broad sense that the consensus forecasts were not a strong basis for the IV models and there are issues linked to the way in which forecasts are reported, too, particularly when not at year end. In effect – and, again, as implemented – IV is broadly a yield-driven model. In turn, this raises important questions about the proxies used for the risk free rate (particularly in the post-GFC period) and the risk premium (which was broadly held constant over the analysis period, based on survey data of uncertain validity. IV also requires an estimate of exit yield and there is a danger that the rolling window moving average method may be pro-cyclical in yield-driven upturns[3].

The major criticisms of AMV rested on its a-theoretical nature, simply fitting a log-linear trend to the inflation-adjusted spliced value series. As such, it failed to incorporate structural factors such as changes in the risk free rate and possibly lacked credibility as a result. For some, this was offset by apparent success rate in flagging future corrections; for others there were concerns that this might be a statistical artefact with no guarantee of continuation in future markets – it relied on a relatively simple concept of mean reversion. As such, it is in effect a black box model of value movements and that may make it harder to justify as a policy/regulatory tool or lead to resistance to market acceptability – although this is offset by the simplicity and visual nature of the discrepancy between AMV and MV.

There were also critiques about the testing of the models, although not from all participants. These ranged from concerns at the lack of a formal statistical/probabilistic test of the success of the models[4] to worries that some of the testing metrics were arguably arbitrary albeit with some market rationale (such as the choice of a five year period for the correction to occur, rolling ahead of the model value). While the report stressed the high proportion of successful signals (see below for further consideration), the models were effectively tested over two or three cycles with only one of those cycles having truly robust.

Overall, while it was clear that good progress had been made, there was a clear sense of concern that much more work was needed to address modelling, data and testing procedures. A number of those interviewed suggested that they felt that the report may have over-stated the strength of the models and the rigour of the testing procedure and that many of the caveats and nuances had been underplayed to widen the appeal and impact of the work. While this is important, there was a sense that more evidential rigour was needed, which provides a clear motivation for this second phase of work.

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[3] This is offset to some extent by extending the length of the window to fifteen years to encompass major cycles – although the three major corrections appear to average a 17-year trough to trough frequency.

[4] It should be noted that conventional forecast tests do not work well here, since the models are not 'predicting' a particular value, only flagging a discrepancy between the model and market value. However, there are analogies with models that providing leading indicators of recessions.

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2.6. Usage

There was a clear view that a long-term value indicator was not an attempt to subvert or replace the existing market value system. Rather it would provide a valuable indicator of potential over-heating (or undervaluation), to act as the 'canary in the coal mine', as an indicator that risks are elevated. There were some differences as to whether it had the potential to be a regulatory tool (or trigger regulatory action). Most of the respondents saw it as a high level tool working at aggregate market level or, at most, applied to high level segments or particularly active markets, rather than at a fine level of disaggregation. While this, in part, was driven by data issues, it also reflected the much greater levels of specific risk once one moved beyond sector-region classifications and many felt that level of risk needed to be dealt with through detailed underwriting at loan or investment level. That said, some saw the potential for using a disaggregated level analysis to characterise the risk of particular loan (or investment portfolios). As noted above, most of the focus seemed to be on lending risk rather than investment (or development) decision-making, probably representing the composition of the group and the origins of the project in the Vision document.

2.7. Other Issues and Recommendations

Most suggestions involved further developing and clarifying the existing models, with some focus on extending the IV model to improve the rental component (both the rent level and the use of forecasts). A greater range of testing procedures featured in recommendations. Some expressed strongly that there should be clear recommendations and findings (in effect endorsing a preferred model) while others cautioned against this and suggested that a multiple indicator approach might prove more effective. There were differences of view on spatial and sectoral disaggregation but general agreement that individual asset level models were inappropriate (beyond some work on the extent to which individual variation swamped systematic effects) but that high level disaggregation to identify hot and cold markets could be very valuable. It was noted that a 'London versus the rest' split could be helpful. Many emphasised how dissemination of findings was vital, with potentially different approaches and communication strategies needed for different stakeholders in real estate finance and investment, between the banking and property communities.

3. The Phase I Models: An Analysis and Critique

As agreed with the steering committee, in the Phase II research the authors have not further considered the mortgage lending value model. The focus here is thus on the Adjusted Market Value and Investment Value models as implemented and tested in Phase I. – each reviewed in turn.

3.1 Adjusted Market Value (AMV)

As noted in the Phase One report, the AMV approach is straightforward in concept in that it defines an evolving long-run time trend in real capital values, anchored on an (arbitrary) starting point. With a sufficient range of data, the evolution is slow and the trend line is the average real compound growth rate from the starting point to the latest valuation point. The current valuation is compared to the trend line and the difference is used as a signal of potential future market 'correction'.

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The authors were able to replicate the results from the original project. The AMV approach uses MSCI/IPD data for the most part, with the primary anchor point being 1971, the starting point of the 'long run' IPD index (in practice, the early part of this series was compiled from multiple sources since it pre-dates the formation of IPD). In the report, a longer time-series is used by splicing in Peter Scott's long-run series from his doctoral work. This is one of the few accessible data series that extend pre-war (there are a number of rental series, usually derived from a single owner or market), but reflects the specific composition of the source so the extent to which it is representative of the aggregate commercial market over this period must be moot.

In general, the valuation-based data from IPD-MSCI is subject to substantial composition shifts over time that may affect the validity of analyses, particularly when disaggregated to sector or sub-market level. This is probably seen most starkly for central London (and, in particular, City of London) offices, where the growth of international ownership in recent decades and the linked decline in institutional holdings by UK investors has significant implications for the validity of a segment level analysis that spanned a substantial time series. The City of London PAS segment's share of the capital value of the annual IPD/MSCI portfolio has declined from 14.7% in 1982 to just 3.5% in 2017. If there is any divergence in the pricing behaviour of prime versus secondary or older versus newer properties over the period, then the segment series will not be representative of the behaviour of the market. Retail holdings have been very volatile over that same period, starting at around 27%, peaking at over 50% in 2004 then declining to below 39% by 2017 – with some of that volatility reflecting the rise (from less than 1% in 1982 to a peak of 18% in 2010 and a subsequent decline to less than 12% by 2017. These compositional shifts are important for disaggregated analyses, but are also significant in interpreting the aggregated index. Although there is a significant common element to price movements across the whole market (the mean annual correlation of PAS segments to the market index is 0.878 1982-2017), there are movements that are sector, market or segment specific. The annual correlation between the capital value movements of individual PAS segments 1982-2017 is only 0.762, with far lower correlations between segments that have changed substantially in market share over the analysis period (City of London offices and Retail Warehouses have a correlation of just 0.566 over that time span, for example). These data concerns apply to the Investment Value model, too, but perhaps with less force, given that a number of its inputs are forward looking or reflect spot market values (in as far as the MSCI-IPD figures used reflect the market).

To convert the series to real values, a long-run inflation series is used, broadly the retail price index. While the Office for National Statistics stresses that RPI is no longer an official series, it is used routinely in analysis and, indeed, persists in financial contracts. It might be preferable to use an official series that does have the coverage of the RPI/long-run indicator series; one candidate might be the implied GDP deflator (which over the 1972-2018 period shows near identical average inflation, although the quarter-on-quarter correlation is only 0.74). Figure 2.1, below, compares the AMV lines produced using the RPI measure in the original report and using the implied GDP deflator. While there is some divergence, noticeably after the 2008 financial crisis, the correlation between quarterly changes in the two series is 0.95. The research team were in agreement that use of a price series stripped of inflation was conceptually sound, even though use of real values is comparatively unusual in real estate market practice[5]. The authors note, in passing, that while real estate is generally held to be a hedge against inflation, the research consensus suggests that while anticipated inflation is hedged, unexpected inflation is not in entirety – in part due to the periodic rent review process.

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[5] Indeed, the IPF's hurdle rate study revealed some inconsistencies in the treatment of inflation in the usage of target rates of return and cap rates.

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Figure 3.1: AMV RPI versus GDP Deflator
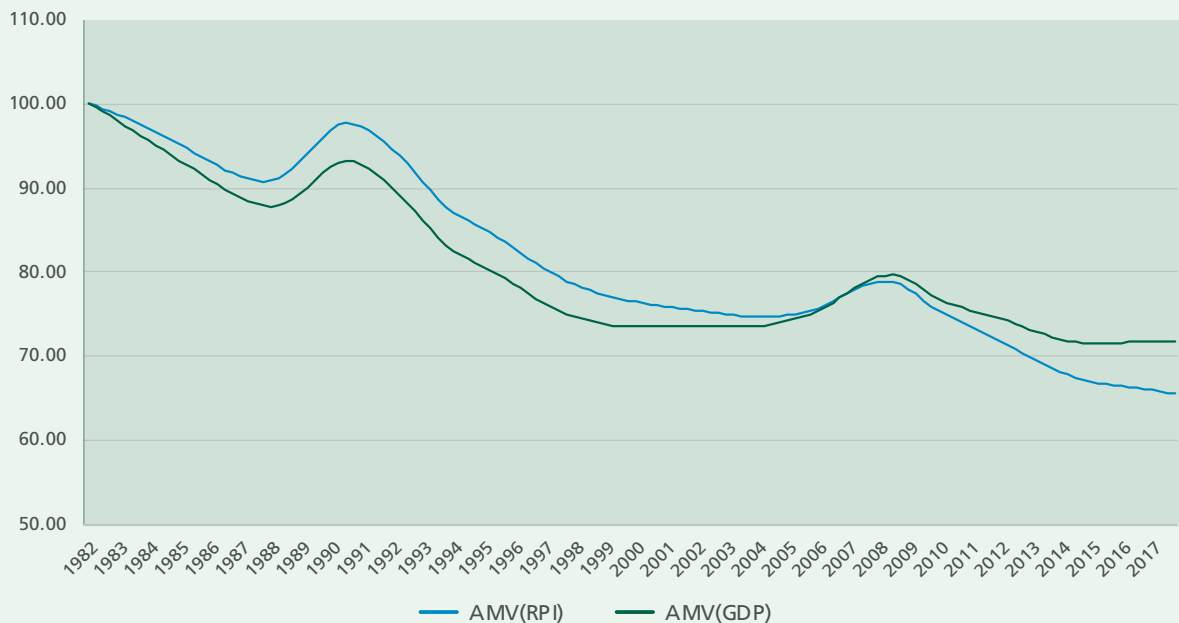
The reported AMV series is quarterly, although much of the data in the early part of the series (including all the Scott series) is annual, while the early quarterly data on IPD is presumably derived from the monthly index until the quarterly series is formed. The method used to convert the annual series to quarterly is non-standard: for the first two quarters in the year, the index one year previous is raised by the annual return given by the Scott series in that year; for the last two quarters, the index one year previous is raised by the annual return in the subsequent year. It would be more conventional to blend/weight the returns and also to consider any seasonal patterns observable in the quarterly data. In practice, this is unlikely to have a material impact on the outcomes (and initial trend tests reveal no strong quarterly patterns in returns). Some quarterly effects have been observed in prior literature, for example due to end of year valuations of those properties not quarterly or monthly appraised, providing an information 'shock' in the market.

Since the average compound growth rate evolves only slowly as the estimation window increases, there is substantial autocorrelation in the series (using the 1971-base, the first order serial correlation of the AMV return series from 1981 is 0.974 compared to a still high 0.785 in the underlying data). This has some implications for the reporting of 'successful' warnings of corrections. Since the reported success is a correction of greater than X% in the subsequent five year period, then a succession of quarterly observations will provide warning indicators (that is, if the gap between AMV and MV in Q2 2006 is warning of a correction, then so too will the Q3 2006 and Q4 2006 gaps). Thus the reporting of percentage positive scores gives a potentially misleading indicator of 'success': one significant correction can create many positives. Given that there are, in effect, only two substantial correction cycles in the data, this implies that the high success rate might be less robust than it seems at first sight.

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The serial correlation in the underlying market value series is a reminder that the market value series used here is appraisal based and that, as a result, quarterly returns are subject to valuation smoothing effects, from anchoring effects from prior valuations, from temporal aggregation and from the use of historic comparables. Most analyses demonstrate, thus, that smoothed series lag underlying market performance and turning points (albeit less within the UK than in the US, in part due to the use of stale appraisals in the NCREIF quarterly index). Interpretation of warning signals of corrections need to be aware of this lagging effect.

Tests indicate that the compound growth rate trend is sensitive to starting point and to the length of the estimation window. Figure 3.2, below, shows the slope coefficient (compound trend) for 20 year estimation windows – the variation is substantial. Anchoring on a particular time point and lengthening the estimation window does, of course, lead to the slope coefficient becoming more stable as the time series lengthens, although even here, both strong upward growth phases and market corrections do alter the slope; using the 1971 anchor, the slope moves from -2.3% to -1.4% across the asset price boom preceding the GFC correction, and then back out to -1.6%.

It is also important to recall that the AMV 'forecasts' are based on a slope coefficient which is a point estimate, subject to error margins. These can be very broad. The slope coefficient was examined for 15-year estimation windows, shifting the window five years forward (that is, 1972-1987, 1977-1992 and onto 2002-2017). The coefficient varied from -3% to +5%, the adjusted R2 as a measure of the explanatory power of the time series trend varied from 96% to 0% and the coefficient itself was statistically insignificant for three of the seven regressions. The authors acknowledge that having a single anchor reduces this issue, but these results once again emphasise that the robustness of the trend varies over time (and that the results are sensitive to the starting point chosen).

Figure 3.2: 20 Year Moving Average Slope Coefficient
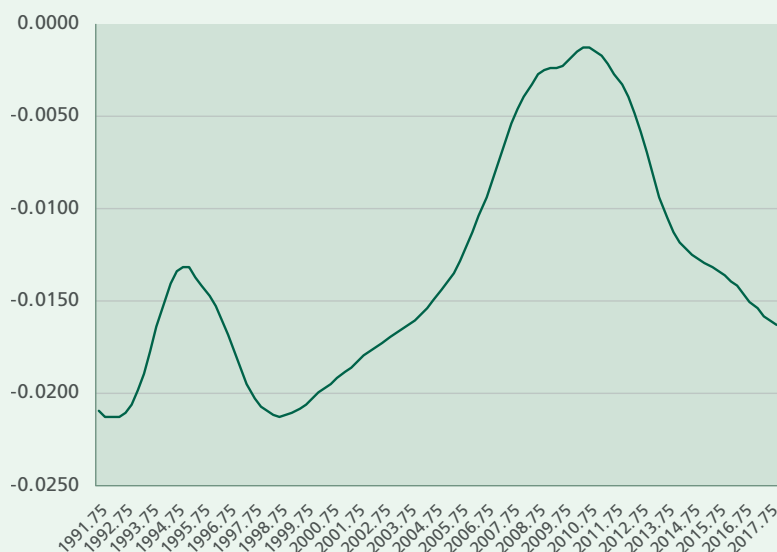
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Keeping these statistical issues in mind, the AMV approach has some attractive features. First, it is simple to calculate and maintain, seems to require minimal assumptions (this issue is returned to below) and has low data demands, requiring only a market value series and a measure of inflation. Over the period where the AMV has been estimated, strong upward divergence from the long-run trend does seem to have been followed by sharp market corrections over the next five years, a period relevant to the commercial real estate loan market (it is less clear that downward divergence presages sharp upward movements). Use of the approach might have limited excess leverage in the run-up to the GFC (which should have contributed to lower 'excess' growth in asset prices and fewer non-performing loans) and, unlike the Investment Value approach, AMV provided warning signs in advance of the early 1990s correction driven more by rental cycle and over-supply than yield-driven asset prices. In principle, the model can be applied at varying scales of disaggregation provided that robust value indices exist (note, however, that the reported tests do suggest that the AMV approach is less successful in flagging corrections when taken down to sector and region level – as might be expected if there are structural shifts in sectoral markets as seems to be the case at present with the retail market).

However, the relative simplicity of the approach also represents an Achilles' heel. The model rests on the assumption that commercial real estate values follow a long-term, slowly evolving compound growth path; and that, should values diverge from that path, they will trend-revert (hence, the greater the divergence, the larger the subsequent correction). For such a model to gain general acceptance, there would need to be an economic logic or rationale behind that assumption, rather than simply an empirical association or artefact over the analysis period. While concepts of mean reversion are found in the macro-economic and financial literature, they tend to be conceptualised as mean reversion to some equilibrium relationship between drivers of market performance.

Standard equilibrium models of real estate market dynamics do suggest that supply should adjust in the long run to demand shocks in a market and that, thus, one might not expect to see long run real rental growth. A (positive) demand shock would, other things equal, lead to an increase in rental values due to short-run supply inelasticity. However, that rental growth would be expected to increase capital values which, in turn, would lead to a development response as those values increase above replacement cost, resulting in new supply in excess of that required to replace obsolete stock, restoring rents to equilibrium levels. Lags in the system may induce cyclical behaviour (exacerbated perhaps by variations in capital availability and demand cycles) but in the long run supply adjusts to demand[6]. This long-run elasticity helps to explain why very long time series analysis of residential and commercial rents (and prices) show little to no real growth over time in a wide range of urban markets[7]. The phase one study's negative growth coefficients are consistent with this view, showing a real depreciation in value of buildings/standing investments over time.

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[6] As an example, the annualised growth of financial and business services employment in the City of London over a forty year period is almost exactly matched to the annualised growth in office space.

[7] Studies include Wheaton and co-workers' analysis of Manhattan office prices, Devaney's work on London office rents, Eichholtz et al.'s very long run studies of Amsterdam and the more recent Lindenthal et al. work on European cities including Paris and London, all broadly confirming the absence of long-run real growth in rents or prices per square metre: broadly confirmed in studies on pre-revolutionary Chinese and on Norway. Typically, though, these papers also reveal lengthy periods where prices deviate from the flat long run real trend.

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Some note of caution is necessary here, however. First, while the long-run data sets show near zero real growth over the whole period, most generally exhibit substantial periods of divergence, of real growth and decline, longer than normal loan maturities. Second, these results are for rents and prices per unit area and reflect the values of a building in existing use. Economic growth (particularly in markets where there are land-use constraints on new supply) will largely be captured in land values and exercise of redevelopment options (for example through change of use or through increasing density on a plot of land). This means that the value path for a freehold owner will depend on the land leverage, the proportion of value that relates to the building and to the land[8]. Since this varies substantially across markets and sectors, a single indicator (e.g. an all property measure) will be insensitive.

Second, the supply-demand adjustment process makes strong assumptions about stability over time in occupier, investment and development markets. In occupier markets, it assumes no structural change in demand (for example, technological innovation, changes in working practices or consumption patterns that might fundamentally alter the demand for space): this seems unlikely to hold. Further, it is likely that such changes will affect different sectors of the economy (and hence different segments of the real estate market) unevenly over time, affecting relative price movements across sectors. In investment markets, the link between rental and capital values depends on the underlying (real) risk free rate and investor attitudes to risk which, together, form the discount rate. It is, again, a strong assumption to assume that these are not time varying or, at most, evolve only very slowly, anchored on prior values[9], not least given the shift towards a more global market for prime real estate assets. Similarly, but perhaps less significantly, technological and financial disruption in the development market might lead to shifts in supply side responsiveness. The AMV approach will not be able to distinguish value changes resulting from such structural shifts from those that are moving prices away from underlying fundamental values.

In later sections of this research, consideration will be given to how some of these issues might be addressed while retaining some of the benefits of the AMV approach. Within the context of a univariate framework, it might be possible to build time-series models that are more nuanced in terms of trends and cycles (and their evolution over time), that help detect structural breaks and/or periods of enhanced volatility. There is a trade-off here between analytic rigour and communicability, but the authors are not convinced that this justifies opting for a model that is open to external criticism for lack of sophistication. Their preference, however, would be to move towards a model that considered more causal drivers of value change where it would be possible to identify the source of divergence from fundamental levels at any particular time point and where sensitivity to the different drivers of supply and demand in the linked real estate markets was considered.

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[8] The authors note that while the mortgage lending value approach was not favoured in phase one, nor forms part of their research brief, this does distinguish land and building components.

[9]

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3.2. Investment Value

The Investment Value (IV) approach attempts to estimate an 'objective' value based on rent levels, rental forecasts, discount rates and exit yields – in effect a short-cut DCF valuation or fair economic value calculation – which is then compared to market value. Where the IV is greater than the MV this is seen as an indicator of potential overpricing. As with AMV, IV correctly warns of a likely correction in advance of the price falls in the aftermath of the GFC but, unlike AMV, the IV calculated in the Phase I research does not warn of the price falls associated with the 1990s over-supply and rental adjustment. As with AMV, the authors were given access to the data used in the Phase 1 report and were able to replicate the results presented. Given that the Phase 1 application of IV relied on the availability of rental forecasts, it was not possible to extend the approach over a longer period or to many sub-markets and nor is it possible to examine the statistical qualities in the same way.

Investment Value's starting conception is more closely aligned to the formal cycles and bubbles literature in attempting to estimate some form of fundamental underlying value by relating rational expectations of future income stream to a current value through the interest rate channel. In essence it is a model that applies a user cost of capital to current income, but adjusted for the typical UK lease format and rent review clause through a form of term and reversion valuation. Current rental values are present valued using a discount rate based on bond yields and a risk premium, then rental forecasts are used to estimate a forward rental rate, which is capitalised at an assumed exit yield and then present valued at the same discount rate as the term income to provide the reversionary component. This is defensible in terms of corporate finance – provided that the inputs can be justified.

Unlike AMV, the model is run in nominal terms with the discount rate presumed to account for inflation expectations. The discount rate used is based on the ten year Government bond yield with a risk premium derived from survey evidence but, in practice, held constant at 3.5% over the analysis period. This appears problematic, particularly with the fall in Government bond rates in the aftermath of the GFC. With UK bond redemption yields below the anticipated inflation rate (index linked bond yields negative, for example), it is hard to interpret bond rates as a valid proxy for the intrinsic risk free rate. Further, if bond rates have been driven down by a flight to safety (rather than just as a result of central bank intervention) then logically this should imply an upward shift in the risk premium. This is, of course, an issue facing any analysis of asset market pricing in the aftermath of the financial crisis. Nonetheless, a more defensible model would need to focus on ways of estimating underlying risk free rates and risk premia.

The exit yield, from the report, is a fifteen year backward rolling average of equivalent yields. This means that it will incorporate not only any structural/economic shifts in target rates of return and risk premia but also shifts that are a result of above-equilibrium prices rises in the build-up to a period of overpricing or an asset bubble driven by excess or over-exuberant investment. The fifteen year span dampens these effects to some extent but, as an example, the all property rolling fifteen year average equivalent yield in 2007 was 110 bp below the 2000 figure, while the ten year bond yield had only fallen by 32 bp. That cap rates in the market had fallen by 160bp indicates that the moving average approach to the exit yield has taken out some, but not all, of the pricing 'euphoria'[10].

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[10] In fairness to the model, the outturn equivalent yield for 2012 was 7.0%, some 40bp below that used in the 2007 investment valuation.

APPENDIX A: REVIEW OF THE 2017 REPORT

Perhaps the most problematic area of the IV model as developed in the Phase One report (and fully acknowledged in that report) is the rental component. First, if rents are 'too high' at the point of valuation, then the investment value will also be too high, unless the rental forecasts assume a correction. This would be the case, for example, if rents had been driven up by short term demand shocks that could not be accommodated given inelastic short-run supply (as in the City of London in the late 1980s). Second, and critically, the model relies on rental forecasts that are 'rational' and not affected by any market sentiment factors. Again this must be open to question. It has been argued that 1980s and early 1990s rental growth forecasts substantially over-predicted outturns, as do the IPF consensus forecasts in the mid-2000s. If rental forecast inaccuracy is pro-cyclical (rather than conservative as suggested in some of the literature) or if it misses turning points, then the use of a growth forecast that is sentiment driven may dampen the effectiveness of IV-MV disparities as a warning signal of potential corrections.

In the Phase 1 report, it is clear that the authors are fully aware of this issue and it is explored through the concept of 'sustainable rent'. It would be possible to follow the AMV trend approach to produce a long run rental series (it would require all the caveats noted above as to validity and robustness). If one then applied long run yield and discount rates (or if the AMV model was adjusted to account for shifts in interest rates), the two methods would, to all intents and purposes, conflate. However, it might be possible to estimate a real fundamental, equilibrium or economic rental value based around the supply and demand models that have emerged, largely in office market analysis, since the mid-1990s. That would still leave unresolved how to forecast rental growth over the term period of the existing IV model to estimate a reversionary value, unless that equilibrium rental value were simply capitalised at a 'rational yield'. While this once again might seem to converge on an AMV approach adjusted for shifts in underlying interest rates, it would have the benefit of having the components of the model clearly available for analysis and debate and with an underlying economic logic. This extension forms part of the Phase II work and will be reported later.

APPENDIX A: REVIEW OF THE 2017 REPORT

3.3. Measures of Success

As noted in the earlier section on interviews, participants expressed concerns over the measures of success utilised in the Phase I report. This will be the subject of further research and consideration in the later work packages of the Phase II study. Here, the authors briefly comment on the approach adopted. It should be acknowledged that there is no simple robust solution to measuring the success of a long-term value indicator. The efficacy of forecasting models can be assessed more readily since they generate point estimates and, hence, the deviation from forecast to actual can be subjected to statistical testing (e.g. using root mean square error, mean absolute deviation and other derivatives or, for comparison between models, measures such as Theil's U). To an extent, the problem faced here is more akin to analysing the effectiveness of a leading indicator: for example a leading indicator of a recession. However, that, too, has characteristics that make it more straightforward to estimate, in that a recession has a precise technical definition (two or more quarters of negative economic growth) which allows more formal statistical procedures to be used (for example Probit analysis) to compare methods and models. There are analogies here in that the time frame needs to be assumed (does the leading indicator give a signal one quarter, two quarters, one year ahead?).

For the long-term value model, the target is more intangible: that there is a divergence between current market valuation and long-term model can be readily measured, but what does this indicate? The Phase I report focuses on subsequent market value correction, since this has most significance for lending purposes, but needs to select a time horizon and an extent of fall to define an 'incident'. There is an underlying rationale to the selection of time period (to the extent that five years may represent the typical time to maturity of a commercial real estate loan or bond issue – although this will vary over time); the choice of size of correction presumably needs to reflect typical loan to value ratios since a correction c such that (1-c) < LTV will cause covenant breaches. However, LTV will be time-varying, too. An alternative might take the underlying logic of the AMV approach and assume reversion to trend over a fixed period (e.g. five years) such that current deviations from trend will be reversed, giving a point estimate. This is, however, somewhat restrictive, not least due to the sharp and abrupt nature of real estate market price corrections (which in turn suggests that a testing procedure may need to consider asymmetric adjustment processes)[11].

Moreover, the five year time horizon becomes problematic since the metric simply says, for example, there is a 20% correction in the five year period. If that correction occurs at the end of the period, but from the date of valuation there is a period of further capital growth, then the correction may not stress any loan (the AMV model is giving warming signals in the third quarter of 2004: capital values rose 33.7% before the correction of June 2007 began). As noted above, the risks of a simplistic 'success ratio' metric over-stating the benefits of any particular model, given strong serial correlation in both underlying and calculated indices, not least in the context of an estimated quarterly series based on annual data. Later work packages will explore additional testing procedures, where possible accounting for non-parametric and asymmetric processes in the underlying data.

[11] Both quarterly and annual MSCI-IPD capital growth series exhibit negative skewness and significant kurtosis.

APPENDIX A: REVIEW OF THE 2017 REPORT

4. Concluding Comments

In appraising the strengths and weaknesses of the models tested in Phase I of the Long Term Value process, it was not the authors' intention to criticise the work conducted, which represented a valuable contribution to the debate about property cycles, pro-cyclical investment and lending and the risks from sudden market corrections and forms a strong foundation for the Phase II project. Further, the research team from Phase I were clearly aware of the limitations of the work conducted in Phase I and there are a number of caveats in the published report. There is, though, an understandable tendency to emphasise the positive elements of the Phase I work and, hence, it is important to flag issues and problems.

Both AMV and the version of IV implemented in Phase I raise technical and conceptual issues. AMV, while apparently successful in signalling the market downturns in the analysis period, relies on a simple trend reversion concept that is not related to underlying economic models, nor is sensitive to structural change in market processes or the factors that drive market prices. IV, as developed in Phase I, is closer to more conventional models of fundamental value. However, it relies on a current market rental value which may, itself, be distorted and, more problematically, on consensus forecasts of rental growth that may be myopic and pro-cyclical. Both models rely on data that are subject to measurement issues and compositional changes over the analysis period. The testing procedures which seek to define the 'success' of the models lack some formality and there is a danger of overstating the proportion of positive results as a result of the metrics chosen. The authors stress again both that the Phase I team were aware of these deficiencies and were constrained by time and resource and that their work is an important springboard.

Later work packages of Phase II will explore possible additional models and extensions to the models tested in Phase I. As expressed by a number of the Phase I project group, the models analysed were somewhat restricted in nature, either drawing from existing property valuation processes or basic trend analysis. The research will seek to extend those models to incorporate ideas from the corporate finance, economic forecasting and bubble detection literature, employing time-series and equilibrium concepts and where possible, extending and adapting the existing models within this framework. Additional ways to approach measuring the success of the models and comparing success across models will also be explored.

APPENDIX B: SUSTAINABLE RENT COEFFICIENT TABLES

Supplementary Table B1: Long-run Econometric Model – Outputs for Office Sector Models using MSCI Dataset

Window end	Rolling windows					Anchored windows				
	Constant	ß real GDP	ß stock	Adj R2	No obs.	Constant	ß real GDP	ß stock	Adj R2	No obs.
1995 Q3	4.081	3.632***	-4.151***	61.9%	42	4.081	3.632***	-4.151***	61.9%	42
1995 Q4	3.934	3.767***	-4.294***	62.9%	42	4.741*	3.656***	-4.241***	62.6%	43
1996 Q1	4.743	3.762***	-4.364***	63.3%	43	5.436*	3.665***	-4.315***	63.1%	44
1996 Q2	5.460*	3.758***	-4.426***	63.8%	44	6.055**	3.673***	-4.383***	63.7%	45
1996 Q3	6.157**	3.747***	-4.478***	64.4%	45	6.654**	3.674***	-4.440***	64.3%	46
1996 Q4	6.254*	3.811***	-4.562***	64.8%	45	7.235***	3.663***	-4.481***	64.8%	47
1997 Q1	7.446**	3.700***	-4.543***	64.6%	46	8.036***	3.609***	-4.492***	64.6%	48
1997 Q2	8.567**	3.585***	-4.514***	64.4%	47	8.801***	3.549***	-4.493***	64.5%	49
1997 Q3	9.501***	3.490***	-4.490***	64.5%	48	9.454***	3.497***	-4.494***	64.6%	50
1997 Q4	10.98***	3.290***	-4.395***	64.7%	48	10.040***	3.443***	-4.485***	64.7%	51
1998 Q1	11.77***	3.190***	-4.351***	65.0%	49	10.530***	3.394***	-4.474***	64.9%	52
1998 Q2	12.47***	3.096***	-4.308***	65.3%	50	10.990***	3.344***	-4.459***	65.0%	53
1998 Q3	13.01***	3.023***	-4.272***	65.6%	51	11.360***	3.301***	-4.443***	65.3%	54
1998 Q4	15.55***	2.652***	-4.075***	67.6%	51	11.720***	3.256***	-4.424***	65.4%	55
1999 Q1	15.76***	2.621***	-4.059***	67.9%	52	11.990***	3.222***	-4.410***	65.7%	56
1999 Q2	15.81***	2.615***	-4.056***	68.3%	53	12.140***	3.205***	-4.404***	66.0%	57
1999 Q3	15.90***	2.601***	-4.048***	68.6%	54	12.35***	3.174***	-4.388***	66.2%	58
1999 Q4	18.01***	2.290***	-3.882***	71.1%	54	12.60***	3.134***	-4.364***	66.3%	59
2000 Q1	17.94***	2.302***	-3.889***	71.3%	55	12.82***	3.097***	-4.342***	66.4%	60
2000 Q2	17.78***	2.327***	-3.904***	71.4%	56	12.96***	3.072***	-4.327***	66.5%	61
2000 Q3	17.49***	2.376***	-3.932***	71.5%	57	12.99***	3.069***	-4.324***	66.6%	62
2000 Q4	18.53***	2.259***	-3.892***	73.8%	57	12.89***	3.083***	-4.332***	66.7%	63
2001 Q1	17.93***	2.355***	-3.948***	73.4%	58	12.76***	3.102***	-4.343***	66.6%	64
2001 Q2	17.38***	2.443***	-4.000***	73.0%	59	12.64***	3.123***	-4.355***	66.6%	65
2001 Q3	16.85***	2.528***	-4.050***	72.6%	60	12.50***	3.145***	-4.368***	66.6%	66
2001 Q4	17.13***	2.561***	-4.114***	73.8%	60	12.33***	3.170***	-4.382***	66.4%	67
2002 Q1	17.47***	2.597***	-4.185***	75.1%	60	12.20***	3.189***	-4.391***	66.4%	68
2002 Q2	17.75***	2.653***	-4.276***	76.3%	60	12.10***	3.202***	-4.397***	66.4%	69
2002 Q3	18.05***	2.759***	-4.426***	77.8%	60	12.06***	3.208***	-4.400***	66.5%	70
2002 Q4	18.46***	2.866***	-4.587***	79.3%	60	12.11***	3.200***	-4.396***	66.7%	71
2003 Q1	18.98***	3.009***	-4.799***	81.1%	60	12.23***	3.183***	-4.387***	66.9%	72
2003 Q2	19.52***	3.127***	-4.987***	82.2%	60	12.42***	3.155***	-4.372***	67.1%	73
2003 Q3	20.19***	3.284***	-5.229***	83.3%	60	12.67***	3.117***	-4.351***	67.2%	74
2003 Q4	20.87***	3.450***	-5.483***	84.0%	60	12.93***	3.077***	-4.329***	67.3%	75
2004 Q1	21.54***	3.631***	-5.755***	84.4%	60	13.18***	3.042***	-4.311***	67.5%	76
2004 Q2	22.23***	3.855***	-6.076***	84.8%	60	13.39***	3.016***	-4.301***	67.8%	77
2004 Q3	22.78***	4.064***	-6.369***	84.6%	60	13.56***	3.000***	-4.298***	68.3%	78
2004 Q4	23.21***	4.258***	-6.633***	83.7%	60	13.69***	2.991***	-4.299***	68.8%	79
2005 Q1	23.82***	4.535***	-7.009***	82.7%	60	13.81***	2.981***	-4.298***	69.2%	80
2005 Q2	25.03***	5.036***	-7.700***	82.6%	60	13.95***	2.965***	-4.293***	69.7%	81
2005 Q3	26.11***	5.439***	-8.265***	81.6%	60	14.10***	2.944***	-4.283***	70.0%	82
2005 Q4	27.00***	5.732***	-8.686***	79.3%	60	14.26***	2.915***	-4.264***	70.3%	83
2006 Q1	27.41***	5.893***	-8.909***	75.8%	60	14.38***	2.895***	-4.251***	70.6%	84
2006 Q2	27.34***	5.912***	-8.925***	71.4%	60	14.47***	2.881***	-4.244***	71.0%	85
2006 Q3	26.09***	5.597***	-8.446***	65.5%	60	14.52***	2.875***	-4.241***	71.3%	86
2006 Q4	24.13***	5.094***	-7.685***	58.8%	60	14.54***	2.872***	-4.240***	71.7%	87
2007 Q1	22.29***	4.662***	-7.018***	53.4%	60	14.56***	2.869***	-4.238***	71.9%	88
2007 Q2	20.72***	4.378***	-6.546***	50.5%	60	14.57***	2.869***	-4.238***	72.2%	89
2007 Q3	19.38***	4.202***	-6.221***	48.8%	60	14.54***	2.873***	-4.241***	72.4%	90

APPENDIX B: SUSTAINABLE RENT COEFFICIENT TABLES

Supplementary Table B1: Long-run Econometric Model – Outputs for Office Sector Models using MSCI Dataset cont'd

Window end	Rolling windows					Anchored windows				
	Constant	ß real GDP	ß stock	Adj R2	No obs.	Constant	ß real GDP	ß stock	Adj R2	No obs.
2007 Q4	18.45***	4.146***	-6.071***	48.4%	60	14.51***	2.878***	-4.244***	72.5%	91
2008 Q1	17.67***	4.138***	-5.993***	48.9%	60	14.47***	2.885***	-4.249***	72.6%	92
2008 Q2	16.75***	4.061***	-5.820***	48.9%	60	14.42***	2.889***	-4.249***	72.8%	93
2008 Q3	14.84***	3.600***	-5.112***	45.1%	60	14.31***	2.879***	-4.226***	72.8%	94
2008 Q4	12.20***	2.773***	-3.915***	37.2%	60	14.15***	2.820***	-4.143***	72.4%	95
2009 Q1	10.60***	2.210***	-3.117***	34.8%	60	14.00***	2.730***	-4.025***	72.2%	96
2009 Q2	10.04***	2.007***	-2.831***	38.2%	60	13.89***	2.656***	-3.929***	72.3%	97
2009 Q3	9.843***	1.935***	-2.729***	43.2%	60	13.81***	2.595***	-3.851***	72.7%	98
2009 Q4	9.775***	1.912***	-2.697***	48.5%	60	13.75***	2.543***	-3.785***	73.3%	99
2010 Q1	9.742***	1.892***	-2.671***	53.1%	60	13.69***	2.493***	-3.722***	73.8%	100
2010 Q2	9.807***	1.877***	-2.659***	57.2%	60	13.64***	2.454***	-3.672***	74.3%	101
2010 Q3	9.921***	1.847***	-2.635***	60.7%	60	13.59***	2.416***	-3.622***	74.8%	102
2010 Q4	10.04***	1.813***	-2.606***	63.9%	60	13.54***	2.375***	-3.570***	75.3%	103
2011 Q1	10.25***	1.779***	-2.585***	66.9%	60	13.50***	2.343***	-3.530***	75.9%	104
2011 Q2	10.51***	1.723***	-2.544***	69.5%	60	13.46***	2.307***	-3.484***	76.4%	105
2011 Q3	10.86***	1.656***	-2.497***	72.0%	60	13.42***	2.273***	-3.441***	76.8%	106
2011 Q4	11.23***	1.588***	-2.452***	74.1%	60	13.38***	2.241***	-3.400***	77.2%	107
2012 Q1	11.77***	1.515***	-2.416***	76.5%	60	13.35***	2.218***	-3.371***	77.7%	108
2012 Q2	12.37***	1.438***	-2.379***	78.8%	60	13.33***	2.197***	-3.345***	78.1%	109
2012 Q3	13.07***	1.357***	-2.349***	80.8%	60	13.31***	2.189***	-3.334***	78.6%	110
2012 Q4	13.72***	1.286***	-2.324***	82.4%	60	13.30***	2.181***	-3.322***	79.0%	111
2013 Q1	14.38***	1.215***	-2.301***	83.8%	60	13.29***	2.176***	-3.316***	79.5%	112
2013 Q2	15.08***	1.138***	-2.275***	85.0%	60	13.28***	2.172***	-3.311***	79.9%	113
2013 Q3	15.80***	1.060***	-2.249***	86.0%	60	13.28***	2.172***	-3.311***	80.3%	114
2013 Q4	16.51***	0.981***	-2.221***	86.8%	60	13.28***	2.172***	-3.310***	80.6%	115
2014 Q1	17.20***	0.902***	-2.190***	87.5%	60	13.28***	2.172***	-3.310***	80.9%	116
2014 Q2	17.90***	0.814***	-2.151***	88.0%	60	13.28***	2.172***	-3.310***	81.2%	117
2014 Q3	18.44***	0.753***	-2.129***	88.4%	60	13.28***	2.172***	-3.311***	81.5%	118
2014 Q4	18.79***	0.720***	-2.122***	88.6%	60	13.28***	2.172***	-3.311***	81.7%	119
2015 Q1	18.95***	0.713***	-2.128***	88.5%	60	13.27***	2.172***	-3.310***	81.8%	120
2015 Q2	18.88***	0.733***	-2.145***	88.2%	60	13.25***	2.174***	-3.310***	82.0%	121
2015 Q3	18.48***	0.787***	-2.172***	87.4%	60	13.23***	2.176***	-3.311***	82.1%	122
2015 Q4	17.66***	0.885***	-2.212***	86.3%	60	13.21***	2.180***	-3.313***	82.2%	123
2016 Q1	16.57***	1.003***	-2.251***	85.1%	60	13.18***	2.184***	-3.316***	82.3%	124
2016 Q2	15.44***	1.113***	-2.277***	84.1%	60	13.15***	2.189***	-3.318***	82.4%	125
2016 Q3	14.25***	1.215***	-2.290***	83.5%	60	13.13***	2.193***	-3.321***	82.4%	126
2016 Q4	12.98***	1.315***	-2.293***	83.5%	60	13.11***	2.195***	-3.323***	82.5%	127
2017 Q1	11.80***	1.399***	-2.285***	84.0%	60	13.11***	2.196***	-3.323***	82.6%	128
2017 Q2	10.75***	1.462***	-2.264***	84.9%	60	13.11***	2.196***	-3.323***	82.7%	129
2017 Q3	9.895***	1.498***	-2.231***	85.9%	60	13.11***	2.195***	-3.322***	82.9%	130
2017 Q4	9.355***	1.508***	-2.194***	86.2%	60	13.12***	2.193***	-3.321***	83.0%	131
2018 Q1	9.010***	1.511***	-2.166***	85.9%	60	13.13***	2.192***	-3.320***	83.1%	132
2018 Q2	8.984***	1.495***	-2.146***	85.3%	60	13.14***	2.190***	-3.319***	83.2%	133
2018 Q3	9.243***	1.468***	-2.138***	84.5%	60	13.16***	2.186***	-3.315***	83.3%	134
2018 Q4	9.635***	1.446***	-2.148***	84.2%	60	13.17***	2.182***	-3.312***	83.4%	135
2019 Q1	10.03***	1.433***	-2.168***	84.1%	60	13.18***	2.179***	-3.310***	83.5%	136

Note: *, **, *** denote significance at the 10%, 5% and 1% levels, respectively. Estimation windows for early periods include some years where only annual observations were available.

APPENDIX B: SUSTAINABLE RENT COEFFICIENT TABLES

Supplementary Table B2: Long-run Econometric Model – Outputs for Retail Sector Models using MSCI Dataset

Window end	Rolling windows					Anchored windows				
	Constant	ß real HHC	ß stock	Adj R2	No obs.	Constant	ß real HHC	ß stock	Adj R2	No obs.
1995 Q3	22.19***	1.892***	-3.557***	81.9%	42	22.19***	1.892***	-3.557***	81.9%	42
1995 Q4	23.06***	1.973***	-3.721***	80.4%	42	22.96***	1.908***	-3.644***	81.3%	43
1996 Q1	23.84***	1.985***	-3.803***	79.5%	43	23.72***	1.922***	-3.726***	80.5%	44
1996 Q2	24.55***	1.995***	-3.876***	78.8%	44	24.43***	1.935***	-3.801***	79.9%	45
1996 Q3	25.18***	2.002***	-3.940***	78.2%	45	25.04***	1.944***	-3.866***	79.3%	46
1996 Q4	25.97***	2.082***	-4.094***	75.9%	45	25.54***	1.951***	-3.917***	78.9%	47
1997 Q1	26.45***	2.079***	-4.134***	75.3%	46	26.02***	1.955***	-3.963***	78.4%	48
1997 Q2	26.93***	2.071***	-4.167***	74.4%	47	26.49***	1.957***	-4.007***	77.7%	49
1997 Q3	27.36***	2.057***	-4.189***	73.4%	48	26.93***	1.954***	-4.043***	77.0%	50
1997 Q4	27.75***	2.090***	-4.260***	70.4%	48	27.17***	1.956***	-4.065***	76.8%	51
1998 Q1	27.95***	2.077***	-4.263***	70.1%	49	27.38***	1.955***	-4.084***	76.6%	52
1998 Q2	28.15***	2.060***	-4.263***	69.7%	50	27.62***	1.953***	-4.103***	76.4%	53
1998 Q3	28.31***	2.038***	-4.254***	69.1%	51	27.85***	1.948***	-4.118***	76.0%	54
1998 Q4	27.99***	1.955***	-4.138***	65.7%	51	27.91***	1.948***	-4.124***	76.0%	55
1999 Q1	28.04***	1.945***	-4.130***	65.7%	52	28.01***	1.947***	-4.130***	75.9%	56
1999 Q2	28.06***	1.923***	-4.110***	65.4%	53	28.13***	1.942***	-4.137***	75.7%	57
1999 Q3	28.08***	1.911***	-4.098***	65.4%	54	28.21***	1.940***	-4.141***	75.7%	58
1999 Q4	27.41***	1.783***	-3.904***	62.5%	54	28.27***	1.937***	-4.143***	75.6%	59
2000 Q1	27.40***	1.779***	-3.899***	62.6%	55	28.30***	1.933***	-4.142***	75.7%	60
2000 Q2	27.41***	1.784***	-3.904***	62.7%	56	28.31***	1.933***	-4.143***	75.8%	61
2000 Q3	27.42***	1.789***	-3.911***	62.7%	57	28.32***	1.932***	-4.143***	75.9%	62
2000 Q4	26.75***	1.670***	-3.725***	62.6%	57	28.31***	1.933***	-4.143***	76.0%	63
2001 Q1	26.80***	1.693***	-3.754***	62.4%	58	28.27***	1.935***	-4.141***	76.1%	64
2001 Q2	26.83***	1.709***	-3.774***	62.4%	59	28.24***	1.936***	-4.139***	76.1%	65
2001 Q3	26.86***	1.720***	-3.789***	62.4%	60	28.24***	1.936***	-4.139***	76.3%	66
2001 Q4	26.86***	1.692***	-3.759***	63.8%	60	28.22***	1.938***	-4.140***	76.4%	67
2002 Q1	26.95***	1.676***	-3.749***	65.3%	60	28.19***	1.940***	-4.140***	76.6%	68
2002 Q2	27.25***	1.673***	-3.772***	67.6%	60	28.18***	1.941***	-4.140***	76.8%	69
2002 Q3	27.84***	1.699***	-3.851***	70.2%	60	28.17***	1.943***	-4.140***	77.0%	70
2002 Q4	28.57***	1.745***	-3.963***	72.4%	60	28.14***	1.945***	-4.140***	77.2%	71
2003 Q1	29.45***	1.806***	-4.106***	74.2%	60	28.12***	1.947***	-4.140***	77.3%	72
2003 Q2	30.37***	1.863***	-4.247***	75.6%	60	28.12***	1.945***	-4.139***	77.5%	73
2003 Q3	31.61***	1.944***	-4.442***	76.8%	60	28.13***	1.944***	-4.138***	77.7%	74
2003 Q4	33.08***	2.046***	-4.679***	77.8%	60	28.11***	1.945***	-4.138***	77.9%	75
2004 Q1	34.83***	2.164***	-4.959***	78.8%	60	28.11***	1.946***	-4.138***	78.1%	76
2004 Q2	37.09***	2.308***	-5.310***	80.0%	60	28.11***	1.945***	-4.138***	78.3%	77
2004 Q3	38.84***	2.421***	-5.584***	79.8%	60	28.11***	1.946***	-4.138***	78.5%	78
2004 Q4	40.41***	2.528***	-5.835***	78.7%	60	28.09***	1.947***	-4.138***	78.7%	79
2005 Q1	42.10***	2.638***	-6.100***	77.5%	60	28.08***	1.948***	-4.138***	78.9%	80
2005 Q2	46.58***	2.913***	-6.786***	78.8%	60	28.07***	1.950***	-4.139***	79.2%	81
2005 Q3	50.68***	3.167***	-7.416***	79.0%	60	28.03***	1.951***	-4.137***	79.3%	82
2005 Q4	54.25***	3.390***	-7.966***	78.0%	60	27.98***	1.953***	-4.134***	79.5%	83
2006 Q1	56.40***	3.535***	-8.309***	75.3%	60	27.87***	1.953***	-4.125***	79.5%	84
2006 Q2	53.93***	3.407***	-7.956***	72.8%	60	27.79***	1.952***	-4.117***	79.5%	85
2006 Q3	45.44***	2.931***	-6.706***	71.3%	60	27.70***	1.952***	-4.109***	79.6%	86
2006 Q4	30.68***	2.097***	-4.524***	71.6%	60	27.54***	1.948***	-4.090***	79.5%	87
2007 Q1	22.26***	1.639***	-3.298***	76.5%	60	27.43***	1.945***	-4.078***	79.5%	88
2007 Q2	16.83***	1.347***	-2.513***	80.4%	60	27.33***	1.942***	-4.066***	79.5%	89

APPENDIX B: SUSTAINABLE RENT COEFFICIENT TABLES

Supplementary Table B2: Long-run Econometric Model – Outputs for Retail Sector Models using MSCI Dataset cont'd

Window end	Rolling windows					Anchored windows				
	Constant	ß real HHC	ß stock	Adj R2	No obs.	Constant	ß real HHC	ß stock	Adj R2	No obs.
2007 Q3	14.16***	1.215***	-2.138***	84.3%	60	27.27***	1.942***	-4.060***	79.6%	90
2007 Q4	13.63***	1.213***	-2.091***	88.3%	60	27.18***	1.939***	-4.049***	79.6%	91
2008 Q1	13.35***	1.223***	-2.077***	91.4%	60	27.02***	1.933***	-4.028***	79.5%	92
2008 Q2	14.63***	1.324***	-2.297***	93.7%	60	26.79***	1.922***	-3.997***	79.3%	93
2008 Q3	13.53***	1.276***	-2.150***	94.7%	60	26.27***	1.894***	-3.922***	78.7%	94
2008 Q4	9.930***	1.073***	-1.619***	94.8%	60	25.01***	1.821***	-3.734***	76.5%	95
2009 Q1	7.891***	0.962***	-1.321***	95.0%	60	23.57***	1.733***	-3.514***	74.0%	96
2009 Q2	7.319***	0.938***	-1.246***	95.2%	60	22.10***	1.641***	-3.286***	71.8%	97
2009 Q3	7.618***	0.968***	-1.304***	95.4%	60	21.08***	1.577***	-3.128***	70.5%	98
2009 Q4	8.389***	1.026***	-1.434***	95.2%	60	20.46***	1.538***	-3.032***	69.9%	99
2010 Q1	9.033***	1.077***	-1.545***	94.9%	60	19.82***	1.497***	-2.932***	69.4%	100
2010 Q2	9.990***	1.144***	-1.701***	93.6%	60	19.61***	1.483***	-2.900***	69.6%	101
2010 Q3	10.73***	1.200***	-1.825***	92.7%	60	19.40***	1.470***	-2.867***	69.7%	102
2010 Q4	11.28***	1.244***	-1.920***	92.1%	60	19.13***	1.452***	-2.825***	69.9%	103
2011 Q1	11.76***	1.280***	-2.001***	91.7%	60	18.91***	1.437***	-2.789***	70.3%	104
2011 Q2	12.12***	1.306***	-2.061***	91.6%	60	18.67***	1.421***	-2.751***	70.7%	105
2011 Q3	12.50***	1.334***	-2.123***	91.4%	60	18.54***	1.412***	-2.730***	71.3%	106
2011 Q4	12.84***	1.362***	-2.183***	91.5%	60	18.46***	1.407***	-2.717***	71.9%	107
2012 Q1	13.21***	1.387***	-2.243***	91.3%	60	18.45***	1.407***	-2.716***	72.6%	108
2012 Q2	13.58***	1.405***	-2.293***	91.3%	60	18.47***	1.408***	-2.719***	73.2%	109
2012 Q3	14.06***	1.420***	-2.351***	91.0%	60	18.58***	1.415***	-2.736***	73.9%	110
2012 Q4	14.49***	1.451***	-2.422***	90.3%	60	18.74***	1.426***	-2.762***	74.6%	111
2013 Q1	14.97***	1.479***	-2.493***	89.4%	60	18.95***	1.439***	-2.795***	75.2%	112
2013 Q2	15.41***	1.496***	-2.550***	89.1%	60	19.13***	1.451***	-2.822***	75.8%	113
2013 Q3	15.98***	1.502***	-2.606***	88.3%	60	19.35***	1.465***	-2.858***	76.3%	114
2013 Q4	16.42***	1.524***	-2.667***	87.6%	60	19.58***	1.480***	-2.894***	76.7%	115
2014 Q1	16.90***	1.533***	-2.719***	86.9%	60	19.81***	1.494***	-2.929***	77.1%	116
2014 Q2	17.49***	1.522***	-2.758***	86.4%	60	20.04***	1.508***	-2.964***	77.4%	117
2014 Q3	18.11***	1.500***	-2.788***	85.7%	60	20.27***	1.522***	-2.999***	77.6%	118
2014 Q4	18.73***	1.470***	-2.809***	85.4%	60	20.47***	1.534***	-3.029***	77.8%	119
2015 Q1	19.36***	1.434***	-2.825***	85.1%	60	20.66***	1.545***	-3.058***	78.0%	120
2015 Q2	20.07***	1.380***	-2.829***	84.7%	60	20.86***	1.556***	-3.086***	78.1%	121
2015 Q3	20.95***	1.293***	-2.810***	84.1%	60	21.06***	1.565***	-3.113***	77.9%	122
2015 Q4	21.85***	1.202***	-2.789***	83.9%	60	21.24***	1.574***	-3.139***	77.8%	123
2016 Q1	22.83***	1.090***	-2.753***	83.5%	60	21.42***	1.581***	-3.162***	77.6%	124
2016 Q2	24.04***	0.942***	-2.698***	83.5%	60	21.59***	1.587***	-3.184***	77.2%	125
2016 Q3	25.46***	0.771***	-2.636***	83.8%	60	21.76***	1.591***	-3.203***	76.6%	126
2016 Q4	26.73***	0.629***	-2.592***	84.1%	60	21.94***	1.595***	-3.223***	76.0%	127
2017 Q1	28.06***	0.483**	-2.548***	84.6%	60	22.10***	1.598***	-3.240***	75.3%	128
2017 Q2	29.41***	0.350*	-2.521***	85.4%	60	22.27***	1.601***	-3.258***	74.7%	129
2017 Q3	30.77***	0.226	-2.503***	86.5%	60	22.43***	1.603***	-3.275***	73.9%	130
2017 Q4	32.05***	0.117	-2.496***	87.5%	60	22.60***	1.605***	-3.291***	73.2%	131
2018 Q1	33.27***	0.026	-2.504***	88.6%	60	22.75***	1.605***	-3.305***	72.4%	132
2018 Q2	34.55***	-0.048	-2.534***	89.8%	60	22.90***	1.604***	-3.316***	71.4%	133
2018 Q3	35.85***	-0.113	-2.574***	91.0%	60	23.05***	1.601***	-3.327***	70.3%	134
2018 Q4	37.17***	-0.182	-2.613***	92.0%	60	23.20***	1.598***	-3.336***	69.1%	135
2019 Q1	38.43***	-0.233*	-2.667***	93.0%	60	23.33***	1.592***	-3.342***	67.7%	136

Note: *, **, *** denote significance at the 10%, 5% and 1% levels, respectively. Estimation windows for early periods include some years where only annual observations were available.

APPENDIX B: SUSTAINABLE RENT COEFFICIENT TABLES

Supplementary Table B3: Long-run Econometric Model – Outputs for Industrial Sector Models using MSCI Dataset

Window end	Rolling windows					Anchored windows				
	Constant	ß real GDP	ß stock	Adj R2	No obs.	Constant	ß real GDP	ß stock	Adj R2	No obs.
1995 Q3	15.50***	1.454***	-2.548***	23.3%	42	15.50***	1.454***	-2.548***	23.3%	42
1995 Q4	15.96***	1.607***	-2.759***	26.5%	42	16.58***	1.484***	-2.677***	25.5%	43
1996 Q1	17.01***	1.616***	-2.861***	28.1%	43	17.55***	1.502***	-2.782***	27.5%	44
1996 Q2	18.00***	1.628***	-2.962***	30.0%	44	18.47***	1.522***	-2.886***	29.7%	45
1996 Q3	18.91***	1.634***	-3.049***	31.9%	45	19.31***	1.537***	-2.977***	31.8%	46
1996 Q4	19.46***	1.728***	-3.202***	33.9%	45	20.06***	1.542***	-3.049***	33.7%	47
1997 Q1	20.30***	1.670***	-3.211***	35.0%	46	20.75***	1.521***	-3.086***	35.1%	48
1997 Q2	21.05***	1.611***	-3.212***	36.1%	47	21.38***	1.496***	-3.115***	36.5%	49
1997 Q3	21.72***	1.562***	-3.218***	37.5%	48	21.95***	1.477***	-3.144***	38.1%	50
1997 Q4	22.29***	1.495**	-3.193***	38.8%	48	22.41***	1.454***	-3.158***	39.5%	51
1998 Q1	22.74***	1.430**	-3.161***	40.1%	49	22.78***	1.432***	-3.167***	40.9%	52
1998 Q2	23.14***	1.366**	-3.126***	41.4%	50	23.12***	1.408***	-3.170***	42.2%	53
1998 Q3	23.44***	1.318**	-3.099***	42.7%	51	23.39***	1.390***	-3.174***	43.5%	54
1998 Q4	24.02***	1.064*	-2.870***	45.1%	51	23.59***	1.374***	-3.174***	44.7%	55
1999 Q1	24.11***	1.048*	-2.859***	46.3%	52	23.72***	1.365***	-3.177***	45.8%	56
1999 Q2	24.14***	1.044*	-2.858***	47.4%	53	23.81***	1.363***	-3.181***	46.9%	57
1999 Q3	24.15***	1.043*	-2.857***	48.3%	54	23.86***	1.358***	-3.181***	47.8%	58
1999 Q4	24.48***	0.784	-2.599***	51.1%	54	23.90***	1.352***	-3.178***	48.6%	59
2000 Q1	24.38***	0.817	-2.627***	51.6%	55	23.91***	1.352***	-3.178***	49.3%	60
2000 Q2	24.25***	0.853	-2.655***	52.1%	56	23.88***	1.355***	-3.179***	50.0%	61
2000 Q3	24.08***	0.888*	-2.680***	52.4%	57	23.80***	1.360***	-3.177***	50.5%	62
2000 Q4	24.29***	0.702	-2.492***	55.6%	57	23.63***	1.364***	-3.167***	50.7%	63
2001 Q1	24.01***	0.761	-2.532***	55.3%	58	23.47***	1.371***	-3.161***	50.9%	64
2001 Q2	23.76***	0.812	-2.567***	55.1%	59	23.33***	1.378***	-3.156***	51.1%	65
2001 Q3	23.50***	0.865*	-2.602***	54.8%	60	23.15***	1.386***	-3.149***	51.2%	66
2001 Q4	23.77***	0.828*	-2.585***	57.1%	60	22.92***	1.392***	-3.135***	51.0%	67
2002 Q1	24.03***	0.809*	-2.586***	59.0%	60	22.68***	1.395***	-3.117***	50.8%	68
2002 Q2	24.40***	0.826*	-2.636***	61.0%	60	22.46***	1.396***	-3.100***	50.7%	69
2002 Q3	24.99***	0.924**	-2.797***	62.9%	60	22.25***	1.399***	-3.084***	50.6%	70
2002 Q4	25.72***	1.056**	-3.006***	65.0%	60	22.08***	1.403***	-3.073***	50.6%	71
2003 Q1	26.59***	1.236***	-3.281***	66.6%	60	21.92***	1.406***	-3.063***	50.7%	72
2003 Q2	27.55***	1.426***	-3.575***	68.2%	60	21.81***	1.410***	-3.057***	50.9%	73
2003 Q3	28.57***	1.646***	-3.907***	68.9%	60	21.72***	1.415***	-3.055***	51.2%	74
2003 Q4	29.59***	1.867***	-4.241***	68.8%	60	21.64***	1.420***	-3.054***	51.5%	75
2004 Q1	30.57***	2.080***	-4.561***	68.3%	60	21.56***	1.424***	-3.051***	51.9%	76
2004 Q2	31.39***	2.265***	-4.838***	66.9%	60	21.47***	1.425***	-3.045***	52.3%	77
2004 Q3	31.30***	2.311***	-4.880***	63.8%	60	21.37***	1.424***	-3.034***	52.7%	78
2004 Q4	30.75***	2.286***	-4.806***	60.1%	60	21.24***	1.420***	-3.018***	53.0%	79
2005 Q1	29.74***	2.184***	-4.604***	55.4%	60	21.14***	1.418***	-3.008***	53.4%	80
2005 Q2	28.80***	2.084**	-4.411***	50.5%	60	21.08***	1.420***	-3.004***	53.9%	81
2005 Q3	26.37***	1.759*	-3.840***	45.3%	60	21.05***	1.422***	-3.004***	54.3%	82
2005 Q4	21.84***	1.128	-2.747*	40.0%	60	21.04***	1.425***	-3.006***	54.8%	83
2006 Q1	15.12**	0.200	-1.134	35.8%	60	21.02***	1.427***	-3.007***	55.3%	84
2006 Q2	7.664	-0.819	0.644	34.0%	60	21.00***	1.428***	-3.007***	55.9%	85
2006 Q3	1.439	-1.633*	2.087	34.4%	60	20.97***	1.429***	-3.004***	56.4%	86
2006 Q4	-2.433	-2.094**	2.934**	36.1%	60	20.93***	1.428***	-3.000***	57.0%	87
2007 Q1	-3.633	-2.160***	3.111**	37.1%	60	20.92***	1.428***	-2.999***	57.7%	88
2007 Q2	-2.353	-1.870***	2.678**	35.2%	60	20.91***	1.428***	-2.999***	58.3%	89

APPENDIX B: SUSTAINABLE RENT COEFFICIENT TABLES

Supplementary Table B3: Long-run Econometric Model – Outputs for Industrial Sector Models using MSCI Dataset cont'd

Window end	Rolling windows					Anchored windows				
	Constant	ß real GDP	ß stock	Adj R2	No obs.	Constant	ß real GDP	ß stock	Adj R2	No obs.
2007 Q3	-0.876	-1.551**	2.195**	32.7%	60	20.90***	1.428***	-2.998***	58.9%	90
2007 Q4	0.791	-1.218**	1.681*	29.6%	60	20.91***	1.428***	-2.998***	59.6%	91
2008 Q1	2.933	-0.813	1.046	26.0%	60	20.90***	1.428***	-2.998***	60.2%	92
2008 Q2	6.360**	-0.225	0.095	22.6%	60	20.87***	1.426***	-2.993***	61.0%	93
2008 Q3	10.00***	0.428	-0.945	23.7%	60	20.70***	1.404***	-2.953***	61.7%	94
2008 Q4	10.79***	0.642**	-1.251**	27.4%	60	20.11***	1.310***	-2.797***	61.8%	95
2009 Q1	10.48***	0.651***	-1.235***	31.4%	60	19.31***	1.173***	-2.576***	61.6%	96
2009 Q2	10.50***	0.708***	-1.300***	38.1%	60	18.70***	1.067***	-2.406***	61.9%	97
2009 Q3	10.58***	0.768***	-1.374***	45.8%	60	18.26***	0.988***	-2.279***	62.5%	98
2009 Q4	10.72***	0.838***	-1.463***	53.6%	60	17.95***	0.933***	-2.192***	63.3%	99
2010 Q1	10.89***	0.911***	-1.559***	60.7%	60	17.76***	0.899***	-2.137***	64.3%	100
2010 Q2	11.13***	0.977***	-1.654***	66.2%	60	17.67***	0.882***	-2.111***	65.4%	101
2010 Q3	11.33***	1.029***	-1.729***	70.4%	60	17.60***	0.871***	-2.092***	66.6%	102
2010 Q4	11.52***	1.081***	-1.803***	74.0%	60	17.57***	0.865***	-2.083***	67.7%	103
2011 Q1	11.77***	1.135***	-1.885***	76.7%	60	17.60***	0.871***	-2.092***	68.9%	104
2011 Q2	12.03***	1.181***	-1.958***	79.0%	60	17.65***	0.879***	-2.106***	70.1%	105
2011 Q3	12.31***	1.218***	-2.023***	80.9%	60	17.71***	0.890***	-2.123***	71.3%	106
2011 Q4	12.59***	1.246***	-2.079***	82.5%	60	17.77***	0.901***	-2.141***	72.4%	107
2012 Q1	12.97***	1.258***	-2.124***	84.0%	60	17.84***	0.914***	-2.161***	73.4%	108
2012 Q2	13.37***	1.259***	-2.160***	85.5%	60	17.91***	0.925***	-2.179***	74.4%	109
2012 Q3	13.90***	1.248***	-2.194***	86.5%	60	18.00***	0.941***	-2.204***	75.3%	110
2012 Q4	14.43***	1.237***	-2.227***	87.6%	60	18.09***	0.957***	-2.231***	76.2%	111
2013 Q1	15.01***	1.219***	-2.257***	88.2%	60	18.19***	0.974***	-2.259***	77.0%	112
2013 Q2	15.70***	1.184***	-2.277***	89.0%	60	18.30***	0.991***	-2.286***	77.8%	113
2013 Q3	16.48***	1.133***	-2.288***	89.6%	60	18.41***	1.007***	-2.314***	78.5%	114
2013 Q4	17.30***	1.073***	-2.291***	90.1%	60	18.51***	1.022***	-2.339***	79.1%	115
2014 Q1	18.15***	0.999***	-2.282***	90.5%	60	18.61***	1.034***	-2.361***	79.7%	116
2014 Q2	19.11***	0.898***	-2.253***	90.9%	60	18.70***	1.044***	-2.381***	80.2%	117
2014 Q3	20.11***	0.796***	-2.225***	91.4%	60	18.79***	1.053***	-2.397***	80.6%	118
2014 Q4	21.07***	0.701***	-2.201***	92.1%	60	18.86***	1.058***	-2.410***	81.0%	119
2015 Q1	21.92***	0.618***	-2.182***	92.9%	60	18.92***	1.062***	-2.419***	81.4%	120
2015 Q2	22.71***	0.541***	-2.164***	93.6%	60	18.97***	1.065***	-2.427***	81.8%	121
2015 Q3	23.41***	0.470***	-2.145***	94.3%	60	19.00***	1.067***	-2.432***	82.2%	122
2015 Q4	23.95***	0.413***	-2.128***	94.7%	60	19.03***	1.068***	-2.435***	82.5%	123
2016 Q1	24.32***	0.381***	-2.124***	95.0%	60	19.05***	1.068***	-2.437***	82.8%	124
2016 Q2	24.66***	0.356***	-2.124***	95.3%	60	19.06***	1.069***	-2.439***	83.1%	125
2016 Q3	24.85***	0.346**	-2.130***	95.4%	60	19.07***	1.069***	-2.441***	83.3%	126
2016 Q4	24.82***	0.358***	-2.140***	95.2%	60	19.08***	1.070***	-2.441***	83.6%	127
2017 Q1	24.70***	0.379***	-2.153***	95.0%	60	19.07***	1.069***	-2.441***	83.8%	128
2017 Q2	24.52***	0.404***	-2.166***	94.6%	60	19.07***	1.069***	-2.440***	84.1%	129
2017 Q3	24.28***	0.437***	-2.182***	94.2%	60	19.05***	1.069***	-2.438***	84.3%	130
2017 Q4	23.95***	0.478***	-2.199***	93.6%	60	19.03***	1.068***	-2.436***	84.5%	131
2018 Q1	23.51***	0.526***	-2.215***	92.7%	60	19.00***	1.066***	-2.430***	84.6%	132
2018 Q2	23.04***	0.575***	-2.229***	91.7%	60	18.95***	1.063***	-2.422***	84.7%	133
2018 Q3	22.53***	0.628***	-2.244***	90.5%	60	18.90***	1.059***	-2.415***	84.8%	134
2018 Q4	21.95***	0.681***	-2.254***	89.0%	60	18.84***	1.055***	-2.404***	84.9%	135
2019 Q1	21.29***	0.738***	-2.261***	87.2%	60	18.77***	1.049***	-2.391***	84.9%	136

Note: *, **, *** denote significance at the 10%, 5% and 1% levels, respectively. Estimation windows for early periods include some years where only annual observations were available.

APPENDIX B: SUSTAINABLE RENT COEFFICIENT TABLES

Supplementary Table B4: Long-run Econometric Model – Outputs for Office Sector Models using JLL Dataset

	Rolling windows					Anchored windows				
Window end	Constant	ß real GDP	ß stock	Adj R2	No obs.	Constant	ß real GDP	ß stock	Adj R2	No obs.
1983 Q4	26.03***	2.141***	-4.482***	68.6%	35	26.03***	2.141***	-4.482***	68.6%	35
1984 Q1	26.32***	2.128***	-4.495***	69.6%	36	26.32***	2.128***	-4.495***	69.6%	36
1984 Q2	29.05***	1.522***	-4.048***	76.8%	36	26.33***	2.128***	-4.495***	70.8%	37
1984 Q3	28.95***	1.521***	-4.038***	77.7%	37	26.33***	2.128***	-4.495***	71.9%	38
1984 Q4	28.99***	1.518***	-4.039***	78.6%	38	26.50***	2.121***	-4.504***	72.9%	39
1985 Q1	29.08***	1.512***	-4.040***	79.5%	39	26.72***	2.111***	-4.512***	73.9%	40
1985 Q2	32.70***	0.775**	-3.527***	87.8%	39	27.19***	2.054***	-4.491***	74.5%	41
1985 Q3	32.50***	0.801**	-3.537***	88.3%	40	27.41***	2.036***	-4.491***	75.4%	42
1985 Q4	32.07***	0.846**	-3.550***	88.3%	41	27.39***	2.038***	-4.490***	76.1%	43
1986 Q1	31.62***	0.907**	-3.577***	88.3%	42	27.35***	2.041***	-4.491***	76.7%	44
1986 Q2	32.92***	0.737**	-3.502***	90.3%	42	27.32***	2.044***	-4.491***	77.3%	45
1986 Q3	32.11***	0.841**	-3.546***	89.4%	43	27.10***	2.062***	-4.491***	77.6%	46
1986 Q4	31.30***	0.991***	-3.643***	88.4%	44	26.91***	2.091***	-4.508***	77.7%	47
1987 Q1	30.57***	1.132***	-3.737***	87.5%	45	26.73***	2.123***	-4.527***	77.8%	48
1987 Q2	30.53***	1.352***	-3.989***	85.6%	45	26.49***	2.175***	-4.565***	77.7%	49
1987 Q3	29.68***	1.609***	-4.206***	83.5%	46	26.25***	2.269***	-4.651***	77.2%	50
1987 Q4	28.87***	1.863***	-4.426***	81.1%	47	25.98***	2.385***	-4.760***	76.4%	51
1988 Q1	28.14***	2.148***	-4.687***	78.3%	48	25.71***	2.540***	-4.914***	75.2%	52
1988 Q2	28.15***	2.494***	-5.090***	71.1%	48	25.44***	2.672***	-5.042***	74.0%	53
1988 Q3	27.79***	2.718***	-5.315***	68.8%	49	25.23***	2.802***	-5.172***	73.0%	54
1988 Q4	27.32***	2.971***	-5.565***	65.4%	50	24.93***	2.971***	-5.340***	71.0%	55
1989 Q1	26.69***	3.203***	-5.774***	61.0%	51	24.52***	3.140***	-5.497***	68.0%	56
1989 Q2	23.57***	3.053***	-5.306***	47.0%	51	24.05***	3.285***	-5.622***	65.1%	57
1989 Q3	22.43***	3.159***	-5.322***	41.8%	52	23.39***	3.399***	-5.691***	61.2%	58
1989 Q4	20.97***	3.187***	-5.216***	36.5%	53	22.55***	3.470***	-5.694***	56.8%	59
1990 Q1	19.51***	3.189***	-5.082***	32.4%	54	21.71***	3.524***	-5.677***	52.8%	60
1990 Q2	15.53***	2.965***	-4.448***	30.2%	54	20.82***	3.546***	-5.618***	49.1%	61
1990 Q3	13.13***	2.725***	-3.943***	25.6%	55	19.36***	3.435***	-5.352***	43.4%	62
1990 Q4	10.43***	2.384***	-3.295***	21.0%	56	17.57***	3.225***	-4.939***	36.9%	63
1991 Q1	7.861**	2.012***	-2.620***	17.4%	57	15.60***	2.941***	-4.424***	30.2%	64
1991 Q2	5.027*	1.801***	-2.110**	22.1%	57	13.97***	2.672***	-3.958***	25.6%	65
1991 Q3	4.005	1.627***	-1.812**	21.3%	58	12.55***	2.410***	-3.520***	21.9%	66
1991 Q4	3.766*	1.585***	-1.741**	21.3%	59	11.64***	2.234***	-3.230***	20.3%	67
1992 Q1	3.995*	1.628***	-1.812***	21.8%	60	11.13***	2.126***	-3.056***	20.4%	68
1992 Q2	4.000**	1.794***	-2.006***	26.5%	60	10.88***	2.070***	-2.968***	21.7%	69
1992 Q3	4.190**	1.997***	-2.260***	31.8%	60	10.90***	2.076***	-2.977***	24.4%	70
1992 Q4	4.335***	2.152***	-2.454***	36.4%	60	10.99***	2.095***	-3.007***	27.4%	71
1993 Q1	4.523***	2.297***	-2.640***	40.6%	60	11.14***	2.131***	-3.064***	30.8%	72
1993 Q2	4.793***	2.424***	-2.814***	44.2%	60	11.35***	2.179***	-3.138***	34.5%	73
1993 Q3	5.272***	2.554***	-3.010***	47.2%	60	11.65***	2.250***	-3.250***	38.7%	74
1993 Q4	5.574***	2.653***	-3.153***	50.0%	60	11.90***	2.307***	-3.339***	42.4%	75
1994 Q1	5.851***	2.748***	-3.290***	52.5%	60	12.16***	2.362***	-3.428***	45.8%	76
1994 Q2	6.558***	2.846***	-3.470***	53.4%	60	12.52***	2.432***	-3.543***	49.1%	77
1994 Q3	7.170***	2.924***	-3.618***	54.5%	60	12.84***	2.488***	-3.638***	51.9%	78
1994 Q4	7.873***	3.002***	-3.774***	55.9%	60	13.15***	2.540***	-3.728***	54.5%	79
1995 Q1	8.502***	3.070***	-3.912***	57.5%	60	13.42***	2.588***	-3.808***	56.9%	80
1995 Q2	9.015***	3.130***	-4.030***	59.2%	60	13.66***	2.633***	-3.883***	59.2%	81

APPENDIX B: SUSTAINABLE RENT COEFFICIENT TABLES

Supplementary Table B4: Long-run Econometric Model – Outputs for Office Sector Models using JLL Dataset cont'd

Window end	Rolling windows					Anchored windows				
	Constant	ß real GDP	ß stock	Adj R2	No obs.	Constant	ß real GDP	ß stock	Adj R2	No obs.
1995 Q3	9.375***	3.189***	-4.131***	60.7%	60	13.89***	2.669***	-3.947***	61.1%	82
1995 Q4	9.467***	3.266***	-4.230***	62.4%	60	14.05***	2.696***	-3.994***	62.8%	83
1996 Q1	9.543***	3.346***	-4.330***	63.9%	60	14.22***	2.720***	-4.036***	64.3%	84
1996 Q2	9.596***	3.423***	-4.425***	65.3%	60	14.37***	2.741***	-4.075***	65.7%	85
1996 Q3	9.685***	3.486***	-4.507***	66.4%	60	14.51***	2.760***	-4.111***	67.0%	86
1996 Q4	9.642***	3.570***	-4.601***	67.6%	60	14.65***	2.776***	-4.142***	68.2%	87
1997 Q1	9.583***	3.658***	-4.698***	68.4%	60	14.83***	2.781***	-4.165***	69.1%	88
1997 Q2	9.689***	3.701***	-4.758***	68.8%	60	14.99***	2.783***	-4.183***	69.8%	89
1997 Q3	9.672***	3.760***	-4.825***	69.3%	60	15.11***	2.785***	-4.196***	70.6%	90
1997 Q4	9.546***	3.820***	-4.883***	69.8%	60	15.17***	2.784***	-4.201***	71.2%	91
1998 Q1	9.639***	3.826***	-4.899***	70.1%	60	15.21***	2.783***	-4.204***	71.7%	92
1998 Q2	9.775***	3.814***	-4.898***	70.2%	60	15.20***	2.784***	-4.203***	72.2%	93
1998 Q3	10.21***	3.754***	-4.868***	70.4%	60	15.21***	2.783***	-4.204***	72.6%	94
1998 Q4	10.64***	3.691***	-4.835***	70.6%	60	15.20***	2.784***	-4.204***	72.9%	95
1999 Q1	11.01***	3.636***	-4.805***	70.8%	60	15.17***	2.787***	-4.203***	73.2%	96
1999 Q2	11.12***	3.621***	-4.798***	70.9%	60	15.13***	2.789***	-4.202***	73.5%	97
1999 Q3	11.40***	3.573***	-4.769***	71.0%	60	15.11***	2.791***	-4.203***	73.7%	98
1999 Q4	12.03***	3.468***	-4.705***	71.2%	60	15.10***	2.792***	-4.204***	74.0%	99
2000 Q1	12.76***	3.350***	-4.635***	71.6%	60	15.09***	2.794***	-4.204***	74.2%	100
2000 Q2	13.54***	3.261***	-4.603***	72.8%	60	15.04***	2.802***	-4.210***	74.3%	101
2000 Q3	14.02***	3.213***	-4.591***	73.6%	60	14.94***	2.817***	-4.218***	74.3%	102
2000 Q4	14.23***	3.197***	-4.592***	74.0%	60	14.81***	2.833***	-4.224***	74.1%	103
2001 Q1	14.45***	3.198***	-4.612***	74.5%	60	14.67***	2.855***	-4.236***	73.8%	104
2001 Q2	14.75***	3.194***	-4.634***	75.2%	60	14.55***	2.875***	-4.248***	73.7%	105
2001 Q3	14.92***	3.205***	-4.662***	75.6%	60	14.42***	2.895***	-4.259***	73.4%	106
2001 Q4	15.03***	3.247***	-4.721***	76.0%	60	14.28***	2.915***	-4.268***	73.1%	107
2002 Q1	15.16***	3.293***	-4.786***	76.6%	60	14.14***	2.931***	-4.274***	72.8%	108
2002 Q2	15.31***	3.354***	-4.871***	77.2%	60	14.01***	2.945***	-4.278***	72.6%	109
2002 Q3	15.49***	3.456***	-5.004***	78.0%	60	13.91***	2.956***	-4.282***	72.5%	110
2002 Q4	15.80***	3.557***	-5.149***	78.9%	60	13.85***	2.964***	-4.286***	72.5%	111
2003 Q1	16.18***	3.683***	-5.330***	79.8%	60	13.82***	2.968***	-4.287***	72.7%	112
2003 Q2	16.88***	3.791***	-5.519***	80.9%	60	13.86***	2.962***	-4.284***	73.0%	113
2003 Q3	17.72***	3.961***	-5.793***	82.4%	60	13.92***	2.953***	-4.280***	73.4%	114
2003 Q4	18.54***	4.137***	-6.071***	83.2%	60	14.00***	2.942***	-4.274***	73.7%	115
2004 Q1	19.28***	4.319***	-6.350***	83.5%	60	14.07***	2.934***	-4.271***	74.1%	116
2004 Q2	20.10***	4.555***	-6.698***	83.8%	60	14.14***	2.927***	-4.270***	74.5%	117
2004 Q3	20.77***	4.795***	-7.037***	83.7%	60	14.18***	2.925***	-4.272***	74.9%	118
2004 Q4	21.37***	5.040***	-7.376***	83.2%	60	14.21***	2.925***	-4.274***	75.3%	119
2005 Q1	22.22***	5.393***	-7.863***	82.7%	60	14.25***	2.924***	-4.276***	75.8%	120
2005 Q2	23.64***	5.955***	-8.643***	82.8%	60	14.29***	2.921***	-4.276***	76.1%	121
2005 Q3	24.86***	6.379***	-9.245***	81.6%	60	14.34***	2.914***	-4.274***	76.5%	122
2005 Q4	25.88***	6.675***	-9.680***	79.0%	60	14.40***	2.903***	-4.266***	76.8%	123
2006 Q1	26.21***	6.769***	-9.819***	74.7%	60	14.45***	2.894***	-4.261***	77.1%	124
2006 Q2	26.23***	6.789***	-9.844***	69.9%	60	14.49***	2.889***	-4.258***	77.4%	125
2006 Q3	25.21***	6.517***	-9.437***	64.3%	60	14.52***	2.886***	-4.258***	77.8%	126
2006 Q4	23.79***	6.155***	-8.889***	58.3%	60	14.52***	2.886***	-4.258***	78.0%	127
2007 Q1	22.42***	5.834***	-8.392***	54.1%	60	14.52***	2.886***	-4.258***	78.3%	128
2007 Q2	21.26***	5.626***	-8.046***	52.7%	60	14.52***	2.886***	-4.258***	78.5%	129

APPENDIX B: SUSTAINABLE RENT COEFFICIENT TABLES

Supplementary Table B4: Long-run Econometric Model – Outputs for Office Sector Models using JLL Dataset cont'd

Window end	Rolling windows					Anchored windows				
	Constant	ß real GDP	ß stock	Adj R2	No obs.	Constant	ß real GDP	ß stock	Adj R2	No obs.
2007 Q3	20.35***	5.504***	-7.822***	52.1%	60	14.50***	2.890***	-4.260***	78.7%	130
2007 Q4	19.69***	5.472***	-7.725***	53.1%	60	14.49***	2.892***	-4.262***	78.8%	131
2008 Q1	19.14***	5.484***	-7.690***	54.6%	60	14.47***	2.895***	-4.264***	79.0%	132
2008 Q2	18.29***	5.443***	-7.565***	56.4%	60	14.45***	2.896***	-4.262***	79.2%	133
2008 Q3	16.13***	4.899***	-6.740***	52.9%	60	14.39***	2.884***	-4.243***	79.3%	134
2008 Q4	12.77***	3.822***	-5.186***	43.4%	60	14.28***	2.830***	-4.170***	79.2%	135
2009 Q1	10.42***	2.970***	-3.985***	37.2%	60	14.16***	2.743***	-4.059***	79.0%	136
2009 Q2	9.544***	2.581***	-3.455***	37.6%	60	14.08***	2.671***	-3.967***	79.1%	137
2009 Q3	9.126***	2.356***	-3.157***	39.7%	60	14.00***	2.601***	-3.878***	79.2%	138
2009 Q4	8.986***	2.213***	-2.977***	42.6%	60	13.93***	2.537***	-3.798***	79.4%	139
2010 Q1	8.972***	2.103***	-2.849***	45.8%	60	13.87***	2.477***	-3.723***	79.6%	140
2010 Q2	9.108***	2.022***	-2.767***	49.3%	60	13.81***	2.429***	-3.661***	79.9%	141
2010 Q3	9.323***	1.943***	-2.694***	52.8%	60	13.76***	2.382***	-3.602***	80.2%	142
2010 Q4	9.517***	1.872***	-2.629***	55.9%	60	13.71***	2.334***	-3.542***	80.4%	143
2011 Q1	9.833***	1.804***	-2.579***	59.2%	60	13.67***	2.294***	-3.492***	80.7%	144
2011 Q2	10.22***	1.715***	-2.510***	62.2%	60	13.63***	2.251***	-3.438***	81.0%	145
2011 Q3	10.74***	1.599***	-2.423***	65.1%	60	13.59***	2.208***	-3.384***	81.2%	146
2011 Q4	11.39***	1.468***	-2.328***	68.1%	60	13.55***	2.165***	-3.330***	81.4%	147
2012 Q1	12.18***	1.342***	-2.253***	71.5%	60	13.51***	2.131***	-3.287***	81.6%	148
2012 Q2	13.05***	1.206***	-2.174***	74.8%	60	13.48***	2.097***	-3.244***	81.8%	149
2012 Q3	14.01***	1.069***	-2.100***	77.9%	60	13.45***	2.075***	-3.217***	82.1%	150
2012 Q4	14.79***	0.962***	-2.047***	80.0%	60	13.42***	2.054***	-3.190***	82.3%	151
2013 Q1	15.59***	0.859***	-1.998***	81.8%	60	13.40***	2.038***	-3.170***	82.5%	152
2013 Q2	16.20***	0.781***	-1.962***	82.9%	60	13.38***	2.026***	-3.154***	82.8%	153
2013 Q3	17.01***	0.681**	-1.919***	84.2%	60	13.37***	2.018***	-3.144***	83.0%	154
2013 Q4	17.70***	0.597**	-1.884***	85.2%	60	13.35***	2.012***	-3.134***	83.2%	155
2014 Q1	18.33***	0.519**	-1.849***	85.8%	60	13.34***	2.007***	-3.128***	83.4%	156
2014 Q2	19.08***	0.421	-1.802***	86.6%	60	13.33***	2.004***	-3.124***	83.6%	157
2014 Q3	19.64***	0.356	-1.777***	87.1%	60	13.32***	2.002***	-3.120***	83.8%	158
2014 Q4	19.89***	0.335	-1.776***	87.2%	60	13.30***	2.000***	-3.116***	83.9%	159
2015 Q1	19.96***	0.342	-1.789***	87.0%	60	13.28***	1.998***	-3.112***	84.0%	160
2015 Q2	19.63***	0.392	-1.818***	86.1%	60	13.25***	1.998***	-3.109***	84.1%	161
2015 Q3	18.84***	0.491*	-1.862***	84.4%	60	13.22***	1.999***	-3.107***	84.2%	162
2015 Q4	17.63***	0.635**	-1.920***	82.5%	60	13.19***	2.002***	-3.108***	84.2%	163
2016 Q1	16.27***	0.781***	-1.968***	80.7%	60	13.16***	2.005***	-3.109***	84.3%	164
2016 Q2	14.97***	0.910***	-2.001***	79.1%	60	13.13***	2.008***	-3.110***	84.3%	165
2016 Q3	13.88***	0.998***	-2.006***	78.2%	60	13.12***	2.009***	-3.110***	84.4%	166
2016 Q4	12.67***	1.086***	-2.001***	78.2%	60	13.12***	2.011***	-3.111***	84.5%	167
2017 Q1	11.40***	1.170***	-1.985***	79.0%	60	13.11***	2.012***	-3.112***	84.6%	168
2017 Q2	10.20***	1.237***	-1.957***	80.7%	60	13.11***	2.012***	-3.112***	84.7%	169
2017 Q3	9.147***	1.281***	-1.914***	83.1%	60	13.10***	2.013***	-3.113***	84.9%	170
2017 Q4	8.355***	1.298***	-1.863***	85.1%	60	13.10***	2.013***	-3.113***	85.0%	171
2018 Q1	7.680***	1.309***	-1.816***	86.9%	60	13.10***	2.014***	-3.113***	85.1%	172

Note: *, **, *** denote significance at the 10%, 5% and 1% levels, respectively. Estimation windows for early periods include some years where only annual observations were available.

APPENDIX B: SUSTAINABLE RENT COEFFICIENT TABLES

Supplementary Table B5: Long-run Econometric Model – Outputs for Retail Sector Models using JLL Dataset

Window end	Rolling windows					Anchored windows				
	Constant	ß real HHC	ß stock	Adj R2	No obs.	Constant	ß real HHC	ß stock	Adj R2	No obs.
1988 Q4	64.70***	2.626***	-8.109***	69.6%	50	64.70***	2.626***	-8.109***	69.6%	50
1989 Q1	66.22***	2.740***	-8.363***	72.1%	51	66.22***	2.740***	-8.363***	72.1%	51
1989 Q2	39.02***	2.168***	-5.348***	79.7%	51	66.78***	2.820***	-8.496***	74.0%	52
1989 Q3	36.85***	2.177***	-5.165***	80.2%	52	65.42***	2.855***	-8.411***	74.7%	53
1989 Q4	33.02**	2.134***	-4.780***	80.7%	53	62.50***	2.842***	-8.139***	75.0%	54
1990 Q1	27.56**	2.043***	-4.200**	81.0%	54	57.87***	2.780***	-7.662***	75.0%	55
1990 Q2	4.071	1.511***	-1.556	85.3%	54	53.15***	2.702***	-7.161***	75.3%	56
1990 Q3	-0.876	1.400***	-1.002	86.0%	55	46.10***	2.554***	-6.379***	75.2%	57
1990 Q4	-4.793	1.310***	-0.559	86.6%	56	38.66***	2.386***	-5.543***	75.1%	58
1991 Q1	-7.937	1.234***	-0.201	87.2%	57	31.26**	2.211***	-4.702***	75.1%	59
1991 Q2	-11.99	1.169***	0.226	89.7%	57	24.42**	2.039***	-3.915***	75.1%	60
1991 Q3	-11.13	1.191***	0.128	90.0%	58	19.16*	1.903***	-3.306**	75.3%	61
1991 Q4	-9.875	1.224***	-0.018	90.2%	59	14.97	1.792***	-2.818**	75.6%	62
1992 Q1	-8.315	1.265***	-0.200	90.4%	60	11.82	1.706***	-2.448**	75.9%	63
1992 Q2	-5.440	1.360***	-0.555	90.3%	60	10.69	1.675***	-2.314**	76.2%	64
1992 Q3	-2.731	1.444***	-0.884	90.0%	60	10.46	1.669***	-2.288**	76.5%	65
1992 Q4	-0.592	1.518***	-1.151*	89.8%	60	10.32	1.665***	-2.271**	76.8%	66
1993 Q1	1.328	1.582***	-1.389**	89.6%	60	10.64	1.674***	-2.308***	77.0%	67
1993 Q2	3.354	1.656***	-1.646***	89.4%	60	11.24*	1.691***	-2.380***	77.2%	68
1993 Q3	5.417	1.717***	-1.892***	88.7%	60	12.30**	1.720***	-2.504***	77.2%	69
1993 Q4	7.309*	1.782***	-2.129***	88.2%	60	13.32**	1.748***	-2.625***	77.1%	70
1994 Q1	9.021**	1.832***	-2.333***	87.5%	60	14.34***	1.776***	-2.744***	77.1%	71
1994 Q2	11.31***	1.890***	-2.597***	86.9%	60	15.37***	1.805***	-2.867***	77.0%	72
1994 Q3	12.87***	1.932***	-2.780***	86.0%	60	16.39***	1.833***	-2.986***	76.9%	73
1994 Q4	14.36***	1.969***	-2.951***	85.2%	60	17.33***	1.860***	-3.098***	76.7%	74
1995 Q1	15.76***	2.004***	-3.112***	84.4%	60	18.19***	1.885***	-3.200***	76.6%	75
1995 Q2	17.10***	2.039***	-3.268***	83.3%	60	19.13***	1.912***	-3.312***	76.4%	76
1995 Q3	18.34***	2.076***	-3.415***	82.3%	60	20.04***	1.939***	-3.421***	76.2%	77
1995 Q4	19.54***	2.123***	-3.571***	81.4%	60	20.88***	1.964***	-3.521***	76.0%	78
1996 Q1	20.59***	2.176***	-3.720***	81.1%	60	21.66***	1.986***	-3.613***	75.8%	79
1996 Q2	21.73***	2.227***	-3.876***	80.4%	60	22.46***	2.008***	-3.708***	75.5%	80
1996 Q3	22.82***	2.285***	-4.032***	79.8%	60	23.15***	2.027***	-3.789***	75.3%	81
1996 Q4	23.88***	2.345***	-4.191***	79.2%	60	23.73***	2.043***	-3.857***	75.1%	82
1997 Q1	25.02***	2.412***	-4.362***	78.4%	60	24.33***	2.059***	-3.926***	74.9%	83
1997 Q2	26.18***	2.482***	-4.539***	77.4%	60	24.88***	2.073***	-3.991***	74.7%	84
1997 Q3	27.22***	2.539***	-4.691***	76.2%	60	25.42***	2.085***	-4.051***	74.5%	85
1997 Q4	28.05***	2.603***	-4.833***	75.5%	60	25.72***	2.093***	-4.086***	74.5%	86
1998 Q1	28.77***	2.653***	-4.949***	74.6%	60	26.01***	2.100***	-4.119***	74.5%	87
1998 Q2	29.36***	2.694***	-5.044***	73.5%	60	26.19***	2.104***	-4.139***	74.5%	88
1998 Q3	29.83***	2.700***	-5.093***	71.5%	60	26.48***	2.110***	-4.172***	74.5%	89
1998 Q4	30.25***	2.729***	-5.161***	70.0%	60	26.59***	2.113***	-4.184***	74.6%	90
1999 Q1	30.77***	2.762***	-5.241***	68.3%	60	26.76***	2.117***	-4.203***	74.7%	91
1999 Q2	31.13***	2.766***	-5.278***	65.8%	60	26.94***	2.120***	-4.223***	74.8%	92
1999 Q3	31.73***	2.813***	-5.380***	63.4%	60	27.05***	2.122***	-4.235***	74.9%	93
1999 Q4	32.07***	2.824***	-5.423***	60.7%	60	27.17***	2.125***	-4.248***	75.0%	94
2000 Q1	31.79***	2.736***	-5.304***	57.0%	60	27.34***	2.126***	-4.265***	75.1%	95
2000 Q2	31.37***	2.634***	-5.159***	53.1%	60	27.46***	2.128***	-4.278***	75.2%	96
2000 Q3	30.81***	2.511***	-4.979***	49.6%	60	27.59***	2.131***	-4.292***	75.4%	97

APPENDIX B: SUSTAINABLE RENT COEFFICIENT TABLES

Supplementary Table B5: Long-run Econometric Model – Outputs for Retail Sector Models using JLL Dataset cont'd

| Window end | Rolling windows | | | | | Anchored windows | | | | |
	Constant	ß real HHC	ß stock	Adj R2	No obs.	Constant	ß real HHC	ß stock	Adj R2	No obs.
2000 Q4	30.13***	2.383***	-4.782***	46.7%	60	27.63***	2.131***	-4.295***	75.6%	98
2001 Q1	29.64***	2.256***	-4.604***	45.9%	60	27.62***	2.131***	-4.295***	75.8%	99
2001 Q2	29.38***	2.138***	-4.455***	46.5%	60	27.72***	2.133***	-4.305***	76.0%	100
2001 Q3	29.13***	2.011***	-4.298***	48.1%	60	27.86***	2.136***	-4.321***	76.1%	101
2001 Q4	28.93***	1.895***	-4.157***	50.7%	60	27.98***	2.137***	-4.333***	76.2%	102
2002 Q1	28.96***	1.821***	-4.080***	53.6%	60	28.09***	2.139***	-4.345***	76.3%	103
2002 Q2	29.35***	1.772***	-4.063***	58.5%	60	28.21***	2.141***	-4.358***	76.4%	104
2002 Q3	30.39***	1.782***	-4.164***	65.6%	60	28.34***	2.143***	-4.371***	76.5%	105
2002 Q4	31.75***	1.829***	-4.332***	72.8%	60	28.46***	2.145***	-4.384***	76.6%	106
2003 Q1	33.29***	1.905***	-4.549***	78.0%	60	28.60***	2.148***	-4.399***	76.6%	107
2003 Q2	34.64***	1.972***	-4.738***	80.8%	60	28.75***	2.149***	-4.413***	76.6%	108
2003 Q3	36.24***	2.060***	-4.971***	82.7%	60	28.90***	2.150***	-4.428***	76.6%	109
2003 Q4	37.69***	2.148***	-5.193***	83.4%	60	29.05***	2.153***	-4.444***	76.6%	110
2004 Q1	39.25***	2.240***	-5.427***	83.5%	60	29.21***	2.155***	-4.460***	76.6%	111
2004 Q2	41.30***	2.359***	-5.734***	83.7%	60	29.38***	2.157***	-4.478***	76.5%	112
2004 Q3	42.80***	2.449***	-5.961***	82.7%	60	29.54***	2.160***	-4.495***	76.4%	113
2004 Q4	44.51***	2.555***	-6.224***	81.3%	60	29.67***	2.163***	-4.510***	76.5%	114
2005 Q1	46.11***	2.652***	-6.467***	79.1%	60	29.80***	2.165***	-4.523***	76.5%	115
2005 Q2	50.32***	2.905***	-7.106***	78.8%	60	29.92***	2.167***	-4.536***	76.5%	116
2005 Q3	54.28***	3.145***	-7.708***	77.8%	60	30.02***	2.170***	-4.548***	76.6%	117
2005 Q4	58.91***	3.425***	-8.412***	76.2%	60	30.11***	2.172***	-4.559***	76.7%	118
2006 Q1	61.77***	3.607***	-8.857***	71.1%	60	30.15***	2.174***	-4.563***	76.8%	119
2006 Q2	61.43***	3.598***	-8.817***	66.0%	60	30.24***	2.176***	-4.574***	76.9%	120
2006 Q3	57.11***	3.359***	-8.185***	60.9%	60	30.33***	2.180***	-4.586***	76.9%	121
2006 Q4	44.47***	2.644***	-6.315***	56.3%	60	30.37***	2.181***	-4.591***	77.0%	122
2007 Q1	37.24***	2.250***	-5.263***	60.0%	60	30.46***	2.185***	-4.603***	77.0%	123
2007 Q2	32.50***	1.995***	-4.577***	63.5%	60	30.57***	2.189***	-4.616***	77.0%	124
2007 Q3	30.63***	1.902***	-4.314***	67.2%	60	30.71***	2.194***	-4.634***	77.0%	125
2007 Q4	30.79***	1.934***	-4.362***	72.6%	60	30.88***	2.200***	-4.656***	77.0%	126
2008 Q1	30.21***	1.922***	-4.299***	77.1%	60	30.99***	2.205***	-4.670***	77.0%	127
2008 Q2	30.06***	1.937***	-4.302***	81.2%	60	31.05***	2.208***	-4.679***	77.0%	128
2008 Q3	26.82***	1.755***	-3.824***	81.4%	60	30.87***	2.199***	-4.653***	77.0%	129
2008 Q4	21.12***	1.421***	-2.969***	77.4%	60	30.11***	2.160***	-4.545***	76.7%	130
2009 Q1	17.59***	1.213***	-2.439***	74.9%	60	29.14***	2.109***	-4.406***	76.3%	131
2009 Q2	15.95***	1.119***	-2.195***	74.6%	60	28.09***	2.051***	-4.252***	75.8%	132
2009 Q3	15.93***	1.123***	-2.199***	75.9%	60	27.41***	2.014***	-4.153***	75.5%	133
2009 Q4	16.45***	1.160***	-2.283***	77.5%	60	26.99***	1.992***	-4.092***	75.5%	134
2010 Q1	16.74***	1.183***	-2.332***	79.3%	60	26.46***	1.963***	-4.015***	75.3%	135
2010 Q2	17.39***	1.221***	-2.430***	80.3%	60	26.27***	1.952***	-3.987***	75.4%	136
2010 Q3	17.91***	1.247***	-2.503***	81.6%	60	26.08***	1.942***	-3.959***	75.4%	137
2010 Q4	18.30***	1.263***	-2.554***	83.4%	60	25.81***	1.926***	-3.919***	75.4%	138
2011 Q1	18.69***	1.279***	-2.605***	85.4%	60	25.55***	1.912***	-3.881***	75.5%	139
2011 Q2	19.00***	1.280***	-2.634***	87.6%	60	25.26***	1.895***	-3.838***	75.5%	140
2011 Q3	19.37***	1.287***	-2.673***	89.2%	60	25.06***	1.884***	-3.809***	75.7%	141
2011 Q4	19.71***	1.293***	-2.709***	90.6%	60	24.91***	1.875***	-3.786***	75.8%	142
2012 Q1	20.14***	1.295***	-2.749***	91.7%	60	24.86***	1.872***	-3.778***	76.0%	143
2012 Q2	20.58***	1.294***	-2.785***	92.7%	60	24.83***	1.871***	-3.774***	76.2%	144
2012 Q3	21.08***	1.287***	-2.821***	93.6%	60	24.87***	1.873***	-3.780***	76.4%	145

APPENDIX B: SUSTAINABLE RENT COEFFICIENT TABLES

Supplementary Table B5: Long-run Econometric Model – Outputs for Retail Sector Models using JLL Dataset cont'd

Window end	Rolling windows					Anchored windows				
	Constant	ß real HHC	ß stock	Adj R2	No obs.	Constant	ß real HHC	ß stock	Adj R2	No obs.
2012 Q4	21.52***	1.293***	-2.865***	93.8%	60	24.96***	1.878***	-3.792***	76.6%	146
2013 Q1	22.03***	1.297***	-2.914***	93.7%	60	25.11***	1.886***	-3.815***	76.8%	147
2013 Q2	22.45***	1.310***	-2.965***	93.7%	60	25.24***	1.894***	-3.834***	77.1%	148
2013 Q3	23.04***	1.305***	-3.010***	93.5%	60	25.44***	1.905***	-3.864***	77.3%	149
2013 Q4	23.52***	1.311***	-3.058***	93.1%	60	25.64***	1.916***	-3.894***	77.4%	150
2014 Q1	24.05***	1.306***	-3.098***	92.8%	60	25.86***	1.928***	-3.925***	77.6%	151
2014 Q2	24.62***	1.292***	-3.134***	92.5%	60	26.08***	1.940***	-3.958***	77.7%	152
2014 Q3	25.23***	1.275***	-3.167***	91.9%	60	26.34***	1.954***	-3.996***	77.8%	153
2014 Q4	25.83***	1.250***	-3.192***	91.4%	60	26.59***	1.968***	-4.031***	77.9%	154
2015 Q1	26.55***	1.204***	-3.205***	91.2%	60	26.82***	1.980***	-4.064***	77.9%	155
2015 Q2	27.30***	1.145***	-3.207***	90.8%	60	27.06***	1.992***	-4.099***	77.9%	156
2015 Q3	28.22***	1.053***	-3.186***	90.4%	60	27.31***	2.005***	-4.134***	77.8%	157
2015 Q4	28.96***	0.981***	-3.173***	90.0%	60	27.55***	2.016***	-4.168***	77.7%	158
2016 Q1	29.79***	0.888***	-3.143***	89.5%	60	27.80***	2.028***	-4.202***	77.5%	159
2016 Q2	31.00***	0.740***	-3.089***	89.2%	60	28.06***	2.039***	-4.237***	77.2%	160
2016 Q3	32.65***	0.538**	-3.012***	88.8%	60	28.36***	2.051***	-4.276***	76.5%	161
2016 Q4	34.20***	0.361	-2.954***	88.7%	60	28.65***	2.063***	-4.315***	75.9%	162
2017 Q1	35.80***	0.180	-2.897***	88.9%	60	28.95***	2.075***	-4.353***	75.2%	163
2017 Q2	37.40***	0.016	-2.858***	89.3%	60	29.24***	2.086***	-4.391***	74.6%	164
2017 Q3	39.03***	-0.141	-2.829***	89.8%	60	29.54***	2.097***	-4.429***	73.8%	165
2017 Q4	40.65***	-0.283	-2.814***	90.6%	60	29.84***	2.108***	-4.467***	73.1%	166
2018 Q1	42.20***	-0.404**	-2.817***	91.5%	60	30.12***	2.118***	-4.502***	72.3%	167

Note: *, **, *** denote significance at the 10%, 5% and 1% levels, respectively. Estimation windows for early periods include some years where only annual observations were available.

APPENDIX B: SUSTAINABLE RENT COEFFICIENT TABLES

Supplementary Table B6: Long-run Econometric Model – Outputs for Industrial Sector Models using JLL Dataset

Window end	Rolling windows					Anchored windows				
	Constant	ß real GDP	ß stock	Adj R2	No obs.	Constant	ß real GDP	ß stock	Adj R2	No obs.
1983 Q4	28.65***	0.454	-2.622***	82.0%	35	28.65***	0.454	-2.622***	82.0%	35
1984 Q1	28.71***	0.447	-2.619***	82.7%	36	28.71***	0.447	-2.619***	82.7%	36
1984 Q2	29.73***	0.356	-2.610***	82.1%	36	28.90***	0.443	-2.632***	83.4%	37
1984 Q3	29.80***	0.352	-2.613***	82.9%	37	28.99***	0.439	-2.636***	84.1%	38
1984 Q4	29.87***	0.340	-2.606***	83.6%	38	29.08***	0.423	-2.626***	84.7%	39
1985 Q1	30.03***	0.307	-2.583***	84.3%	39	29.22***	0.386	-2.599***	85.3%	40
1985 Q2	30.99***	0.161	-2.510***	83.3%	39	29.37***	0.287	-2.503***	85.6%	41
1985 Q3	31.15***	0.115	-2.473***	84.0%	40	29.48***	0.226	-2.447***	86.1%	42
1985 Q4	31.22***	0.094	-2.457***	84.7%	41	29.55***	0.192	-2.416***	86.6%	43
1986 Q1	31.31***	0.063	-2.430***	85.4%	42	29.61***	0.145	-2.370***	87.1%	44
1986 Q2	31.83***	0.033	-2.444***	84.0%	42	29.66***	0.106	-2.331***	87.5%	45
1986 Q3	31.81***	0.039	-2.449***	84.6%	43	29.67***	0.095	-2.320***	88.0%	46
1986 Q4	31.74***	0.068	-2.474***	85.1%	44	29.67***	0.103	-2.328***	88.3%	47
1987 Q1	31.68***	0.096	-2.500***	85.5%	45	29.67***	0.113	-2.339***	88.7%	48
1987 Q2	31.28***	0.120	-2.491***	83.3%	45	29.67***	0.137	-2.366***	88.9%	49
1987 Q3	31.25***	0.177	-2.551***	83.5%	46	29.72***	0.179	-2.416***	89.1%	50
1987 Q4	31.19***	0.281	-2.658***	82.9%	47	29.82***	0.273	-2.528***	88.9%	51
1988 Q1	31.20***	0.396*	-2.786***	81.9%	48	29.98***	0.382*	-2.662***	88.4%	52
1988 Q2	29.29***	0.358	-2.574***	76.9%	48	30.10***	0.481**	-2.782***	87.9%	53
1988 Q3	29.47***	0.478**	-2.721***	75.2%	49	30.27***	0.585***	-2.911***	87.2%	54
1988 Q4	29.68***	0.637**	-2.915***	71.1%	50	30.51***	0.731***	-3.092***	85.5%	55
1989 Q1	29.75***	0.786***	-3.084***	66.0%	51	30.69***	0.875***	-3.266***	83.1%	56
1989 Q2	26.50***	0.774***	-2.782***	50.4%	51	30.86***	1.043***	-3.464***	79.1%	57
1989 Q3	25.90***	0.913***	-2.881***	38.6%	52	30.86***	1.210***	-3.649***	73.3%	58
1989 Q4	24.81***	1.001***	-2.881***	28.5%	53	30.67***	1.348***	-3.783***	67.3%	59
1990 Q1	23.65***	1.070***	-2.853***	21.0%	54	30.44***	1.470***	-3.896***	61.9%	60
1990 Q2	20.73***	1.042**	-2.563***	12.8%	54	30.17***	1.559***	-3.969***	58.1%	61
1990 Q3	18.57***	0.994**	-2.317**	8.5%	55	29.46***	1.603***	-3.954***	53.2%	62
1990 Q4	15.86***	0.894**	-1.967**	4.7%	56	28.43***	1.611***	-3.871***	47.7%	63
1991 Q1	12.98**	0.760*	-1.564*	1.9%	57	27.15***	1.583***	-3.726***	42.2%	64
1991 Q2	9.145*	0.594	-1.041	0.6%	57	25.70***	1.527***	-3.534***	36.9%	65
1991 Q3	6.793	0.461	-0.685	0.2%	58	24.13***	1.445***	-3.304***	32.2%	66
1991 Q4	5.247	0.369	-0.447	0.4%	59	22.72***	1.361***	-3.086***	28.6%	67
1992 Q1	4.312	0.310	-0.299	0.7%	60	21.41***	1.274***	-2.875***	25.7%	68
1992 Q2	4.181	0.304	-0.280	0.6%	60	20.39***	1.199***	-2.702***	24.1%	69
1992 Q3	4.948	0.355	-0.404	0.3%	60	19.89***	1.163***	-2.617***	24.1%	70
1992 Q4	5.900	0.421	-0.562	0.3%	60	19.65***	1.145***	-2.576***	24.7%	71
1993 Q1	6.859*	0.494	-0.727	0.6%	60	19.58***	1.140***	-2.564***	25.9%	72
1993 Q2	7.769**	0.566	-0.887	1.2%	60	19.62***	1.143***	-2.570***	27.4%	73
1993 Q3	8.671**	0.628*	-1.036	1.9%	60	19.71***	1.150***	-2.587***	29.0%	74
1993 Q4	9.213***	0.670*	-1.131*	2.6%	60	19.84***	1.159***	-2.608***	30.7%	75
1994 Q1	9.904***	0.717**	-1.244*	3.4%	60	20.02***	1.171***	-2.638***	32.5%	76
1994 Q2	10.98***	0.767**	-1.394**	4.2%	60	20.33***	1.189***	-2.685***	34.5%	77
1994 Q3	12.08***	0.820**	-1.550**	5.4%	60	20.63***	1.205***	-2.729***	36.5%	78
1994 Q4	12.69***	0.844**	-1.630**	6.1%	60	20.92***	1.221***	-2.773***	38.4%	79
1995 Q1	13.51***	0.888**	-1.752**	7.5%	60	21.22***	1.238***	-2.818***	40.4%	80
1995 Q2	14.54***	0.949**	-1.910***	9.6%	60	21.56***	1.258***	-2.870***	42.4%	81

APPENDIX B: SUSTAINABLE RENT COEFFICIENT TABLES

Supplementary Table B6: Long-run Econometric Model – Outputs for Industrial Sector Models using JLL Dataset cont'd

Window end	Rolling windows					Anchored windows				
	Constant	ß real GDP	ß stock	Adj R2	No obs.	Constant	ß real GDP	ß stock	Adj R2	No obs.
1995 Q3	15.31***	1.004**	-2.039***	11.5%	60	21.87***	1.274***	-2.915***	44.2%	82
1995 Q4	15.90***	1.085***	-2.182***	13.8%	60	22.12***	1.288***	-2.953***	45.9%	83
1996 Q1	16.47***	1.180***	-2.336***	16.2%	60	22.36***	1.299***	-2.986***	47.5%	84
1996 Q2	17.07***	1.278***	-2.498***	18.8%	60	22.58***	1.310***	-3.019***	49.1%	85
1996 Q3	17.63***	1.363***	-2.642***	21.2%	60	22.80***	1.320***	-3.049***	50.6%	86
1996 Q4	18.10***	1.445***	-2.773***	23.3%	60	22.95***	1.326***	-3.069***	51.9%	87
1997 Q1	18.58***	1.524***	-2.903***	25.2%	60	23.10***	1.326***	-3.082***	53.0%	88
1997 Q2	19.03***	1.576***	-3.001***	26.7%	60	23.23***	1.324***	-3.092***	54.1%	89
1997 Q3	19.43***	1.646***	-3.114***	28.3%	60	23.33***	1.324***	-3.100***	55.2%	90
1997 Q4	19.76***	1.716***	-3.220***	29.6%	60	23.39***	1.322***	-3.104***	56.1%	91
1998 Q1	20.03***	1.751***	-3.283***	30.6%	60	23.44***	1.321***	-3.106***	56.9%	92
1998 Q2	20.31***	1.760***	-3.317***	31.4%	60	23.49***	1.318***	-3.108***	57.7%	93
1998 Q3	20.56***	1.748***	-3.326***	32.2%	60	23.53***	1.316***	-3.109***	58.5%	94
1998 Q4	20.77***	1.730***	-3.325***	32.9%	60	23.55***	1.315***	-3.110***	59.2%	95
1999 Q1	20.92***	1.724***	-3.331***	33.6%	60	23.55***	1.315***	-3.110***	59.9%	96
1999 Q2	21.05***	1.719***	-3.337***	34.5%	60	23.53***	1.315***	-3.109***	60.5%	97
1999 Q3	21.18***	1.706***	-3.334***	35.2%	60	23.53***	1.315***	-3.109***	61.1%	98
1999 Q4	21.29***	1.653***	-3.285***	35.8%	60	23.52***	1.316***	-3.109***	61.6%	99
2000 Q1	21.40***	1.574***	-3.207***	36.6%	60	23.50***	1.319***	-3.110***	62.1%	100
2000 Q2	21.66***	1.478***	-3.124***	38.3%	60	23.48***	1.321***	-3.110***	62.5%	101
2000 Q3	21.82***	1.394**	-3.045***	39.7%	60	23.40***	1.323***	-3.106***	62.8%	102
2000 Q4	21.80***	1.317**	-2.958***	40.7%	60	23.24***	1.321***	-3.090***	62.7%	103
2001 Q1	21.92***	1.244**	-2.887***	42.2%	60	23.11***	1.323***	-3.080***	62.7%	104
2001 Q2	22.06***	1.173**	-2.821***	43.9%	60	22.97***	1.324***	-3.069***	62.6%	105
2001 Q3	22.17***	1.106**	-2.756***	45.4%	60	22.83***	1.325***	-3.057***	62.5%	106
2001 Q4	22.36***	1.082**	-2.746***	46.9%	60	22.64***	1.323***	-3.038***	62.2%	107
2002 Q1	22.60***	1.065**	-2.747***	48.5%	60	22.44***	1.317***	-3.014***	61.9%	108
2002 Q2	22.96***	1.083**	-2.797***	50.4%	60	22.24***	1.311***	-2.990***	61.6%	109
2002 Q3	23.67***	1.186**	-2.973***	53.0%	60	22.06***	1.306***	-2.968***	61.4%	110
2002 Q4	24.38***	1.308***	-3.170***	55.0%	60	21.91***	1.303***	-2.952***	61.3%	111
2003 Q1	25.39***	1.488***	-3.458***	57.5%	60	21.79***	1.300***	-2.938***	61.4%	112
2003 Q2	26.57***	1.685***	-3.779***	60.1%	60	21.70***	1.299***	-2.929***	61.6%	113
2003 Q3	28.25***	1.975***	-4.246***	63.4%	60	21.63***	1.300***	-2.923***	61.9%	114
2003 Q4	29.92***	2.272***	-4.720***	65.3%	60	21.57***	1.300***	-2.918***	62.1%	115
2004 Q1	31.67***	2.584***	-5.219***	66.7%	60	21.50***	1.300***	-2.911***	62.4%	116
2004 Q2	33.12***	2.855***	-5.645***	66.4%	60	21.42***	1.298***	-2.902***	62.7%	117
2004 Q3	33.60***	2.985***	-5.830***	63.7%	60	21.31***	1.292***	-2.885***	62.9%	118
2004 Q4	33.41***	3.008***	-5.839***	59.9%	60	21.20***	1.284***	-2.867***	63.1%	119
2005 Q1	33.12***	3.010***	-5.816***	55.1%	60	21.11***	1.280***	-2.854***	63.4%	120
2005 Q2	33.77***	3.148***	-6.025***	50.6%	60	21.05***	1.278***	-2.847***	63.8%	121
2005 Q3	32.23***	2.945***	-5.666***	44.4%	60	21.01***	1.278***	-2.844***	64.1%	122
2005 Q4	28.27***	2.379**	-4.695***	37.2%	60	20.99***	1.280***	-2.845***	64.5%	123
2006 Q1	21.83***	1.481	-3.140*	30.1%	60	20.96***	1.281***	-2.844***	64.9%	124
2006 Q2	13.92**	0.396	-1.249	25.1%	60	20.93***	1.281***	-2.841***	65.3%	125
2006 Q3	7.368	-0.462	0.271	22.9%	60	20.89***	1.280***	-2.835***	65.7%	126
2006 Q4	3.594	-0.910	1.095	22.4%	60	20.85***	1.278***	-2.830***	66.1%	127
2007 Q1	2.587	-0.949	1.225	21.8%	60	20.84***	1.277***	-2.828***	66.6%	128

APPENDIX B: SUSTAINABLE RENT COEFFICIENT TABLES

Supplementary Table B6: Long-run Econometric Model – Outputs for Industrial Sector Models using JLL Dataset cont'd

Window end	Rolling windows					Anchored windows				
	Constant	ß real GDP	ß stock	Adj R2	No obs.	Constant	ß real GDP	ß stock	Adj R2	No obs.
2007 Q2	4.278	-0.602	0.693	19.7%	60	20.84***	1.277***	-2.828***	67.2%	129
2007 Q3	5.963	-0.286	0.196	17.7%	60	20.85***	1.277***	-2.829***	67.7%	130
2007 Q4	7.778**	0.031	-0.314	16.9%	60	20.86***	1.278***	-2.830***	68.3%	131
2008 Q1	9.689***	0.366	-0.852	17.1%	60	20.86***	1.277***	-2.830***	68.8%	132
2008 Q2	12.53***	0.859	-1.645	20.5%	60	20.83***	1.274***	-2.823***	69.3%	133
2008 Q3	14.24***	1.202***	-2.174	26.6%	60	20.66***	1.253***	-2.785***	69.8%	134
2008 Q4	13.50***	1.148***	-2.051	31.4%	60	20.24***	1.189***	-2.678***	70.0%	135
2009 Q1	12.21***	0.977***	-1.749	34.3%	60	19.64***	1.093***	-2.519***	70.0%	136
2009 Q2	11.75***	0.919***	-1.645*	39.3%	60	19.14***	1.011***	-2.384***	70.3%	137
2009 Q3	11.57***	0.901***	-1.609***	44.7%	60	18.72***	0.942***	-2.272***	70.6%	138
2009 Q4	11.54***	0.907***	-1.613***	50.2%	60	18.38***	0.888***	-2.182***	71.0%	139
2010 Q1	11.59***	0.919***	-1.631***	55.5%	60	18.13***	0.845***	-2.112***	71.5%	140
2010 Q2	11.80***	0.940***	-1.672***	60.7%	60	17.97***	0.819***	-2.070***	72.1%	141
2010 Q3	12.06***	0.956***	-1.712***	65.2%	60	17.86***	0.801***	-2.040***	72.8%	142
2010 Q4	12.30***	0.978***	-1.758***	69.1%	60	17.78***	0.788***	-2.019***	73.5%	143
2011 Q1	12.64***	1.005***	-1.817***	72.5%	60	17.77***	0.786***	-2.016***	74.2%	144
2011 Q2	12.99***	1.024***	-1.868***	75.5%	60	17.78***	0.788***	-2.018***	74.9%	145
2011 Q3	13.38***	1.033***	-1.912***	78.1%	60	17.81***	0.792***	-2.026***	75.6%	146
2011 Q4	13.73***	1.044***	-1.954***	80.1%	60	17.84***	0.797***	-2.034***	76.3%	147
2012 Q1	14.17***	1.042***	-1.990***	82.1%	60	17.88***	0.804***	-2.045***	77.0%	148
2012 Q2	14.65***	1.030***	-2.018***	84.0%	60	17.92***	0.811***	-2.056***	77.7%	149
2012 Q3	15.17***	1.016***	-2.047***	85.2%	60	17.98***	0.822***	-2.074***	78.3%	150
2012 Q4	15.67***	1.008***	-2.081***	86.2%	60	18.06***	0.834***	-2.095***	78.9%	151
2013 Q1	16.24***	0.989***	-2.110***	87.0%	60	18.15***	0.848***	-2.118***	79.5%	152
2013 Q2	16.92***	0.951***	-2.126***	87.9%	60	18.23***	0.861***	-2.139***	80.0%	153
2013 Q3	17.70***	0.896***	-2.132***	88.7%	60	18.31***	0.874***	-2.161***	80.5%	154
2013 Q4	18.51***	0.833***	-2.131***	89.5%	60	18.39***	0.886***	-2.181***	81.0%	155
2014 Q1	19.37***	0.755***	-2.118***	90.1%	60	18.47***	0.897***	-2.200***	81.5%	156
2014 Q2	20.39***	0.644***	-2.082***	90.8%	60	18.55***	0.908***	-2.218***	81.9%	157
2014 Q3	21.47***	0.532***	-2.049***	91.8%	60	18.62***	0.916***	-2.234***	82.3%	158
2014 Q4	22.48***	0.431***	-2.024***	92.9%	60	18.68***	0.923***	-2.247***	82.6%	159
2015 Q1	23.39***	0.342**	-2.004***	93.9%	60	18.72***	0.928***	-2.257***	82.9%	160
2015 Q2	24.30***	0.255*	-1.984***	95.1%	60	18.76***	0.933***	-2.265***	83.3%	161
2015 Q3	25.03***	0.181	-1.965***	95.9%	60	18.79***	0.936***	-2.271***	83.6%	162
2015 Q4	25.49***	0.134	-1.951***	96.2%	60	18.82***	0.939***	-2.276***	83.8%	163
2016 Q1	25.84***	0.103	-1.947***	96.5%	60	18.84***	0.941***	-2.281***	84.1%	164
2016 Q2	26.08***	0.085	-1.948***	96.6%	60	18.86***	0.943***	-2.285***	84.4%	165
2016 Q3	26.30***	0.070	-1.950***	96.8%	60	18.89***	0.946***	-2.290***	84.6%	166
2016 Q4	26.31***	0.077	-1.957***	96.7%	60	18.91***	0.947***	-2.294***	84.9%	167
2017 Q1	26.10***	0.103	-1.970***	96.4%	60	18.92***	0.948***	-2.295***	85.1%	168
2017 Q2	25.81***	0.138	-1.983***	96.0%	60	18.92***	0.948***	-2.296***	85.3%	169
2017 Q3	25.41***	0.184	-2.000***	95.5%	60	18.91***	0.947***	-2.294***	85.5%	170
2017 Q4	24.99***	0.230*	-2.016***	94.9%	60	18.90***	0.946***	-2.291***	85.7%	171
2018 Q1	24.58***	0.275**	-2.030***	94.1%	60	18.87***	0.943***	-2.286***	85.9%	172

Note: *, **, *** denote significance at the 10%, 5% and 1% levels, respectively. Estimation windows for early periods include some years where only annual observations were available.

APPENDIX B: SUSTAINABLE RENT COEFFICIENT TABLES

Supplementary Table B7: Long-run Econometric Model – Outputs for Office Sector Models using CBRE Dataset

Window end	Rolling windows					Anchored windows				
	Constant	ß real GDP	ß stock	Adj R2	No obs.	Constant	ß real GDP	ß stock	Adj R2	No obs.
1987 Q2	20.68***	3.709***	-5.842***	57.5%	60	20.68***	3.709***	-5.842***	57.5%	60
1987 Q3	19.75***	3.991***	-6.082***	55.9%	60	19.69***	3.989***	-6.073***	56.6%	61
1987 Q4	18.69***	4.250***	-6.282***	53.8%	60	18.77***	4.261***	-6.302***	55.9%	62
1988 Q1	18.34***	4.633***	-6.692***	51.7%	60	18.01***	4.523***	-6.534***	56.1%	63
1988 Q2	17.65***	4.879***	-6.913***	48.0%	60	17.27***	4.759***	-6.738***	56.3%	64
1988 Q3	16.60***	4.978***	-6.928***	45.2%	60	16.69***	4.967***	-6.924***	57.1%	65
1988 Q4	15.17***	4.985***	-6.802***	43.3%	60	16.16***	5.153***	-7.090***	58.2%	66
1989 Q1	12.59***	4.894***	-6.453***	45.4%	60	15.55***	5.338***	-7.247***	59.0%	67
1989 Q2	9.739***	4.711***	-5.972***	47.5%	60	14.90***	5.513***	-7.389***	59.6%	68
1989 Q3	6.137	4.392***	-5.264***	50.1%	60	14.11***	5.673***	-7.499***	59.7%	69
1989 Q4	1.792	4.004***	-4.404***	55.3%	60	13.18***	5.804***	-7.564***	59.3%	70
1990 Q1	-2.516	3.592***	-3.522***	61.3%	60	12.33***	5.913***	-7.609***	59.2%	71
1990 Q2	-5.951	3.381***	-2.953**	67.8%	60	11.48***	5.992***	-7.621***	59.1%	72
1990 Q3	-9.423***	3.169***	-2.382**	73.9%	60	10.23***	5.971***	-7.479***	57.5%	73
1990 Q4	-12.71***	2.902***	-1.764*	78.4%	60	8.740***	5.863***	-7.212***	55.3%	74
1991 Q1	-15.35***	2.645***	-1.218	81.8%	60	7.186***	5.686***	-6.859***	52.8%	75
1991 Q2	-16.75***	2.607***	-1.043	84.7%	60	5.703**	5.469***	-6.468***	50.6%	76
1991 Q3	-17.39***	2.663***	-1.048	86.9%	60	4.363*	5.233***	-6.068***	48.6%	77
1991 Q4	-17.37***	2.764***	-1.168**	87.7%	60	3.280	5.023***	-5.721***	47.2%	78
1992 Q1	-16.96***	2.937***	-1.408***	88.0%	60	2.358	4.824***	-5.402***	46.0%	79
1992 Q2	-16.42***	3.170***	-1.729***	88.0%	60	1.585	4.637***	-5.113***	45.0%	80
1992 Q3	-15.80***	3.417***	-2.074***	87.7%	60	1.076	4.512***	-4.920***	44.5%	81
1992 Q4	-14.97***	3.653***	-2.426***	86.6%	60	0.825	4.450***	-4.824***	44.5%	82
1993 Q1	-14.18***	3.860***	-2.742***	85.4%	60	0.681	4.414***	-4.768***	44.6%	83
1993 Q2	-13.39***	4.037***	-3.021***	84.1%	60	0.589	4.390***	-4.732***	44.8%	84
1993 Q3	-12.55***	4.194***	-3.282***	82.8%	60	0.562	4.383***	-4.721***	45.2%	85
1993 Q4	-11.77***	4.324***	-3.506***	81.7%	60	0.534	4.376***	-4.711***	45.5%	86
1994 Q1	-11.11***	4.432***	-3.694***	80.6%	60	0.559	4.382***	-4.720***	45.8%	87
1994 Q2	-9.987***	4.600***	-3.994***	80.3%	60	0.639	4.398***	-4.746***	46.1%	88
1994 Q3	-9.059***	4.692***	-4.187***	79.3%	60	0.742	4.416***	-4.777***	46.4%	89
1994 Q4	-8.148***	4.784***	-4.379***	79.0%	60	0.817	4.429***	-4.799***	46.6%	90
1995 Q1	-7.444***	4.841***	-4.510***	78.6%	60	0.856	4.437***	-4.811***	46.9%	91
1995 Q2	-7.037***	4.882***	-4.596***	78.0%	60	0.886	4.442***	-4.821***	47.1%	92
1995 Q3	-6.682***	4.922***	-4.676***	77.3%	60	0.936	4.450***	-4.835***	47.4%	93
1995 Q4	-6.642***	4.991***	-4.759***	76.9%	60	0.956	4.454***	-4.840***	47.5%	94
1996 Q1	-6.696***	5.081***	-4.860***	76.7%	60	0.996	4.459***	-4.851***	47.7%	95
1996 Q2	-6.890***	5.180***	-4.957***	76.8%	60	1.002	4.460***	-4.852***	47.8%	96
1996 Q3	-7.036***	5.260***	-5.037***	76.7%	60	1.003	4.460***	-4.852***	47.9%	97
1996 Q4	-7.264***	5.359***	-5.130***	76.6%	60	1.013	4.461***	-4.854***	48.0%	98
1997 Q1	-7.386***	5.458***	-5.234***	76.2%	60	1.098	4.462***	-4.863***	48.0%	99
1997 Q2	-7.292***	5.505***	-5.298***	75.3%	60	1.182	4.461***	-4.870***	48.0%	100
1997 Q3	-7.402***	5.582***	-5.377***	74.7%	60	1.227	4.460***	-4.874***	48.0%	101
1997 Q4	-7.468***	5.641***	-5.440***	74.1%	60	1.260	4.459***	-4.875***	48.0%	102
1998 Q1	-7.242***	5.629***	-5.448***	73.2%	60	1.261	4.459***	-4.875***	48.0%	103
1998 Q2	-6.832***	5.580***	-5.429***	72.2%	60	1.259	4.459***	-4.875***	48.0%	104
1998 Q3	-6.191***	5.490***	-5.384***	71.2%	60	1.257	4.459***	-4.875***	48.1%	105
1998 Q4	-5.350***	5.367***	-5.318***	70.2%	60	1.267	4.458***	-4.875***	48.1%	106

APPENDIX B: SUSTAINABLE RENT COEFFICIENT TABLES

Supplementary Table B7: Long-run Econometric Model – Outputs for Office Sector Models using CBRE Dataset cont'd

Window end	Rolling windows					Anchored windows				
	Constant	ß real GDP	ß stock	Adj R2	No obs.	Constant	ß real GDP	ß stock	Adj R2	No obs.
1999 Q1	-4.534**	5.247***	-5.255***	69.6%	60	1.265	4.458***	-4.875***	48.2%	107
1999 Q2	-4.178**	5.192***	-5.224***	68.8%	60	1.216	4.462***	-4.875***	48.3%	108
1999 Q3	-3.577*	5.090***	-5.161***	67.8%	60	1.214	4.463***	-4.875***	48.4%	109
1999 Q4	-2.508	4.910***	-5.051***	67.1%	60	1.243	4.457***	-4.871***	48.5%	110
2000 Q1	-1.474	4.741***	-4.950***	66.9%	60	1.261	4.453***	-4.869***	48.7%	111
2000 Q2	-0.369	4.599***	-4.887***	68.1%	60	1.258	4.454***	-4.869***	49.0%	112
2000 Q3	0.349	4.514***	-4.853***	69.2%	60	1.196	4.465***	-4.877***	49.3%	113
2000 Q4	0.739	4.474***	-4.842***	70.0%	60	1.076	4.484***	-4.887***	49.6%	114
2001 Q1	1.142	4.450***	-4.851***	71.3%	60	0.961	4.507***	-4.903***	50.1%	115
2001 Q2	1.550	4.431***	-4.866***	72.6%	60	0.856	4.528***	-4.917***	50.5%	116
2001 Q3	1.852	4.423***	-4.884***	73.6%	60	0.760	4.547***	-4.930***	51.0%	117
2001 Q4	2.173	4.440***	-4.932***	75.1%	60	0.659	4.565***	-4.941***	51.4%	118
2002 Q1	2.448	4.460***	-4.980***	76.3%	60	0.577	4.577***	-4.948***	51.8%	119
2002 Q2	2.745*	4.490***	-5.043***	77.4%	60	0.517	4.586***	-4.953***	52.1%	120
2002 Q3	3.138**	4.554***	-5.152***	79.1%	60	0.487	4.591***	-4.955***	52.4%	121
2002 Q4	3.634***	4.614***	-5.267***	80.4%	60	0.498	4.589***	-4.954***	52.6%	122
2003 Q1	4.239***	4.702***	-5.425***	81.8%	60	0.541	4.582***	-4.950***	52.6%	123
2003 Q2	4.975***	4.775***	-5.576***	82.7%	60	0.626	4.567***	-4.941***	52.5%	124
2003 Q3	5.858***	4.895***	-5.796***	83.7%	60	0.738	4.546***	-4.927***	52.2%	125
2003 Q4	6.844***	5.054***	-6.070***	84.8%	60	0.866	4.522***	-4.911***	51.9%	126
2004 Q1	7.772***	5.232***	-6.361***	85.5%	60	0.985	4.502***	-4.899***	51.5%	127
2004 Q2	8.644***	5.455***	-6.699***	86.2%	60	1.086	4.489***	-4.893***	51.2%	128
2004 Q3	9.333***	5.668***	-7.008***	86.4%	60	1.162	4.482***	-4.893***	51.1%	129
2004 Q4	9.864***	5.859***	-7.279***	86.0%	60	1.222*	4.479***	-4.895***	51.0%	130
2005 Q1	10.66***	6.163***	-7.703***	86.0%	60	1.283*	4.475***	-4.896***	50.9%	131
2005 Q2	11.98***	6.650***	-8.388***	86.7%	60	1.359**	4.466***	-4.893***	50.7%	132
2005 Q3	13.07***	6.994***	-8.885***	86.2%	60	1.447**	4.452***	-4.885***	50.4%	133
2005 Q4	13.98***	7.209***	-9.217***	84.6%	60	1.556**	4.426***	-4.865***	50.1%	134
2006 Q1	14.58***	7.370***	-9.458***	83.4%	60	1.638**	4.408***	-4.852***	49.9%	135
2006 Q2	14.89***	7.464***	-9.595***	82.4%	60	1.705***	4.396***	-4.843***	49.7%	136
2006 Q3	14.54***	7.396***	-9.485***	81.6%	60	1.743***	4.390***	-4.841***	49.7%	137
2006 Q4	13.75***	7.218***	-9.206***	80.7%	60	1.756***	4.388***	-4.840***	49.8%	138
2007 Q1	12.77***	6.999***	-8.864***	80.7%	60	1.767***	4.386***	-4.838***	50.0%	139
2007 Q2	11.60***	6.788***	-8.513***	81.3%	60	1.764***	4.387***	-4.839***	50.2%	140
2007 Q3	10.72***	6.664***	-8.290***	81.8%	60	1.759***	4.388***	-4.840***	50.5%	141
2007 Q4	10.27***	6.621***	-8.198***	82.0%	60	1.761***	4.388***	-4.839***	50.7%	142
2008 Q1	9.901***	6.591***	-8.131***	81.9%	60	1.770***	4.385***	-4.838***	50.9%	143
2008 Q2	8.941***	6.408***	-7.832***	80.8%	60	1.760***	4.386***	-4.838***	51.1%	144
2008 Q3	6.539***	5.690***	-6.782***	76.7%	60	1.712***	4.377***	-4.823***	51.0%	145
2008 Q4	3.199**	4.509***	-5.109***	69.7%	60	1.622***	4.328***	-4.757***	50.6%	146
2009 Q1	1.153	3.662***	-3.942***	64.4%	60	1.529***	4.247***	-4.654***	50.0%	147
2009 Q2	0.556	3.328***	-3.501***	62.1%	60	1.463***	4.181***	-4.572***	49.7%	148
2009 Q3	0.388	3.136***	-3.263***	60.5%	60	1.403**	4.118***	-4.493***	49.4%	149
2009 Q4	0.360	3.001***	-3.103***	59.2%	60	1.347**	4.056***	-4.416***	49.2%	150
2010 Q1	0.319	2.861***	-2.937***	57.4%	60	1.287**	3.986***	-4.329***	48.9%	151
2010 Q2	0.411	2.756***	-2.823***	55.7%	60	1.234**	3.928***	-4.256***	48.6%	152
2010 Q3	0.589	2.644***	-2.710***	54.2%	60	1.181**	3.868***	-4.182***	48.3%	153

APPENDIX B: SUSTAINABLE RENT COEFFICIENT TABLES

Supplementary Table B7: Long-run Econometric Model – Outputs for Office Sector Models using CBRE Dataset cont'd

Window end	Rolling windows					Anchored windows				
	Constant	ß real GDP	ß stock	Adj R2	No obs.	Constant	ß real GDP	ß stock	Adj R2	No obs.
2010 Q4	0.780	2.529***	-2.593***	52.6%	60	1.127**	3.803***	-4.101***	47.9%	154
2011 Q1	1.119	2.434***	-2.514***	51.8%	60	1.084**	3.751***	-4.038***	47.7%	155
2011 Q2	1.452	2.345***	-2.441***	51.3%	60	1.043*	3.700***	-3.974***	47.5%	156
2011 Q3	1.852	2.259***	-2.376***	51.4%	60	1.006*	3.653***	-3.916***	47.3%	157
2011 Q4	2.331*	2.171***	-2.317***	52.2%	60	0.974*	3.609***	-3.862***	47.1%	158
2012 Q1	3.015**	2.076***	-2.269***	54.4%	60	0.947*	3.578***	-3.824***	47.1%	159
2012 Q2	3.774***	1.977***	-2.221***	57.2%	60	0.923*	3.550***	-3.788***	47.0%	160
2012 Q3	4.561***	1.890***	-2.191***	59.9%	60	0.911*	3.539***	-3.774***	47.1%	161
2012 Q4	5.298***	1.810***	-2.164***	62.7%	60	0.898*	3.526***	-3.758***	47.2%	162
2013 Q1	5.950***	1.741***	-2.142***	64.9%	60	0.888*	3.517***	-3.747***	47.3%	163
2013 Q2	6.583***	1.670***	-2.117***	66.8%	60	0.878*	3.510***	-3.738***	47.3%	164
2013 Q3	7.270***	1.591***	-2.087***	68.5%	60	0.873*	3.506***	-3.733***	47.4%	165
2013 Q4	7.985***	1.508***	-2.054***	70.2%	60	0.866*	3.503***	-3.729***	47.4%	166
2014 Q1	8.681***	1.423***	-2.018***	71.6%	60	0.861*	3.501***	-3.726***	47.4%	167
2014 Q2	9.289***	1.346***	-1.983***	72.5%	60	0.862*	3.501***	-3.727***	47.4%	168
2014 Q3	9.857***	1.281***	-1.959***	73.4%	60	0.866*	3.502***	-3.728***	47.5%	169
2014 Q4	10.26***	1.243***	-1.951***	74.0%	60	0.868*	3.502***	-3.728***	47.5%	170
2015 Q1	10.38***	1.242***	-1.959***	74.0%	60	0.866*	3.502***	-3.728***	47.5%	171
2015 Q2	10.31***	1.261***	-1.975***	73.5%	60	0.867*	3.502***	-3.728***	47.5%	172
2015 Q3	9.854***	1.316***	-1.998***	72.4%	60	0.871*	3.502***	-3.728***	47.5%	173
2015 Q4	8.886***	1.422***	-2.035***	71.3%	60	0.879*	3.501***	-3.728***	47.5%	174
2016 Q1	7.671***	1.540***	-2.064***	70.3%	60	0.883*	3.501***	-3.728***	47.5%	175
2016 Q2	6.445***	1.648***	-2.080***	69.8%	60	0.887*	3.500***	-3.727***	47.6%	176
2016 Q3	5.260***	1.740***	-2.080***	70.0%	60	0.897*	3.499***	-3.727***	47.6%	177
2016 Q4	4.124***	1.815***	-2.066***	71.4%	60	0.917**	3.494***	-3.724***	47.6%	178
2017 Q1	3.197**	1.863***	-2.039***	73.1%	60	0.944**	3.488***	-3.719***	47.5%	179
2017 Q2	2.445*	1.888***	-2.001***	75.0%	60	0.975**	3.482***	-3.714***	47.4%	180
2017 Q3	1.887	1.893***	-1.957***	76.5%	60	1.008**	3.474***	-3.708***	47.3%	181
2017 Q4	1.637	1.871***	-1.911***	76.8%	60	1.044**	3.465***	-3.702***	47.2%	182
2018 Q1	1.545	1.850***	-1.878***	76.5%	60	1.074**	3.459***	-3.697***	47.1%	183
2018 Q2	1.814	1.814***	-1.860***	75.7%	60	1.107**	3.451***	-3.691***	46.9%	184
2018 Q3	2.367**	1.767***	-1.855***	74.8%	60	1.148***	3.440***	-3.682***	46.8%	185
2018 Q4	3.063***	1.729***	-1.874***	74.8%	60	1.186***	3.430***	-3.674***	46.6%	186
2019 Q1	3.740***	1.704***	-1.904***	75.5%	60	1.222***	3.421***	-3.667***	46.4%	187

Note: *, **, *** denote significance at the 10%, 5% and 1% levels, respectively.

APPENDIX B: SUSTAINABLE RENT COEFFICIENT TABLES

Supplementary Table B8: Long-run Econometric Model – Outputs for Retail Sector Models using CBRE Dataset

	Rolling windows					Anchored windows				
Window end	Constant	ß real HHC	ß stock	Adj R2	No obs.	Constant	ß real HHC	ß stock	Adj R2	No obs.
1988 Q4	89.23***	3.478***	-11.19***	84.4%	60	89.23***	3.478***	-11.19***	84.4%	60
1989 Q1	89.73***	3.562***	-11.32***	84.6%	60	90.75***	3.588***	-11.44***	84.9%	61
1989 Q2	89.45***	3.618***	-11.35***	84.9%	60	91.69***	3.674***	-11.61***	85.3%	62
1989 Q3	87.65***	3.638***	-11.21***	84.4%	60	91.58***	3.736***	-11.66***	84.9%	63
1989 Q4	84.14***	3.612***	-10.87***	83.7%	60	90.38***	3.769***	-11.59***	84.1%	64
1990 Q1	77.24***	3.489***	-10.13***	83.2%	60	88.16***	3.765***	-11.39***	83.3%	65
1990 Q2	72.13***	3.395***	-9.580***	83.1%	60	85.62***	3.741***	-11.14***	82.9%	66
1990 Q3	59.66***	3.112***	-8.175***	82.7%	60	81.05***	3.657***	-10.64***	82.0%	67
1990 Q4	46.20***	2.803***	-6.656***	82.8%	60	75.24***	3.534***	-10.00***	80.8%	68
1991 Q1	35.08**	2.545***	-5.399***	83.0%	60	68.97***	3.389***	-9.291***	79.7%	69
1991 Q2	25.81**	2.326***	-4.347***	83.2%	60	61.44***	3.200***	-8.424***	78.3%	70
1991 Q3	19.87*	2.189***	-3.676***	83.5%	60	54.40***	3.016***	-7.606***	77.3%	71
1991 Q4	15.84	2.097***	-3.222***	83.6%	60	47.57***	2.831***	-6.805***	76.4%	72
1992 Q1	14.10	2.076***	-3.047***	83.8%	60	41.42***	2.658***	-6.078***	75.6%	73
1992 Q2	14.56*	2.113***	-3.126***	83.8%	60	37.65***	2.553***	-5.633***	75.4%	74
1992 Q3	15.23**	2.155***	-3.230***	83.9%	60	34.81***	2.472***	-5.296***	75.3%	75
1992 Q4	15.72**	2.185***	-3.305***	83.7%	60	32.55***	2.407***	-5.027***	75.3%	76
1993 Q1	16.34**	2.212***	-3.388***	83.5%	60	31.05***	2.363***	-4.848***	75.3%	77
1993 Q2	17.24***	2.257***	-3.515***	83.5%	60	29.99***	2.332***	-4.722***	75.4%	78
1993 Q3	18.64***	2.310***	-3.695***	83.3%	60	29.97***	2.332***	-4.719***	75.5%	79
1993 Q4	20.00***	2.377***	-3.886***	83.7%	60	30.03***	2.333***	-4.726***	75.6%	80
1994 Q1	21.07***	2.433***	-4.040***	84.1%	60	30.21***	2.338***	-4.747***	75.6%	81
1994 Q2	22.06***	2.461***	-4.157***	83.9%	60	30.38***	2.343***	-4.767***	75.7%	82
1994 Q3	22.91***	2.510***	-4.285***	84.3%	60	30.60***	2.350***	-4.795***	75.8%	83
1994 Q4	23.48***	2.550***	-4.377***	84.9%	60	30.77***	2.355***	-4.814***	75.8%	84
1995 Q1	24.08***	2.578***	-4.461***	84.9%	60	30.89***	2.358***	-4.829***	75.9%	85
1995 Q2	24.95***	2.635***	-4.598***	85.3%	60	31.06***	2.363***	-4.849***	75.9%	86
1995 Q3	25.70***	2.680***	-4.711***	85.4%	60	31.24***	2.369***	-4.871***	75.9%	87
1995 Q4	26.72***	2.756***	-4.882***	86.1%	60	31.43***	2.375***	-4.894***	76.0%	88
1996 Q1	27.58***	2.808***	-5.014***	86.1%	60	31.67***	2.382***	-4.922***	76.0%	89
1996 Q2	28.48***	2.864***	-5.152***	86.0%	60	31.87***	2.387***	-4.946***	76.0%	90
1996 Q3	29.40***	2.929***	-5.302***	86.1%	60	32.01***	2.392***	-4.963***	76.1%	91
1996 Q4	30.47***	3.009***	-5.483***	86.2%	60	32.17***	2.396***	-4.982***	76.1%	92
1997 Q1	31.64***	3.099***	-5.681***	86.4%	60	32.35***	2.401***	-5.004***	76.1%	93
1997 Q2	33.00***	3.201***	-5.909***	86.4%	60	32.59***	2.408***	-5.032***	76.2%	94
1997 Q3	34.14***	3.275***	-6.089***	85.8%	60	32.85***	2.414***	-5.061***	76.2%	95
1997 Q4	34.97***	3.347***	-6.238***	85.6%	60	32.83***	2.414***	-5.059***	76.3%	96
1998 Q1	35.64***	3.397***	-6.350***	85.0%	60	32.81***	2.413***	-5.056***	76.4%	97
1998 Q2	36.27***	3.439***	-6.450***	84.1%	60	32.81***	2.413***	-5.056***	76.5%	98
1998 Q3	36.69***	3.440***	-6.489***	82.7%	60	32.84***	2.414***	-5.060***	76.7%	99
1998 Q4	36.98***	3.462***	-6.537***	81.5%	60	32.63***	2.408***	-5.035***	76.8%	100
1999 Q1	37.32***	3.487***	-6.594***	80.3%	60	32.44***	2.403***	-5.013***	77.0%	101
1999 Q2	37.59***	3.493***	-6.624***	78.6%	60	32.31***	2.400***	-4.999***	77.2%	102
1999 Q3	38.33***	3.573***	-6.774***	77.4%	60	32.11***	2.396***	-4.976***	77.4%	103
1999 Q4	38.77***	3.612***	-6.855***	75.8%	60	31.93***	2.392***	-4.956***	77.6%	104
2000 Q1	38.57***	3.546***	-6.767***	73.5%	60	31.85***	2.391***	-4.948***	77.9%	105
2000 Q2	38.33***	3.483***	-6.680***	71.2%	60	31.71***	2.388***	-4.932***	78.2%	106

APPENDIX B: SUSTAINABLE RENT COEFFICIENT TABLES

Supplementary Table B8: Long-run Econometric Model – Outputs for Retail Sector Models using CBRE Dataset cont'd

Window end	Rolling windows					Anchored windows				
	Constant	ß real HHC	ß stock	Adj R2	No obs.	Constant	ß real HHC	ß stock	Adj R2	No obs.
2000 Q3	37.93***	3.392***	-6.547***	68.9%	60	31.58***	2.385***	-4.918***	78.5%	107
2000 Q4	37.46***	3.298***	-6.406***	66.7%	60	31.43***	2.382***	-4.902***	78.7%	108
2001 Q1	37.03***	3.186***	-6.248***	66.3%	60	31.21***	2.377***	-4.877***	79.0%	109
2001 Q2	36.78***	3.074***	-6.107***	67.2%	60	31.05***	2.373***	-4.858***	79.2%	110
2001 Q3	36.55***	2.950***	-5.955***	68.9%	60	30.98***	2.371***	-4.850***	79.4%	111
2001 Q4	36.33***	2.827***	-5.804***	71.8%	60	30.91***	2.370***	-4.843***	79.7%	112
2002 Q1	36.38***	2.752***	-5.729***	74.8%	60	30.80***	2.367***	-4.831***	80.0%	113
2002 Q2	36.74***	2.711***	-5.717***	78.3%	60	30.75***	2.366***	-4.825***	80.2%	114
2002 Q3	37.60***	2.725***	-5.806***	82.2%	60	30.68***	2.365***	-4.817***	80.5%	115
2002 Q4	38.60***	2.767***	-5.938***	85.1%	60	30.59***	2.363***	-4.808***	80.7%	116
2003 Q1	39.54***	2.818***	-6.075***	86.6%	60	30.54***	2.362***	-4.802***	81.0%	117
2003 Q2	39.99***	2.829***	-6.126***	86.6%	60	30.58***	2.362***	-4.806***	81.2%	118
2003 Q3	40.99***	2.882***	-6.270***	87.0%	60	30.61***	2.363***	-4.808***	81.4%	119
2003 Q4	41.96***	2.941***	-6.418***	87.0%	60	30.60***	2.363***	-4.808***	81.6%	120
2004 Q1	43.26***	3.016***	-6.612***	87.0%	60	30.62***	2.363***	-4.810***	81.8%	121
2004 Q2	45.08***	3.124***	-6.886***	87.3%	60	30.64***	2.363***	-4.812***	82.0%	122
2004 Q3	46.23***	3.196***	-7.064***	86.8%	60	30.63***	2.363***	-4.811***	82.2%	123
2004 Q4	46.98***	3.248***	-7.185***	86.0%	60	30.58***	2.362***	-4.805***	82.5%	124
2005 Q1	48.28***	3.333***	-7.389***	85.5%	60	30.53***	2.361***	-4.799***	82.7%	125
2005 Q2	52.69***	3.601***	-8.062***	86.6%	60	30.48***	2.360***	-4.794***	82.9%	126
2005 Q3	56.93***	3.861***	-8.709***	87.2%	60	30.40***	2.357***	-4.785***	83.1%	127
2005 Q4	61.12***	4.118***	-9.351***	87.5%	60	30.30***	2.354***	-4.773***	83.3%	128
2006 Q1	64.36***	4.326***	-9.855***	86.6%	60	30.11***	2.348***	-4.749***	83.5%	129
2006 Q2	61.92***	4.200***	-9.507***	85.6%	60	29.97***	2.343***	-4.731***	83.6%	130
2006 Q3	55.00***	3.814***	-8.490***	85.0%	60	29.84***	2.339***	-4.715***	83.8%	131
2006 Q4	38.31***	2.870***	-6.024***	85.1%	60	29.60***	2.329***	-4.684***	83.9%	132
2007 Q1	28.53***	2.336***	-4.598***	87.6%	60	29.40***	2.321***	-4.658***	84.0%	133
2007 Q2	21.87***	1.976***	-3.631***	89.4%	60	29.20***	2.313***	-4.632***	84.1%	134
2007 Q3	18.69***	1.816***	-3.183***	91.4%	60	29.07***	2.309***	-4.616***	84.3%	135
2007 Q4	17.65***	1.783***	-3.057***	93.2%	60	28.90***	2.302***	-4.593***	84.4%	136
2008 Q1	16.43***	1.739***	-2.903***	94.6%	60	28.65***	2.291***	-4.559***	84.5%	137
2008 Q2	15.90***	1.735***	-2.854***	95.6%	60	28.28***	2.274***	-4.509***	84.5%	138
2008 Q3	13.19***	1.585***	-2.456***	95.7%	60	27.64***	2.243***	-4.420***	84.4%	139
2008 Q4	8.262***	1.298***	-1.719***	95.0%	60	26.39***	2.179***	-4.242***	84.0%	140
2009 Q1	6.148***	1.177***	-1.405***	94.8%	60	25.08***	2.111***	-4.055***	83.6%	141
2009 Q2	7.243***	1.253***	-1.582***	94.6%	60	24.08***	2.058***	-3.910***	83.4%	142
2009 Q3	8.753***	1.354***	-1.822***	94.0%	60	23.44***	2.024***	-3.819***	83.3%	143
2009 Q4	9.972***	1.436***	-2.016***	93.3%	60	22.98***	2.000***	-3.753***	83.2%	144
2010 Q1	10.81***	1.496***	-2.154***	92.8%	60	22.46***	1.971***	-3.676***	83.1%	145
2010 Q2	11.87***	1.564***	-2.320***	91.6%	60	22.25***	1.960***	-3.646***	83.1%	146
2010 Q3	12.59***	1.610***	-2.432***	90.8%	60	22.01***	1.947***	-3.610***	83.1%	147
2010 Q4	13.13***	1.644***	-2.515***	90.2%	60	21.71***	1.931***	-3.567***	83.1%	148
2011 Q1	13.54***	1.666***	-2.574***	89.8%	60	21.40***	1.914***	-3.522***	83.0%	149
2011 Q2	13.93***	1.687***	-2.631***	89.7%	60	21.14***	1.899***	-3.483***	83.0%	150
2011 Q3	14.25***	1.703***	-2.674***	89.7%	60	20.91***	1.886***	-3.449***	83.0%	151
2011 Q4	14.57***	1.715***	-2.716***	89.8%	60	20.74***	1.876***	-3.424***	83.0%	152
2012 Q1	14.99***	1.726***	-2.764***	89.9%	60	20.66***	1.872***	-3.413***	83.0%	153

APPENDIX B: SUSTAINABLE RENT COEFFICIENT TABLES

Supplementary Table B8: Long-run Econometric Model – Outputs for Retail Sector Models using CBRE Dataset cont'd

Window end	Rolling windows					Anchored windows				
	Constant	ß real HHC	ß stock	Adj R2	No obs.	Constant	ß real HHC	ß stock	Adj R2	No obs.
2012 Q2	15.42***	1.726***	-2.802***	90.3%	60	20.61***	1.869***	-3.405***	83.0%	154
2012 Q3	16.03***	1.728***	-2.856***	90.5%	60	20.68***	1.873***	-3.415***	83.0%	155
2012 Q4	16.49***	1.737***	-2.906***	90.4%	60	20.75***	1.877***	-3.425***	83.0%	156
2013 Q1	17.01***	1.750***	-2.964***	90.0%	60	20.88***	1.884***	-3.445***	83.0%	157
2013 Q2	17.45***	1.750***	-3.003***	90.3%	60	20.95***	1.888***	-3.455***	83.0%	158
2013 Q3	17.98***	1.739***	-3.037***	90.3%	60	21.06***	1.894***	-3.471***	83.0%	159
2013 Q4	18.36***	1.744***	-3.076***	90.2%	60	21.18***	1.900***	-3.488***	83.0%	160
2014 Q1	18.73***	1.751***	-3.115***	90.1%	60	21.30***	1.907***	-3.506***	83.0%	161
2014 Q2	19.12***	1.749***	-3.146***	90.0%	60	21.42***	1.914***	-3.524***	83.0%	162
2014 Q3	19.50***	1.749***	-3.180***	89.6%	60	21.58***	1.922***	-3.546***	82.9%	163
2014 Q4	19.83***	1.747***	-3.206***	89.4%	60	21.70***	1.929***	-3.564***	82.9%	164
2015 Q1	20.27***	1.725***	-3.221***	89.2%	60	21.83***	1.935***	-3.582***	82.9%	165
2015 Q2	20.69***	1.700***	-3.229***	88.9%	60	21.95***	1.941***	-3.599***	82.8%	166
2015 Q3	21.27***	1.645***	-3.220***	88.5%	60	22.09***	1.948***	-3.619***	82.7%	167
2015 Q4	21.64***	1.608***	-3.213***	88.5%	60	22.16***	1.952***	-3.629***	82.7%	168
2016 Q1	21.97***	1.572***	-3.202***	88.3%	60	22.25***	1.956***	-3.641***	82.7%	169
2016 Q2	22.39***	1.521***	-3.183***	88.3%	60	22.31***	1.959***	-3.649***	82.6%	170
2016 Q3	22.98***	1.451***	-3.158***	88.3%	60	22.38***	1.961***	-3.658***	82.6%	171
2016 Q4	23.55***	1.389***	-3.140***	88.4%	60	22.44***	1.964***	-3.667***	82.6%	172
2017 Q1	24.08***	1.330***	-3.123***	88.4%	60	22.52***	1.967***	-3.677***	82.5%	173
2017 Q2	24.72***	1.269***	-3.111***	88.5%	60	22.60***	1.970***	-3.687***	82.5%	174
2017 Q3	25.35***	1.211***	-3.103***	88.6%	60	22.68***	1.974***	-3.698***	82.4%	175
2017 Q4	25.98***	1.156***	-3.098***	88.7%	60	22.77***	1.977***	-3.710***	82.3%	176
2018 Q1	26.74***	1.097***	-3.100***	88.9%	60	22.87***	1.981***	-3.722***	82.2%	177
2018 Q2	27.78***	1.031***	-3.118***	89.5%	60	22.98***	1.985***	-3.736***	82.0%	178
2018 Q3	28.83***	0.969***	-3.141***	89.9%	60	23.11***	1.989***	-3.752***	81.7%	179
2018 Q4	29.92***	0.908***	-3.168***	90.4%	60	23.24***	1.993***	-3.768***	81.4%	180
2019 Q1	31.07***	0.855***	-3.210***	90.9%	60	23.37***	1.997***	-3.784***	81.0%	181

Note: *, **, *** denote significance at the 10%, 5% and 1% levels, respectively.

APPENDIX B: SUSTAINABLE RENT COEFFICIENT TABLES

Supplementary Table B9: Long-run Econometric Model – Outputs for Industrial Sector Models using CBRE Dataset

Window end	Rolling windows					Anchored windows				
	Constant	ß real GDP	ß stock	Adj R2	No obs.	Constant	ß real GDP	ß stock	Adj R2	No obs.
1987 Q2	20.11***	0.432*	-1.873***	61.3%	60	20.11***	0.432*	-1.873***	61.3%	60
1987 Q3	20.99***	0.587**	-2.121***	63.2%	60	20.03***	0.543**	-1.987***	59.9%	61
1987 Q4	21.78***	0.780***	-2.403***	62.8%	60	19.94***	0.679***	-2.128***	57.5%	62
1988 Q1	23.29***	1.144***	-2.936***	60.5%	60	19.90***	0.886***	-2.351***	52.9%	63
1988 Q2	25.05***	1.542***	-3.530***	56.6%	60	19.81***	1.112***	-2.592***	47.3%	64
1988 Q3	26.28***	1.845***	-3.971***	52.5%	60	19.83***	1.323***	-2.824***	44.1%	65
1988 Q4	26.92***	2.072***	-4.277***	48.4%	60	19.84***	1.511***	-3.031***	42.3%	66
1989 Q1	26.30***	2.210***	-4.373***	45.4%	60	19.79***	1.683***	-3.215***	41.3%	67
1989 Q2	25.35***	2.317***	-4.405***	43.1%	60	19.69***	1.847***	-3.386***	41.0%	68
1989 Q3	23.62***	2.358***	-4.297***	41.5%	60	19.46***	1.988***	-3.520***	40.8%	69
1989 Q4	21.08***	2.350***	-4.062***	42.3%	60	19.09***	2.104***	-3.614***	40.7%	70
1990 Q1	18.36***	2.323***	-3.790***	44.7%	60	18.70***	2.208***	-3.694***	41.1%	71
1990 Q2	15.96***	2.323***	-3.577***	48.4%	60	18.28***	2.296***	-3.752***	41.8%	72
1990 Q3	12.69**	2.260***	-3.217***	51.4%	60	17.50***	2.341***	-3.732***	41.4%	73
1990 Q4	8.919*	2.134***	-2.743***	53.4%	60	16.48***	2.354***	-3.656***	40.6%	74
1991 Q1	4.917	1.958***	-2.193**	54.8%	60	15.30***	2.338***	-3.532***	39.6%	75
1991 Q2	1.692	1.818***	-1.753*	56.6%	60	14.16***	2.303***	-3.392***	39.0%	76
1991 Q3	-1.210	1.680***	-1.345	58.4%	60	12.96***	2.249***	-3.226***	38.3%	77
1991 Q4	-3.411	1.563***	-1.020	59.5%	60	11.84***	2.190***	-3.061***	37.7%	78
1992 Q1	-4.690	1.500***	-0.837	60.3%	60	10.86***	2.132***	-2.909***	37.4%	79
1992 Q2	-5.184	1.492***	-0.785	60.7%	60	10.03***	2.076***	-2.774***	37.1%	80
1992 Q3	-5.122	1.523***	-0.825	61.0%	60	9.478***	2.039***	-2.684***	37.0%	81
1992 Q4	-4.631	1.574***	-0.924	60.8%	60	9.184***	2.019***	-2.636***	37.1%	82
1993 Q1	-4.062	1.625***	-1.031	60.4%	60	8.979***	2.005***	-2.603***	37.2%	83
1993 Q2	-3.275	1.681***	-1.163*	59.7%	60	8.869***	1.998***	-2.585***	37.2%	84
1993 Q3	-2.497	1.733***	-1.289*	58.9%	60	8.828***	1.995***	-2.578***	37.3%	85
1993 Q4	-1.782	1.779***	-1.403**	58.2%	60	8.818***	1.994***	-2.576***	37.3%	86
1994 Q1	-1.253	1.816***	-1.491**	57.7%	60	8.885***	1.998***	-2.587***	37.4%	87
1994 Q2	-0.341	1.860***	-1.621**	56.7%	60	9.022***	2.005***	-2.607***	37.3%	88
1994 Q3	0.370	1.893***	-1.720**	55.8%	60	9.169***	2.012***	-2.627***	37.3%	89
1994 Q4	1.063	1.924***	-1.815***	54.8%	60	9.336***	2.020***	-2.651***	37.2%	90
1995 Q1	1.678	1.958***	-1.907***	54.0%	60	9.512***	2.029***	-2.677***	37.1%	91
1995 Q2	2.256	2.012***	-2.018***	53.6%	60	9.717***	2.040***	-2.707***	36.9%	92
1995 Q3	2.788	2.067***	-2.126***	53.2%	60	9.925***	2.050***	-2.736***	36.7%	93
1995 Q4	3.308	2.155***	-2.270***	53.6%	60	10.11***	2.059***	-2.763***	36.5%	94
1996 Q1	3.910	2.256***	-2.434***	53.8%	60	10.31***	2.067***	-2.789***	36.3%	95
1996 Q2	4.546	2.360***	-2.606***	53.7%	60	10.50***	2.075***	-2.815***	36.0%	96
1996 Q3	5.155*	2.448***	-2.757***	53.1%	60	10.69***	2.083***	-2.841***	35.8%	97
1996 Q4	5.800*	2.536***	-2.911***	52.1%	60	10.88***	2.089***	-2.864***	35.5%	98
1997 Q1	6.497**	2.626***	-3.072***	50.8%	60	11.08***	2.087***	-2.880***	35.0%	99
1997 Q2	7.182**	2.695***	-3.209***	48.9%	60	11.27***	2.084***	-2.893***	34.4%	100
1997 Q3	7.866**	2.790***	-3.375***	47.4%	60	11.46***	2.082***	-2.908***	33.9%	101
1997 Q4	8.512***	2.879***	-3.530***	45.8%	60	11.62***	2.077***	-2.917***	33.4%	102
1998 Q1	9.050***	2.918***	-3.621***	43.7%	60	11.76***	2.071***	-2.923***	33.0%	103
1998 Q2	9.565***	2.924***	-3.673***	40.9%	60	11.89***	2.064***	-2.926***	32.6%	104
1998 Q3	10.06***	2.898***	-3.688***	37.9%	60	12.01***	2.057***	-2.930***	32.2%	105
1998 Q4	10.51***	2.844***	-3.668***	34.8%	60	12.11***	2.051***	-2.932***	31.9%	106

APPENDIX B: SUSTAINABLE RENT COEFFICIENT TABLES

Supplementary Table B9: Long-run Econometric Model – Outputs for Industrial Sector Models using CBRE Dataset cont'd

Window end	Rolling windows					Anchored windows				
	Constant	ß real GDP	ß stock	Adj R2	No obs.	Constant	ß real GDP	ß stock	Adj R2	No obs.
1999 Q1	10.91***	2.786***	-3.639***	31.9%	60	12.20***	2.048***	-2.936***	31.7%	107
1999 Q2	11.24***	2.754***	-3.634***	28.9%	60	12.27***	2.047***	-2.942***	31.6%	108
1999 Q3	11.57***	2.672***	-3.571***	25.3%	60	12.35***	2.041***	-2.943***	31.4%	109
1999 Q4	11.85***	2.530***	-3.439***	22.1%	60	12.40***	2.034***	-2.939***	31.3%	110
2000 Q1	12.14***	2.354***	-3.270***	19.1%	60	12.45***	2.028***	-2.936***	31.2%	111
2000 Q2	12.66***	2.173***	-3.115***	17.4%	60	12.49***	2.024***	-2.936***	31.2%	112
2000 Q3	13.10***	1.999***	-2.961***	16.4%	60	12.52***	2.023***	-2.937***	31.2%	113
2000 Q4	13.39***	1.822***	-2.791***	15.8%	60	12.50***	2.023***	-2.935***	31.4%	114
2001 Q1	13.75***	1.683***	-2.668***	16.3%	60	12.48***	2.023***	-2.934***	31.6%	115
2001 Q2	14.06***	1.572***	-2.572***	17.2%	60	12.44***	2.024***	-2.932***	31.9%	116
2001 Q3	14.37***	1.449***	-2.462***	18.6%	60	12.40***	2.024***	-2.929***	32.2%	117
2001 Q4	14.88***	1.377***	-2.426***	21.8%	60	12.33***	2.024***	-2.922***	32.5%	118
2002 Q1	15.45***	1.321***	-2.414***	25.9%	60	12.26***	2.022***	-2.914***	32.8%	119
2002 Q2	16.19***	1.319***	-2.475***	31.5%	60	12.18***	2.021***	-2.905***	33.0%	120
2002 Q3	17.22***	1.438***	-2.696***	38.3%	60	12.11***	2.019***	-2.897***	33.3%	121
2002 Q4	18.26***	1.590***	-2.957***	44.7%	60	12.05***	2.018***	-2.891***	33.7%	122
2003 Q1	19.25***	1.779***	-3.251***	48.7%	60	12.00***	2.017***	-2.886***	33.9%	123
2003 Q2	19.95***	1.931***	-3.480***	50.2%	60	11.97***	2.017***	-2.883***	34.2%	124
2003 Q3	20.94***	2.136***	-3.793***	51.8%	60	11.96***	2.017***	-2.882***	34.5%	125
2003 Q4	22.09***	2.365***	-4.147***	53.0%	60	11.95***	2.018***	-2.881***	34.8%	126
2004 Q1	23.14***	2.580***	-4.477***	52.8%	60	11.94***	2.018***	-2.880***	35.0%	127
2004 Q2	24.02***	2.767***	-4.760***	50.9%	60	11.93***	2.017***	-2.879***	35.2%	128
2004 Q3	24.44***	2.884***	-4.926***	47.0%	60	11.91***	2.016***	-2.876***	35.4%	129
2004 Q4	24.26***	2.906***	-4.935***	41.2%	60	11.89***	2.015***	-2.873***	35.5%	130
2005 Q1	23.85***	2.888***	-4.879***	33.7%	60	11.88***	2.015***	-2.872***	35.7%	131
2005 Q2	23.02***	2.793***	-4.702***	24.2%	60	11.89***	2.015***	-2.873***	35.8%	132
2005 Q3	20.26***	2.400***	-4.026***	13.9%	60	11.92***	2.015***	-2.875***	35.9%	133
2005 Q4	15.12***	1.655**	-2.753**	3.8%	60	11.95***	2.011***	-2.873***	35.9%	134
2006 Q1	7.889	0.635	-0.994	-1.9%	60	11.98***	2.009***	-2.874***	35.9%	135
2006 Q2	1.062	-0.313	0.650	-0.3%	60	12.02***	2.009***	-2.878***	35.8%	136
2006 Q3	-4.054	-0.986	1.840	7.8%	60	12.05***	2.010***	-2.882***	35.9%	137
2006 Q4	-6.760*	-1.304**	2.428**	19.3%	60	12.09***	2.012***	-2.887***	35.9%	138
2007 Q1	-7.238**	-1.302**	2.466***	29.4%	60	12.13***	2.013***	-2.892***	35.8%	139
2007 Q2	-5.933*	-1.050**	2.073**	35.1%	60	12.17***	2.015***	-2.898***	35.8%	140
2007 Q3	-4.755	-0.826*	1.722**	39.6%	60	12.21***	2.015***	-2.902***	35.8%	141
2007 Q4	-3.647	-0.632	1.411*	41.3%	60	12.25***	2.016***	-2.906***	35.8%	142
2008 Q1	-2.252	-0.394	1.026	42.3%	60	12.28***	2.017***	-2.910***	35.8%	143
2008 Q2	0.492	0.051	0.294	40.2%	60	12.32***	2.021***	-2.918***	35.7%	144
2008 Q3	3.457	0.564	-0.533	39.9%	60	12.26***	2.013***	-2.903***	35.7%	145
2008 Q4	3.809**	0.671**	-0.682	42.2%	60	11.87***	1.955***	-2.804***	35.2%	146
2009 Q1	3.324**	0.627**	-0.592	43.6%	60	11.23***	1.853***	-2.637***	34.2%	147
2009 Q2	3.410***	0.674***	-0.651**	44.4%	60	10.69***	1.767***	-2.494***	33.5%	148
2009 Q3	3.597***	0.741***	-0.742***	45.7%	60	10.26***	1.695***	-2.377***	33.0%	149
2009 Q4	3.847***	0.816***	-0.847***	46.8%	60	9.928***	1.641***	-2.288***	32.7%	150
2010 Q1	4.180***	0.904***	-0.973***	47.9%	60	9.716***	1.606***	-2.231***	32.6%	151
2010 Q2	4.537***	0.984***	-1.094***	48.6%	60	9.603***	1.588***	-2.200***	32.7%	152
2010 Q3	4.837***	1.051***	-1.194***	49.7%	60	9.524***	1.575***	-2.179***	32.9%	153

APPENDIX B: SUSTAINABLE RENT COEFFICIENT TABLES

Supplementary Table B9: Long-run Econometric Model – Outputs for Industrial Sector Models using CBRE Dataset cont'd
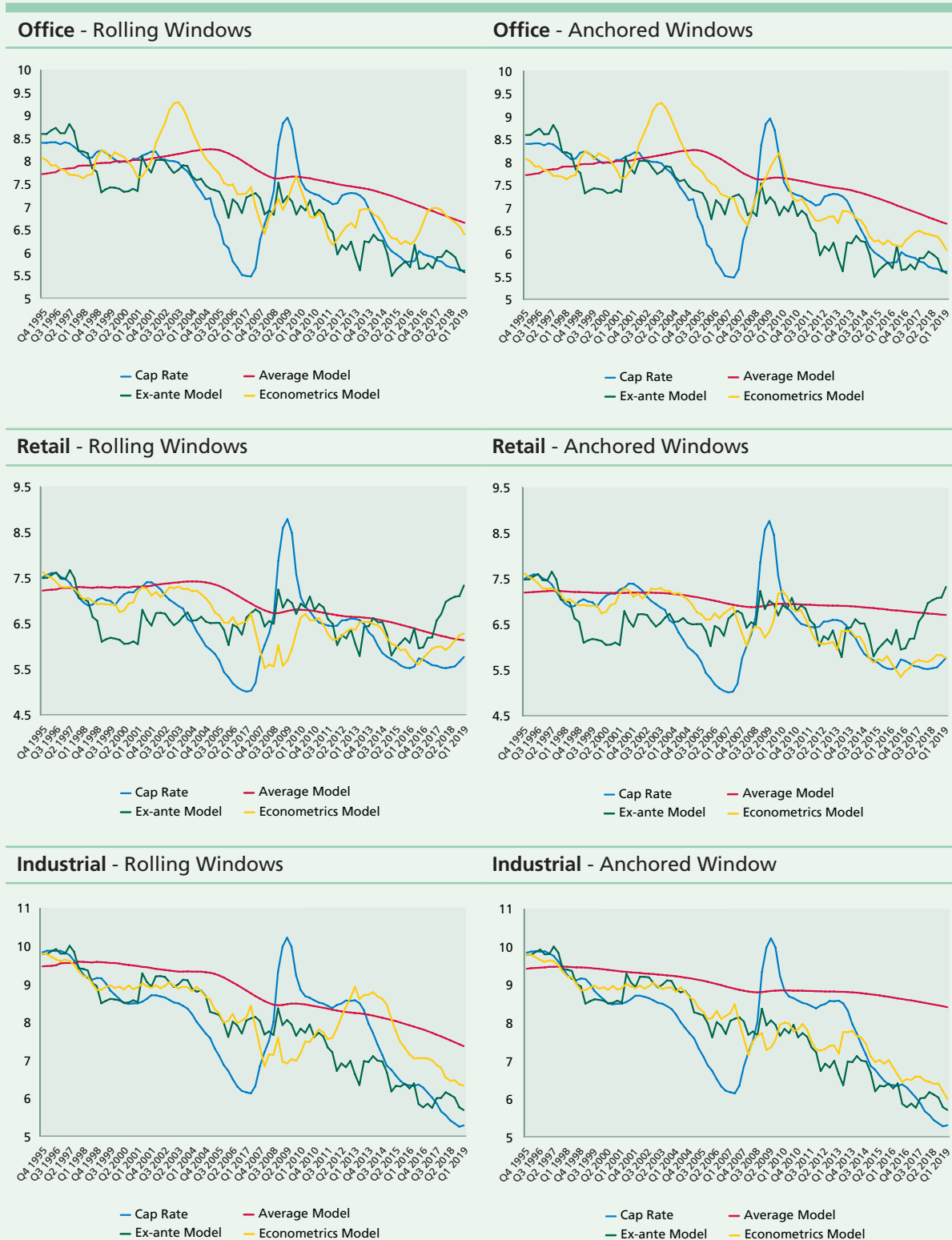
Window end	Rolling windows					Anchored windows				
	Constant	ß real GDP	ß stock	Adj R2	No obs.	Constant	ß real GDP	ß stock	Adj R2	No obs.
2010 Q4	5.102***	1.117***	-1.290***	51.6%	60	9.474***	1.566***	-2.165***	33.2%	154
2011 Q1	5.412***	1.180***	-1.387***	53.4%	60	9.483***	1.568***	-2.168***	33.6%	155
2011 Q2	5.686***	1.238***	-1.475***	55.5%	60	9.501***	1.571***	-2.173***	34.1%	156
2011 Q3	5.961***	1.290***	-1.557***	57.8%	60	9.539***	1.577***	-2.183***	34.6%	157
2011 Q4	6.215***	1.327***	-1.620***	60.1%	60	9.568***	1.582***	-2.191***	35.1%	158
2012 Q1	6.561***	1.343***	-1.668***	62.4%	60	9.606***	1.588***	-2.201***	35.7%	159
2012 Q2	6.947***	1.345***	-1.703***	65.0%	60	9.636***	1.593***	-2.209***	36.2%	160
2012 Q3	7.427***	1.337***	-1.736***	67.0%	60	9.702***	1.604***	-2.227***	36.8%	161
2012 Q4	7.935***	1.328***	-1.769***	69.3%	60	9.772***	1.616***	-2.246***	37.4%	162
2013 Q1	8.498***	1.311***	-1.798***	71.2%	60	9.856***	1.629***	-2.268***	38.0%	163
2013 Q2	9.154***	1.279***	-1.819***	73.1%	60	9.946***	1.644***	-2.292***	38.6%	164
2013 Q3	9.939***	1.228***	-1.830***	74.7%	60	10.05***	1.660***	-2.319***	39.2%	165
2013 Q4	10.76***	1.170***	-1.836***	76.2%	60	10.16***	1.676***	-2.346***	39.7%	166
2014 Q1	11.63***	1.095***	-1.828***	77.3%	60	10.26***	1.690***	-2.371***	40.2%	167
2014 Q2	12.65***	0.990***	-1.798***	78.4%	60	10.37***	1.705***	-2.397***	40.5%	168
2014 Q3	13.84***	0.866***	-1.763***	80.3%	60	10.47***	1.718***	-2.420***	40.9%	169
2014 Q4	14.89***	0.762***	-1.737***	82.3%	60	10.55***	1.728***	-2.439***	41.1%	170
2015 Q1	15.78***	0.676***	-1.717***	84.4%	60	10.61***	1.735***	-2.452***	41.3%	171
2015 Q2	16.60***	0.598***	-1.700***	86.6%	60	10.66***	1.740***	-2.461***	41.5%	172
2015 Q3	17.30***	0.528***	-1.683***	88.4%	60	10.69***	1.744***	-2.469***	41.7%	173
2015 Q4	17.85***	0.471***	-1.667***	89.5%	60	10.73***	1.748***	-2.476***	41.8%	174
2016 Q1	18.10***	0.457***	-1.671***	89.9%	60	10.74***	1.749***	-2.479***	42.0%	175
2016 Q2	18.15***	0.462***	-1.682***	89.7%	60	10.75***	1.750***	-2.480***	42.0%	176
2016 Q3	18.09***	0.480***	-1.697***	89.3%	60	10.75***	1.750***	-2.481***	42.1%	177
2016 Q4	17.83***	0.517***	-1.716***	88.4%	60	10.76***	1.750***	-2.481***	42.2%	178
2017 Q1	17.35***	0.577***	-1.741***	86.7%	60	10.74***	1.749***	-2.478***	42.2%	179
2017 Q2	16.72***	0.649***	-1.768***	84.4%	60	10.71***	1.746***	-2.472***	42.2%	180
2017 Q3	16.00***	0.730***	-1.795***	81.9%	60	10.68***	1.742***	-2.465***	42.1%	181
2017 Q4	15.13***	0.820***	-1.821***	78.7%	60	10.63***	1.738***	-2.456***	41.9%	182
2018 Q1	14.14***	0.913***	-1.839***	74.6%	60	10.56***	1.729***	-2.441***	41.6%	183
2018 Q2	13.13***	1.002***	-1.852***	70.0%	60	10.48***	1.720***	-2.423***	41.3%	184
2018 Q3	12.10***	1.091***	-1.863***	65.5%	60	10.40***	1.710***	-2.405***	40.9%	185
2018 Q4	11.03***	1.174***	-1.863***	60.5%	60	10.30***	1.697***	-2.382***	40.3%	186
2019 Q1	9.880***	1.255***	-1.855***	55.4%	60	10.19***	1.683***	-2.358***	39.7%	187

Note: *, **, *** denote significance at the 10%, 5% and 1% levels, respectively.

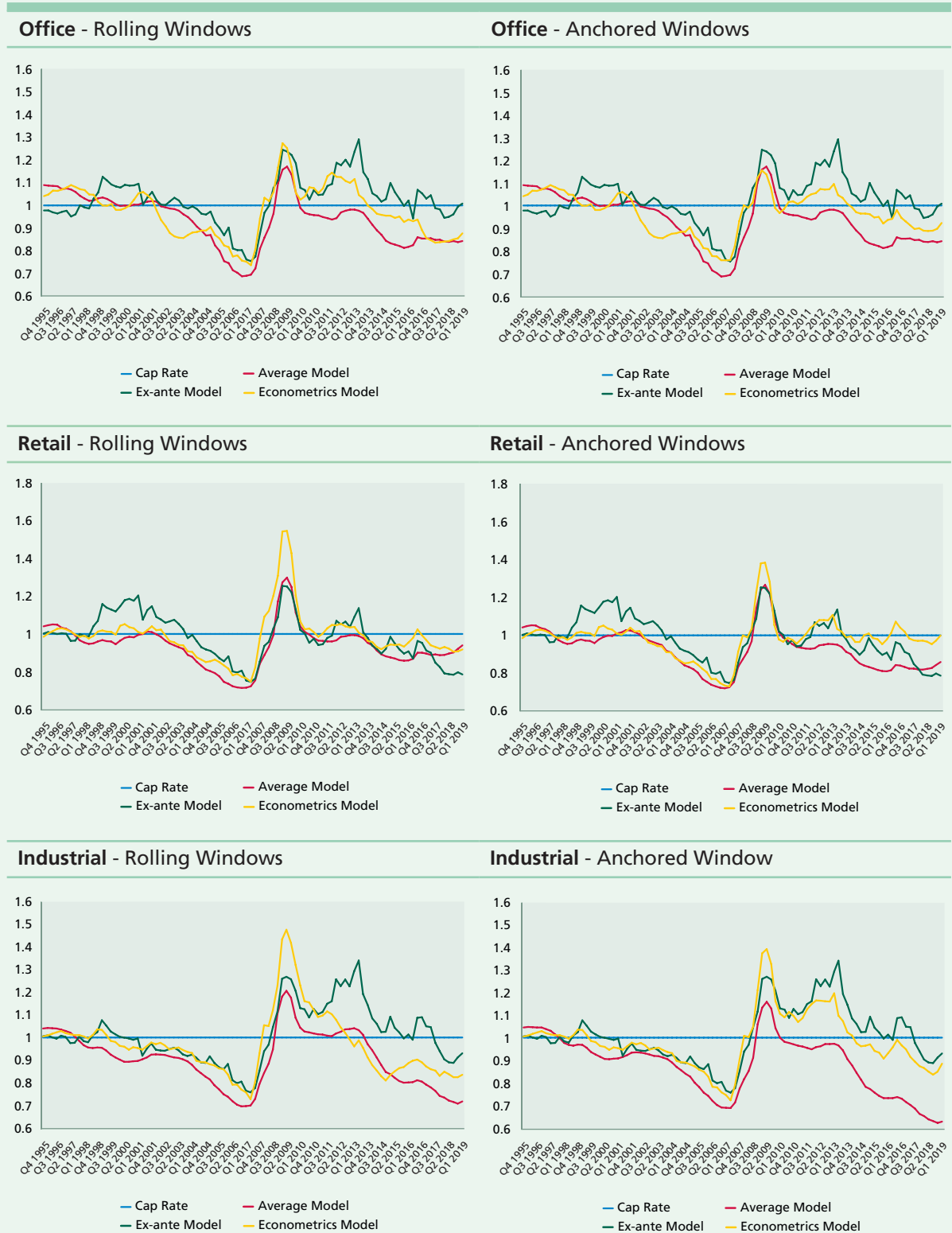# APPENDIX C: SUSTAINABLE CAPITAL VALUE

Appendices for Section 3.3

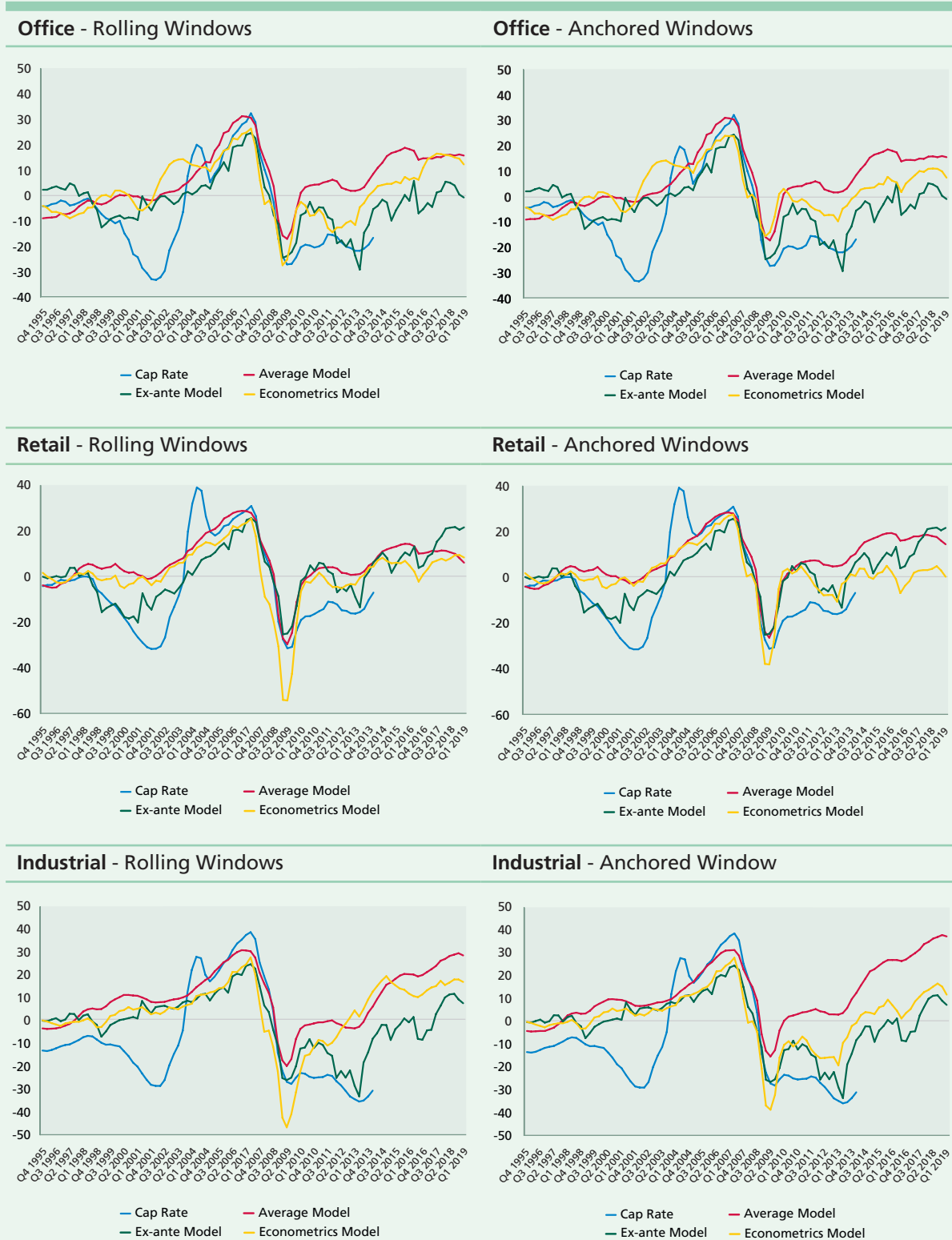### Figure C1: Sustainable Cap Rates and MSCI Cap Rate through Time – Sector Level

Office - Rolling Windows

Office - Anchored Windows

Retail - Rolling Windows

Retail - Anchored Windows

Industrial - Rolling Windows

Industrial - Anchored Window

APPENDIX C: SUSTAINABLE CAPITAL VALUE

Figure C2: Ratio of MSCI Cap Rate to Sustainable Cap Rate – Sector Level

Office - Rolling Windows

Office - Anchored Windows

Retail - Rolling Windows

Retail - Anchored Windows

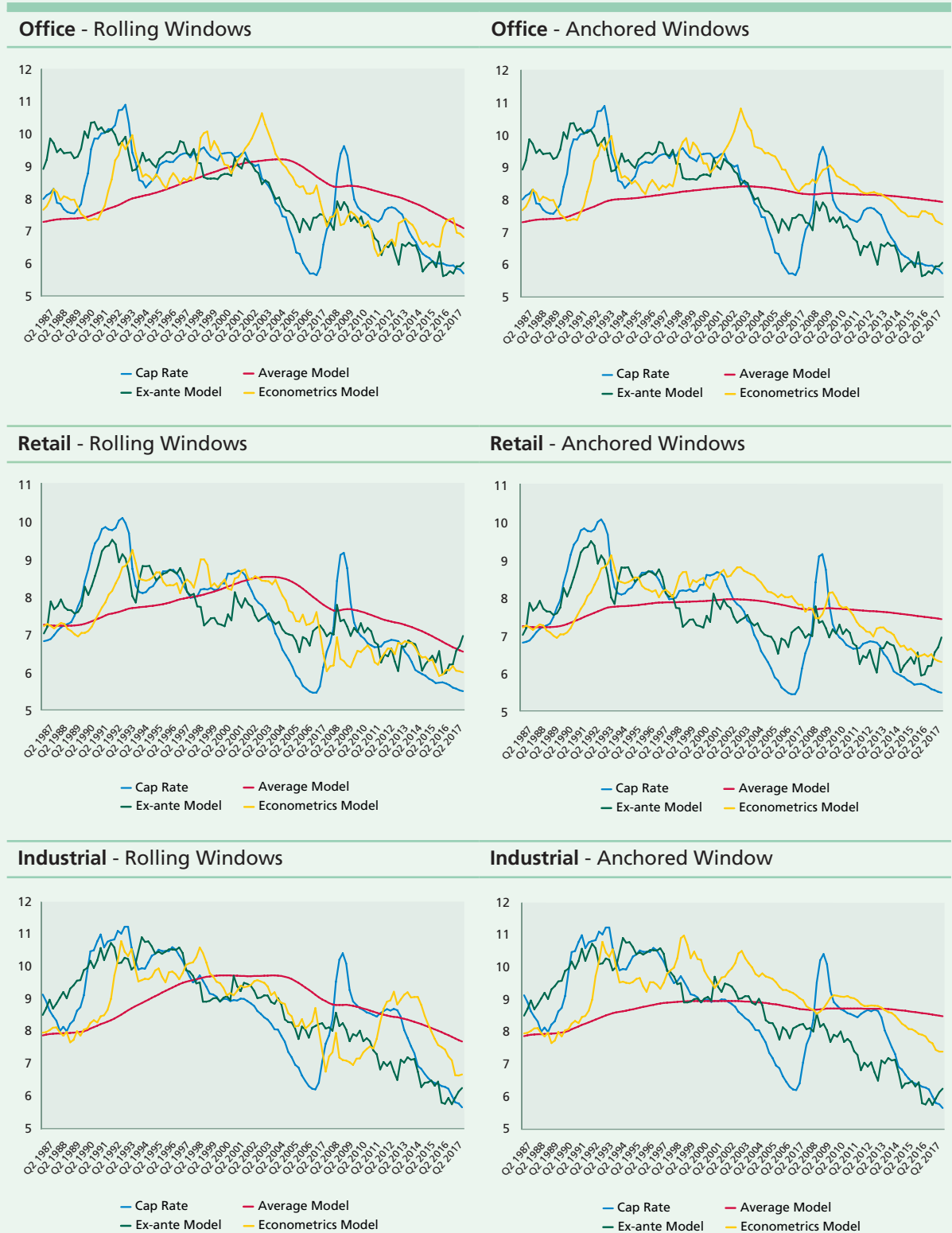**Industrial** - Rolling Windows

Industrial - Anchored Window

APPENDIX C: SUSTAINABLE CAPITAL VALUE

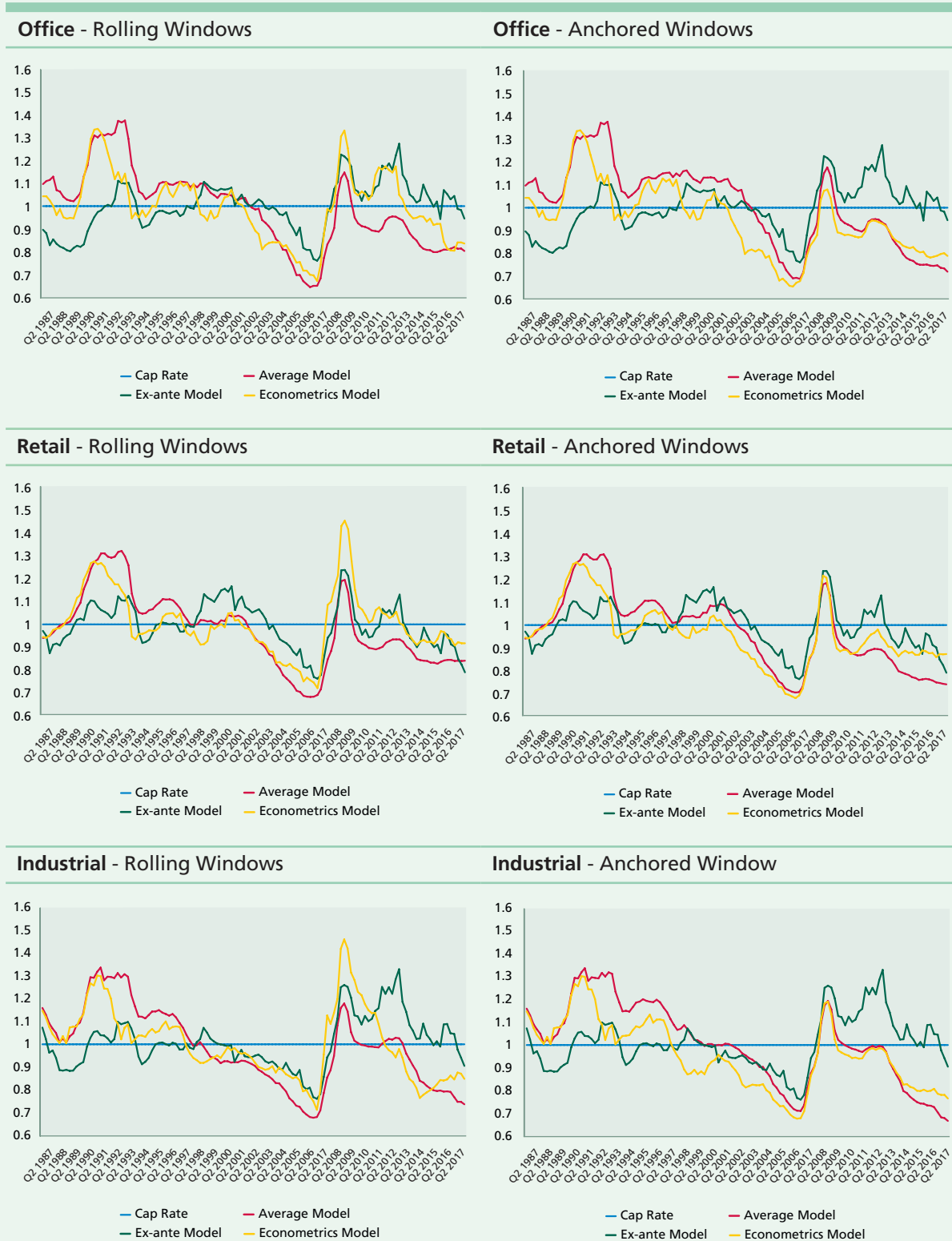## Figure C3: Implied Correction in Cap Rate vs. Subsequent Five Year Outturn in MSCI Series – Sector Level

Office - Rolling Windows

Office - Anchored Windows

Retail - Rolling Windows

Retail - Anchored Windows

Industrial - Rolling Windows

Industrial - Anchored Window

APPENDIX C: SUSTAINABLE CAPITAL VALUE

Figure C4: Sustainable Cap Rates and JLL Cap Rate through Time – Sector Level

Office - Rolling Windows
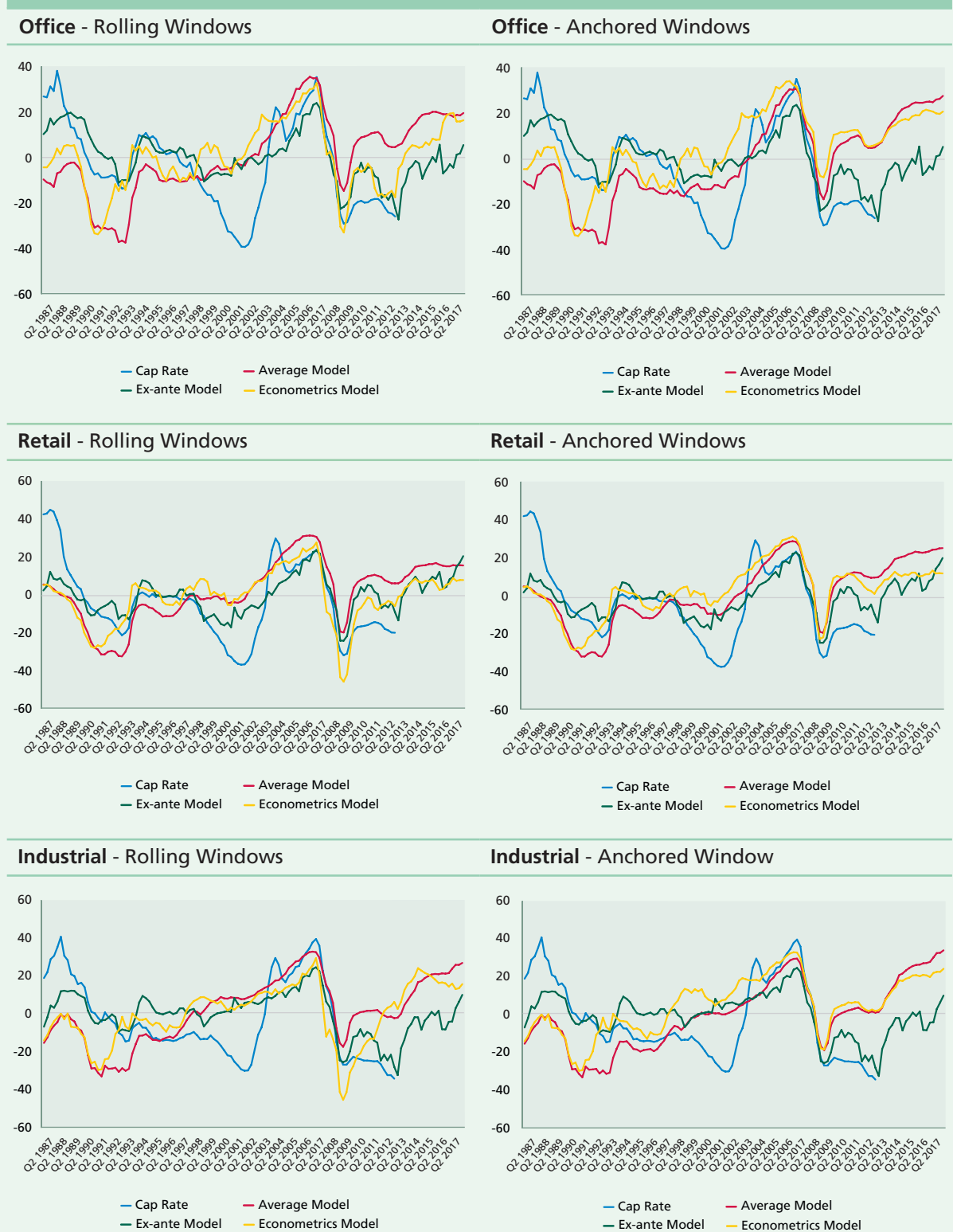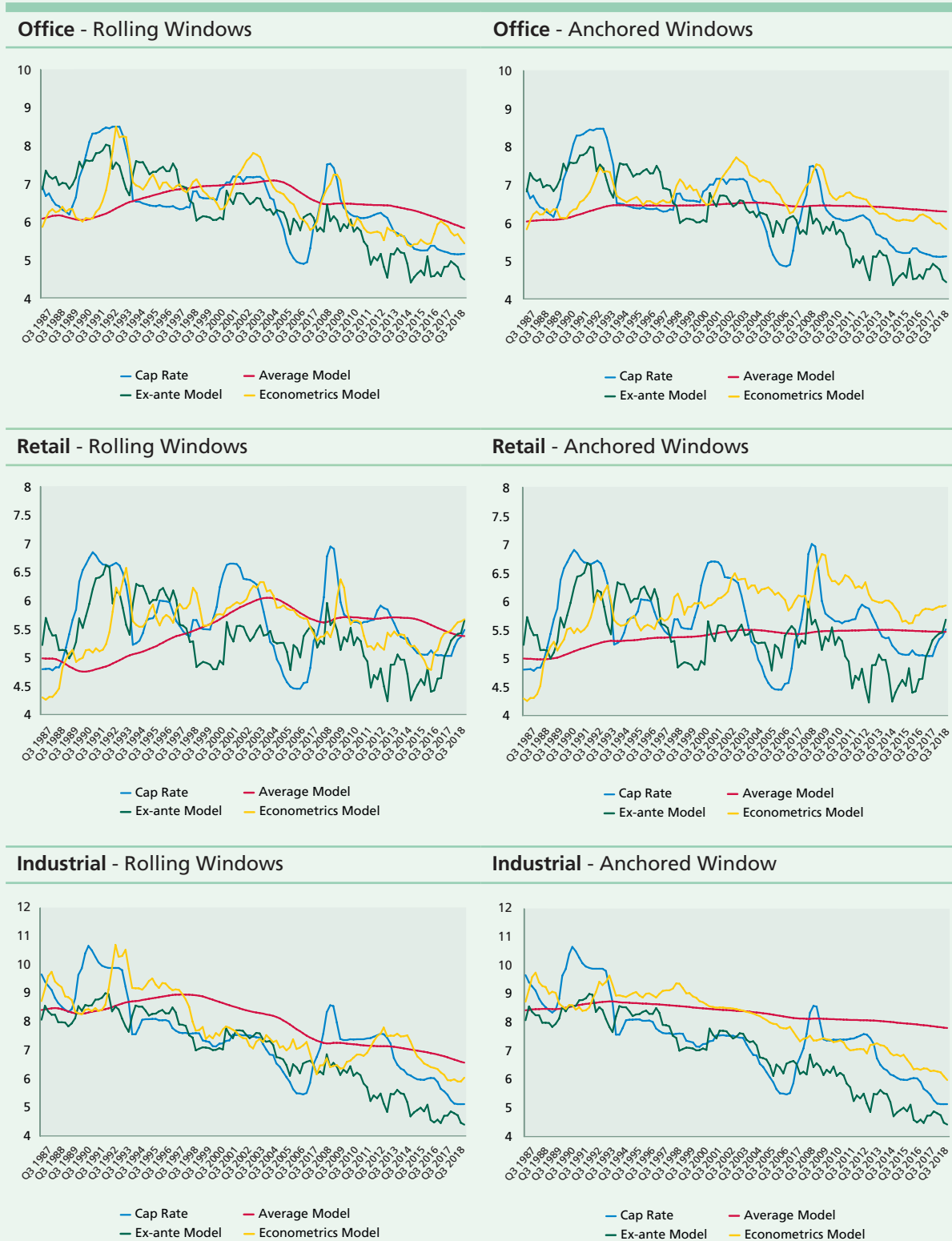

Office - Anchored Windows

Retail - Rolling Windows

Retail - Anchored Windows

Industrial - Rolling Windows

Industrial - Anchored Window

APPENDIX C: SUSTAINABLE CAPITAL VALUE

Figure C5: Ratio of JLL Cap Rate to Sustainable Cap Rate – Sector Level

Office - Rolling Windows

— Cap Rate — Average Model
— Ex-ante Model — Econometrics Model

Office - Anchored Windows

— Cap Rate — Average Model
— Ex-ante Model — Econometrics Model

Retail - Rolling Windows

— Cap Rate — Average Model
— Ex-ante Model — Econometrics Model

Retail - Anchored Windows

— Cap Rate — Average Model
— Ex-ante Model — Econometrics Model

Industrial - Rolling Windows

— Cap Rate — Average Model
— Ex-ante Model — Econometrics Model

Industrial - Anchored Window

— Cap Rate — Average Model
— Ex-ante Model — Econometrics Model

APPENDIX C: SUSTAINABLE CAPITAL VALUE

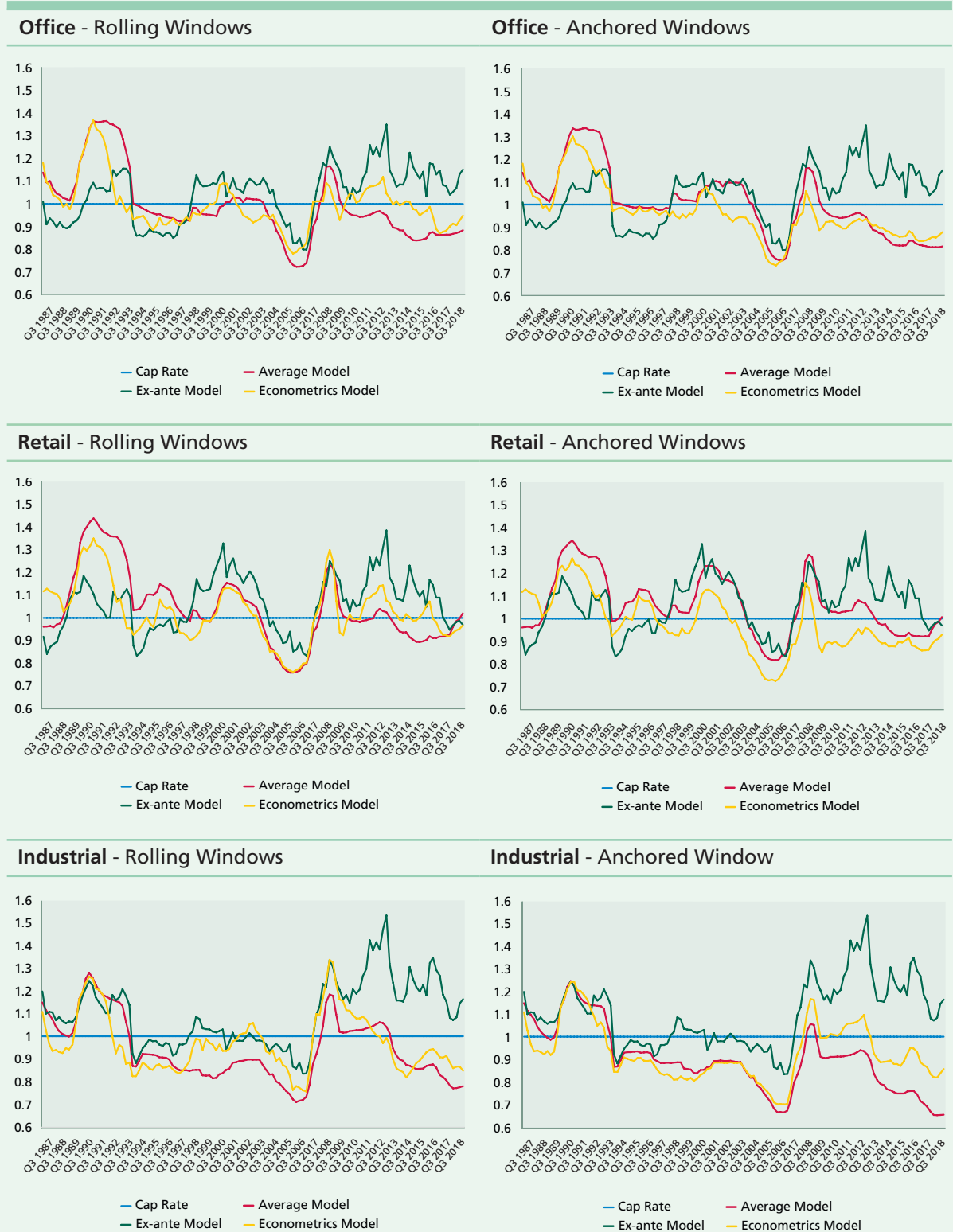**Figure C6: Implied Correction in Cap Rate vs. Subsequent Five Year Outturn in JLL Series – Sector Level**

Office - Rolling Windows

Office - Anchored Windows

- Cap Rate
- Ex-ante Model
- Average Model
- Econometrics Model

Retail - Rolling Windows

Retail - Anchored Windows

- Cap Rate
- Ex-ante Model
- Average Model
- Econometrics Model

Industrial - Rolling Windows

Industrial - Anchored Window

- Cap Rate
- Ex-ante Model
- Average Model
- Econometrics Model

APPENDIX C: SUSTAINABLE CAPITAL VALUE

Figure C7: Sustainable Cap Rates and CBRE Cap Rate through Time – Sector Level

Office - Rolling Windows

Legend: Cap Rate, Average Model, Ex-ante Model, Econometrics Model

Office - Anchored Windows

Legend: Cap Rate, Average Model, Ex-ante Model, Econometrics Model

Retail - Rolling Windows

Legend: Cap Rate, Average Model, Ex-ante Model, Econometrics Model

Retail - Anchored Windows

Legend: Cap Rate, Average Model, Ex-ante Model, Econometrics Model

Industrial - Rolling Windows

Legend: Cap Rate, Average Model, Ex-ante Model, Econometrics Model

Industrial - Anchored Window

Legend: Cap Rate, Average Model, Ex-ante Model, Econometrics Model

APPENDIX C: SUSTAINABLE CAPITAL VALUE

Figure C8: Ratio of CBRE Cap Rate to Sustainable Cap Rate – Sector Level

Office - Rolling Windows

Office - Anchored Windows

Retail - Rolling Windows

Retail - Anchored Windows

Industrial - Rolling Windows

Industrial - Anchored Window

APPENDIX C: SUSTAINABLE CAPITAL VALUE

Figure C9: Implied Correction in Cap Rate vs. Subsequent Five Year Outturn in CBRE Series – Sector Level

Office - Rolling Windows

Office - Anchored Windows

Retail - Rolling Windows

Retail - Anchored Windows

Industrial - Rolling Windows

Industrial - Anchored Window

Cap Rate — Average Model — Ex-ante Model — Econometrics Model
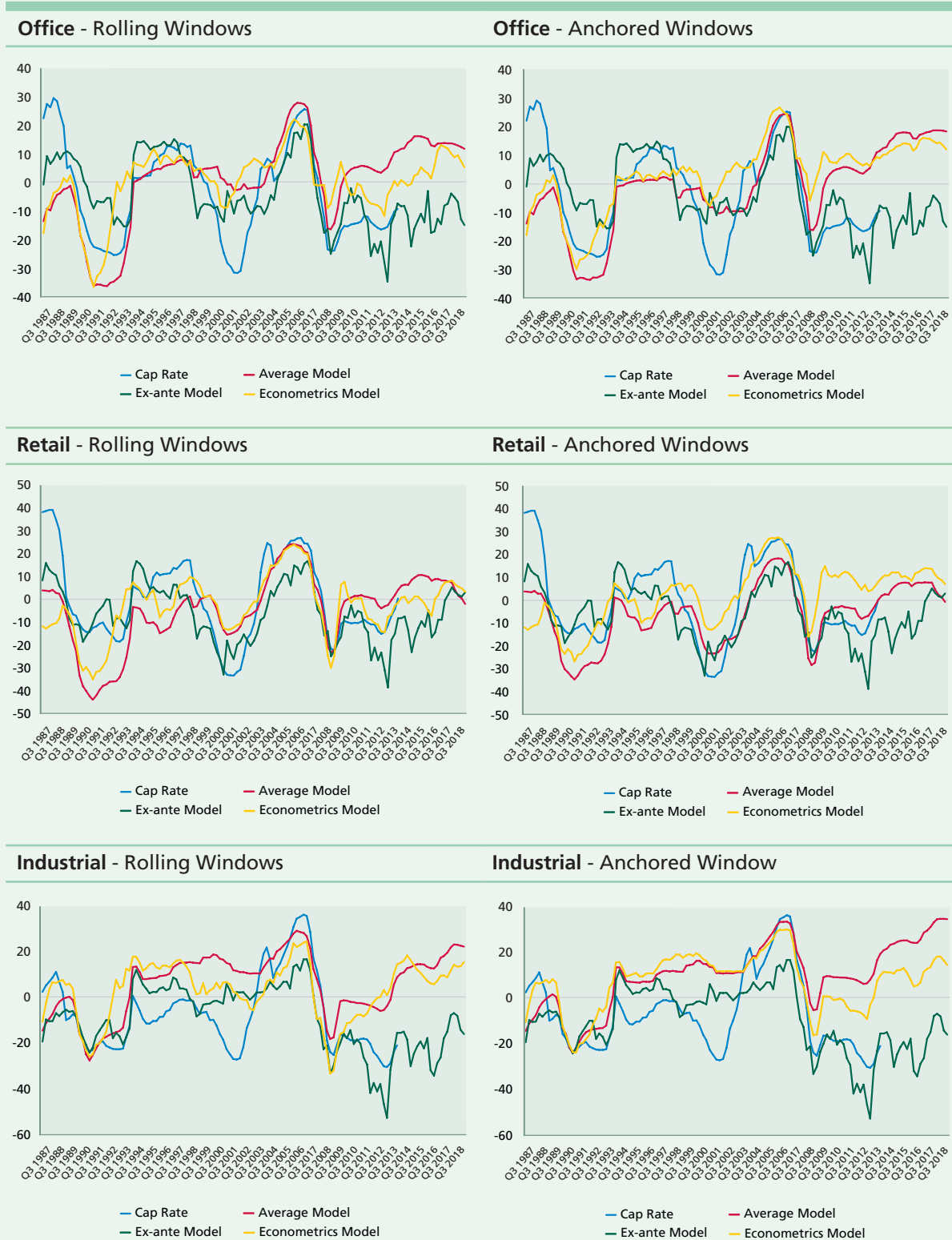
APPENDIX C: SUSTAINABLE CAPITAL VALUE

Table C1: Forecast Accuracy for Models, based on MSCI Sector Level Cap Rate

	Rolling Windows				Anchored Windows			
	ME	MAE	RMSE	U1	ME	MAE	RMSE	U1
A: Office								
Average	-11.1	13	16.2	0.52	-11.1	13	16.2	0.52
Ex-ante	-4.3	8.7	11.5	0.40	-4.3	8.7	11.5	0.40
Econometric	-7.4	10.9	14.6	0.49	-9.1	12.3	15.6	0.56
B: Retail								
Average	-9.4	11.9	15.2	0.48	-9.5	12.5	15.8	0.48
Ex-ante	-3.1	9.3	12.3	0.39	-3.1	9.3	12.3	0.39
Econometric	-4.2	12.1	14.6	0.45	-6	10.7	13.8	0.46
C: Industrial								
Average	-14.4	16.6	20.2	0.53	-15.7	17.8	21.9	0.54
Ex-ante	-6.6	13	15.1	0.43	-6.6	13	15.1	0.43
Econometric	-8.2	16.8	19.5	0.52	-7.8	14.8	16.6	0.47

Table C2: Forecast Accuracy for Models, based on JLL Sector Level Cap Rate

	Rolling Windows				Anchored Windows			
	ME	MAE	RMSE	U1	ME	MAE	RMSE	U1
A: Office								
Average	-1.4	18.7	21.5	0.58	2.1	17.2	20.0	0.53
Ex-ante	-4.5	10.2	13.3	0.44	-4.5	10.2	13.3	0.44
Econometric	-2.1	13.8	17.9	0.52	-6.4	18.1	21.5	0.6
B: Retail								
Average	-3.6	16.7	19.3	0.54	-2.5	15.9	18.6	0.51
Ex-ante	-2.6	10.2	13.9	0.47	-2.6	10.2	13.9	0.47
Econometric	-1.9	13.6	17.4	0.52	-6.2	16.3	19.8	0.58
C: Industrial								
Average	-1.9	17.6	21.5	0.57	1.5	16.9	20.4	0.53
Ex-ante	-3.6	12.6	15.1	0.47	-3.6	12.6	15.1	0.47
Econometric	0.0	17.5	20.5	0.57	-5.5	18.1	22.3	0.61

APPENDIX C: SUSTAINABLE CAPITAL VALUE
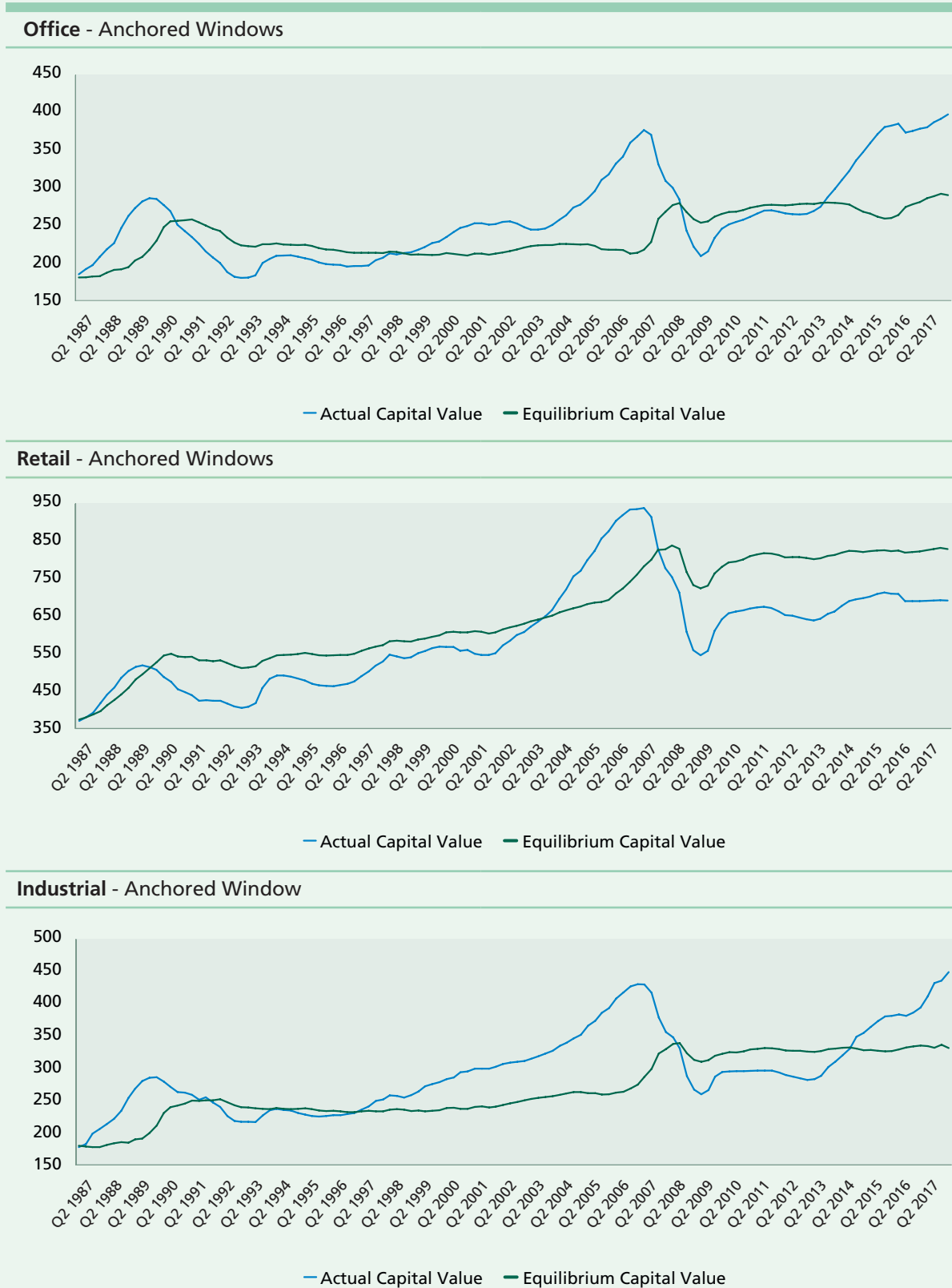
Table C3: Forecast Accuracy for Models, based on CBRE Sector Level Cap Rate

	Rolling Windows				Anchored Windows			
	ME	MAE	RMSE	U1	ME	MAE	RMSE	U1
A: Office								
Average	-2.6	12	15.1	0.48	-0.2	11.4	14.3	0.46
Ex-ante	-1.4	9.2	11.3	0.38	-1.4	9.2	11.3	0.38
Econometric	-3.5	11	14.4	0.52	-5.8	12.9	16.4	0.56
B: Retail								
Average	6.1	13.5	16.3	0.48	7.8	11.7	14.3	0.44
Ex-ante	5.8	10	12.2	0.38	5.8	10	12.2	0.38
Econometric	3.2	11.5	15.9	0.51	-1.1	13.3	17.4	0.57
C: Industrial								
Average	-11.3	14.4	17.6	0.53	-14.2	16.4	19.9	0.56
Ex-ante	0.5	10.4	13	0.37	0.5	10.4	13	0.37
Econometric	-8.9	14.2	17.1	0.55	-13.6	15.1	18.3	0.57

APPENDIX C: SUSTAINABLE CAPITAL VALUE

Appendices for Section 3.4.1

Figure C10: AMV – Actual Capital Value vs. Equilibrium Capital Value for MSCI Series – Sector Level

Office - Anchored Windows

— Actual Capital Value — Equilibrium Capital Value

Retail - Anchored Windows

— Actual Capital Value — Equilibrium Capital Value

Industrial - Anchored window

— Actual Capital Value — Equilibrium Capital Value
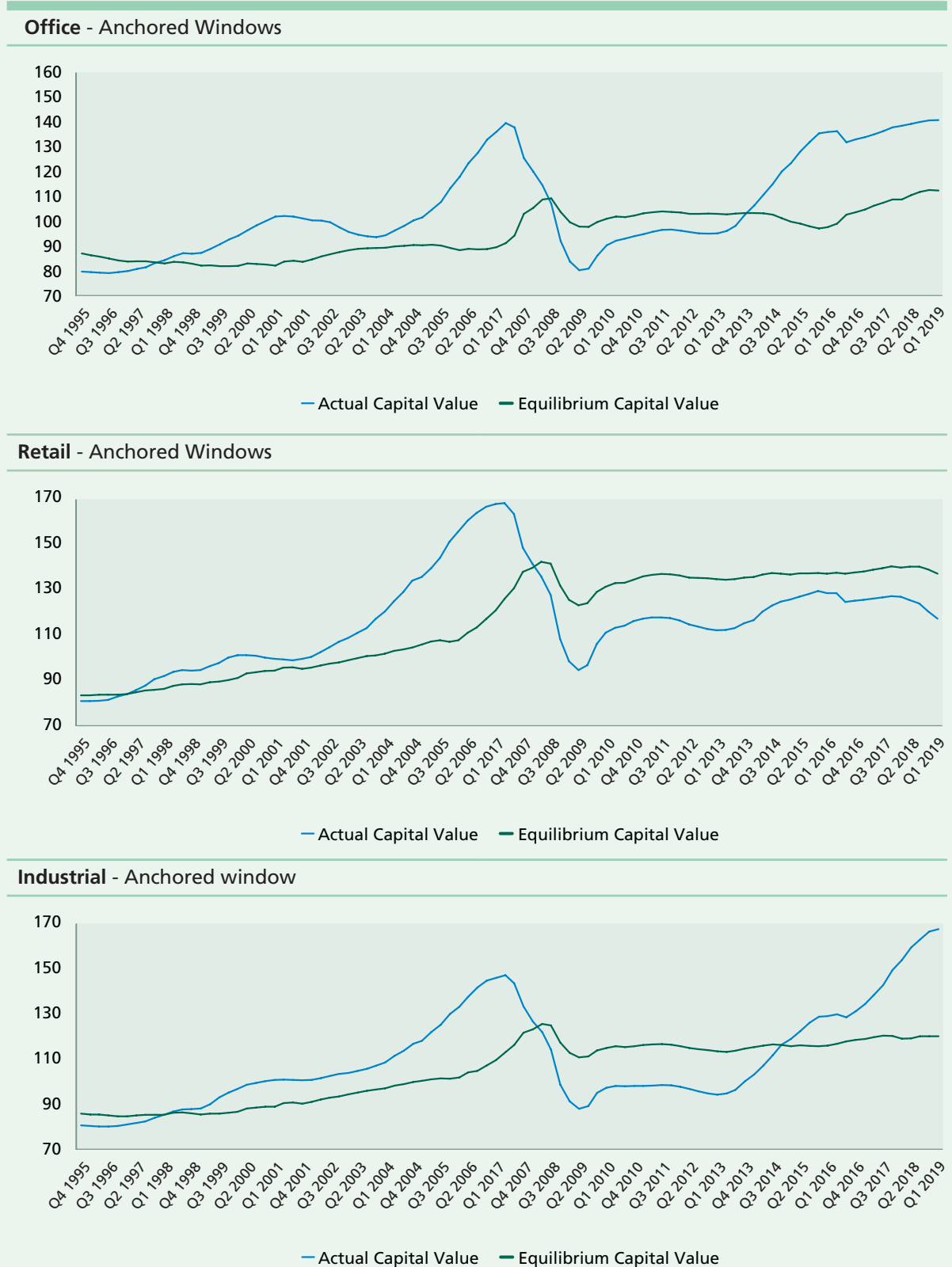
APPENDIX C: SUSTAINABLE CAPITAL VALUE

Figure C11: AMV – Deviation of Actual Capital Value from Equilibrium Capital Value for MSCI Series – Sector Level

Office - Anchored Windows

Retail - Anchored Windows
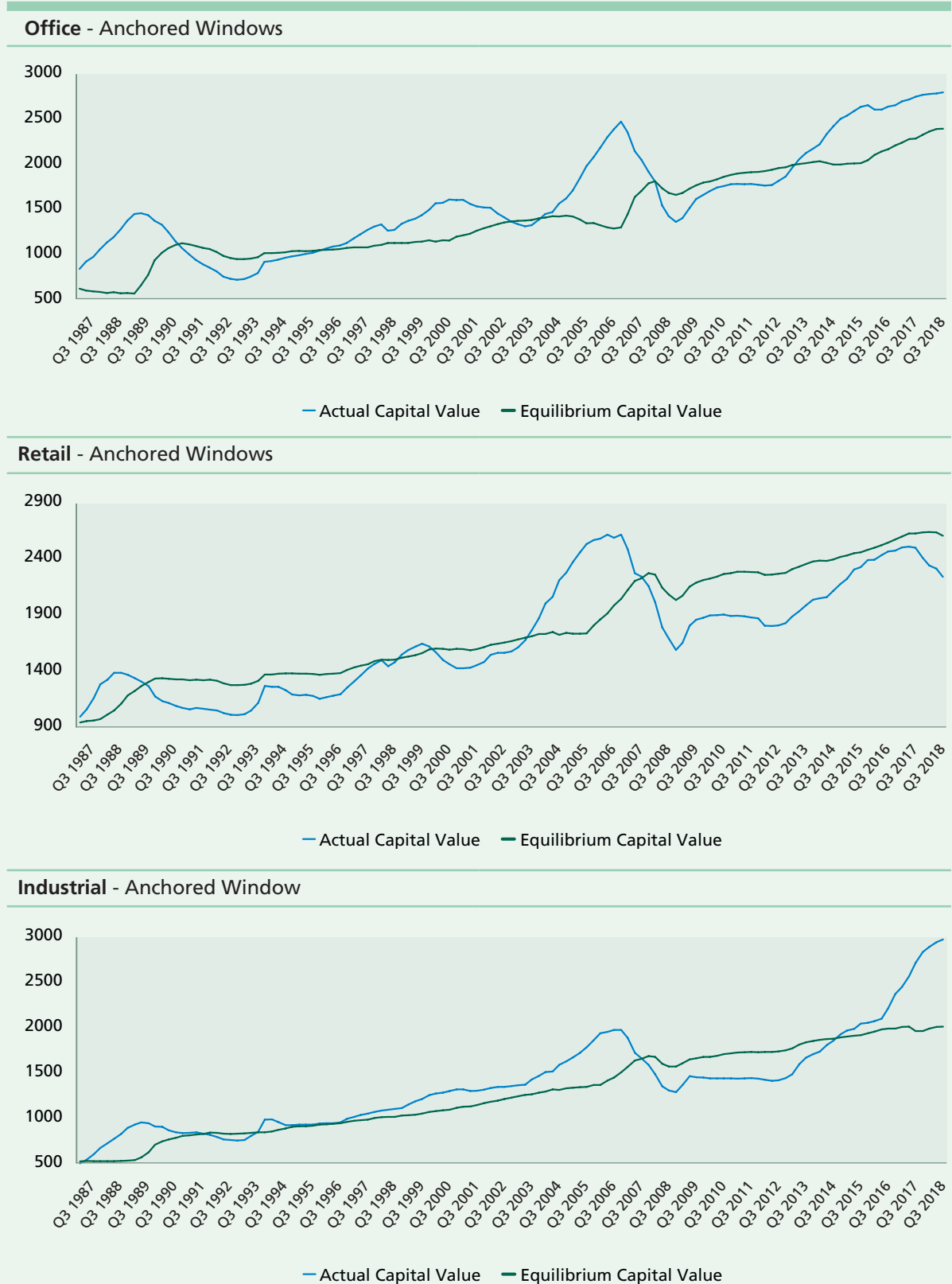

Industrial - Anchored Window
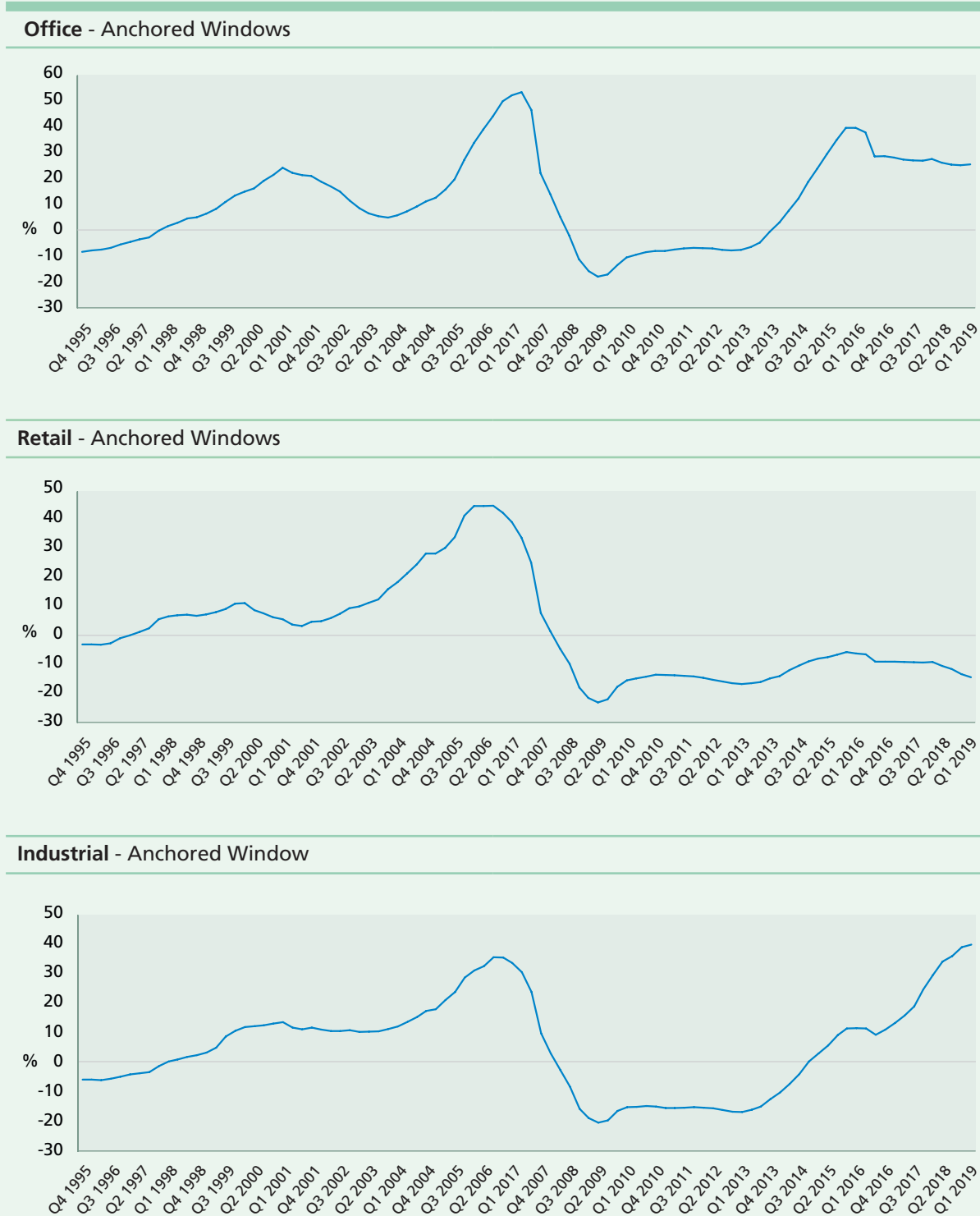
APPENDIX C: SUSTAINABLE CAPITAL VALUE

Figure C12: AMV – Implied Correction in Capital Value vs. Subsequent Five Year Outturn in MSCI Series – Sector Level
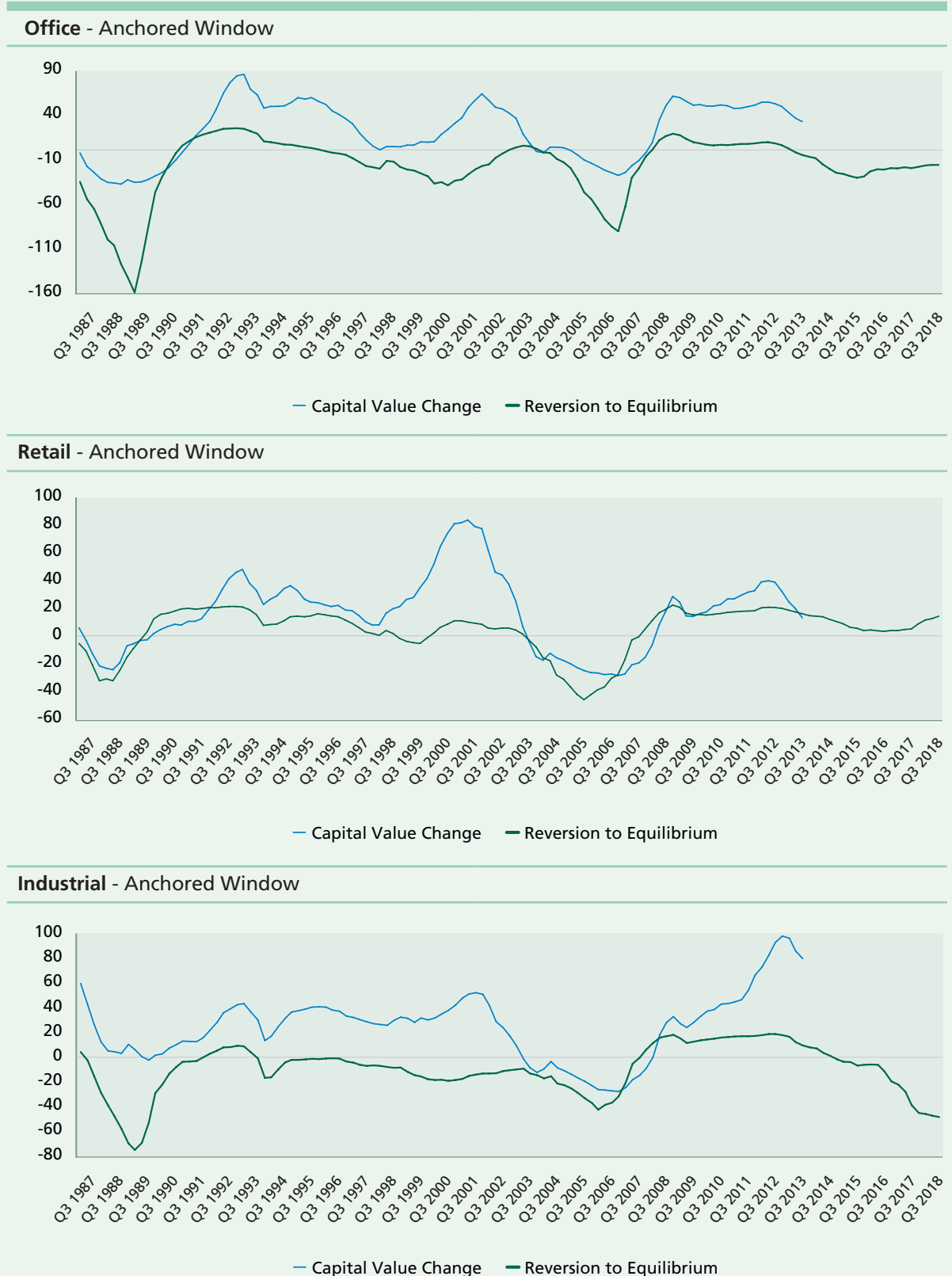
Office - Anchored Windows

— Capital Value Change   — Reversion to Equilibrium

Retail - Anchored Windows

— Capital Value Change   — Reversion to Equilibrium

Industrial - Anchored Window

— Capital Value Change   — Reversion to Equilibrium
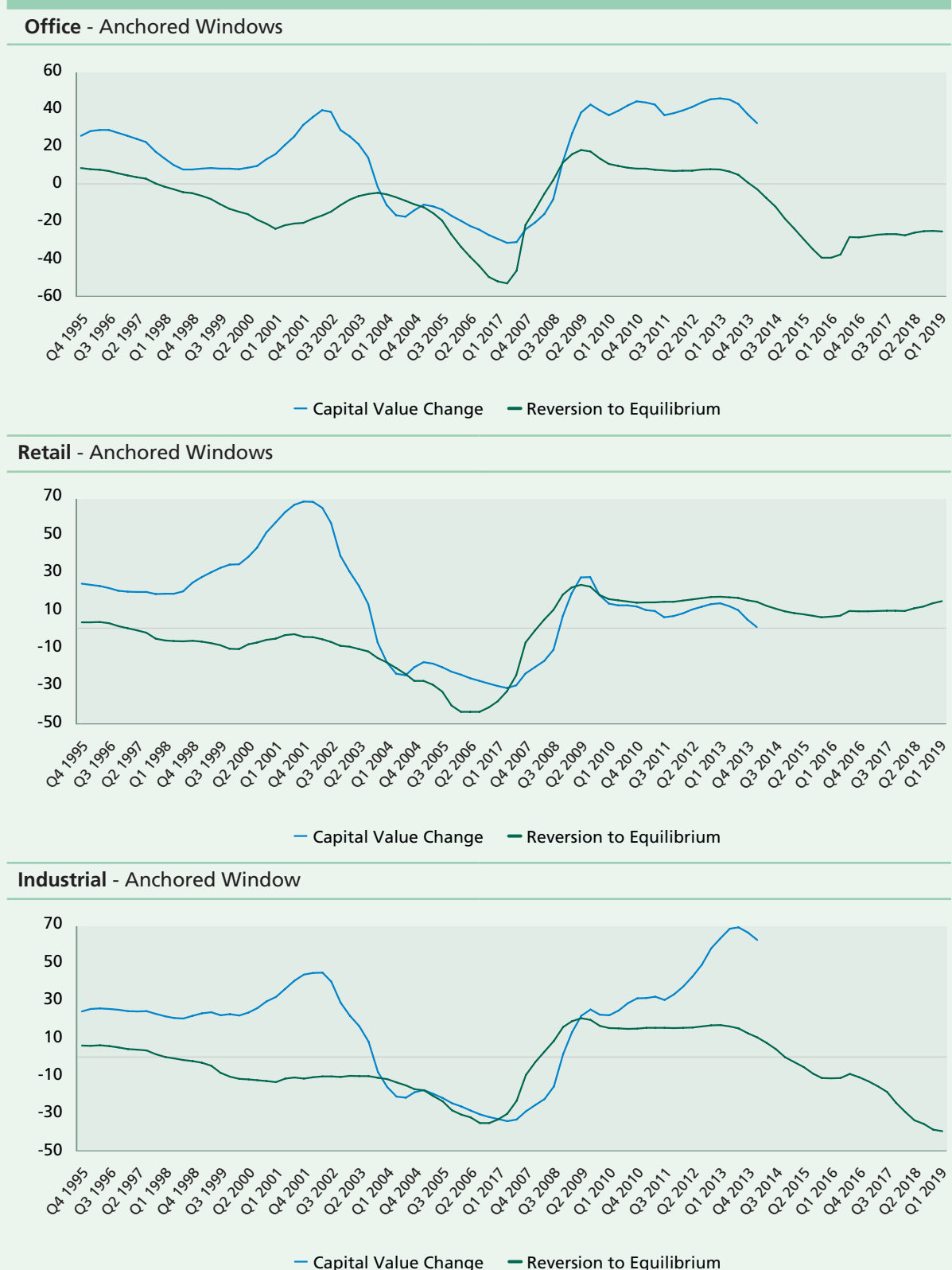
APPENDIX C: SUSTAINABLE CAPITAL VALUE

Figure C13: AMV – Actual Capital Value vs. Equilibrium Capital Value for JLL Series – Sector Level

Office - Anchored Windows

— Actual Capital Value — Equilibrium Capital Value

Retail - Anchored Windows

— Actual Capital Value — Equilibrium Capital Value

Industrial - Anchored Window

— Actual Capital Value — Equilibrium Capital Value

APPENDIX C: SUSTAINABLE CAPITAL VALUE

Figure C14: AMV – Deviation of Actual Capital Value from Equilibrium Capital Value for JLL Series – Sector Level

Office - Anchored Windows

Retail - Anchored Windows
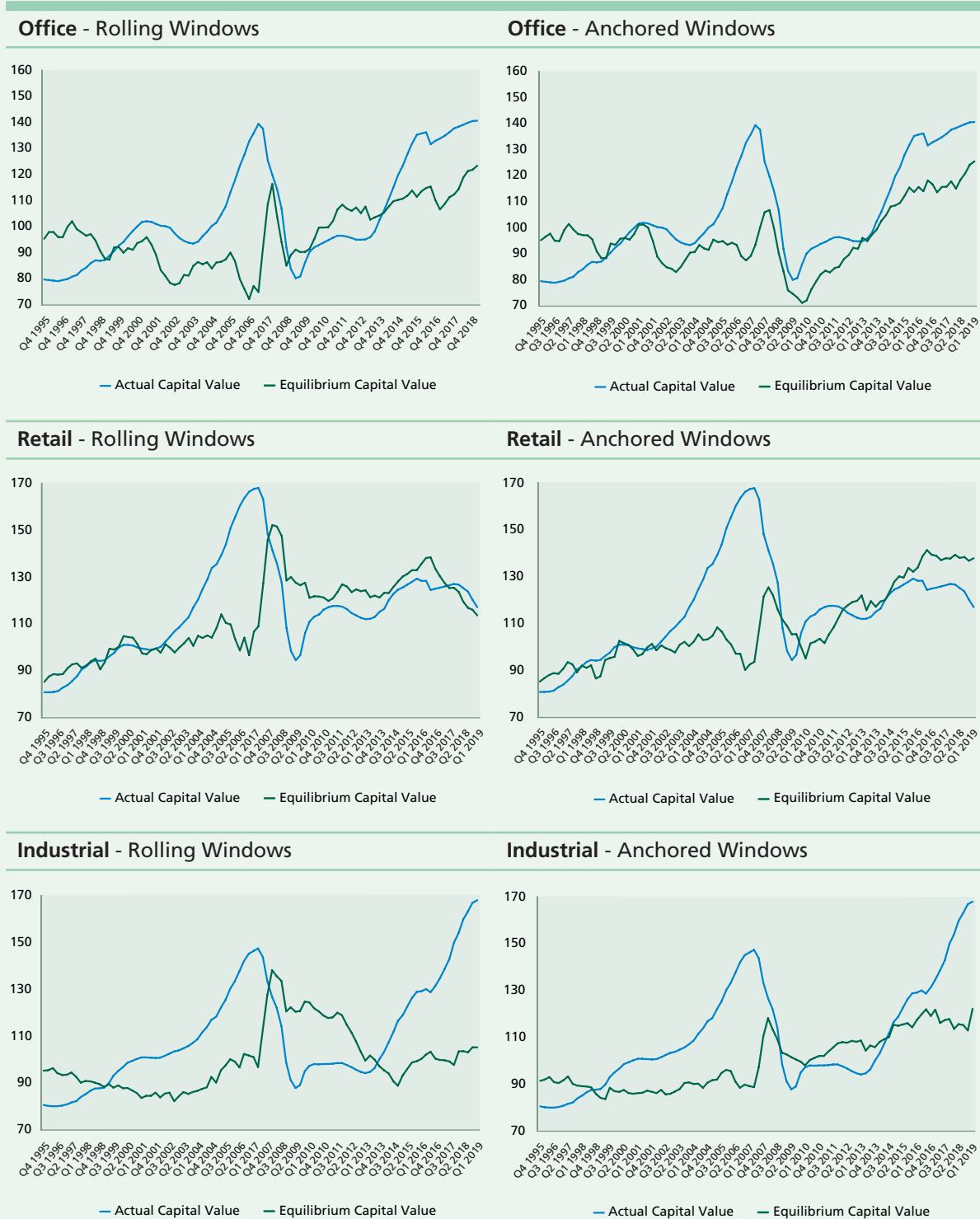

Industrial - Anchored Window
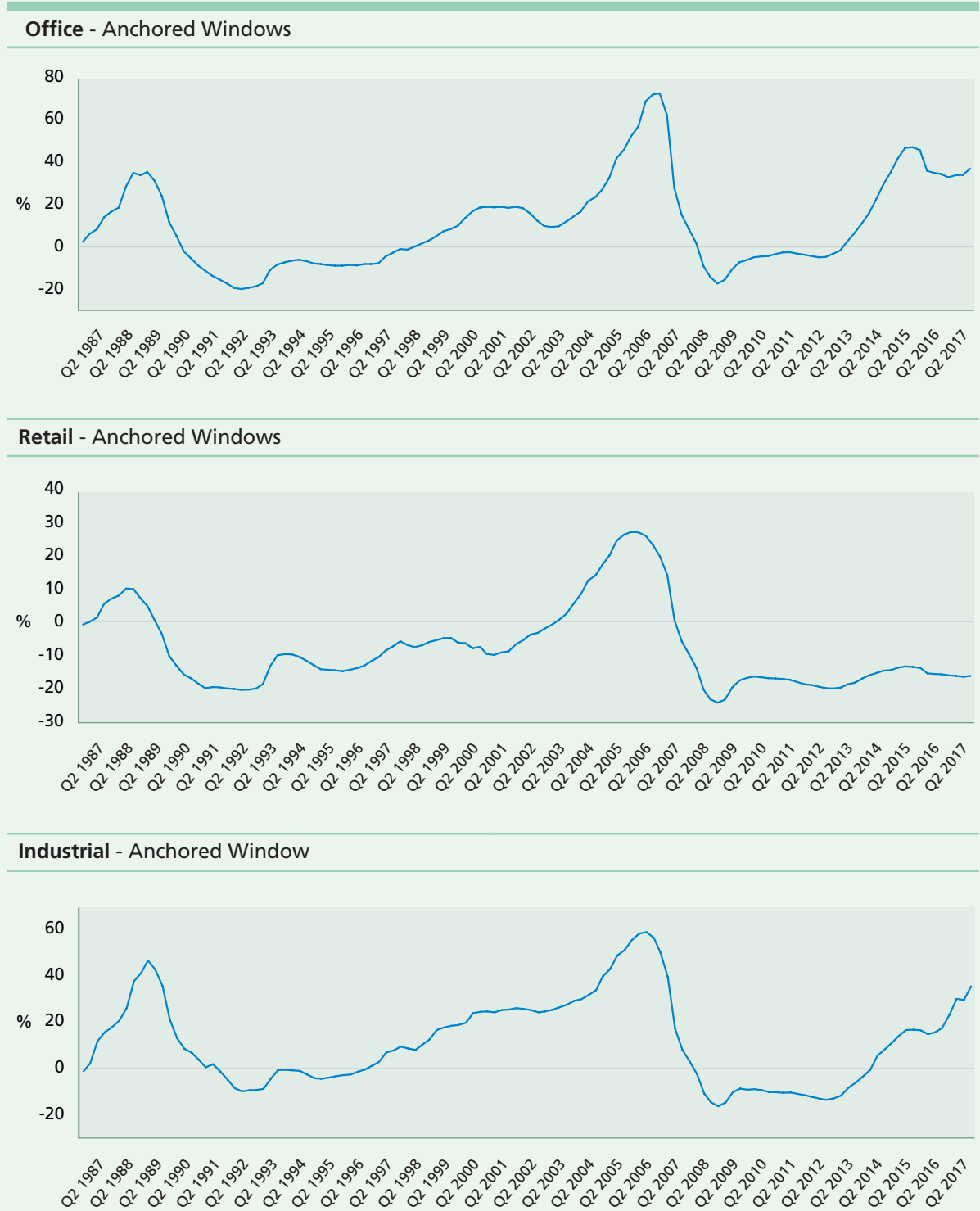
APPENDIX C: SUSTAINABLE CAPITAL VALUE

Figure C15: AMV – Implied Correction in Capital Value vs. Subsequent Five Year Outturn in JLL Series – Sector Level
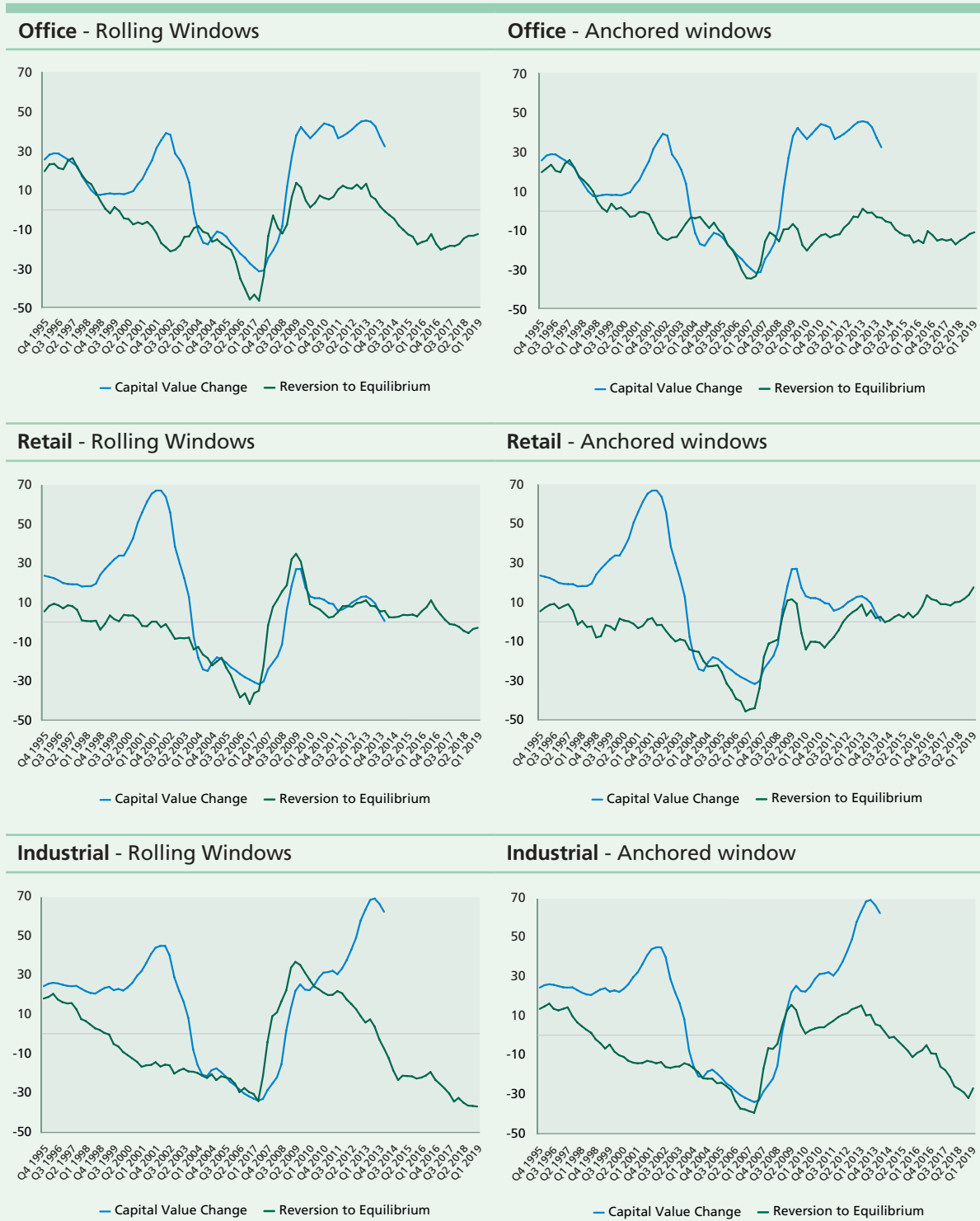
Office - Anchored Windows

— Capital Value Change   — Reversion to Equilibrium

Retail - Anchored Windows

— Capital Value Change   — Reversion to Equilibrium

Industrial - Anchored Window

— Capital Value Change   — Reversion to Equilibrium
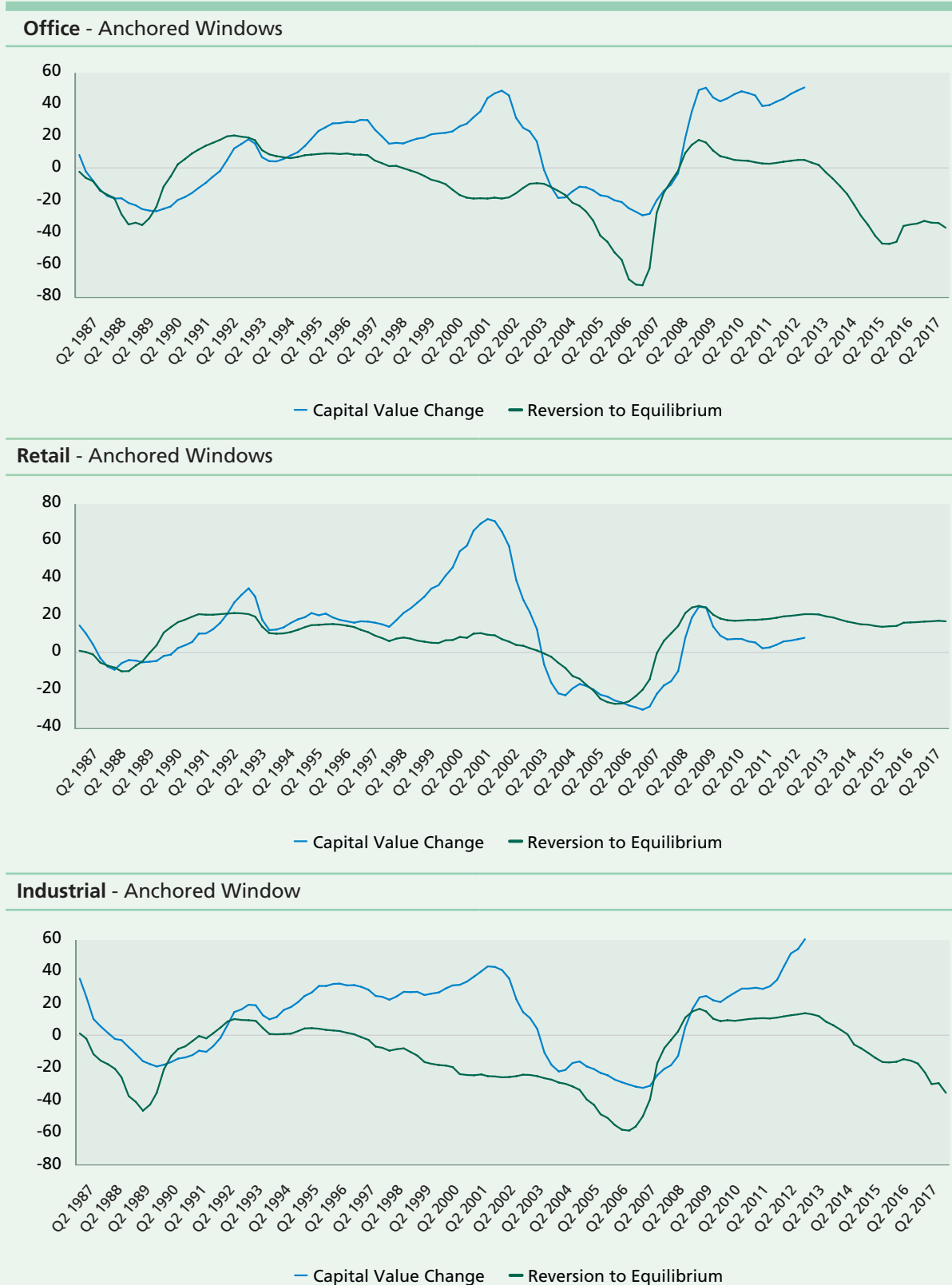
APPENDIX C: SUSTAINABLE CAPITAL VALUE

Figure C16: AMV – Actual Capital Value vs. Equilibrium Capital Value for CBRE Series – Sector Level

Office - Anchored Windows

— Actual Capital Value — Equilibrium Capital Value

Retail - Anchored Windows

— Actual Capital Value — Equilibrium Capital Value

Industrial - Anchored Window

— Actual Capital Value — Equilibrium Capital Value

APPENDIX C: SUSTAINABLE CAPITAL VALUE

Figure C17: AMV – Deviation of Actual Capital Value from Equilibrium Capital Value for CBRE Series – Sector Level

Office - Anchored Windows

Retail - Anchored Windows
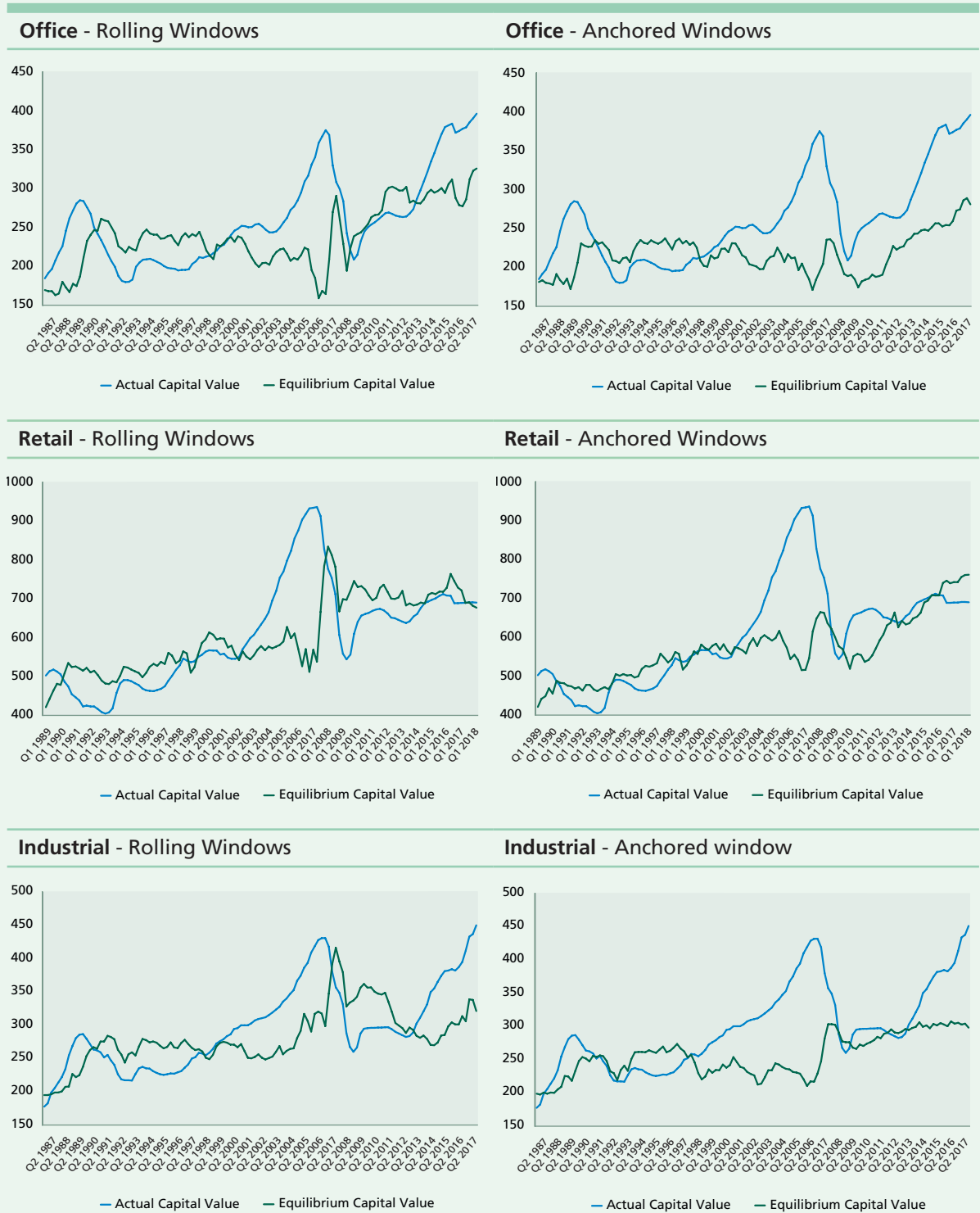

Industrial - Anchored Window
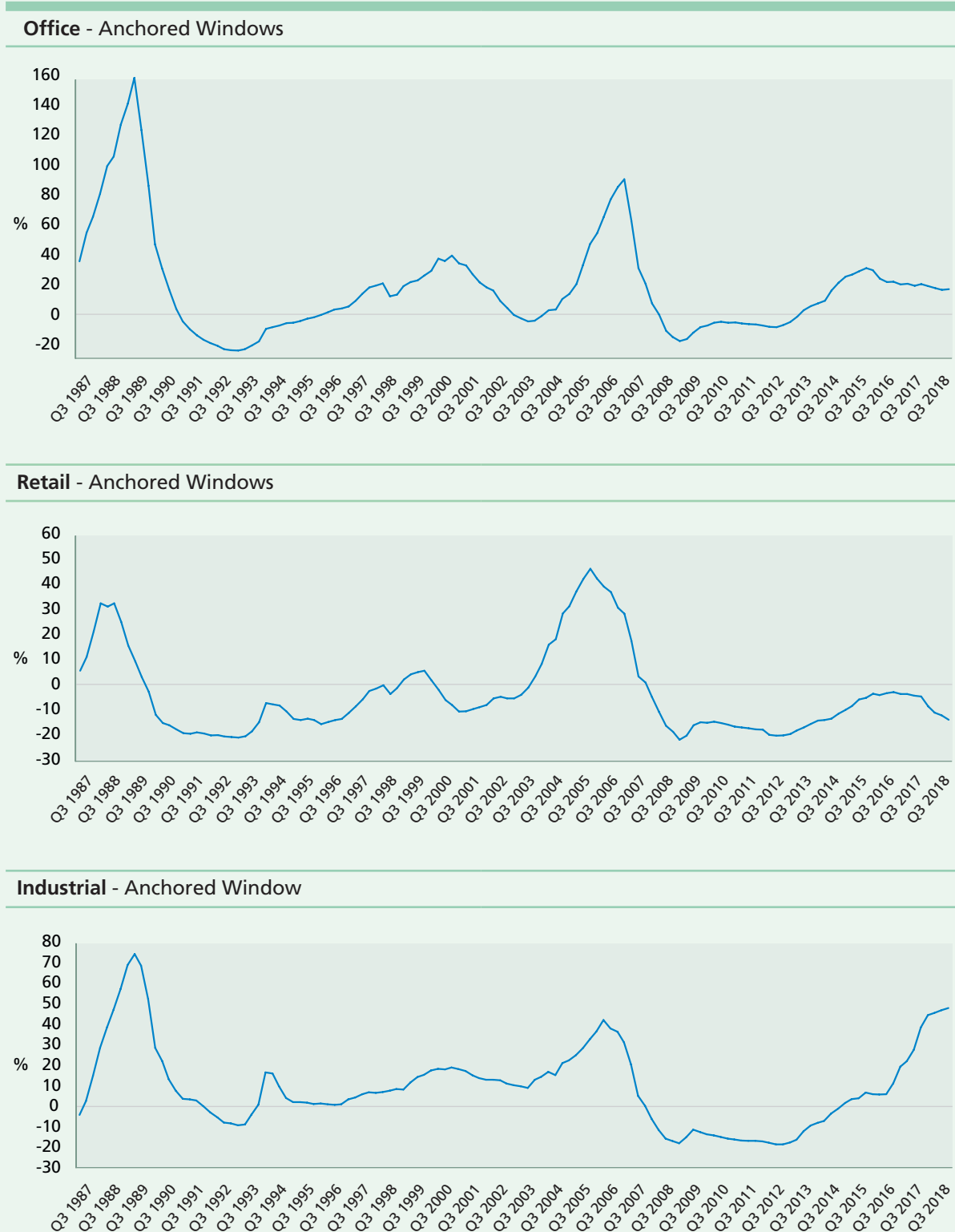
APPENDIX C: SUSTAINABLE CAPITAL VALUE

Figure C18: AMV – Implied Correction in Capital Value vs. Subsequent Five Year Outturn in CBRE Series – Sector Level

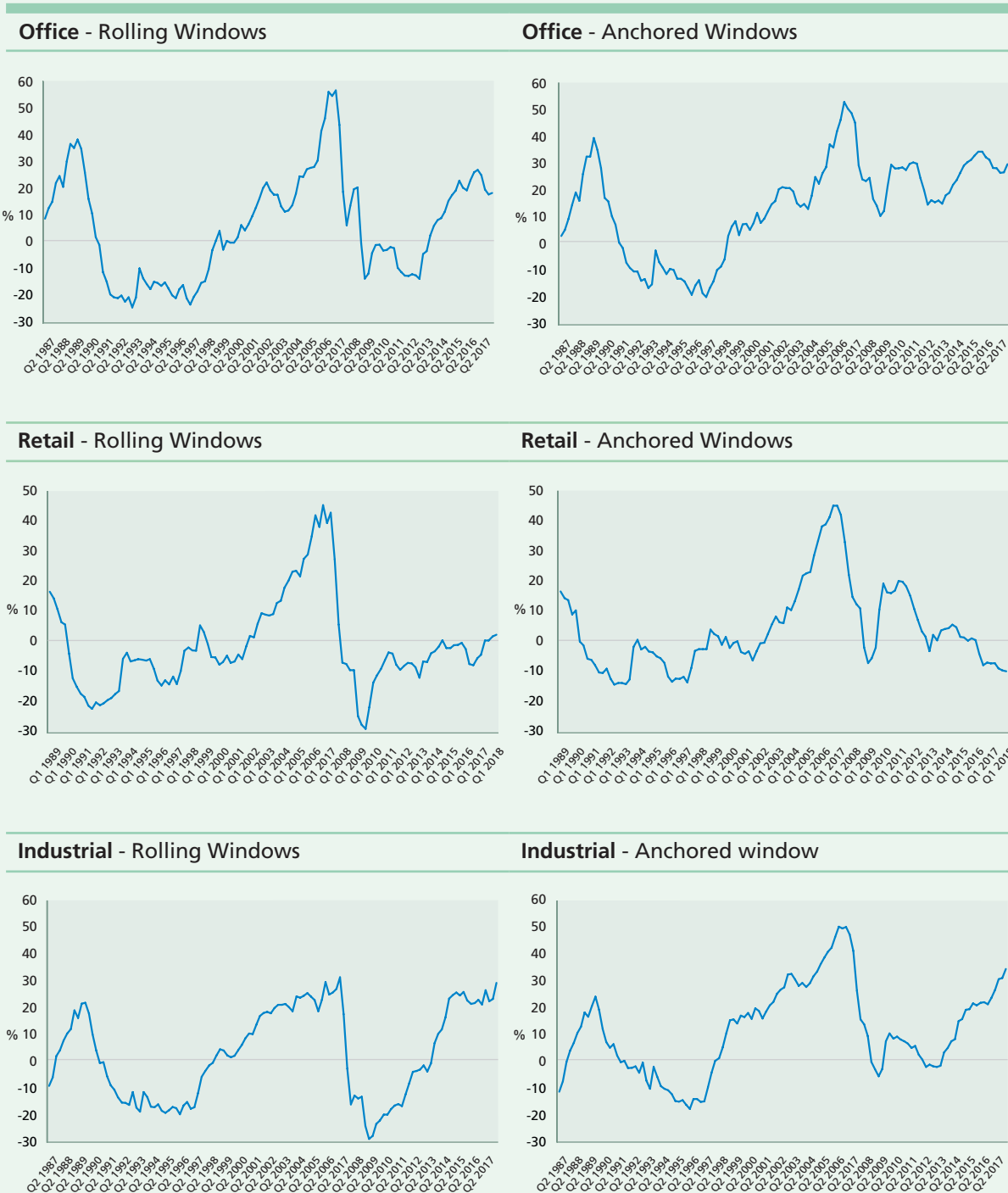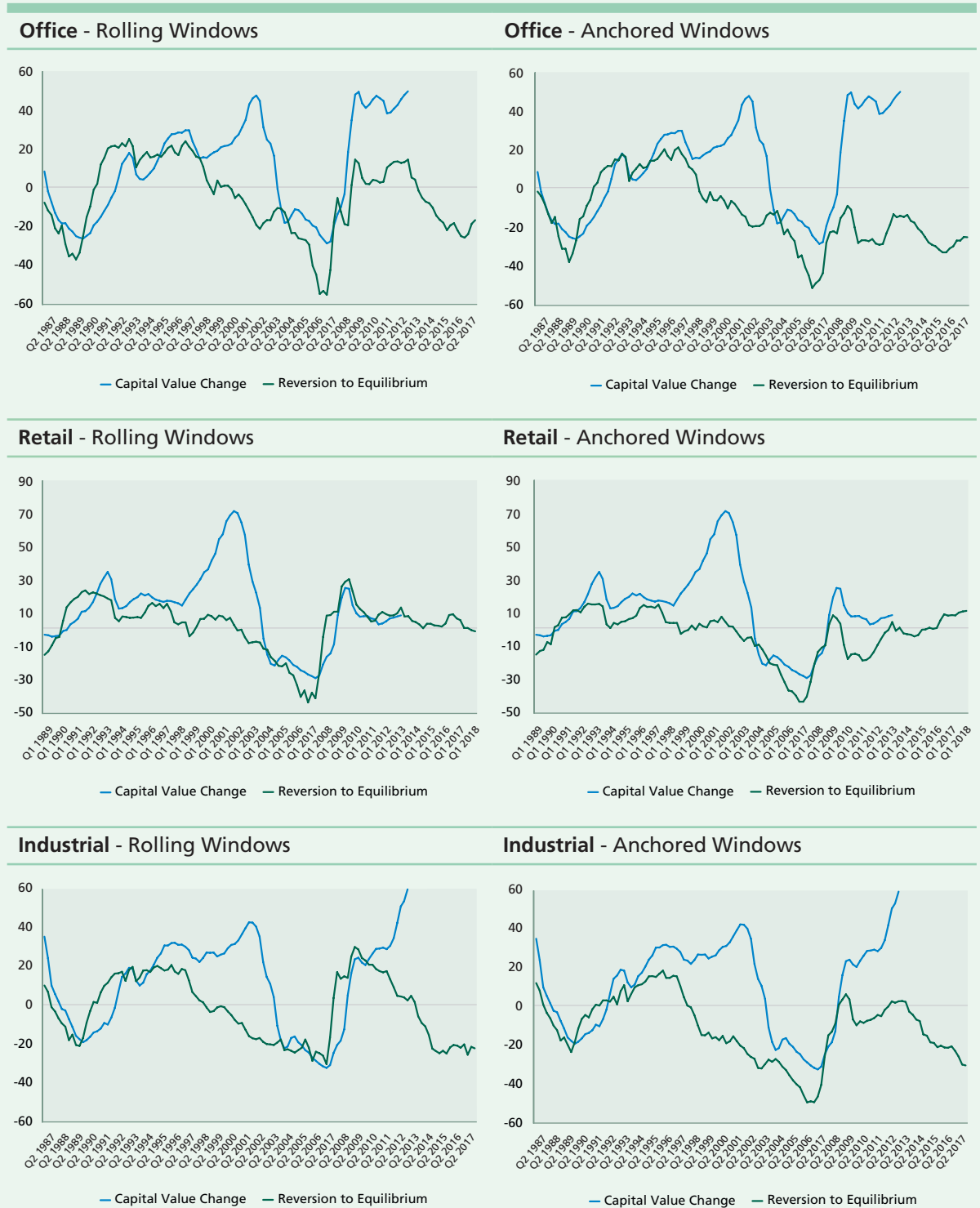**Office** - Anchored Window

— Capital Value Change   — Reversion to Equilibrium

Retail - Anchored Window

— Capital Value Change   — Reversion to Equilibrium

Industrial - Anchored Window

— Capital Value Change   — Reversion to Equilibrium

APPENDIX C: SUSTAINABLE CAPITAL VALUE

Appendices for section 3.4.2

Figure C19: Econometric Model – Actual Capital Value vs. Equilibrium Capital Value for MSCI Series – Sector Level

Office - Rolling Windows

Office - Anchored Windows

Retail - Rolling Windows

Retail - Anchored Windows

Industrial - Rolling Windows

Industrial - Anchored Windows

APPENDIX C: SUSTAINABLE CAPITAL VALUE

Figure C20: Econometric Model – Deviation of Actual Capital Value from Equilibrium Capital Value for MSCI Series – Sector Level
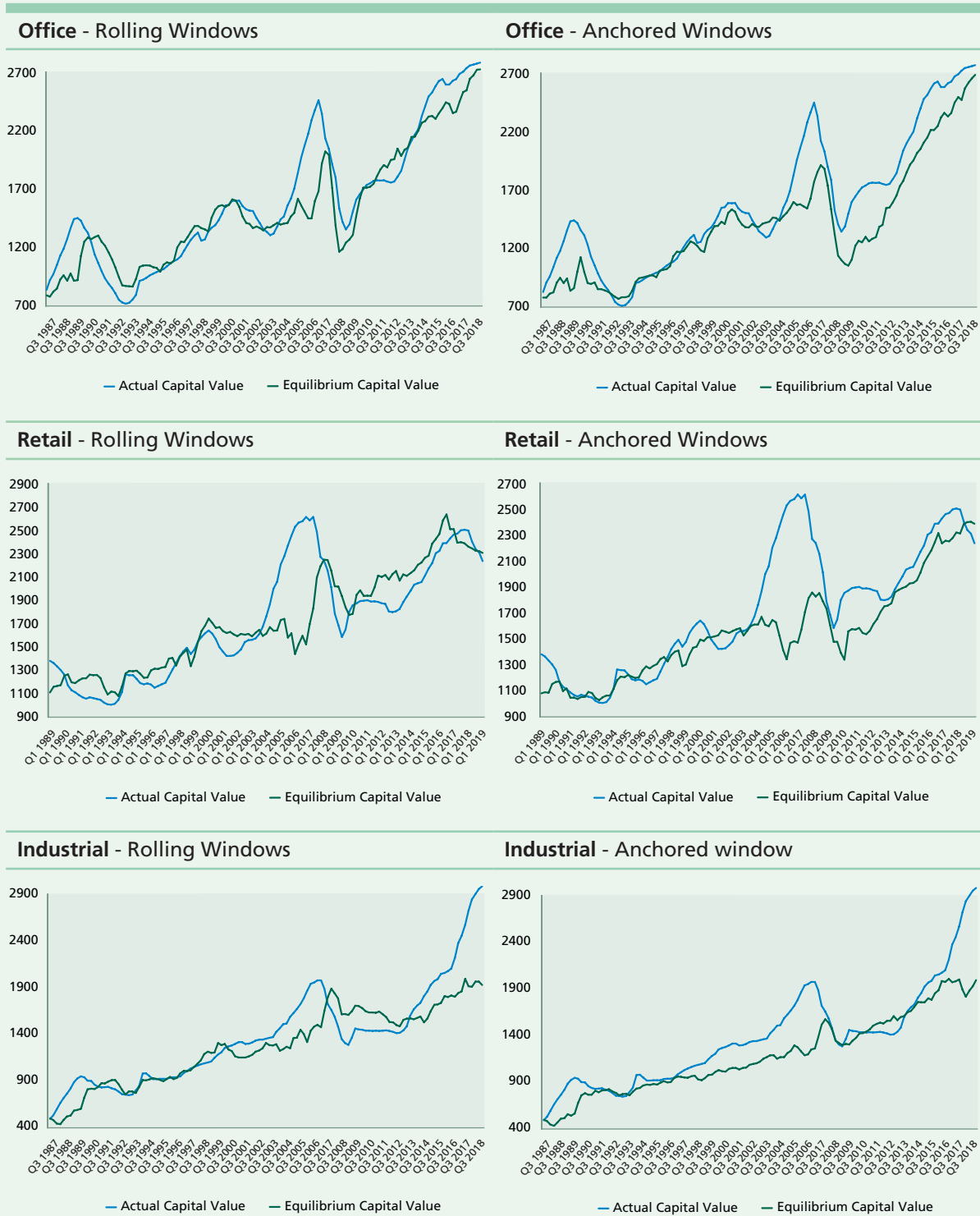
Office - Rolling Windows

Office - Anchored Windows

Retail - Rolling Windows

Retail - Anchored Windows

Industrial - Rolling Windows

Industrial - Anchored window
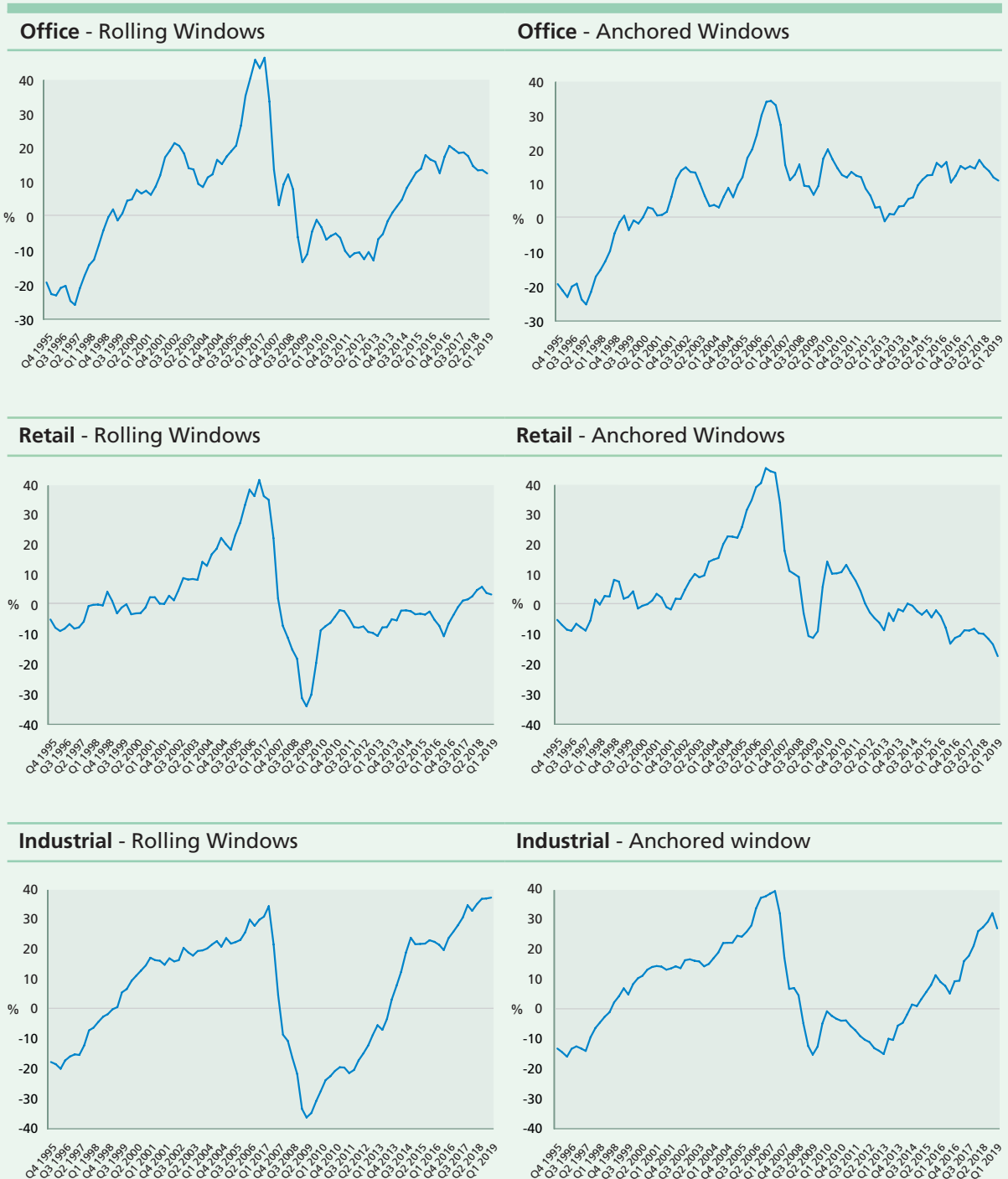
APPENDIX C: SUSTAINABLE CAPITAL VALUE

Figure C21: Econometric Model – Implied Correction in Capital Value vs. Subsequent Five Year Outturn in MSCI Series – Sector Level

Office - Rolling Windows

— Capital Value Change   — Reversion to Equilibrium

Office - Anchored windows

— Capital Value Change   — Reversion to Equilibrium

Retail - Rolling Windows

— Capital Value Change   — Reversion to Equilibrium

Retail - Anchored windows

— Capital Value Change   — Reversion to Equilibrium

Industrial - Rolling Windows

— Capital Value Change   — Reversion to Equilibrium

Industrial - Anchored window

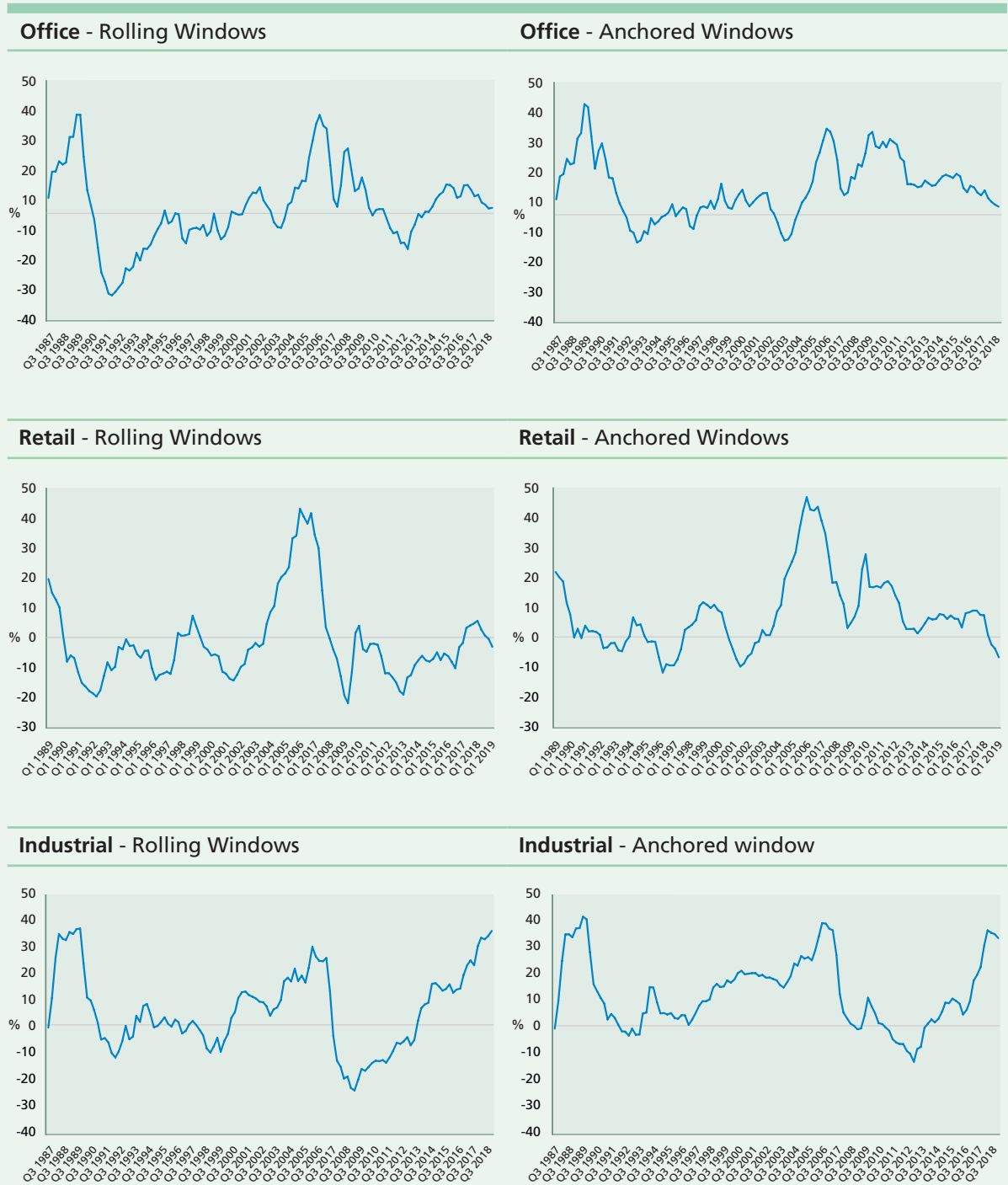— Capital Value Change   — Reversion to Equilibrium

APPENDIX C: SUSTAINABLE CAPITAL VALUE

Figure C22: Econometric Model – Actual Capital Value vs. Equilibrium Capital Value for JLL Series – Sector Level
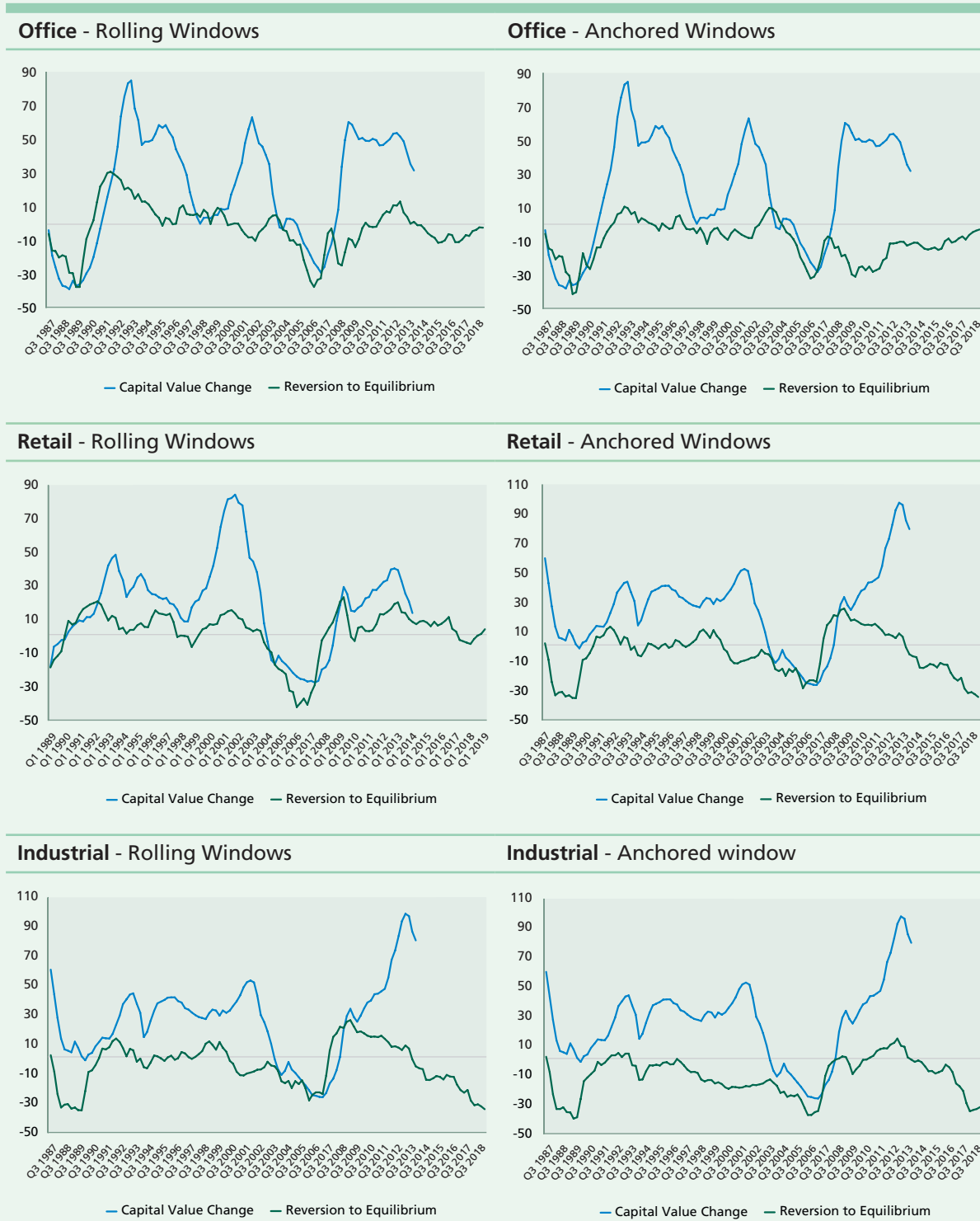
Office - Rolling Windows

— Actual Capital Value — Equilibrium Capital Value

Office - Anchored Windows

— Actual Capital Value — Equilibrium Capital Value

Retail - Rolling Windows

— Actual Capital Value — Equilibrium Capital Value

Retail - Anchored Windows

— Actual Capital Value — Equilibrium Capital Value

Industrial - Rolling Windows

— Actual Capital Value — Equilibrium Capital Value

Industrial - Anchored window

— Actual Capital Value — Equilibrium Capital Value

APPENDIX C: SUSTAINABLE CAPITAL VALUE

Figure C23: Econometric Model – Deviation of Actual Capital Value from Equilibrium Capital Value for JLL Series – Sector Level

Office - Rolling Windows

Office - Anchored Windows

Retail - Rolling Windows

Retail - Anchored Windows

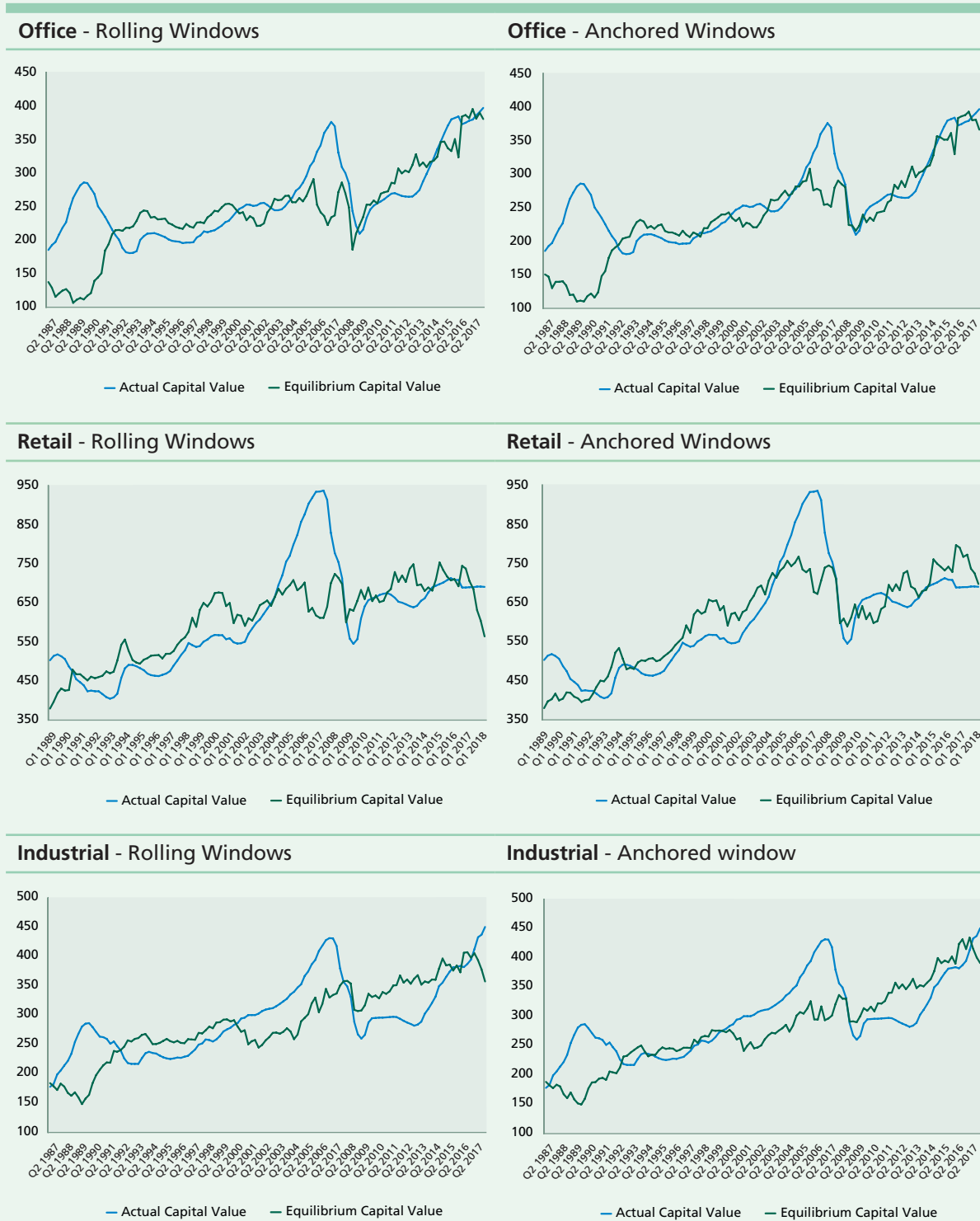**Industrial** - Rolling Windows

Industrial - Anchored window

APPENDIX C: SUSTAINABLE CAPITAL VALUE

Figure C24: Econometric Model – Implied Correction in Capital Value vs. Subsequent Five Year Outturn in JLL Series – Sector Level

Office - Rolling Windows

— Capital Value Change — Reversion to Equilibrium

Office - Anchored Windows

— Capital Value Change — Reversion to Equilibrium

Retail - Rolling Windows

— Capital Value Change — Reversion to Equilibrium

Retail - Anchored Windows

— Capital Value Change — Reversion to Equilibrium

Industrial - Rolling Windows

— Capital Value Change — Reversion to Equilibrium

Industrial - Anchored Windows
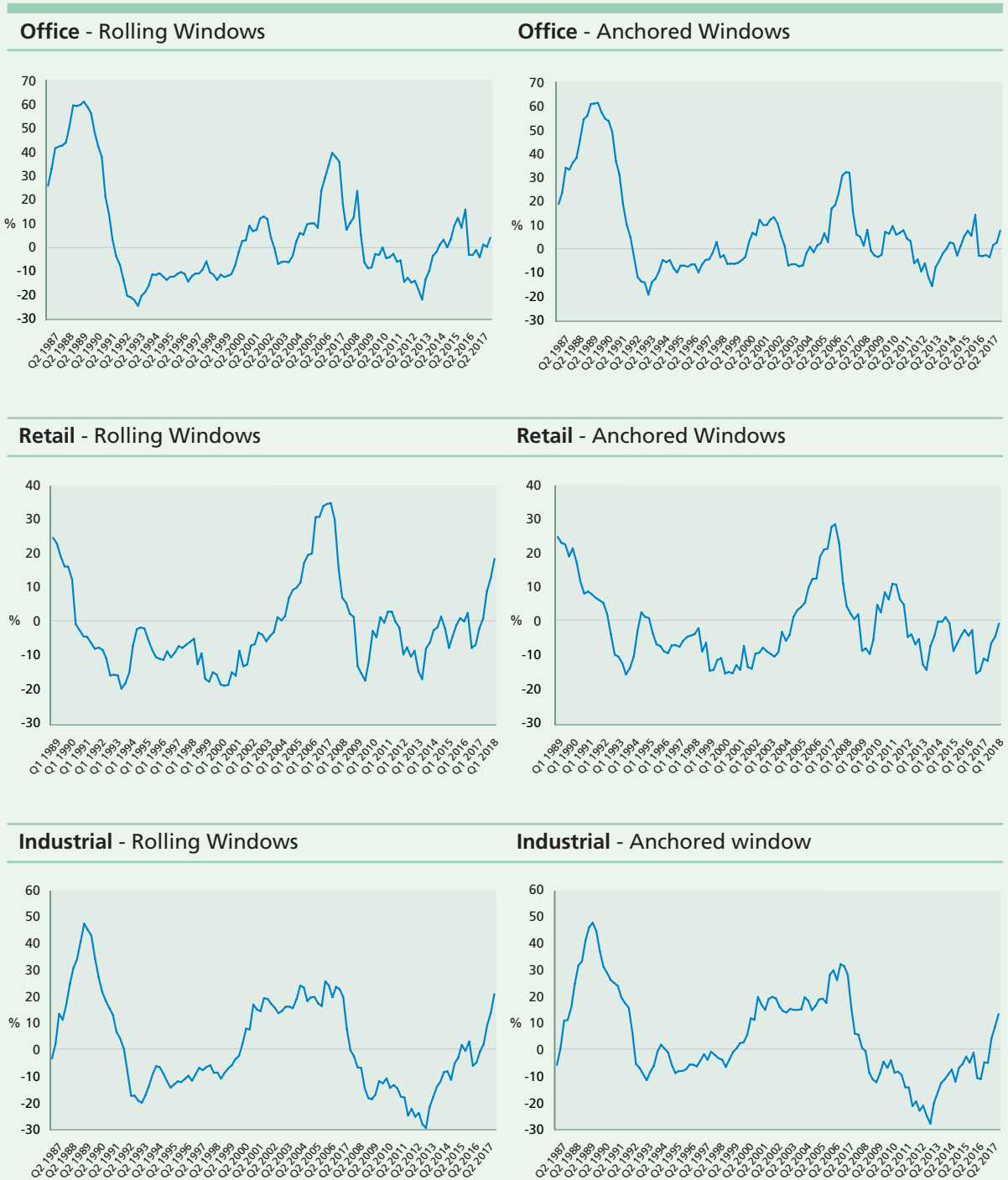

— Capital Value Change — Reversion to Equilibrium

APPENDIX C: SUSTAINABLE CAPITAL VALUE

Figure C25: Econometric Model – Actual Capital Value vs Equilibrium Capital Value for CBRE Series – Sector Level

Office - Rolling Windows

— Actual Capital Value   — Equilibrium Capital Value

Office - Anchored Windows

— Actual Capital Value   — Equilibrium Capital Value

Retail - Rolling Windows

— Actual Capital Value   — Equilibrium Capital Value

Retail - Anchored Windows

— Actual Capital Value   — Equilibrium Capital Value

Industrial - Rolling Windows

— Actual Capital Value   — Equilibrium Capital Value

Industrial - Anchored window
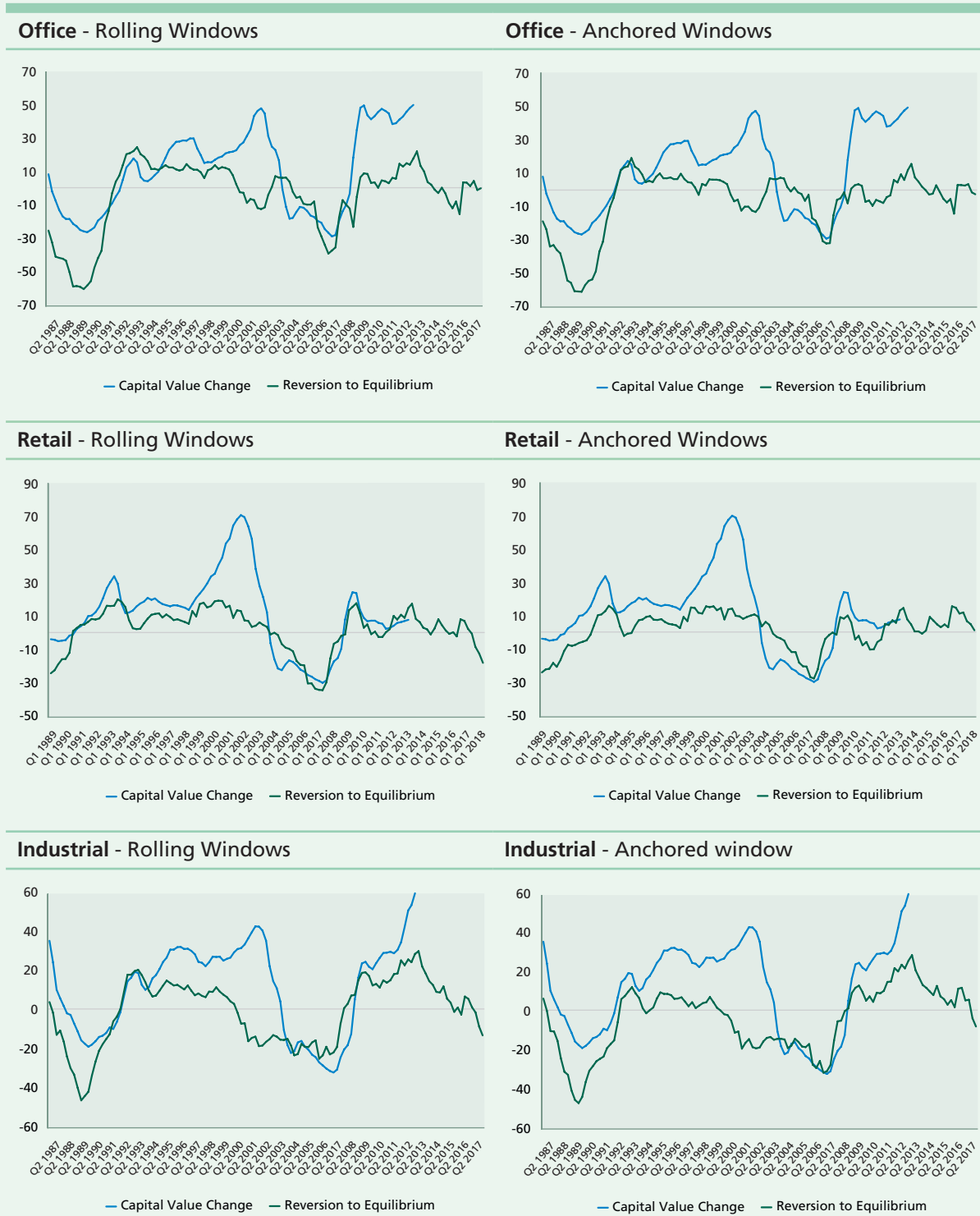

— Actual Capital Value   — Equilibrium Capital Value

APPENDIX C: SUSTAINABLE CAPITAL VALUE

Figure C26: Econometric Model – Deviation of Actual Capital Value from Equilibrium Capital Value for CBRE Series – Sector Level

Office - Rolling Windows

Office - Anchored Windows

Retail - Rolling Windows

Retail - Anchored Windows

Industrial - Rolling Windows

Industrial - Anchored window

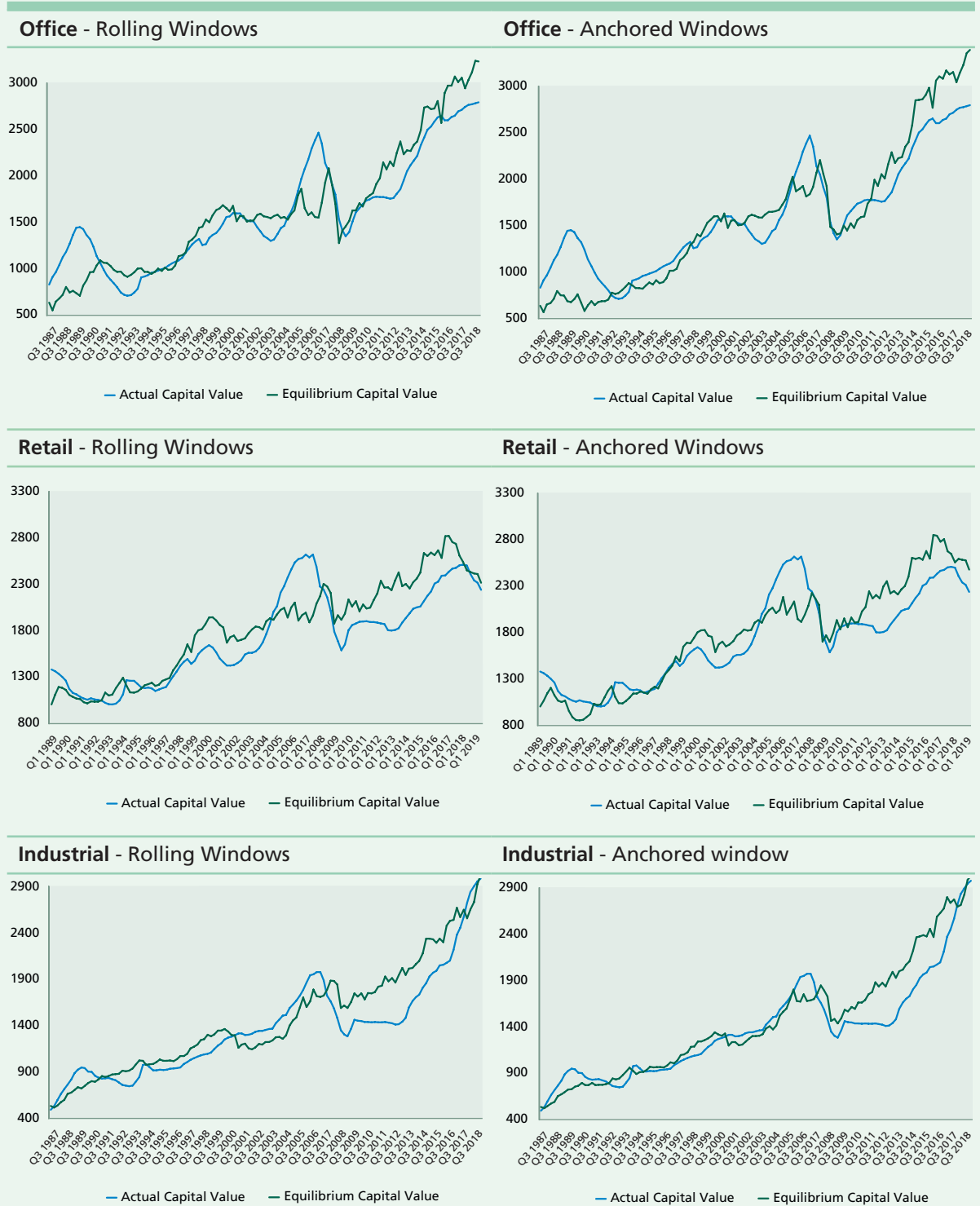# APPENDIX C: SUSTAINABLE CAPITAL VALUE

Figure C27: Econometric Model – Implied Correction in Capital Value vs. Subsequent Five Year Outturn in the CBRE Series – Sector Level
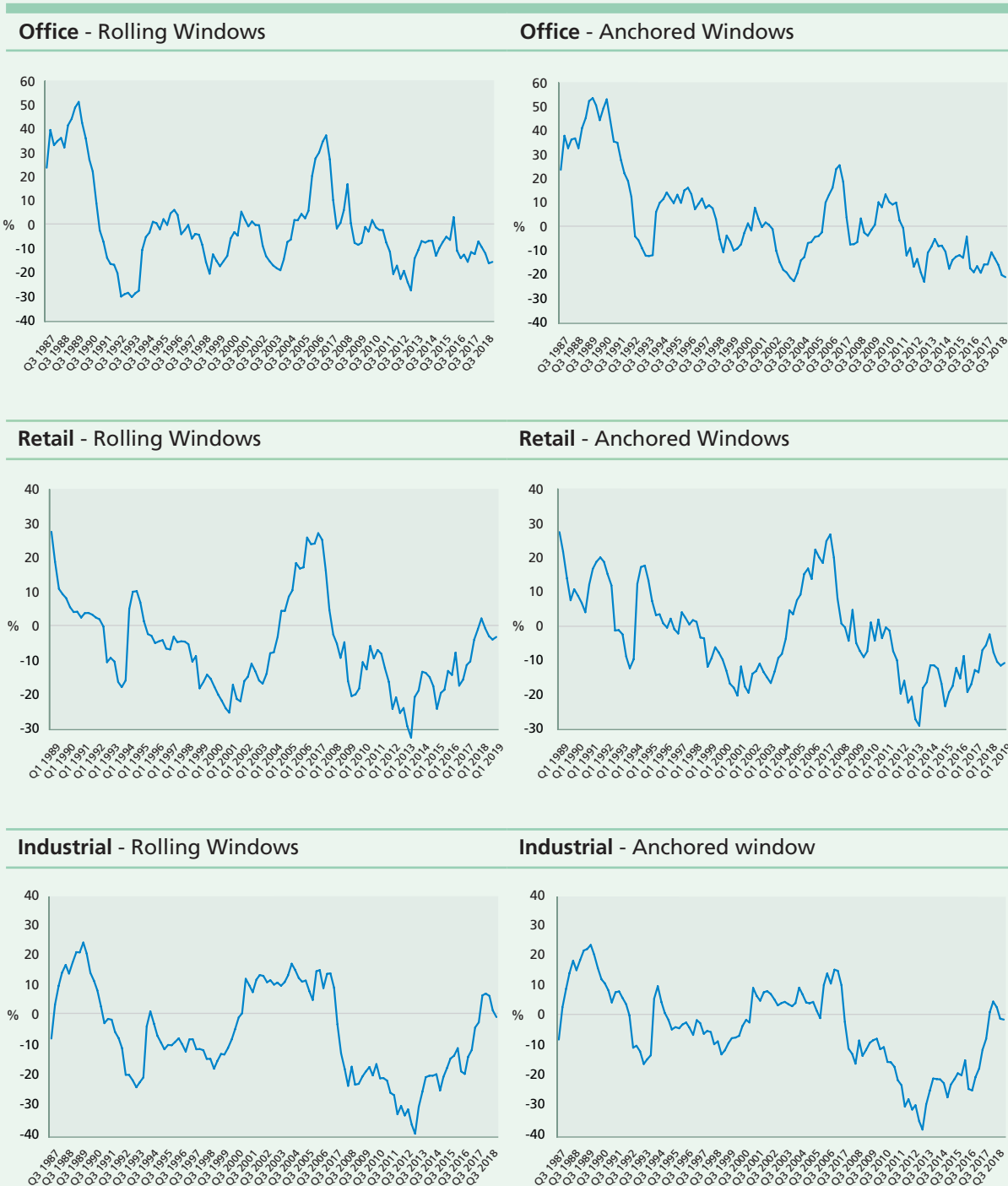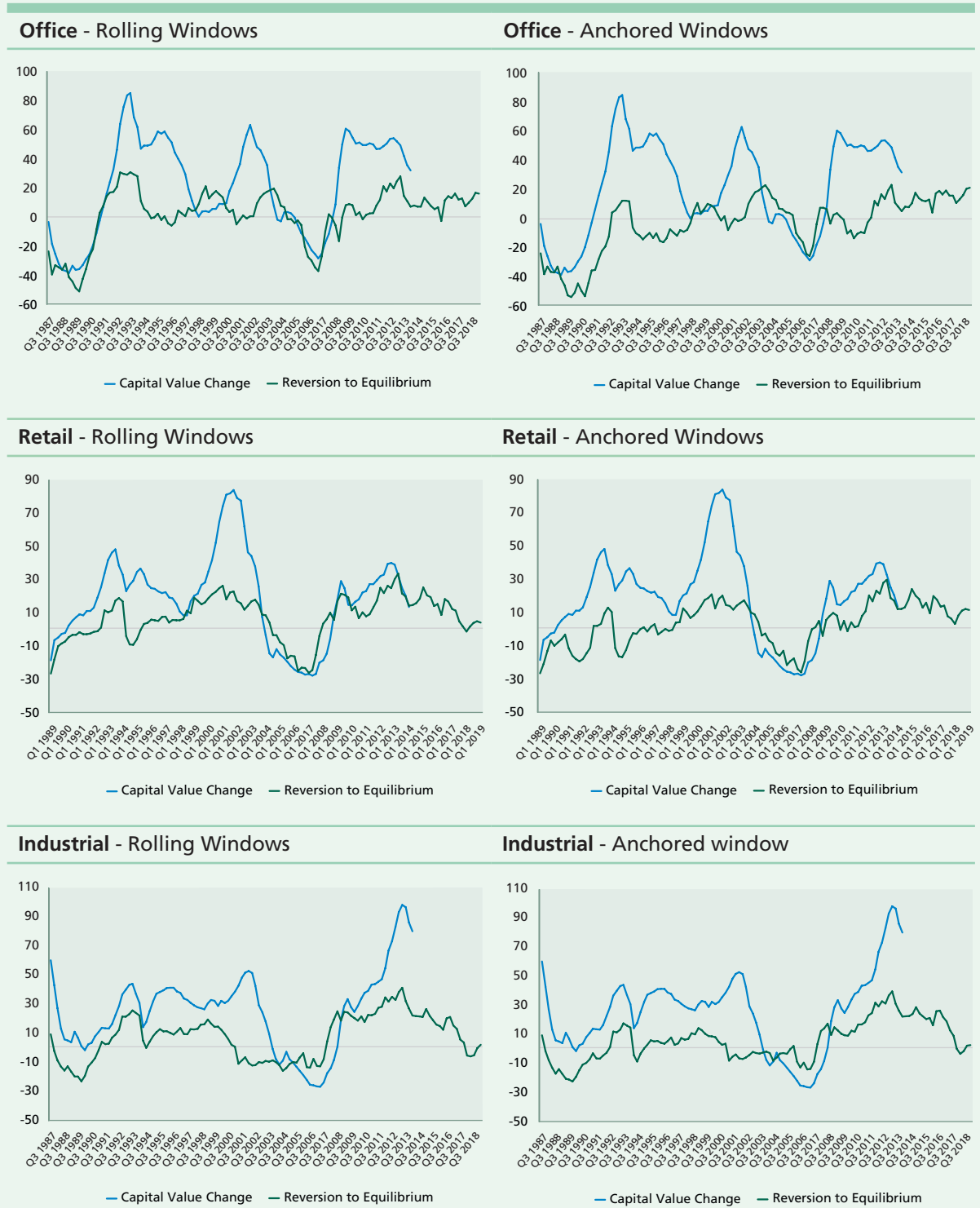
Office - Rolling Windows

— Capital Value Change   — Reversion to Equilibrium

Office - Anchored Windows

— Capital Value Change   — Reversion to Equilibrium

Retail - Rolling Windows

— Capital Value Change   — Reversion to Equilibrium

Retail - Anchored Windows

— Capital Value Change   — Reversion to Equilibrium

Industrial - Rolling Windows

— Capital Value Change   — Reversion to Equilibrium

Industrial - Anchored window

— Capital Value Change   — Reversion to Equilibrium

APPENDIX C: SUSTAINABLE CAPITAL VALUE

Appendices for Section 3.4.3

Figure C28: Ex-ante Approach 1 (RFR+RP) – Actual Capita; Value vs. Equilibrium Capital Value for MSCI Series – Sector Level

Office - Rolling Windows

Office - Anchored Windows

Retail - Rolling Windows

Retail - Anchored Windows

Industrial - Rolling Windows

Industrial - Anchored window
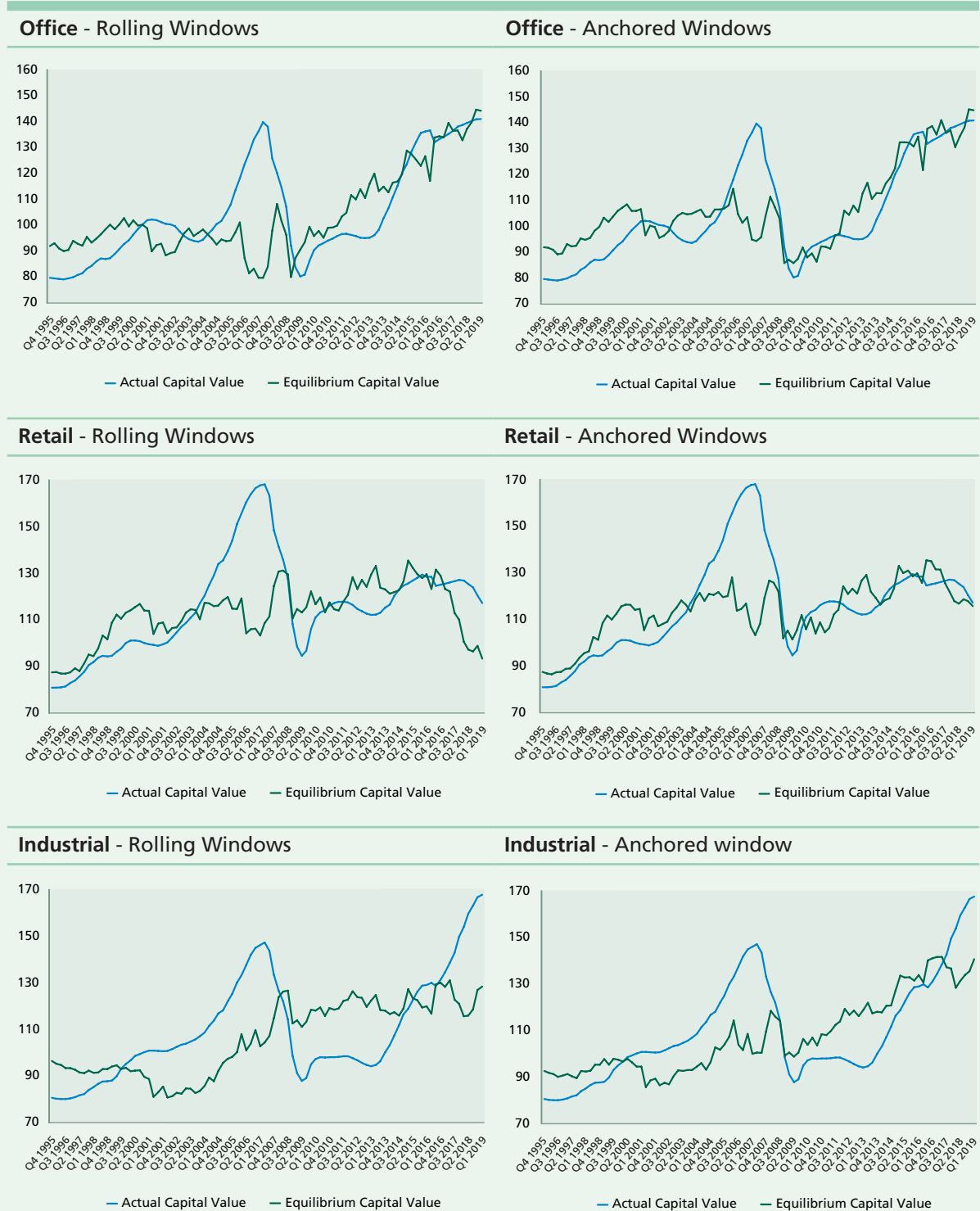
APPENDIX C: SUSTAINABLE CAPITAL VALUE

Figure C29: Ex-ante Approach 1 – Deviation of Actual Capital Value from Equilibrium Capital Value for MSCI Series – Sector Level

Office - Rolling Windows

Office - Anchored Windows

Retail - Rolling Windows

Retail - Anchored Windows

Industrial - Rolling Windows

Industrial - Anchored window
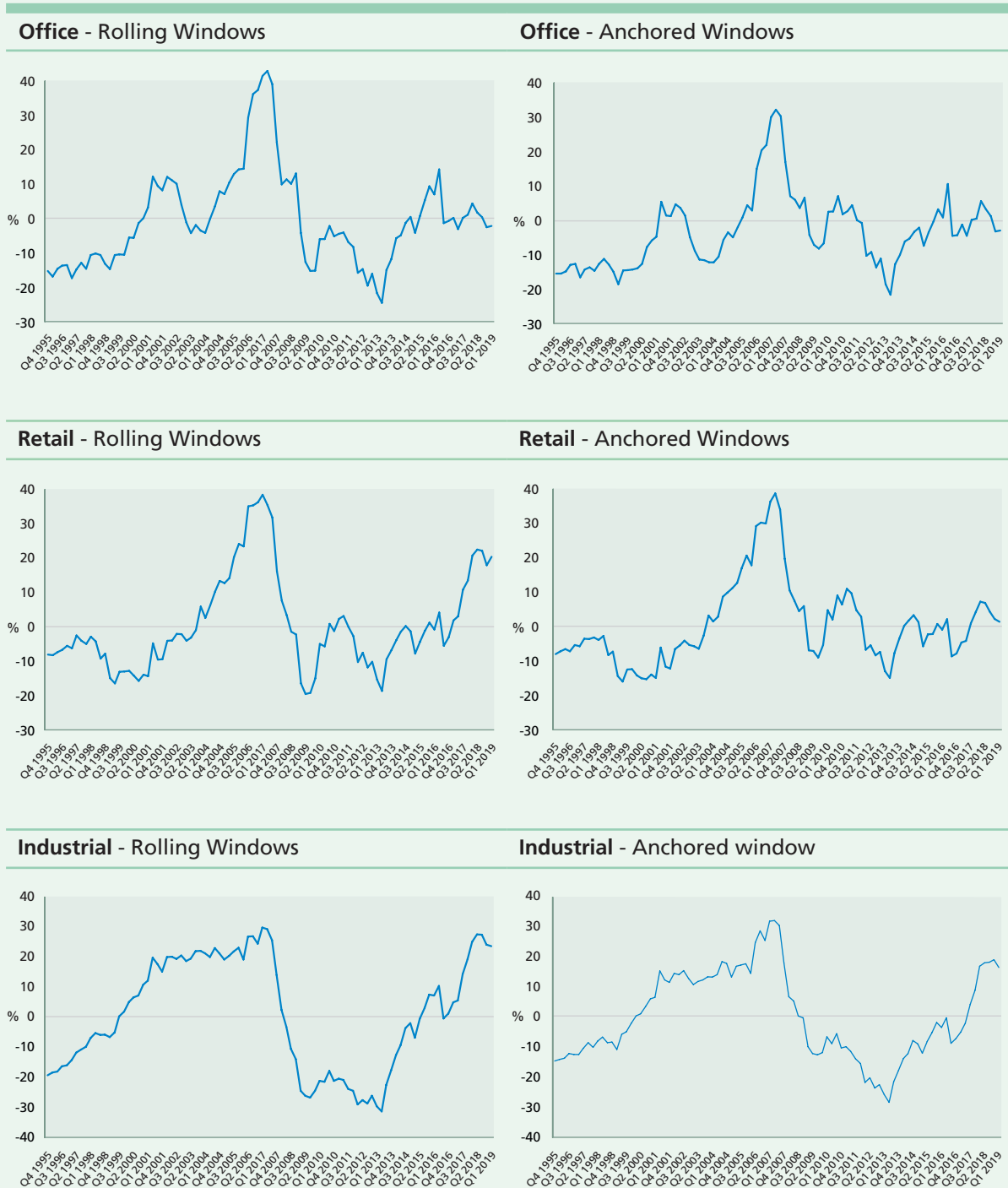
APPENDIX C: SUSTAINABLE CAPITAL VALUE

Figure C30: Ex-ante Approach 1 – Implied Correction in Capital Value vs. Subsequent Five Year Outturn in MSCI Series – Sector Level

Office - Rolling Windows

— Capital Value Change   — Reversion to Equilibrium

Office - Anchored Windows

— Capital Value Change   — Reversion to Equilibrium

Retail - Rolling Windows

— Capital Value Change   — Reversion to Equilibrium

Retail - Anchored Windows

— Capital Value Change   — Reversion to Equilibrium

Industrial - Rolling Windows

— Capital Value Change   — Reversion to Equilibrium

Industrial - Anchored window

— Capital Value Change   — Reversion to Equilibrium
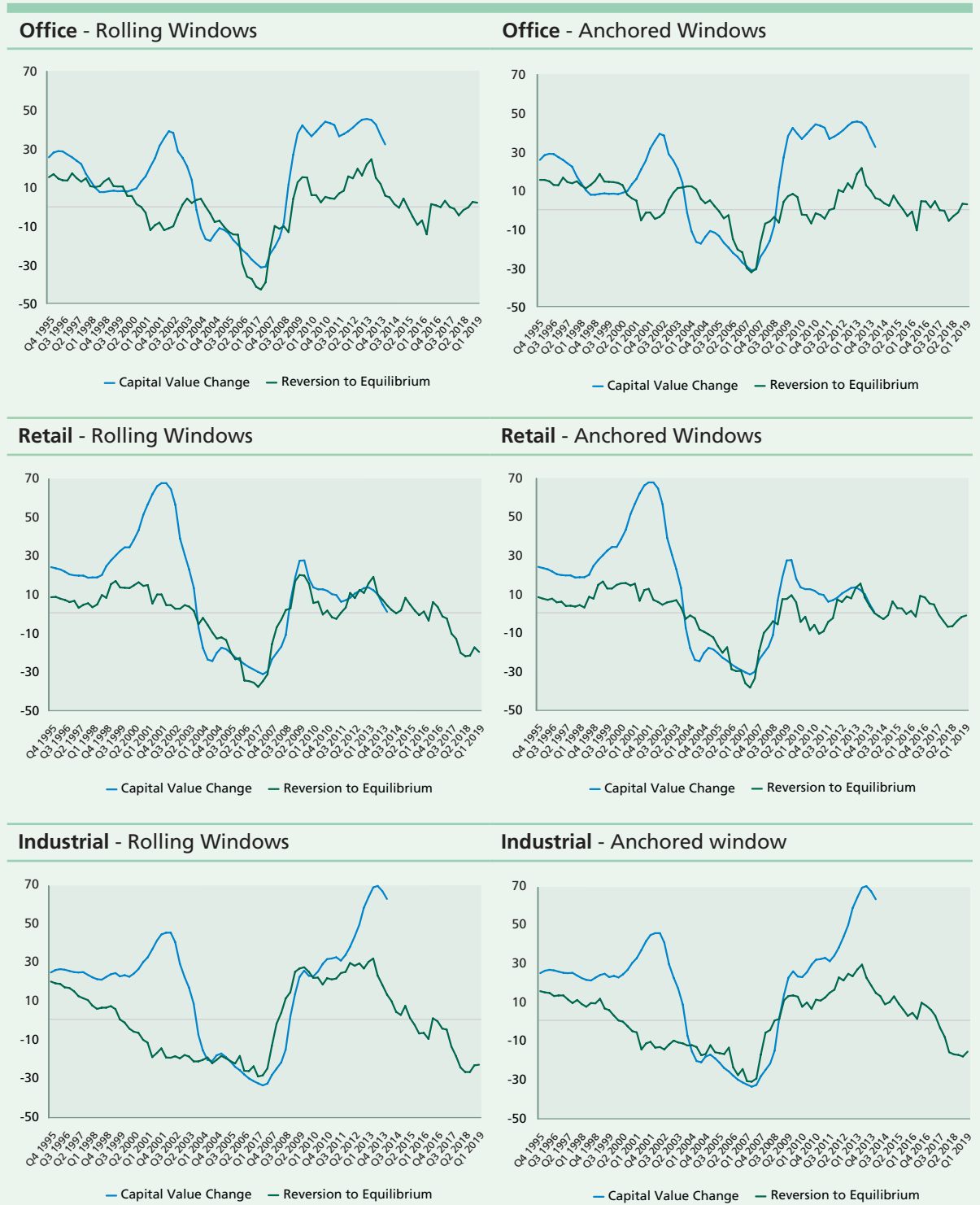
APPENDIX C: SUSTAINABLE CAPITAL VALUE

Figure C31: Ex-ante Approach 1 – Actual Capital Value vs. Equilibrium Capital Value for JLL Series – Sector Level

Office - Rolling Windows

Office - Anchored Windows

Retail - Rolling Windows

Retail - Anchored Windows

Industrial - Rolling Windows

Industrial - Anchored window

APPENDIX C: SUSTAINABLE CAPITAL VALUE

Figure C32: Ex-ante Approach 1 – Deviation of Actual Capital Value from Equilibrium Capital Value for JLL Series – Sector Level

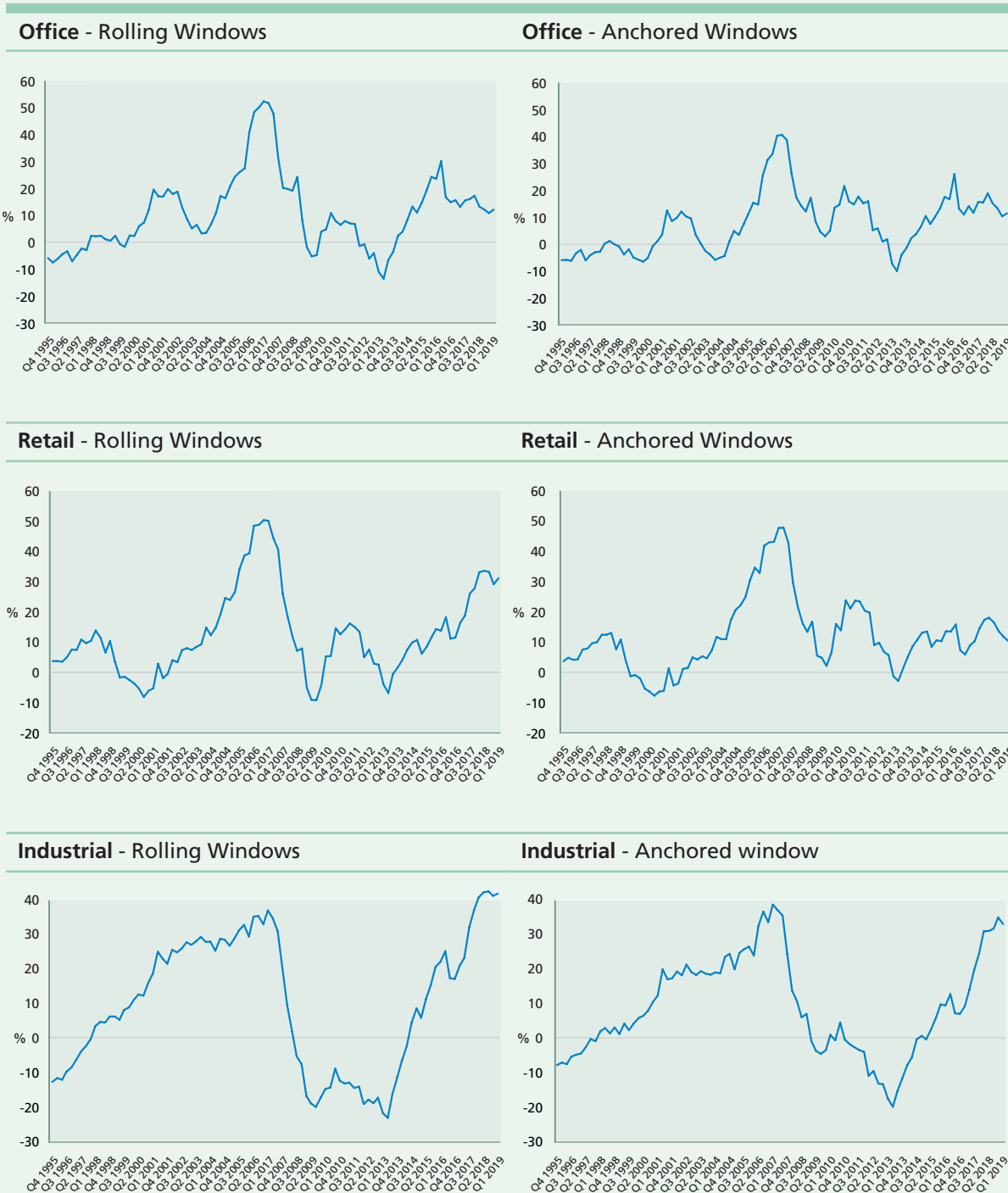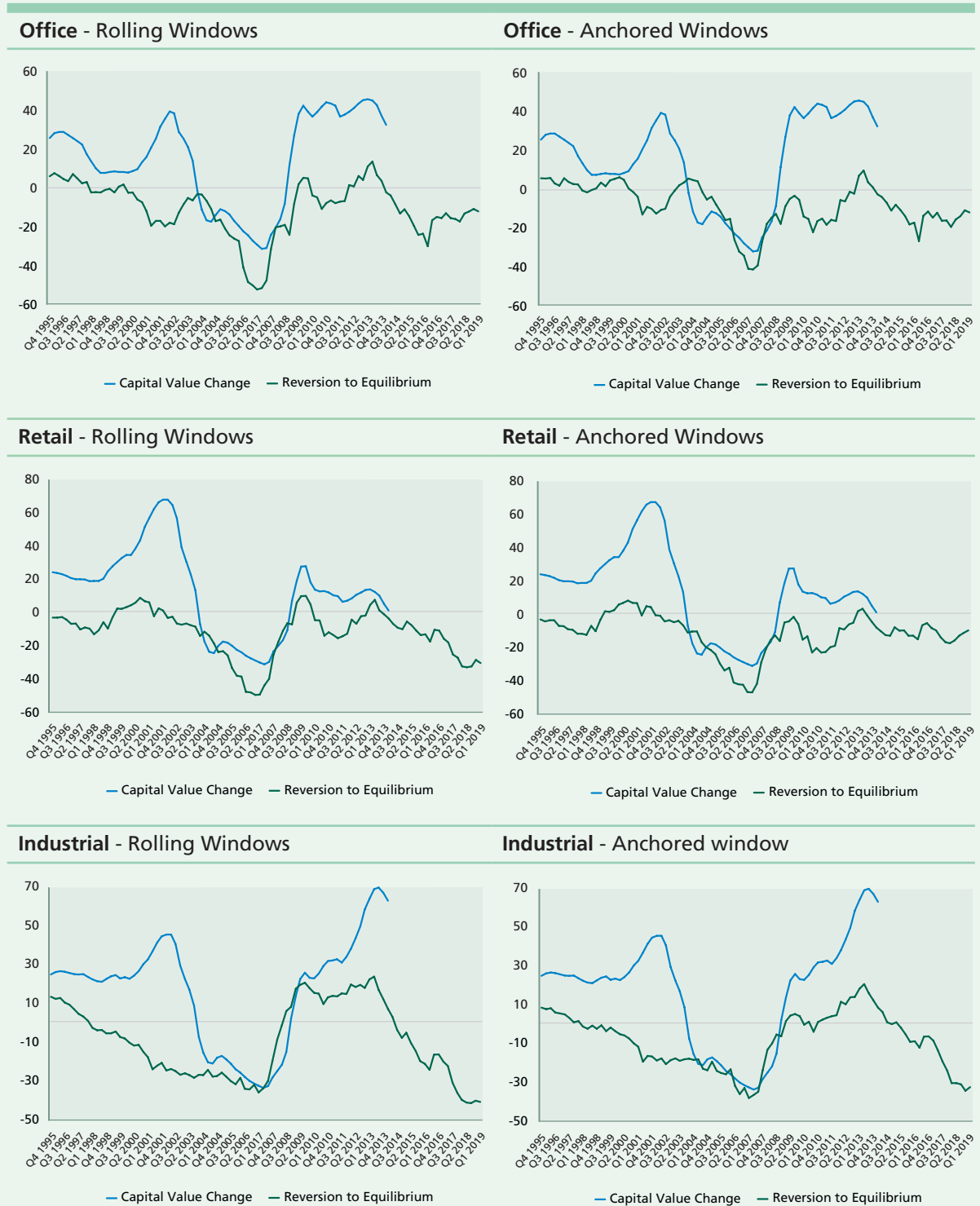**Office** - Rolling Windows

Office - Anchored Windows

Retail - Rolling Windows

Retail - Anchored Windows

Industrial - Rolling Windows

Industrial - Anchored window

APPENDIX C: SUSTAINABLE CAPITAL VALUE

Figure C33: Ex-ante Approach 1 – Implied Correction in Capital Value vs. Subsequent Five Year Outturn in JLL Series – Sector Level

Office - Rolling Windows

Office - Anchored Windows

Retail - Rolling Windows

Retail - Anchored Windows

Industrial - Rolling Windows

Industrial - Anchored window

— Capital Value Change   — Reversion to Equilibrium

APPENDIX C: SUSTAINABLE CAPITAL VALUE

Figure C34: Ex-ante Approach 1 – Capital Value vs. Equilibrium Capital Value for CBRE Series – Sector Level

Office - Rolling Windows

Office - Anchored Windows

Retail - Rolling Windows

Retail - Anchored Windows

Industrial - Rolling Windows

Industrial - Anchored window

APPENDIX C: SUSTAINABLE CAPITAL VALUE

Figure C35: Ex-ante Approach 1 – Deviation of Actual Capital Value from Equilibrium Capital Value for CBRE Series – Sector Level

Office - Rolling Windows

Office - Anchored Windows

Retail - Rolling Windows

Retail - Anchored Windows

Industrial - Rolling Windows

Industrial - Anchored window

APPENDIX C: SUSTAINABLE CAPITAL VALUE

Figure C36: Ex-ante Approach 1 – Implied Correction in Capital Value vs. Subsequent Five Year Outturn in CBRE Series – Sector Level

Office - Rolling Windows

— Capital Value Change — Reversion to Equilibrium

Office - Anchored Windows

— Capital Value Change — Reversion to Equilibrium

Retail - Rolling Windows

— Capital Value Change — Reversion to Equilibrium

Retail - Anchored Windows

— Capital Value Change — Reversion to Equilibrium

Industrial - Rolling Windows

— Capital Value Change — Reversion to Equilibrium

Industrial - Anchored window

— Capital Value Change — Reversion to Equilibrium

APPENDIX C: SUSTAINABLE CAPITAL VALUE

Figure C37: Ex-ante Approach 2 (Sticky Required Returns) – Actual Capital Value vs. Equilibrium Capital Value for MSCI All Property

Rolling Windows

Anchored Windows

— Actual Capital Value   — Equilibrium Capital Value

— Actual Capital Value   — Equilibrium Capital Value
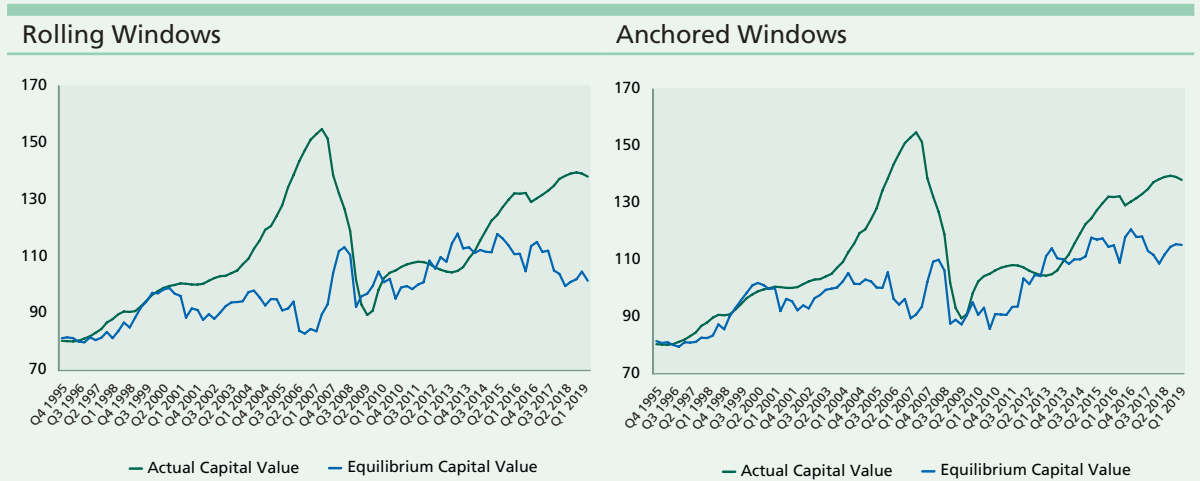
Figure C38: Ex-ante Approach 2 – Deviation of Actual Capital Value from Equilibrium Capital Value for MSCI All Property
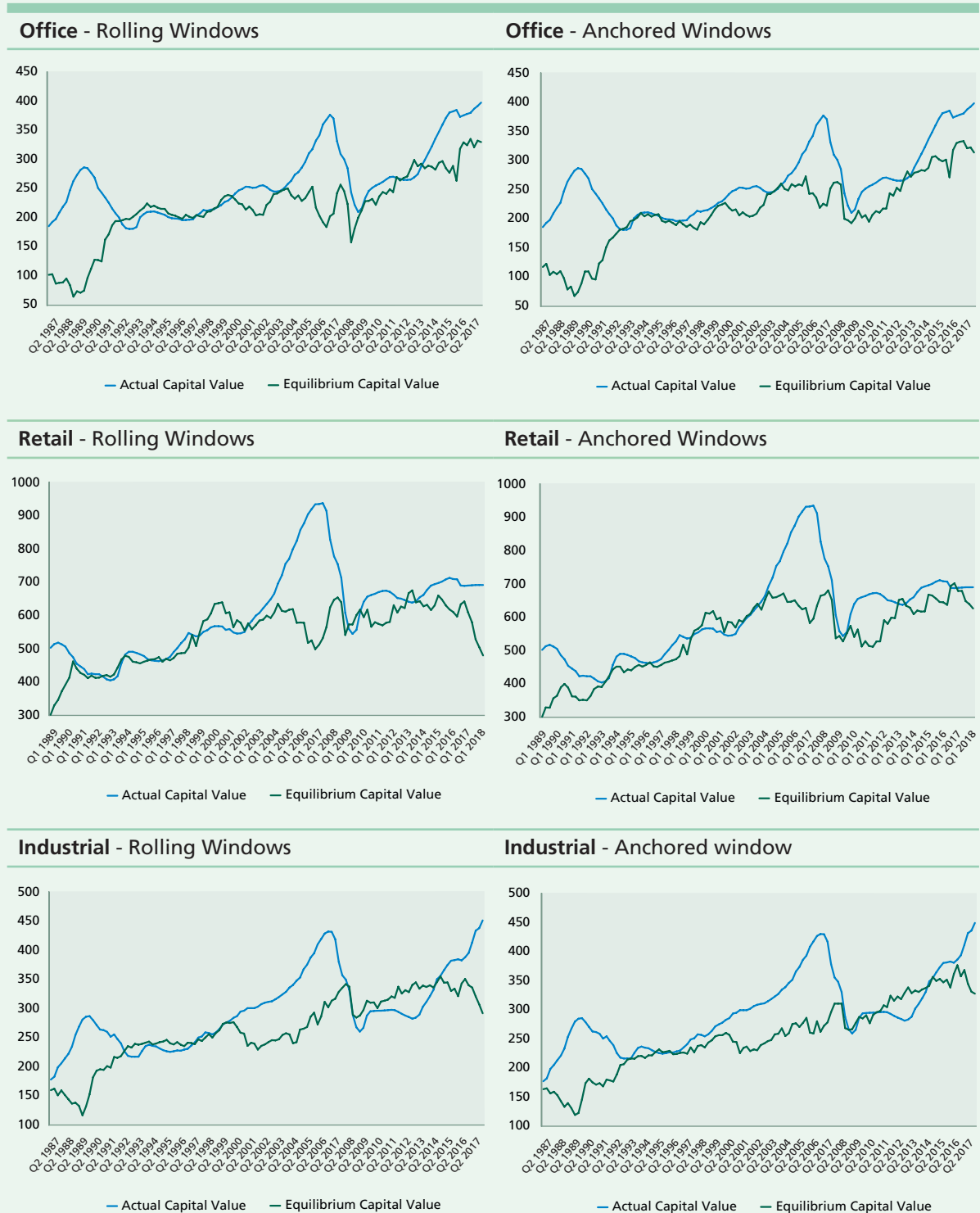
Rolling Windows

Anchored Windows
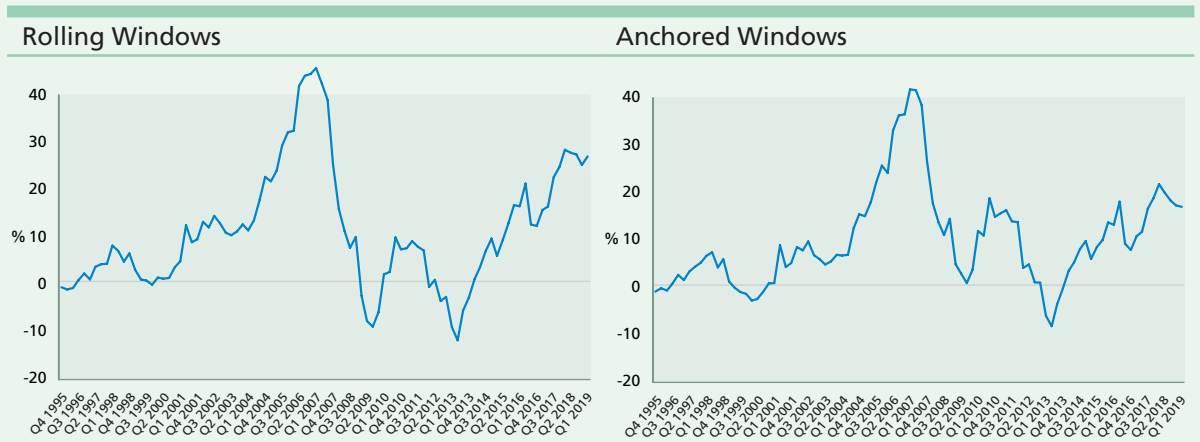
Figure C39: Ex-ante Approach 2 – Implied Correction in Capital Value vs. Subsequent Five Year Outturn in MSCI All Property

Rolling Windows

Anchored Windows

— Capital Value Change   — Reversion to Equilibrium
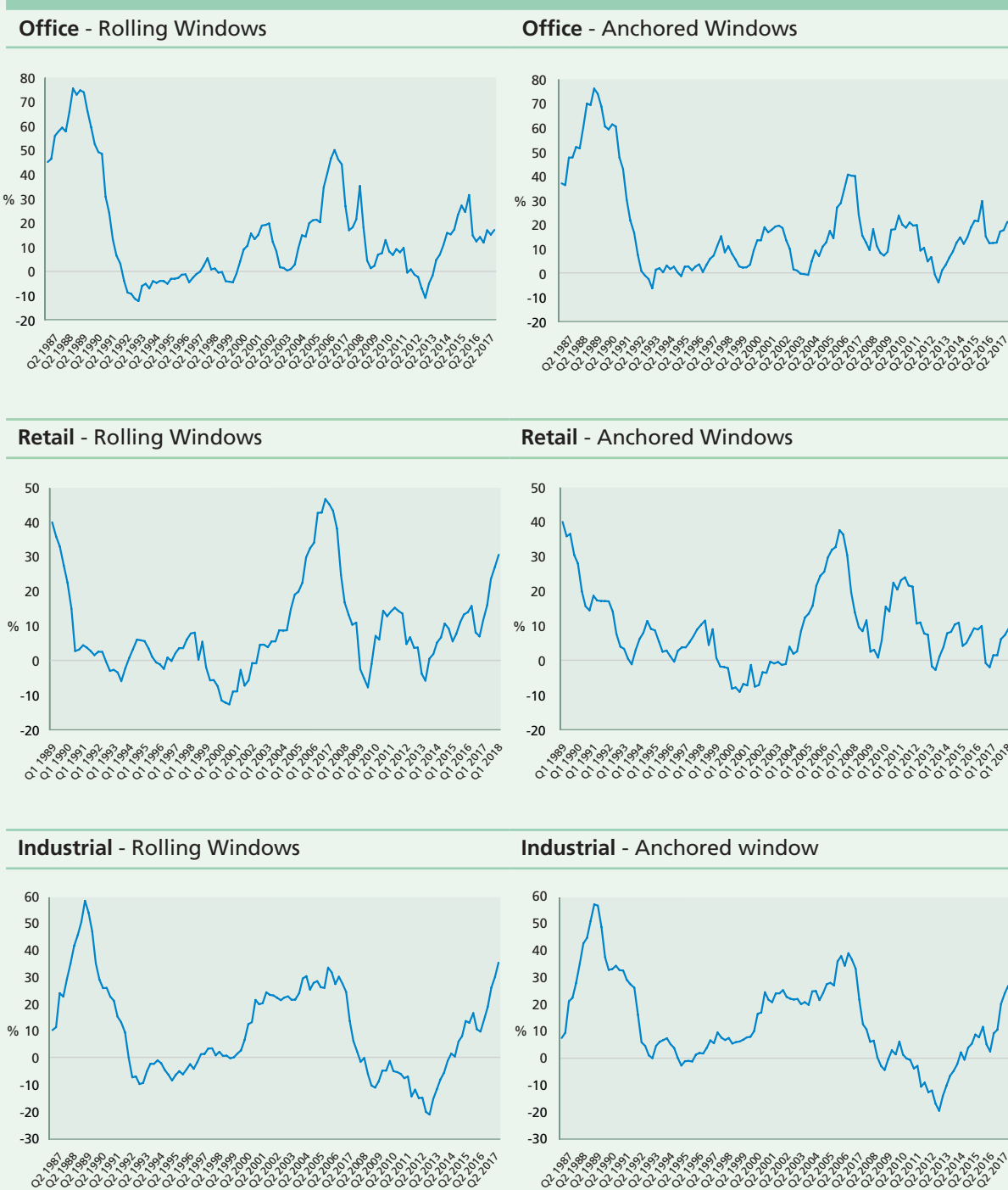
— Capital Value Change   — Reversion to Equilibrium
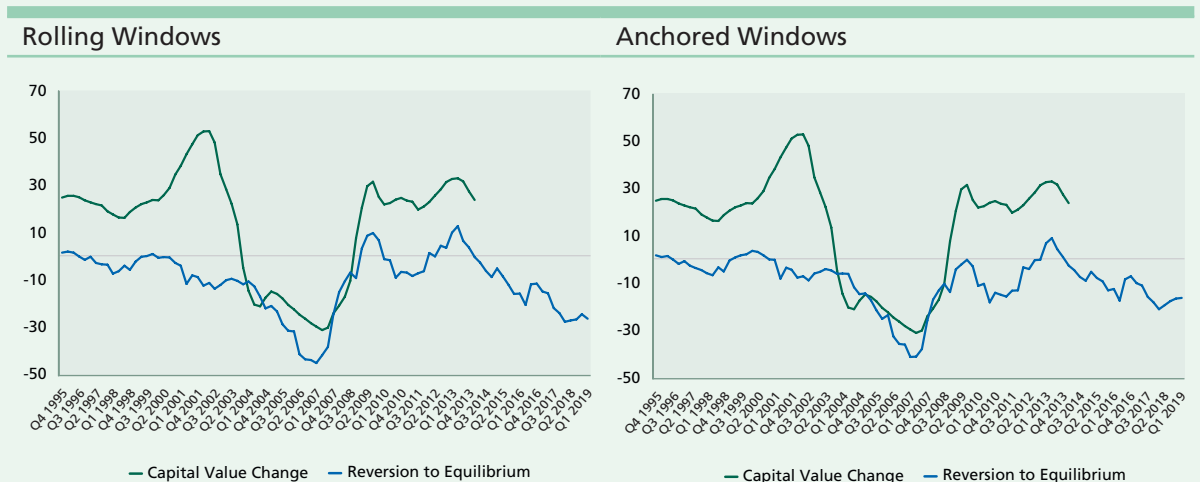
APPENDIX C: SUSTAINABLE CAPITAL VALUE

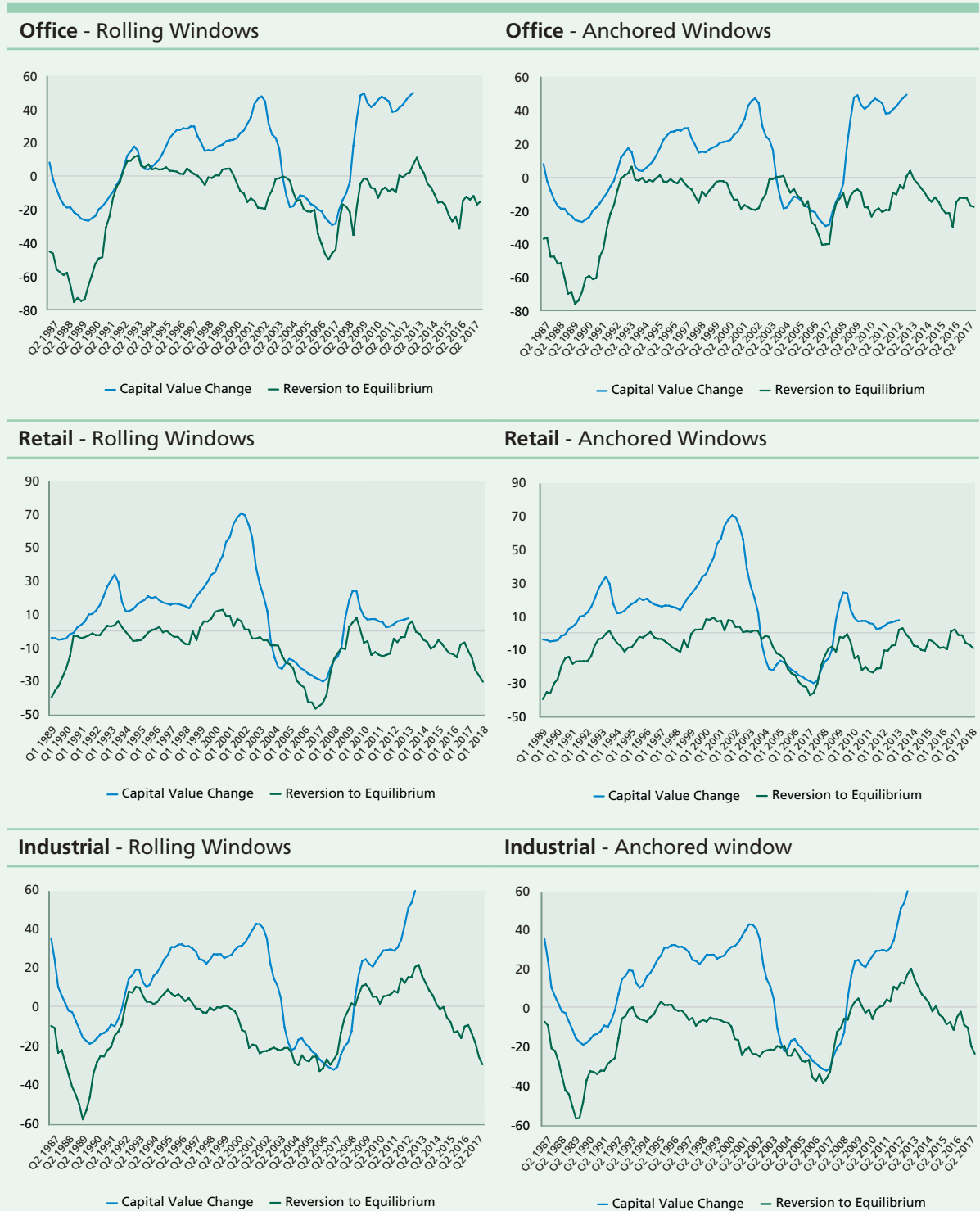**Figure C40: Ex-ante Approach 2 – Actual Capital Value vs. Equilibrium Capital Value for MSCI Series – Sector Level**

Office - Rolling Windows

Office - Anchored Windows

Retail - Rolling Windows

Retail - Anchored Windows

Industrial - Rolling Windows

Industrial - Anchored window
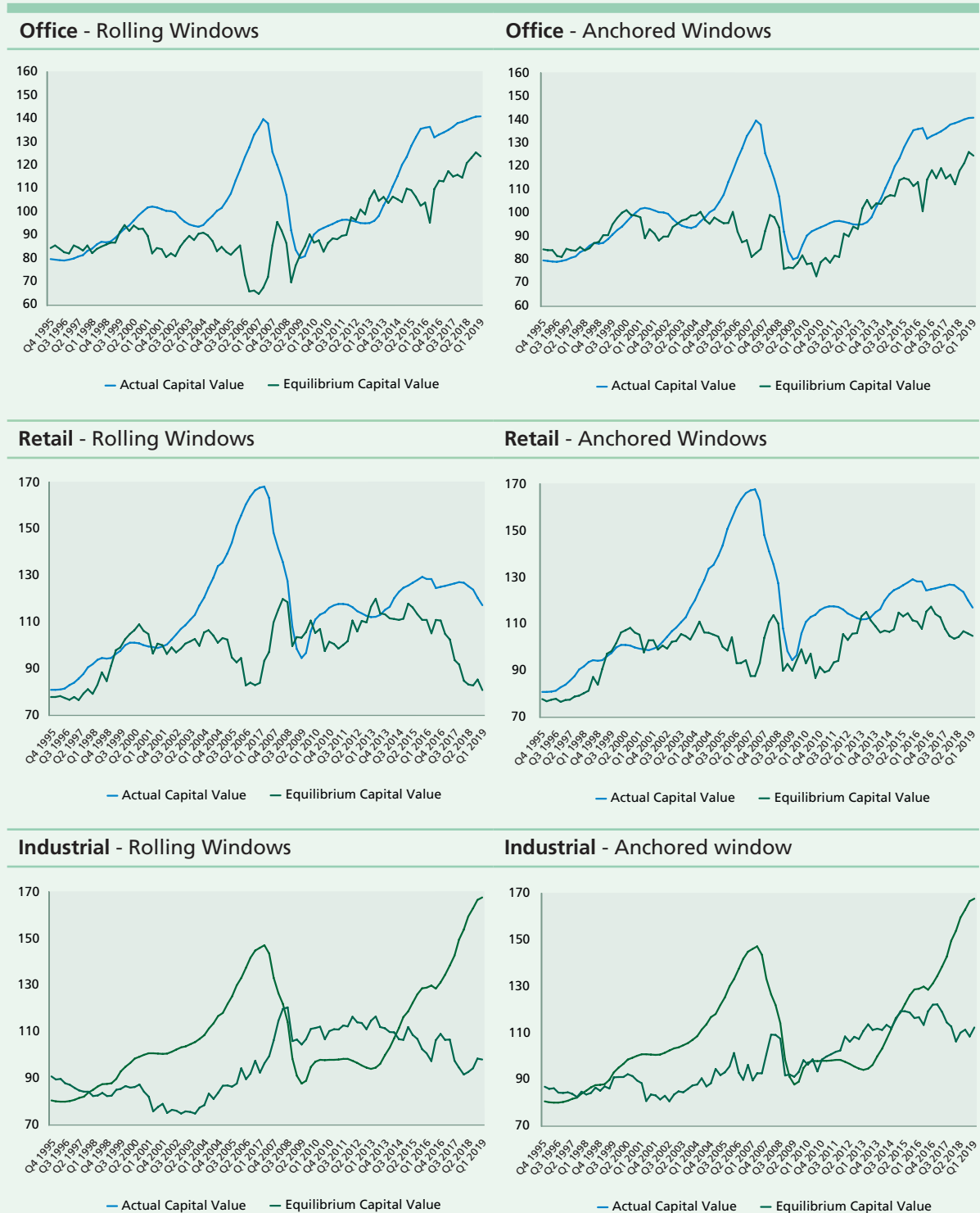
APPENDIX C: SUSTAINABLE CAPITAL VALUE

Figure C41: Ex-ante Approach 2 – Deviation of Actual Capital Value from Equilibrium Capital Value for MSCI Series – Sector Level

Office - Rolling Windows

Office - Anchored Windows

Retail - Rolling Windows

Retail - Anchored Windows

Industrial - Rolling Windows

Industrial - Anchored window

APPENDIX C: SUSTAINABLE CAPITAL VALUE

Figure C42: Ex-ante Approach 2 – Implied Correction in Capital Value vs. Subsequent Five Year Outturn in MSCI Series – Sector Level

Office - Rolling Windows

— Capital Value Change   — Reversion to Equilibrium

Office - Anchored Windows

— Capital Value Change   — Reversion to Equilibrium

Retail - Rolling Windows

— Capital Value Change   — Reversion to Equilibrium

Retail - Anchored Windows

— Capital Value Change   — Reversion to Equilibrium

Industrial - Rolling Windows

— Capital Value Change   — Reversion to Equilibrium

Industrial - Anchored window

— Capital Value Change   — Reversion to Equilibrium

APPENDIX C: SUSTAINABLE CAPITAL VALUE

Figure C43: Ex-ante Approach 2 – Actual Capital Value vs. Equilibrium Capital Value for JLL All Property

Rolling Windows — Anchored Windows

- Actual Capital Value — Equilibrium Capital Value
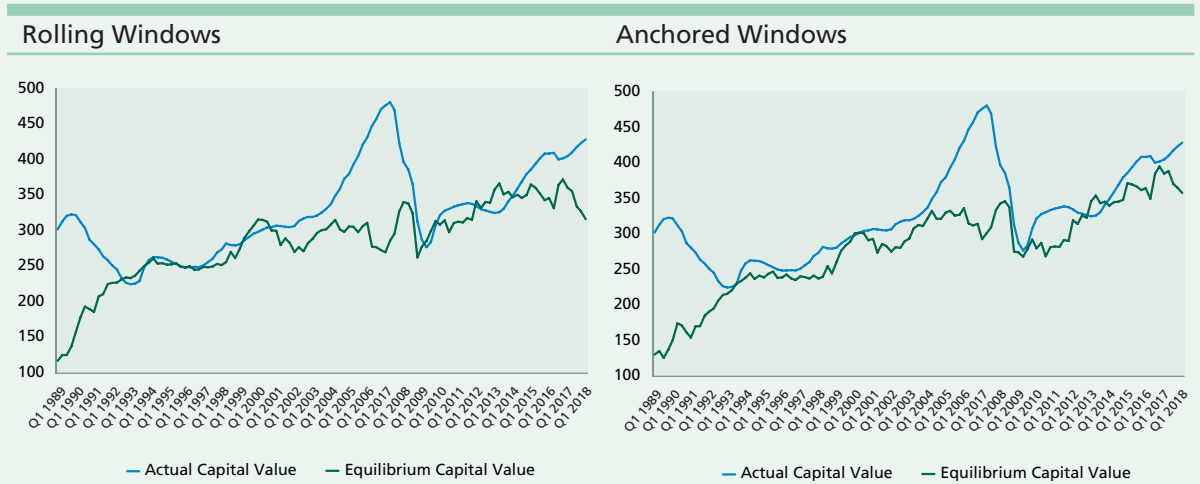
Figure C44: Ex-ante Approach 2 – Deviation of Actual Capital Value from Equilibrium Capital Value for JLL All Property
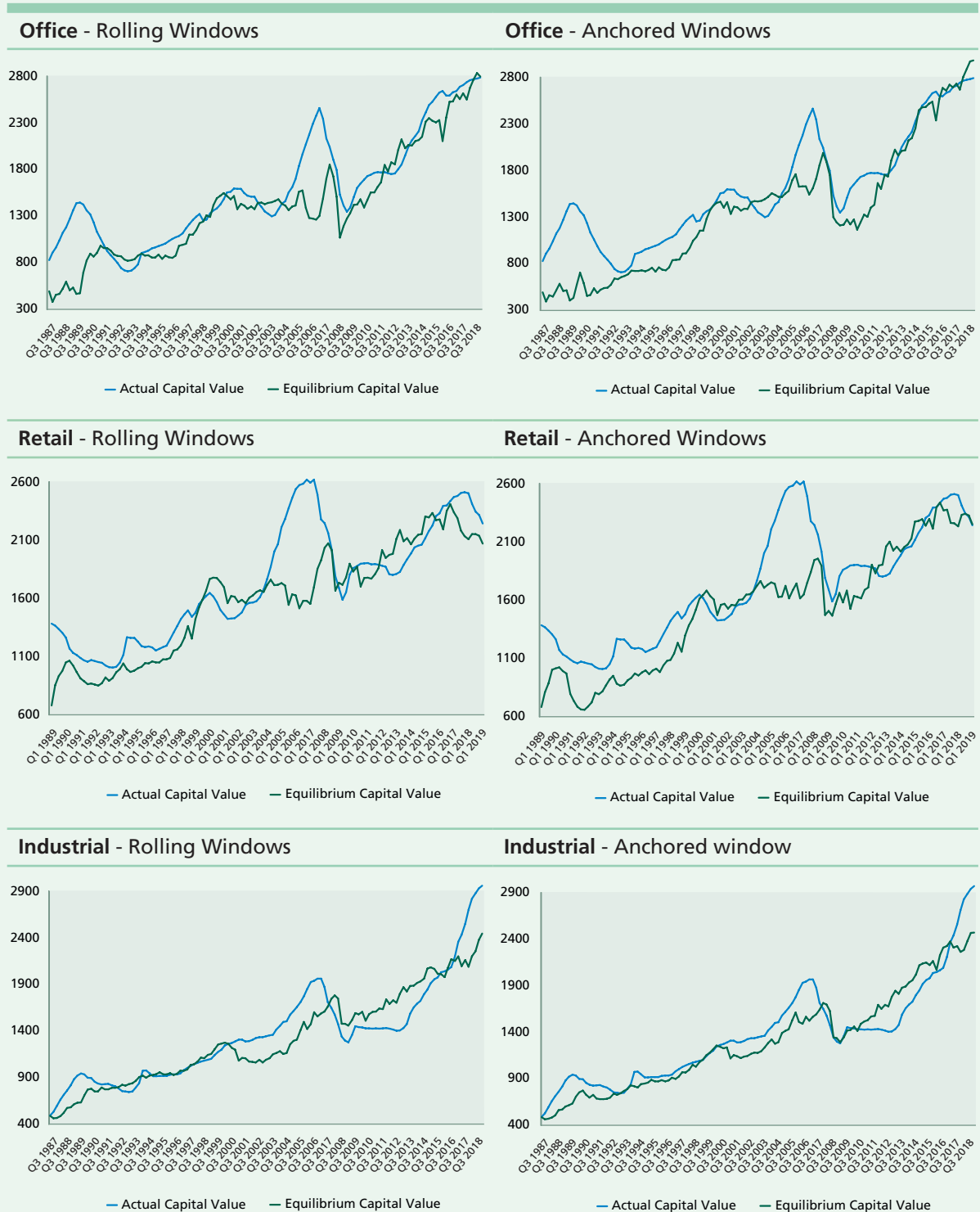

Rolling Windows — Anchored Windows
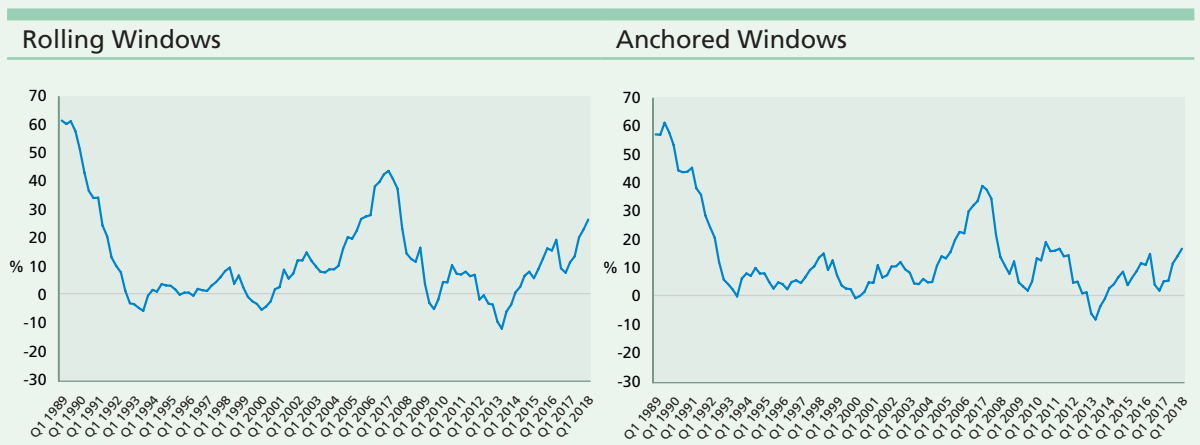
Figure C45: Ex-ante Approach 2 – Implied Correction in Capital Value vs. Subsequent Five Year Outturn in JLL All Property

Rolling Windows — Anchored Windows
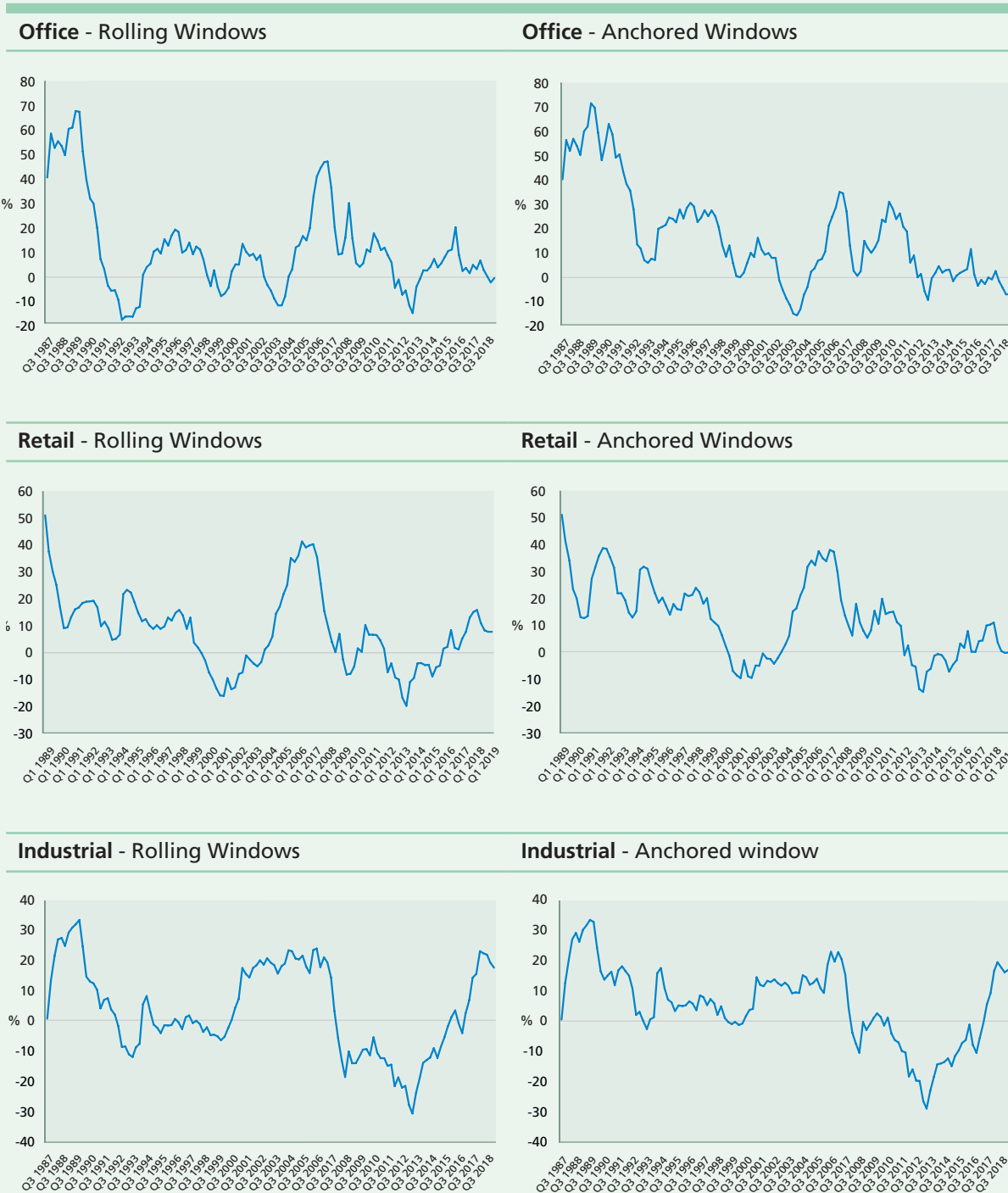
- Capital Value Change — Reversion to Equilibrium
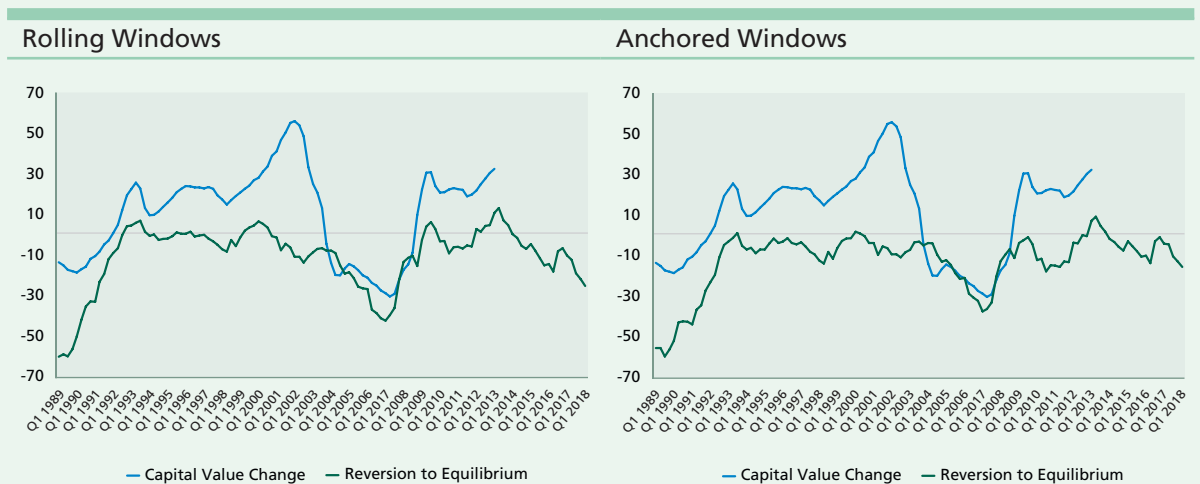
APPENDIX C: SUSTAINABLE CAPITAL VALUE

Figure C46: Ex-ante Approach 2 – Actual Capital Value vs. Equilibrium Capital Value for JLL Series – Sector Level

Office - Rolling Windows

— Actual Capital Value — Equilibrium Capital Value

Office - Anchored Windows

— Actual Capital Value — Equilibrium Capital Value

Retail - Rolling Windows

— Actual Capital Value — Equilibrium Capital Value

Retail - Anchored Windows

— Actual Capital Value — Equilibrium Capital Value

Industrial - Rolling Windows

— Actual Capital Value — Equilibrium Capital Value

Industrial - Anchored window

— Actual Capital Value — Equilibrium Capital Value

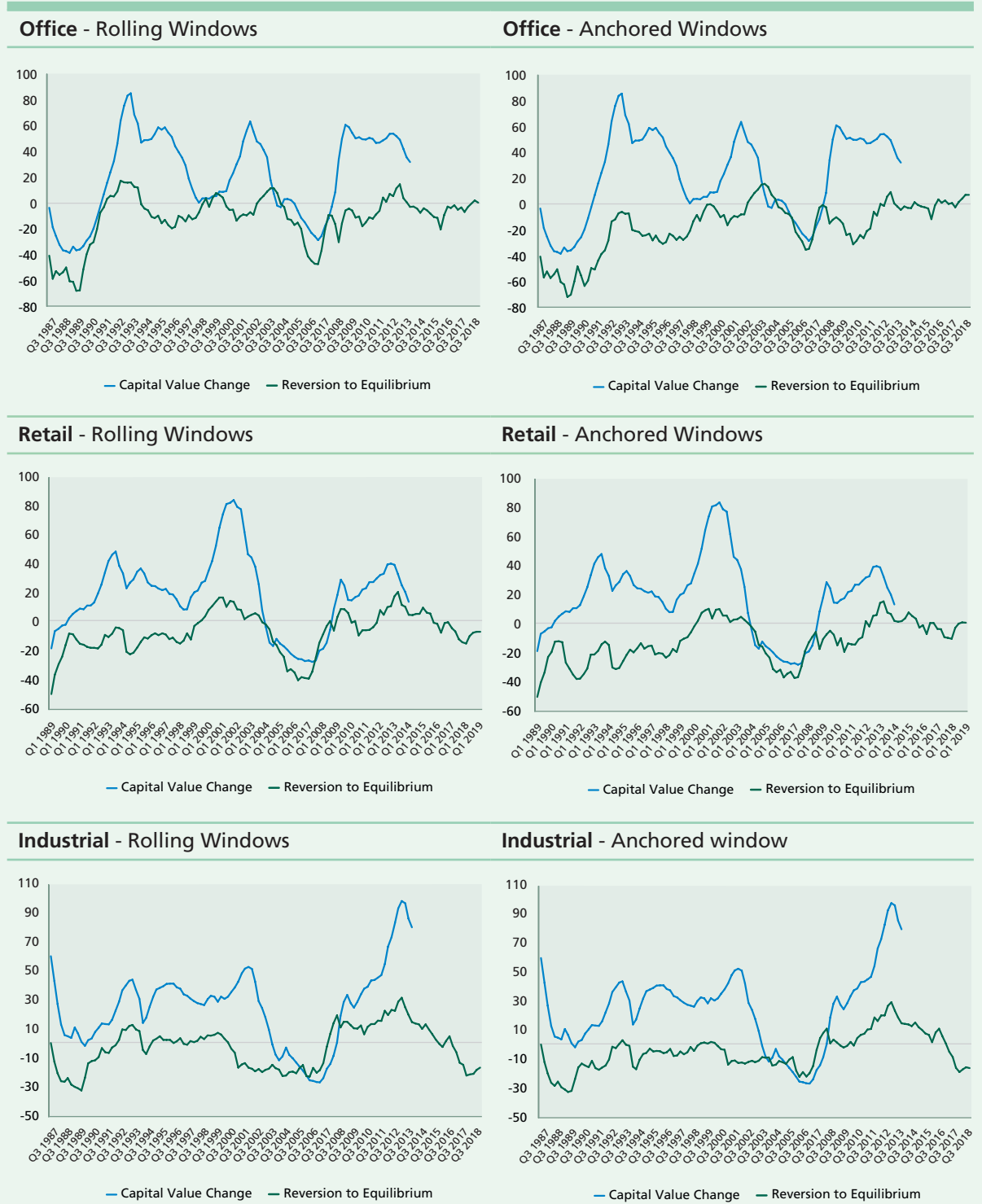# APPENDIX C: SUSTAINABLE CAPITAL VALUE

Figure C47: Ex-ante Approach 2 – Deviation of Actual Capital Value from Equilibrium Capital Value for JLL Series – Sector Level

Office - Rolling Windows

Office - Anchored Windows

Retail - Rolling Windows

Retail - Anchored Windows

Industrial - Rolling Windows

Industrial - Anchored window

APPENDIX C: SUSTAINABLE CAPITAL VALUE

Figure C48: Ex-ante Approach 2 – Implied Correction in Capital Value vs. Subsequent Five Year Outturn in JLL Series – Sector Level

Office - Rolling Windows

— Capital Value Change — Reversion to Equilibrium

Office - Anchored Windows

— Capital Value Change — Reversion to Equilibrium

Retail - Rolling Windows

— Capital Value Change — Reversion to Equilibrium

Retail - Anchored Windows

— Capital Value Change — Reversion to Equilibrium

Industrial - Rolling Windows

— Capital Value Change — Reversion to Equilibrium

Industrial - Anchored window

— Capital Value Change — Reversion to Equilibrium

APPENDIX C: SUSTAINABLE CAPITAL VALUE

Figure C49: Ex-ante Approach 2 – Actual Capital Value vs. Equilibrium Capital Value for CBRE All Property

Rolling Windows — Anchored Windows

Actual Capital Value — Equilibrium Capital Value
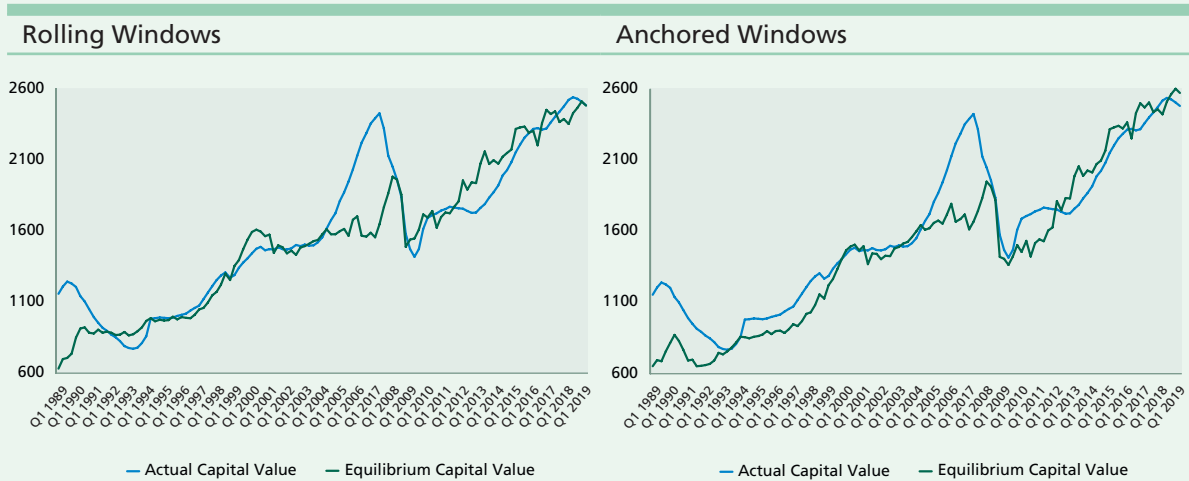
Figure C50: Ex-ante Approach 2 – Deviation of Actual Capital Value from Equilibrium Capital Value for CBRE All Property

Rolling Windows — Anchored Windows
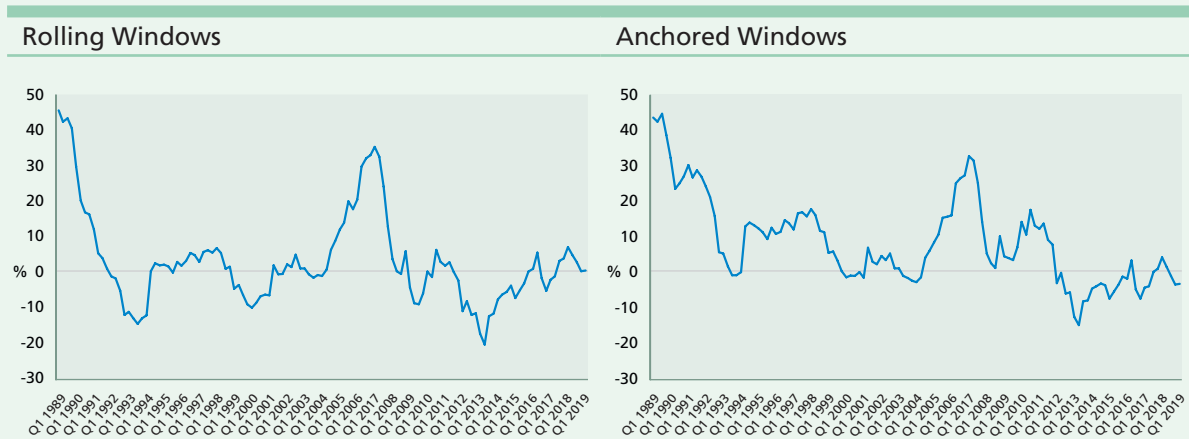
Figure C51: Ex-ante Approach 2 – Implied Correction in Capital Value vs. Subsequent Five Year Outturn in CBRE All Property

Rolling Windows — Anchored Windows

Capital Value Change — Reversion to Equilibrium
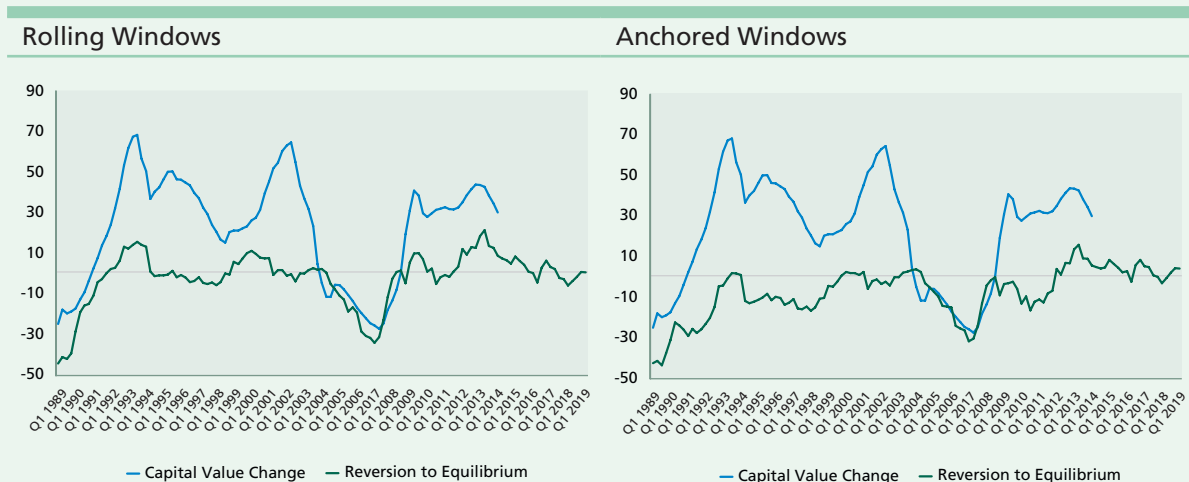
APPENDIX C: SUSTAINABLE CAPITAL VALUE

Figure C52: Ex-ante Approach 2 – Actual Capital Value vs. Equilibrium Capital Value for CBRE Series – Sector Level

Office - Rolling Windows

Office - Anchored Windows

Retail - Rolling Windows

Retail - Anchored Windows

Industrial - Rolling Windows

Industrial - Anchored window

APPENDIX C: SUSTAINABLE CAPITAL VALUE

Figure C53: Ex-ante Approach 2 – Deviation of Actual Capital Value from Equilibrium Capital Value for CBRE Series – Sector Level

Office - Rolling Windows

Office - Anchored Windows

Retail - Rolling Windows

Retail - Anchored Windows

Industrial - Rolling Windows

Industrial - Anchored window

APPENDIX C: SUSTAINABLE CAPITAL VALUE

Figure C54: Ex-ante Approach 2 – Implied Correction in Capital Value vs. Subsequent Five Year Outturn in CBRE Series – Sector Level

Office - Rolling Windows

— Capital Value Change — Reversion to Equilibrium

Office - Anchored Windows

— Capital Value Change — Reversion to Equilibrium

Retail - Rolling Windows

— Capital Value Change — Reversion to Equilibrium

Retail - Anchored Windows

— Capital Value Change — Reversion to Equilibrium

Industrial - Rolling Windows

— Capital Value Change — Reversion to Equilibrium

Industrial - Anchored window

— Capital Value Change — Reversion to Equilibrium

APPENDIX C: SUSTAINABLE CAPITAL VALUE

Appendices for Section 3.4.4

Table C4: Forecast Accuracy for Models, based on MSCI Sector Level Capital Value

	Rolling Windows				Anchored Windows			
	ME	MAE	RMSE	U1	ME	MAE	RMSE	U1
A: Office								
AMV	NA	NA	NA	NA	22.1	23.7	27.2	0.56
Econometrics model	18.1	19.6	25.0	0.56	20	22.3	30.3	0.72
Ex-ante required return (1)	14.3	17.3	21.7	0.52	11.4	19	23.4	0.6
Ex-ante sticky required return (2)	24.6	25.3	29.7	0.65	21.6	24.2	30.4	0.73
B: Retail								
AMV	NA	NA	NA	NA	16.5	21.8	29.6	0.65
Econometrics model	13.4	18.4	26.3	0.61	19.6	20.8	27.5	0.63
Ex-ante required return (1)	11.4	15.1	21.4	0.5	12.6	16.2	21.6	0.53
Ex-ante sticky required return (2)	23	23.9	29	0.61	24.3	25.1	29.7	0.65
C: Industrial								
AMV	NA	NA	NA	NA	18.9	22.9	28.2	0.57
Econometrics model	17.2	23.3	30.9	0.58	21.9	23.7	29.8	0.61
Ex-ante required return (1)	15.3	19.7	26.6	0.52	16.3	19.9	25.3	0.54
Ex-ante sticky required return (2)	22.8	25	31.4	0.58	24.1	25.2	30.7	0.62

Table C5: Forecast Accuracy for Models, based on MSCI Sector Level Capital Value

	Rolling Windows				Anchored Windows			
	ME	MAE	RMSE	U1	ME	MAE	RMSE	U1
A: Office								
AMV	NA	NA	NA	NA	17.4	22.2	27.6	0.56
Econometrics model	14.1	20.1	25.4	0.54	21.4	24.4	33.7	0.69
Ex-ante required return (1)	16.3	20.5	25.3	0.53	18.7	22.6	27.7	0.60
Ex-ante sticky required return (2)	26.4	27.2	33.2	0.63	29.2	30.4	36.0	0.69
B: Retail								
AMV	NA	NA	NA	NA	4.1	13.5	19.7	0.49
Econometrics model	9.7	15.1	22.4	0.54	16.2	17.1	23.6	0.59
Ex-ante required return (1)	9.2	12.4	18.3	0.47	10.9	15.8	20.0	0.54
Ex-ante sticky required return (2)	19.6	20.2	24.8	0.59	21.5	23.1	27.1	0.67
C: Industrial								
AMV	NA	NA	NA	NA	22.4	24.6	29.4	0.62
Econometrics model	4.1	13.5	19.7	0.49	20.4	22.2	28.1	0.62
Ex-ante required return (1)	16.2	17.1	23.6	0.59	17.6	19.4	23.6	0.56
Ex-ante sticky required return (2)	10.9	15.8	20.0	0.54	25.8	26.3	30.2	0.66

APPENDIX C: SUSTAINABLE CAPITAL VALUE

Table C6: Forecast Accuracy for Models, based on CBRE Sector Level Capital Value

	Rolling Windows				Anchored Windows			
	ME	MAE	RMSE	U1	ME	MAE	RMSE	U1
A: Office								
AMV	NA	NA	NA	NA	39.4	39.8	45.8	0.59
Econometrics model	23	28.5	35.5	0.66	32.2	34.4	43.5	0.80
Ex-ante required return (1)	21.6	24.8	31.4	0.55	28.4	32.1	39.4	0.67
Ex-ante sticky required return (2)	34.1	34.5	41.3	0.68	41.9	42.8	50.8	0.78
B: Retail								
AMV	NA	NA	NA	NA	13.2	16.9	23.9	0.50
Econometrics model	16.8	19.5	25.5	0.56	26.7	26.9	32.7	0.70
Ex-ante required return (1)	12.9	16.6	22.4	0.48	17.9	21.5	26.6	0.59
Ex-ante sticky required return (2)	26.9	27.9	32.6	0.68	32.8	33.3	38.5	0.76
C: Industrial								
AMV	NA	NA	NA	NA	32.9	34	39.4	0.67
Econometrics model	27.4	29.6	36.6	0.70	36.1	36.5	41.5	0.76
Ex-ante required return (1)	18.9	22.9	27.6	0.52	21.7	26.1	29.6	0.58
Ex-ante sticky required return (2)	27.7	29.9	34.4	0.67	30.9	33	37.1	0.74

APPENDIX D: BIBLIOGRAPHY

Sustainable Rent References

Adams, Z. and Füss, R. (2012). **Disentangling the Short and Long-Run Effects of Occupied Stock in the Rental Adjustment Process.** Journal of Real Estate Finance and Economics, 44 (4): 570-590.

Ball, M. and Tsolacos, S. (2002). **UK Commercial Property Forecasting: the Devil is in the Data.** Journal of Property Research, 19 (1): 13-38.

Brooks, C. and Tsolacos, S. (2010). **Real Estate Modelling and Forecasting.** Cambridge: Cambridge University Press.

Brounen, D. and Jennen, M. (2009a). **Asymmetric Properties of Office Rent Adjustment.** Journal of Real Estate Finance and Economics, 39 (3): 336-358.

Brounen, D. and Jennen, M. (2009b). **Local Office Rent Dynamics: A Tale of Ten Cities.** Journal of Real Estate Finance and Economics, 39 (4): 385-402.

Bruneau, C. and Cherfouh, S. **(2015). Long-run equilibrium for the Greater Paris office market and short-run adjustments.** Journal of Property Research, 32 (4): 301-323.

Cardozo, C., Clarke, R., Crosby, N. and McTique, J. (2017). **Long-term Value Methodologies and Real Estate Lending.** Report for the Property Industry Alliance. London: Investment Property Forum / Commercial Real Estate Finance Council Europe.

Chau, K. W. and Wong, S. K. (2016). I**nformation Asymmetry and the Rent and Vacancy Rate Dynamics in the Office Market.** Journal of Real Estate Finance and Economics, 53 (2): 162-183.

Chervachidze, S., Costello, J. and Wheaton, W. (2009). **The Secular and Cyclic Determinants of Capitalization Rates: The Role of Property Fundamentals, Macroeconomic Factors and "Structural Changes".** Journal of Portfolio Management, 35 (5): 50-69.

Chervachidze, S. and Wheaton, W. (2013). **What Determined the Great Cap Rate Compression of 2000–2007, and the Dramatic Reversal During the 2008–2009 Financial Crisis?** Journal of Real Estate Finance and Economics, 46 (2): 208-231.

Crook, T. and Sharp, G. (2010), **Development of construction statistics.** Economic & Labour Market Review, 4 (3): 52-58.

Crosby, N., Hughes, C. and Murdoch, S. (2005). **Monitoring the 2002 Code of Practice for commercial leases.** London: Office of the Deputy Prime Minister.

Crosby, N., Hughes, C. and Murdoch, S. (2006). **Flexible property leasing and the small business tenant.** Journal of Property Research, 23 (2): 163-188.

De Francesco, A. J. (2008). **Time-Series Characteristics and Long-Run Equilibrium for Major Australian Office Markets.** Real Estate Economics. 36 (2): 371-402.

Department of the Environment (1995). **Commercial and Industrial Floorspace Statistics 1995.** London: HMSO.

DETR (2000). **Monitoring the Code of Practice for Commercial Leases.** London: Department of the Environment, Transport and the Regions.

APPENDIX D: BIBLIOGRAPHY

Sustainable Rent References con'td

Diebold, F. X. and Mariano, R. S. (1995). **Comparing Predictive Accuracy.** Journal of Business & Economic Statistics, 20 (1): 134-144.

Englund, P., Gunnelin, Å., Hendershott, P. H. and Söderberg, B. (2008). **Adjustment in Property Space Markets: Taking Long-Term Leases and Transaction Costs Seriously.** Real Estate Economics, 36 (1): 81-109.

Hendershott, P. H. (1996). **Rental Adjustment and Valuation in Overbuilt Markets: Evidence from the Sydney Office Market.** Journal of Urban Economics, 39: 51-67.

Hendershott, P. H. and MacGregor, B. D. (2005a). **Investor Rationality: Evidence from U.K. Property Capitalization Rates.** Real Estate Economics, 33 (2): 299-322.

Hendershott, P. H. and MacGregor, B. D. (2005b). **Investor Rationality: An Analysis of NCREIF Commercial Property Data.** Journal of Real Estate Research, 27 (4): 445-475.

Hendershott, P. H., Jennen, M. and MacGregor, B. D. (2013). **Modeling Space Market Dynamics: An Illustration Using Panel Data for US Retail.** Journal of Real Estate Finance and Economics, 47 (4): 659-687.

Hendershott, P. H., Lizieri, C. M. and MacGregor, B. D. (2010). **Asymmetric Adjustment in the City of London Office Market.** Journal of Real Estate Finance and Economics, 41 (1): 80-101.

Hendershott, P. H., MacGregor, B. D. and Tse, R. Y. C. (2002). **Estimation of the Rental Adjustment Process.** Real Estate Economics, 30 (2): 165-183.

Hendershott, P., MacGregor, B. and White, M. (2002). **Explaining Real Commercial Rents Using an Error Correction Model with Panel Data.** Journal of Real Estate Finance and Economics, 24 (1/2): 59-87.

Ibanez, M. R. and Pennington-Cross, A. (2013). **Commercial Property Rent Dynamics in U.S. Metropolitan Areas: An Examination of Office, Industrial, Flex and Retail Space.** Journal of Real Estate Finance and Economics, 46 (2): 232-259.

Ke, Q. and White, M. (2015). **Retail rent dynamics in two Chinese cities.** Journal of Property Research, 32 (4): 324-340.

Ling, D. C. (2005). **A Random Walk Down Main Street: Can Experts Predict Returns on Commercial Real Estate?** Journal of Real Estate Research, 27 (2): 137-154.

Lizieri, C. (2010). **Towers of Capital: Office Markets and International Financial Services.** Chichester: Wiley-Blackwell.

Matysiak, G., Papastamos, D. and Stevenson, S. (2012). **Reassessing the Accuracy of UK Commercial Property Forecasts.** London: Investment Property Forum.

McAllister, P., Newell, G. and Matysiak, G. (2006). **Disagreement and Uncertainty in UK Property Market Forecasts.** London: Investment Property Forum.

McAllister, P., Newell, G. and Matysiak, G. (2008). **Agreement and Accuracy in Consensus Forecasts of the UK Commercial Property Market.** Journal of Property Research, 25 (1): 1-22.

McCartney, J. (2012). **Short and long-run rent adjustment in the Dublin office market.** Journal of Property Research, 29 (3): 201-226.

Mouzakis, F. and Richards, D. (2007). **Panel Data Modelling of Prime Office Rents: A Study of 12 Major European Markets.** Journal of Property Research, 24 (1): 31-53.

APPENDIX D: BIBLIOGRAPHY

Sustainable Rent References con'td

ODPM (2006). **Commercial and Industrial Floorspace Statistics 1974-1985.** London: Office of the Deputy Prime Minister.

Papastamos, D., Matysiak, G. and Stevenson, S. (2015). **Assessing the accuracy and dispersion of real estate investment forecasts.** International Review of Financial Analysis, 42: 141-152.

Stevenson, S. (2007). **Exploring the Intra-Metropolitan Dynamics of the London Office Market.** Journal of Real Estate Portfolio Management, 13 (2): 93-98.

TEGoVA (2016). **European Valuation Standards (8e).** The European Group of Valuers' Associations.

Theil, H. (1966). **Applied Economic Forecasting.** Amsterdam: North-Holland.

Thiel, H. (1971). **Principles of Econometrics.** Amsterdam: North-Holland.

Tsolacos, S. (2006). **An assessment of property performance forecasts: consensus versus econometric.** Journal of Property Investment & Finance, 24 (5): 386-399.

White, M. and Ke, Q. (2014). **Investigating the dynamics of, and interactions between, Shanghai office submarkets.** Journal of Property Research, 31 (1): 26-44.

Sustainable Capital Value References

Ambrose, B., & Nourse, H. (1993). **Factors influencing capitalization rates.** Journal of Real Estate Research, 8(2), 221-237.

Ambrose, B. W., Eichholtz, P., & Lindenthal, T. (2013). **House prices and fundamentals: 355 years of evidence.** Journal of Money, Credit and Banking, 45(2-3), 477-491.

Asness, C. S., Moskowitz, T. J., & Pedersen, L. H. (2013). **Value and momentum everywhere.** The Journal of Finance, 68(3), 929-985.

Banerjee, A. V. (1992). **A simple model of herd behavior.** The quarterly journal of economics, 107(3), 797-817.

Bean, C. R., Broda, C., Itō, T., & Kroszner, R. (2015). **Low for long?: Causes and consequences of persistently low interest rates.** CEPR Press.

Bikhchandani, S., Hirshleifer, D., & Welch, I. (1992). **A theory of fads, fashion, custom, and cultural change as informational cascades.** Journal of political Economy, 100(5), 992-1026.

Bikhchandani, S., & Sharma, S. (2000). **Herd behavior in financial markets.** IMF Staff papers, 47(3), 279-310.

Blanchard, O. J., & Watson, M. W. (1982). **Bubbles, Rational Expectations and Financial Markets (No. 0945).** National Bureau of Economic Research, Inc.

Campbell, J. Y., & Shiller, R. J. (1987). **Cointegration and tests of present value models.** Journal of political economy, 95(5), 1062-1088.

Campbell, J. Y., & Shiller, R. J. (1988). **The dividend-price ratio and expectations of future dividends and discount factors.** The Review of Financial Studies, 1(3), 195-228.

Chan, L. K., Jegadeesh, N., & Lakonishok, J. (1996). **Momentum strategies.** The Journal of Finance, 51(5), 1681-1713.

APPENDIX D: BIBLIOGRAPHY

Sustainable Capital Value References cont'd

Chen, J., S. Hudson-Wilson and N. Nordby. 2004. **Real Estate Pricing: Spreads & Sensibilities: Why Real Estate Pricing is Rational.** Journal of Real Estate Portfolio Management 10: 1–22.

Chervachidze, S., Costello, J., & Wheaton, W. (2009). **The Secular and Cyclic Determinants of Capitalization Rates: The Role of Property Fundamentals, Macroeconomic Factors, and" Structural Changes".** Journal of Portfolio Management, 35(5), 50.

Chervachidze, S., & Wheaton, W. (2013). **What determined the Great Cap Rate Compression of 2000–2007, and the dramatic reversal during the 2008–2009 Financial Crisis?.** The Journal of Real Estate Finance and Economics, 46(2), 208-231.

Chiang, T. C., & Zheng, D. (2010). **An empirical analysis of herd behavior in global stock markets.** Journal of Banking & Finance, 34(8), 1911-1921.

Clayton, J., Ling, D. C., & Naranjo, A. (2009). **Commercial real estate valuation: fundamentals versus investor sentiment.** The Journal of Real Estate Finance and Economics, 38(1), 5-37.

De Long, J. B., Shleifer, A., Summers, L. H., & Waldmann, R. J. (1990). **Positive feedback investment strategies and destabilizing rational speculation.** The Journal of Finance, 45(2), 379-395.

Duca, J. V., & Ling, D. C. (2018). **The other (commercial) real estate boom and bust: the effects of risk premia and regulatory capital arbitrage.** Journal of Banking & Finance.

Evans, G. W. (1991). **Pitfalls in testing for explosive bubbles in asset prices.** The American Economic Review, 81(4), 922-930.

Francke, M. (2018). **Understanding Real Estate Illiquidity Premiums Better.** INREV.

Gordon, M. J. (1962). **The investment, financing, and valuation of the corporation.** RD Irwin.

Hendershott, P. H., & MacGregor, B. D. (2005a). **Investor rationality: evidence from UK property capitalization rates.** Real Estate Economics, 33(2), 299-322.

Hendershott, P. H., & MacGregor, B. D. (2005b). I**nvestor rationality: An analysis of NCREIF commercial property data.** Journal of Real Estate Research, 27(4), 445-475.

Jegadeesh, N., & Titman, S. (1993). **Returns to buying winners and selling losers: Implications for stock market efficiency.** The Journal of finance, 48(1), 65-91.

Jud, D., & Winkler, D. (1995). **The capitalization rate of commercial properties and market returns.** Journal of Real Estate Research, 10(5), 509-518.

Maug, E., & Naik, N. (1996). **Herding and delegated portfolio management.** IFA working Paper 223-1996.

Nofsinger, J. R., & Sias, R. W. (1999). **Herding and feedback trading by institutional and individual investors.** The Journal of finance, 54(6), 2263-2295.

Phillips, P. C., Wu, Y., & Yu, J. (2011). **Explosive behavior in the 1990s Nasdaq: When did exuberance escalate asset values?** International economic review, 52(1), 201-226.

Phillips, P. C., Shi, S., & Yu, J. (2015). T**esting for multiple bubbles: Historical episodes of exuberance and collapse in the S&P 500.** International Economic Review, 56(4), 1043-1078.

Plazzi, A., Torous, W., & Valkanov, R. (2010). **Expected returns and expected growth in rents of commercial real estate.** The Review of Financial Studies, 23(9), 3469-3519.

APPENDIX D: BIBLIOGRAPHY

Sustainable Capital Value References cont'd

Prendergast, C., & Stole, L. (1996). **Impetuous youngsters and jaded old-timers: Acquiring a reputation for learning.** Journal of political Economy, 104(6), 1105-1134.

Rachel, L., & Smith, T. D. (2015). **Staff Working Paper No. 571** Secular drivers of the global real interest rate.

Rajan, R. G. (1994). **Why bank credit policies fluctuate: A theory and some evidence.** The Quarterly Journal of Economics, 109(2), 399-441.

Scharfstein, D. S., & Stein, J. C. (1990). **Herd behavior and investment.** American Economic Review, 80(3), 465-479.

Shiller, R. J. (1981). **Do Stock Prices Move Too Much to be Justified by Subsequent Changes in Dividends?** The American Economic Review, 71(3), 421-436.

Sivitanides, P., Southard, J., Torto, R. G., & Wheaton, W. C. (2001). **The determinants of appraisal-based capitalization rates.** Real Estate Finance, 18(2), 27-38.

Trueman, B. (1994). **Analyst forecasts and herding behavior.** The Review of Financial Studies, 7(1), 97-124.

Welch, I. (1992). **Sequential sales, learning, and cascades.** The Journal of finance, 47(2), 695-732.

West, K. D. (1987). **A specification test for speculative bubbles.** The Quarterly Journal of Economics, 102(3), 553-580.

Wheaton, W. C. (1999). **Real estate "cycles": some fundamentals.** Real estate economics, 27(2), 209-230.

Zwiebel, J. (1995). **Corporate conservatism and relative compensation.** Journal of Political economy, 103(1), 1-25.

Capital Value and Other Indicator References

Adrian, T. and Shin H. (2010) **Liquidity and Leverage.** Journal of Financial Intermediation, 19, 418-437

Barras, R. (1984) **The Office Development Cycle in London,** Land Development Studies, 1, 35-50

Brounen, D., & Laak, M. (2005). **Understanding the discount – Evidence from European property shares.** Journal of Real Estate Portfolio Management, 11, 241–251

Brunnermeier, M. (2009), **Deciphering the liquidity and credit crunch 2007–2008.** Journal of Economic Perspectives, 23, 77–100.

Brunnermeier, M. and Pedersen, L. (2009). **Market Liquidity and Funding Liquidity.** The Review of Financial Studies, 22, 6, 2009, 2201–2238

Clayton, J., Ling, D. and Naranjo, A. (2009). **Non-residential Real Estate Valuation: Fundamentals versus Investor Sentiment.** Journal of Real Estate Finance and Economics, 38, 5–37.

Geanakoplos, J. (2010). **The Leverage Cycle,** NBER Macroeconomics Annual 2010, 24:1, 1-66

Hoesli, M. and Oikarinen, E. (2012). **Are REITs real estate? Evidence from international sector level data.** Journal of International Money & Finance, 31, 1821-1850

Ke, Q. (2015). **What affects the discount to net asset value in the UK-listed property companies?** Journal of Property Research, 32, 240-257.

Kim, D, and Wiley, J. (2019). **NAV Premiums & REIT Property Transactions.** Real Estate Economics, 47, 138-177.

APPENDIX D: BIBLIOGRAPHY

Capital Value and Other Indicator References cont'd

Krystalogianni, A., Matysiak, G. & Tsolacos, S. (2004). **Forecasting UK commercial real estate cycle phases with leading indicators: A probit approach.** Applied Economics 36, 2347-2356.

Ling, D., Naranjo, A. and Scheick, B. (2013). **Investor Sentiment, Limits to Arbitrage, and Private Market Returns.** Real Estate Economics, 2013, 41:2, 1–47.

Marcato, G. and Nanda, A. (2016). **Information Content and Forecasting Ability of Sentiment Indicators: Case of Real Estate Market.** Journal of Real Estate Research, 38, 165-203

Oikarinen, E., Hoesli, M., Serrano, C., (2011). **The long-run dynamics between direct and securitized real estate.** Journal of Real Estate Research 33, 73–104.

Reid, M. (1982). **The secondary banking crisis, 1973-75: Its causes and course.** London: MacMillan

Scott, P. (1996). **The New Alchemy: Veblen's Theory of Crisis and the 1974 British Property and Secondary Banking Crisis.** Journal of Economic Issues 30(1), 1-11
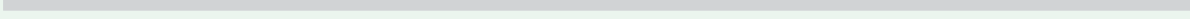
Tsolacos, S. (2012). **The Role of Sentiment Indicators for Real Estate Rent Forecasting.** Journal of European Real Estate Research, 5, 109-120

Tsolacos, S., Brooks, C. and Nneji. O. (2016). **On the Predictive Content of Leading Indicators: The Case of U.S. Real Estate Markets.** Journal of Real Estate Research, 36; 541–73.

World Economic Forum (2016). **Understanding the Commercial Real Estate Investment Eco-System: An Early Warning System Prototype.** World Economic Forum, Geneva, pp40.

World Economic Forum (2015). **Mind the gap: The building cycle in the 1974 London office market,** in An Industry Initiative on Asset Price Dynamics Executive Case Studies, World Economic Forum, Geneva, pp52

Yavas, A. and Yildirim, Y. (2011). **Price discovery in real estate markets: A dynamic analysis.** Journal of Real Estate Finance and Economics 42, 1–29.

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