Property Portfolio Management - Monitoring, Managing and Mitigating Property *Market Risk*

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Abstract:

This paper examines portfolio risk management techniques and tools, commonly used in equity and bond portfolios, to: measure, manage and mitigate property *market risk* / "beta". The techniques used to measure and manage property market risk uses annual historical capital value returns of UK indices (Peter Scott's data from 1920 and MSCI-IPD Data from 1972). These values are then adjusted for inflation and a trend line is established to form a dynamic gauge identifying where we are in the property cycle by indicating when the market is over / undervalued, based off historical metrics. By measuring and monitoring the property market practitioners (asset allocators / fund managers / risk managers) can use an innovative beta risk management tool (MSCI-IPD Futures) to apply "risk on" / "risk off" strategies at specific points in the cycle. Whilst the analysis and approach was applied to the UK property investment market, the approach can be applied to any property market where high quality historical data is evident and where a listed futures market has developed.

Keywords: Property Beta, Portfolio Risk Management, property market risk, multi asset, diversification, IPD Futures, UK

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1. Introduction

Real estate is an illiquid, lumpy, heterogeneous asset class and trading costs are high (c.8.5%[1] round trip costs when buying and selling an asset). As a consequence investors view the asset class as "long only" (i.e. capital flows into the asset class to be invested directly into real estate assets with a capital tie up period of between 5 – 7 years). These structural issues have predominated since the commercial property investment market started becoming more mainstream from the 1960's onwards.

1.1 Property Risks

There are several risks associated with owning and managing a property. The primary risks associated with a property asset can be listed as: tenant default risk, covenant risk, voids, fire, health and safety. The primary risks associated with owning and managing a property portfolio could be extended to include: credit risk; commodity risk; concentration risk; market risk; interest rate risk; currency risk; equity risk; liquidity risk; refinancing risk; operational risk; legal risk; political risk; reputational risk; volatility risk; settlement risk; profit risk; and systemic risk. [2]

1.2 Investment Risk and Property Beta

Investment risk can be broken down into two elements: 1) Beta - systematic risk / market risk and 2) Alpha - unsystematic risk / specific risk. Systematic risk (beta) is the risk-return profile delivered by the market and unsystematic risk (alpha) is referred to as the risk-return profile delivered through stock selection. Property beta is the measure of the sensitivity of returns of a building to changes in the overall property market. Systematic risk reflects the tendency of assets to move together and to be exposed to the risk of the drivers (changes in market prices and rates) behind this correlation. In the case of this research the 'market,' or 'property beta', is the 'IPD UK All Property Capital Returns Index.'

A common expression for beta is:

$$\beta = \frac{\mathrm{Cov}(r_a, r_b)}{\mathrm{Var}(r_b)},$$

where Cov and Var are the covariance and variance operators.

[1] Tom Elliott, Investment Surveyor, Land Securities (April, 2016)

[2] "Assessing Real Estate Risk - Applied Models, Concepts, Methods" Nicole Lux, Sept. 2012

1.3 Traditional Asset Allocation Approach (SAA / TAA)

The traditional approach to portfolio allocation involves strategic asset allocation (SAA) and tactical asset allocation (TAA) strategies undertaken either in isolation or in conjunction with each other. Strategic asset allocation involves long term, high level target allocations for the portfolio. These decisions are based on the constraints and risk / return preferences of the investor. If there is no active management, the strategic allocation decision is the only one that must be made. Tactical asset allocation decisions are those that active managers make to capitalise on opportunities identified in the market. Tactical asset allocation decisions alter systematic risks of the portfolio in order to earn higher risk-adjusted returns, potentially with the goal of earning alpha by timing beta exposures in the market. Given the nature of real estate investing (high transaction costs and long term capital lock up) most of the SAA and TAA at large institutions is devolved from the property team, although a certain amount of TAA occurs at the segment level. When targeting superior risk-adjusted returns this will involve finding good investment properties (effective stock picking). For real estate investors targeting superior risk-adjusted returns this is most easily achieved by choosing the best fund managers.

1.4 Monitoring the Property Market – Benchmarking & Tracking Error

The most effective way of monitoring a market is to benchmark its performance. This has been undertaken in the UK by the Investment Property Databank (IPD – now owned and managed by MSCI) since the early 1980's, although they have data going back to the early 1970's. The IPD measures ungeared total returns to directly held standing property investments from one open market valuation to the next.[3] It is possible to use earlier data provided by Peter Scott from 1920 – 1939 (interrupted due to the war) but picking up again in 1947. [4] The measure by which a portfolio's returns deviate from the benchmark return over a defined time period is known as the tracking error:

$$TE = \sqrt{\frac{\sum_{i=1}^{n}(R_P - R_B)^2}{N-1}}$$

Where:

TE = Tracking Error
R_P = Return of Manager or Fund
R_B = Return of Benchmark
N = Number of Return Periods

The tracking error could be used as a proxy to measure the risk in an investment portfolio resulting from active management decisions made by the portfolio manager.

[3] "IPD UK Quarterly Index Headline," Q1, 2016 taken from MSCI Website: www.msci.com

[4] P Scott 'The Property Masters', E & FN Spon, 1996

1.5 Differences / Deficiencies in Real Estate as an Asset Class

The differences in real estate look like deficiencies when compared to equities or bonds. The intricacies and idiosyncrasies of this heterogeneous asset class define it as "alternative." For example, compared to equities and bonds which are dynamically priced by the second during trading hours, buildings are valued, at best monthly. The IPD Capital Value Indices are appraisal based. Appraised indices are used where price information is scarce and a sample is required as it is impracticable to consider the whole market. RICS Red Book Valuation methodology is used to establish the market value of properties that are legally required to be valued on a regular basis for performance measurement purposes. Most buildings are valued at least once a year. The highest frequency an institution is required to value its assets is monthly, but this is a relatively small sample size. Given that these indices are valuations based, smoothing is a factor that needs to be considered. The RICS 'Red Book' provides guidance on the open market value of properties and defines market value, as: "…the estimated amount for which a property should exchange on the date of valuation between a willing buyer and a willing seller in an arm's-length transaction after proper marketing wherein the parties had each acted knowledgeably, prudently and without compulsion". [5] Whilst the Red Book guidance on property market value is best in class it is not by any means perfect and there are additional issues, other than frequency of valuation, associated with real estate valuations that are not prevalent in the equity or bond markets, such as:

- Backwards looking – valuations are almost immediately out of date as soon as they are released as they use historical and possibly stale comparable data.
- Smoothing - given values are appraisal based, smoothing may result in lower price volatility, lower return volatility, assets appearing less risky than they actually are and assets appearing to improve the risk / reward characteristics of a portfolio more than they actually do.
- Autocorrelation of returns – occurs when the return in one period is directly related to the return from the prior period. This is evident in real estate, in part, due to the use of comparable evidence.
- Indicative not tradeable – just because a building is given a 'market value' does not mean to say it will trade at that level. Market participants calculate the level at which they would feel comfortable bidding for that building by calculating the building's 'investment value' or 'worth.' This is a highly subjective calculation as can be seen by how it is defined: "the value of an asset to the owner or a prospective owner for individual investment or operational objectives." [6]

1.6 Property Cycles

The property cycle seems inevitable. Over the 43 year period since 1972 there have been 3 significant cycles. Despite this inevitability, a correction in the property cycle always seems to catch market participants off guard.
Much is written about asset bubbles and what constitutes or defines a bubble in markets. "There is a bubble if the price of asset first increases dramatically and then almost immediately falls dramatically." (Lind, 2008) In this approach we define a property 'bubble' measure as the percentage by which the inflation adjusted (real), capital value index exceeds the long term trend for the index. In this case by 20%. We defined the subsequent market

[5] RICS Valuation - Professional Standards January 2014, (RICS Nov 2013, 9th Edition)

[6] RICS Valuation - Professional Standards January 2014, (RICS Nov 2013, 9th Edition)

correction as the maximum fall in value of the real index at any time over the subsequent 5 year period. Since 1972 there have been 3 cycles (4 if Peter Scott's data going back to 1920 is included) in the UK capital value index where growth has exceeded the long term trend by 20% or more, only to be followed by an inflation-adjusted downturn in the following 5 years of 30% or more. These peak / trough attributes were similar for each cycle although each cycle had differing drivers. We are currently in the fourth property cycle since 1972. Despite the prevalence of cyclicality lenders and investors always seem to be caught unawares. In addition, during downturns, liquidity may dry up in the market place further exacerbating downwards momentum.

1.7 Purpose of paper

The approach put forward in this paper will not solve the cyclicality of the property cycle, nor does it forecast turning points, but it may give practitioners more certainty and information about where we are along the property cycle continuum and provide a red flag indicating when bubble territory is reached and hence give some fore-warning of an impending downturn. Such vision and knowledge of where the cycle is in its natural evolution may enable prudent investors and lenders to deploy countercyclical methods at critical specific moments in the cycle and hence better protect capital values during the inevitable market downturn. IPD Futures contracts are one such property beta risk management tool and can help fund managers to apply "risk on" / "risk off" strategies on an annual basis through the property cycle depending on where we are through the cycle.

1.8 Motivation and contribution

Tools to mitigate property market risk are now available to the property practitioners who are already monitoring and managing property market risk but now are able to mitigate it too, using the same tools and techniques that have been used in the equity and bond markets for the last 3 decades – that being listed futures contracts enabling hedging and portfolio overlay strategies. Such risk management at the property market level is redundant without efficient tracking and monitoring of the market and the approach in this paper helps to identify points of over / under valuation (i.e. turning points once a ceiling / peak or a floor / trough) when the market is cheap or expensive without forecasting inflection points. Property beta is driven by a multitude of different factors and these factors vary in their weighted significance from cycle to cycle. Whilst property fundamentals play a large part (e.g. rental value growth and capitalisation rates) and these metrics can give a good measure as to whether the market is fundamentally over or undervalued by historic terms, inflection points in the cycle are mostly determined by capital market factors (e.g. credit availability, GDP growth and interest rates) which is why the market can remain fundamentally overvalued, relative to historical norms, for up to five years.

2. Property Portfolio Management

2.1 Bottom Up vs Top Down:

Property portfolios are mostly managed from the bottom up i.e. at the asset specific level. The idea being that if every asset is 'sweated' through the application of good asset management then collectively the portfolio will perform at its optimum level. The characteristics of property investment make it a long only, cumbersome, expensive, time intensive, labour intensive and mid to long term investment class. Property Portfolio managers have always managed their portfolios at the asset specific level within the context of various market environments impacting on these asset management plans. Until recently the idea of managing and executing strategically at the portfolio level has not been considered as the tools have not existed. Now, however, it is possible to trade MSCI-IPD Property Index Futures to 'buy' or 'sell' exposure as a proxy for buying / selling property market risk and returns. This disruptive innovation is enabling a whole host of property portfolio strategies available in real time managers to

2.2 Property Risk Management – Monitoring & Measuring:

Whilst the industry is good at identifying risks, it lacks the tools by which to manage and mitigate these risks. "Drawing the threads of the research together it appears that the methods for measuring and controlling risks available to property investors currently fail to match the variety of risks they are capable of identifying. So what appears as a very diverse and multi-dimensional problem is being attacked through a highly restricted and perhaps inappropriate set of methods and techniques."[7]

There remains a dis-connect in organisations between the identification and tracking of risk and the management and mitigation of risk. This is because these two functions are divorced from each other. For example, multi asset managers may be involved in the Tactical Asset Allocation or the Strategic Asset Allocation at the decision making level but responsibility for execution (i.e. the management and mitigation of risk) is devolved to the real estate team.

Further IPF Research in 2002 set out the measures and methods applied to the management of risk in other asset classes which, the report suggested, set a rigorous standard to which property managers should aspire.[8] These risk management techniques were assessed in additional research disseminated in 2007.[9] For this study, face to face interviews were conducted with senior managers and researchers in 20 leading fund management businesses with £145bn of assets under management.

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7 "The Assessment and Management of Risk in the Property Investment Industry" IPF March, 2000

8 "Risk Measurement and Management for Real Estate Investment Portfolios" IPF, 2002

9 "Risk Management in UK Property Portfolios: A Survey of Current Practice" IPF, November 2007

The results show that property practitioners follow a common broad approach to risk based on investment processes at both the portfolio ("top down") and the asset level ("bottom up"), 'operated within a general framework of market forecasts and discounted cash flow appraisal.'

All respondents stated that they use economic and property market forecasts (12 of the 20 houses produced in-house forecasts) as an input to their assessment of future portfolio risk cash flow models (15 houses) and discounted cash flow (DCF) analysis, over varying time periods (predominantly 3-5 years), when evaluating individual assets. However there is wide divergence in risk adjustments in asset level appraisals with some (9) preferring scenario testing, sensitivity analysis or qualitative judgements. The remaining 11 respondents adjust either their "required return" or their "expected cash flow" or "both" when considering the following risk factors: volatility of rental value growth and void risks as the key risks (100% of those 11 respondents) and the majority also taking account of factors such as tenant default, break clauses, variation in exit yield (91% of those 11 respondents) and Rent Reviews, Tenant default and Depreciation (81% of those 11 respondents). The issues and conclusions of the report are listed below:

"But within that general picture there are big differences in the details:

- Nine out of 20 managers are not using quantitative risk management techniques at both portfolio and asset levels, and even in organisations that do utilise such techniques they are often given less weight than scenario based asset appraisals.

- Only three fund managers are using advanced statistical methods (like Monte Carlo simulation) which would be regarded as standard practice in other asset classes.

The lack of adoption generally of more sophisticated methods does not reflect a lack of concern about risk, or a lack of knowledge about risk management methods. The barriers to more sophisticated risk management in property are perceived as:

- The lack of robust data to quantify the risk characteristics of property assets.

- Methodological problems in applying formal risk adjustments to property appraisals which are potentially influenced by many interlocking market, leasing, tenancy and physical factors.

Property managers may still stand accused, at the worst, of incorrectly assessing risk, or at the minimum of failing to address potential biases in their investment decisions introduced by implicit rather than explicit methods of dealing with risk. Organisations that do utilise quantitative risk adjustment techniques were often not producing guidelines, providing data analysis to calibrate the process or back testing the results to measure the success rate of the decision making process. It is not surprising that these organisations often referred to internal confusion regarding the correct use of the process and in particular how to populate each field to avoid 'double counting' for risk." [10]

10 "Risk Management in UK Property Portfolios: A Survey of Current Practice" IPF, November 2007

3. Hypothesis Development

3.1 Can we determine if Commercial Real Estate markets are over or under-valued by examining current market index levels against long term trends?

This study examines long run trends in the capital returns of UK IPD Indices. Hence the starting point is to adjust these capital returns for inflation and find a line of best fit.

MAt= CVIt /(Ae (-bt)) -1 where A and b are the best fit parameters for [CVI(t) /RPIt)] t= 0-T

(MAt = Market adjustment factor – i.e. the level which the market is deviating from its long run average above or below the line of best fit).

Once the line of best fit has been applied, it will be possible to identify when the market surpasses 20% above its long run average and hits "bubble territory." The model implies a "market correction" will follow. A "market correction" is defined, "following time t if the real index fell by more than 30% at any time during the next 5 years." The choice of 5 years is arbitrary but reflects the average lending term[11] for CRE lending and is a common investment horizon, often described as 'medium term'. Therefore the first hypothesis is as follows:

H1: If MAt ≥ 20% then Market Correction will follow within 5 years

3.2 If so, how predictive has the approach been of subsequent market corrections?

Assuming the hypothesis above is proven it would make sense to analyse the 'ex post' time series data to see how "predictive" the model is in terms of correctly predicting a 30% or more market correction (MaxFall) within a 5 year time frame. This can be done using two methods:

1. Correlation Analysis -

    a. The normal warnings about correlation and causation notwithstanding, the results may provide some support for the usefulness of the approach.

    H2: If there is a high negative correlation between MAt and Market Correctionl (i.e. ≥ 70%) then the model shows strong relevance

2. GINI Coefficient Analysis –
    a. If Hypothesis 1 is proven and the "bubble measure" appears to be predictive of subsequent market corrections, and Hypothesis 2 shows strong relevance a GINI coefficient test can be applied to the approach to assess the level of predictiveness of a market correction. This can be done by ranking the bubble measure for each quarter in the time series and testing it for predictiveness of a market correction, calculating the GINI coefficient.

[11] The De Montfort Commercial Property Lending Report, May 2016

H3: MCt = 1 if (Min [CVIt/RPIt](t=0 to t+5)/CVIt – 1)<-30% else 0

3.3 Is it possible to be countercyclical to avoid radical losses in a downturn?

Assuming the model gives investors / practitioners an indication of where the market is on the property cycle continuum and is able to flag whether the market is growing above or below its long run average (and by how much) this could provide indications of when to apply countercyclical "risk on" / "risk off" trading strategies using IPD Futures and hence protect capital values and enhance returns.

H4: If Cycle is approaching its Peak use "Risk Off" Strategies

4. Methodology

The 4 Hypotheses will be proven / disproven using the model and subsequent correlation analysis and GINI Coefficient analysis. Assuming the model works as a gauge and it is possible to establish where we are in the property cycle it will be possible to subjectively apply “risk on” / “risk off” strategies using IPD Futures.

4.1 Model Specification

The model uses deflated quarterly capital values of various Investment Property Databank (IPD) Commercial Property Market Indices since 1972. Whilst the analysis detailed in this paper uses the various UK Commercial Property markets data (UK All Property, City Offices & Retail Warehouses etc.) the approach could be used, with adjustments, in other international property markets where capital value returns are collated.

4.2 Importance of calculating real capital values vs nominal

Capital values were deflated in order to give real capital values not nominal capital values, thus stripping out the effects of inflation on the capital value growth and showing only the growth due to real estate and capital market factors.

4.3 Line of Best Fit

For each Capital value time series data the line of best fit was established. Anything above this line is over the long run average and anything below this line of best fit is below the long run average.

4.4 MAt – Market Adjustment Factor

The MAt - Market adjustment factor - is the level which the market is deviating from its long run average above or below the line of best fit.

4.5 Market Correction

A “market correction” is defined, “following time t if the real index fell by more than 30% at any time during the next 5 years.”

4.6 Data Analysis (Max / Min / Mean / Std Deviation)

Analysing each time series of data calculating the Maximum / Minimum / Mean and Standard Deviation will enhance the understanding of the data sets and enable much better comparisons of the indices relative to each other and the UK All Property Index.

4.7 Other Structured and Unstructured Information Capture

Information attained from talking to industry participants and from questions asked in conversation and through a formal survey sent to a sample of the market (including those that contribute to the IPF Consensus Forecast and whom requested it on being made aware) were collated and tabulated.

5. Data

The analysis focused on quarterly UK commercial property capital value returns. The study relied on two contributors: Peter Scott for the periods: 1920 – 1938 and 1946 – 1971 and then on the MSCI-IPD data set from 1972 to the end of Q4 2015 when the period of analysis ended. The time series data is not complete, having been interrupted during the War period (1938 -1946). This means that the line of best fit has to be calculated twice as it can only be calculated on uninterrupted time series data.

The UK All Property data set was the most complete and ran throughout the period of analysis from 1920 to 2015 (with the interruption as specified above). There was less data for the other indices as can be seen from the tables below. For example the IPD Segment data only started from 1982.

All time series data was deflated using RPI data from the Office of National Statistics (ONS).

In order to validate the model and ensure that the results were not specific to the UK the US NCREIF Commercial Property Index and the US PPR Office Index were included and analysed in the same way.

5.1 UK All Property

Data Source: MSCI-IPD
Country: UK
Series: All Property CVI
Frequency: Quarterly
Start Date: Q1 1920
End Date: Q4 2015

Measure	**Quantum**
Minimum	-32.7%
Maximum	29.5%
Mean Average	-1.2%
Standard Deviation	10.8%

N.B. The above analysis was carried out on the data between 1972 - 2015

5.2 Retail South East

Data Source: MSCI-IPD
Country: UK
Series: Retail South East CVI
Frequency: Quarterly
Start Date: Q1 1982
End Date: Q4 2015

Measure	**Quantum**

Minimum	-22.3%
Maximum	25.3%
Mean Average	4.1%
Standard Deviation	9.0%

5.3 Retail Rest of UK

Data Source: MSCI-IPD
Country: UK
Series: Retail Rest of UK CVI
Frequency: Quarterly
Start Date: Q1 1982
End Date: Q4 2015

Measure	**Quantum**
Minimum	-24.9%
Maximum	18.2%
Mean Average	2.5%
Standard Deviation	8.5%

5.4 Shopping Centres

Data Source: MSCI-IPD
Country: UK
Series: Shopping Centres CVI
Frequency: Quarterly
Start Date: Q1 1983
End Date: Q4 2015

Measure	**Quantum**
Minimum	-34.9%
Maximum	13.9%
Mean Average	2.0%
Standard Deviation	9.0%

5.5 Retail Warehouse

Data Source: MSCI-IPD
Country: UK
Series: Retail Warehouse CVI
Frequency: Quarterly
Start Date: Q1 1983
End Date: Q4 2015

Measure	Quantum
Minimum	-32.1%
Maximum	29.5%
Mean Average	4.8%
Standard Deviation	11.0%

5.6 Office South East

Data Source: MSCI-IPD
Country: UK
Series: Office South East CVI
Frequency: Quarterly
Start Date: Q1 1983
End Date: Q4 2015

Measure	Quantum
Minimum	-28.6%
Maximum	28.7%
Mean Average	0.7%
Standard Deviation	10.4%

5.7 Office Rest of UK

Data Source: MSCI-IPD
Country: UK
Series: Office Rest of UK CVI
Frequency: Quarterly
Start Date: Q1 1983
End Date: Q4 2015

Measure	Quantum
Minimum	-27.4%
Maximum	39.3%
Mean Average	1.3%
Standard Deviation	10.8%

5.8 Industrial South East

Data Source: MSCI-IPD
Country: UK
Series: Industrial South East CVI
Frequency: Quarterly

Start Date: Q1 1984
End Date: Q4 2015

Measure	Quantum
Minimum	-28.1%
Maximum	32.7%
Mean Average	2.7%
Standard Deviation	10.3%

5.9 Industrial Rest of UK

Data Source: MSCI-IPD
Country: UK
Series: Industrial Rest of UK CVI
Frequency: Quarterly
Start Date: Q1 1984
End Date: Q4 2015

Measure	Quantum
Minimum	-27.7%
Maximum	35.4%
Mean Average	2.4%
Standard Deviation	10.5%

5.10 Midtown

Data Source: MSCI-IPD
Country: UK
Series: Midtown CVI
Frequency: Quarterly
Start Date: Q1 1987
End Date: Q4 2015

Measure	Quantum
Minimum	-31.6%
Maximum	40.2%
Mean Average	4.9%
Standard Deviation	14.1%

5.11 West End

Data Source: MSCI-IPD
Country: UK

Series: West End CVI
Frequency: Quarterly
Start Date: Q1 1987
End Date: Q4 2015

Measure	Quantum
Minimum	-27.5%
Maximum	40.2%
Mean Average	3.5%
Standard Deviation	12.8%

5.12 City Office

Data Source: MSCI-IPD
Country: UK
Series: City Office CVI
Frequency: Quarterly
Start Date: Q1 1994
End Date: Q4 2015

Measure	Quantum
Minimum	-33.2%
Maximum	27.2%
Mean Average	1.9%
Standard Deviation	13.1%

5.13 Caveats of the data

Generally the more data points there are in a data set the better and more reliable the analysis. Real Estate practitioners are used to working with limited data sets whilst the lack of time series data is not ideal it is still possible to analyse the data for our purposes.

Peter Scott's time series data is not complete, having been interrupted during the War period (1939 -1947), so the trend analysis had to be undertaken on the two uninterrupted data sets.

The indices are based on infrequent appraised valuations and comparable evidence using the RICS Red Book valuation methodology. As already discussed this means that the date will suffer from the following issues:

- Backwards looking – valuations are almost immediately out of date as soon as they are released as they use historical and possibly stale comparable data.

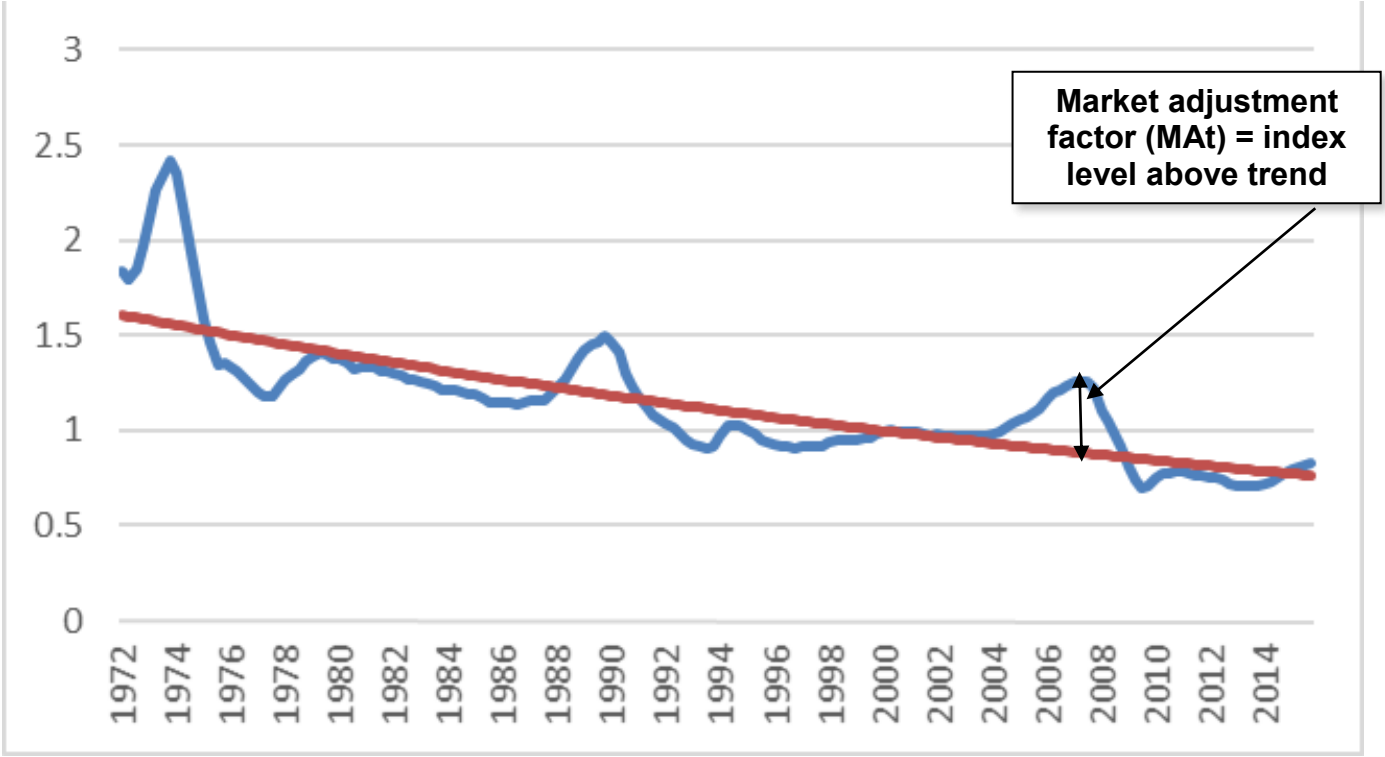
- Smoothing - given values are appraisal based, smoothing may result in lower price volatility, lower return volatility, assets appearing less risky than they actually are and assets appearing to improve the risk / reward characteristics of a portfolio more than they actually do.
- Autocorrelation of returns – occurs when the return in one period is directly related to the return from the prior period. This is evident in real estate, in part, due to the use of comparable evidence.
- Indicative not tradeable – just because a building is given a 'market value' does not mean to say it will trade at that level. Market participants calculate the level at which they would feel comfortable bidding for that building by calculating the building's 'investment value' or 'worth.' This is a highly subjective calculation as can be seen by how it is defined: "the value of an asset to the owner or a prospective owner for individual investment or operational objectives." [12]

[12] RICS Valuation - Professional Standards January 2014, (RICS Nov 2013, 9th Edition)

6. Results and Analysis

6.1 Chart 1: Inflation Adjusted IPD UK All Property CV Index and Best Fit Trend 1972 - 2015

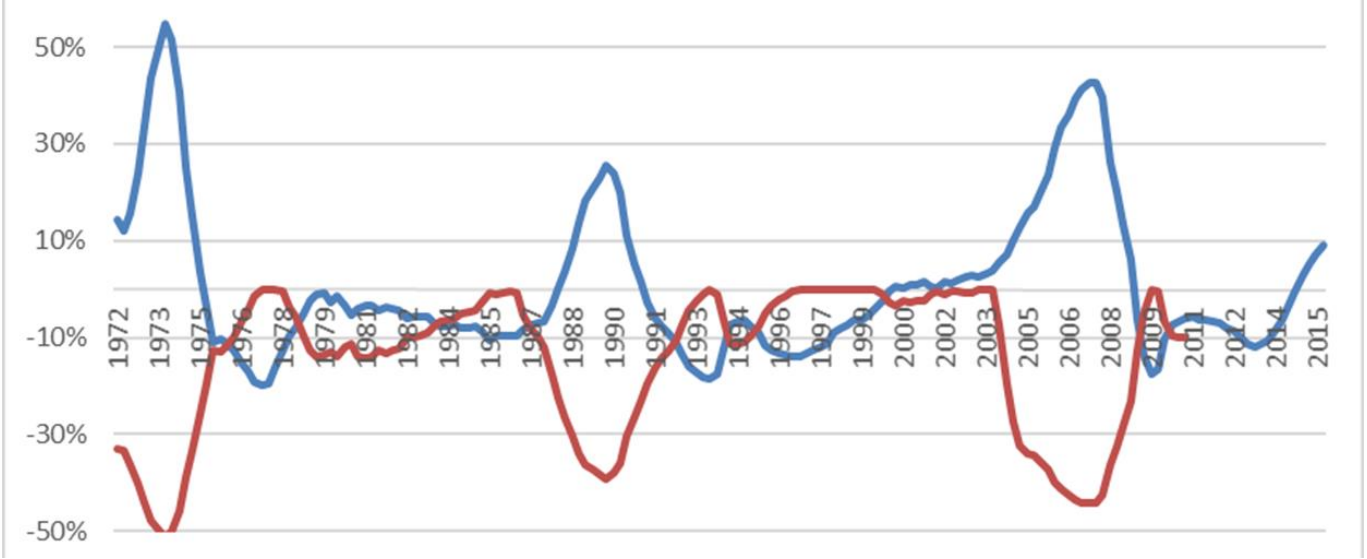
***Real IPD All Property CV Index* and**
Best Fit Trend



The chart above shows the deflated capital values of the UK All Property capital value index with the line of best fit overlaid on top. The following observations are clear: the UK commercial property market index (excluding the effects of refurbishments) has underperformed inflation. In addition, this time period has been characterised by 3 property market bubbles with 3 sharp downturns: 1973, 1990 and 2008 (MAt - marked on the chart). The synchronous regularity of these cycles is about 16/17 years – though analogy with other market cycles suggests that there is no regular length to the cycle. Each of these cycles is characterised by real capital value gains at the end of the cycle exceeding 20% above the long term trend followed by a real 30% capital value decline from peak to trough over the subsequent five years. In an environment where inflation is typically running at 2% a year, the nominal correction should be about 30% over a five-year period. Whilst the approach is backwards looking using 'ex post' data, it can be shown to be predicitive.

6.2 *Chart 2: IPD UK All Property Real CV Index relative to trend (MAt) and max change in real CV index in subsequent 5 years:*

IPD UK All Property Real CV Index Relative to Trend (MAt)
AND Max change in Real CV Index in Subsequent 5 Years



In the chart above, the blue line in Chart 2 represents the bubble measure of the UK All Property Index: - i.e. the value of the inflation adjusted index above or below the long term trend for the index. From this chart we can see that the capital value index has deviated above its long term trend by 20% or more in 3 periods: 1973-74, 1989-1990 and 2005-2007. The red line shows the maximum fall of the real index in the subsequent 5 years, showing the extent of the corrections after the bubbles of 1974, 1990 and 2007. In each case the real correction exceeded 30%.

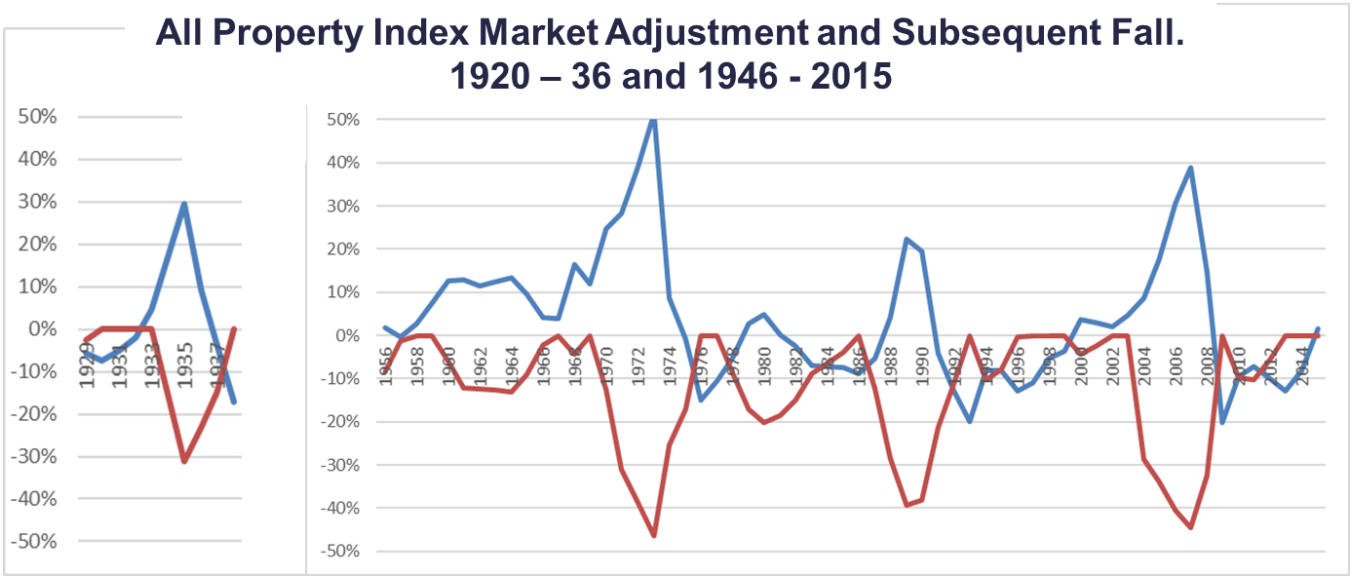
The two data sets are correlated with corrections in the subsequent 5 years. There is a high negative correlation between the two data series. The correlation of MAt and Max subsequent correction is -75% over the 156 quarters of the analysis.

IPD sectoral analyses from 1981 result in correlations between -64% and -94%. The normal warnings about correlation and causation notwithstanding, these results may provide some support for the usefulness of the approach.

The high negative correlations were evident in the time series for a Residential Index (Nationwide) and also an International Commercial Property Index (US NCREIF).

6.3 Chart 3: IPD UK All Property Real CV Index relative to trend (MAt) and max change in real CV index in subsequent 5 years: 1920-1936 and 1946-2015

Market adjustment (MA) factor: the extent to which the real CV index exceeds the best fit long term trend
Subsequent fall: the maximum real fall in the index in the following five years

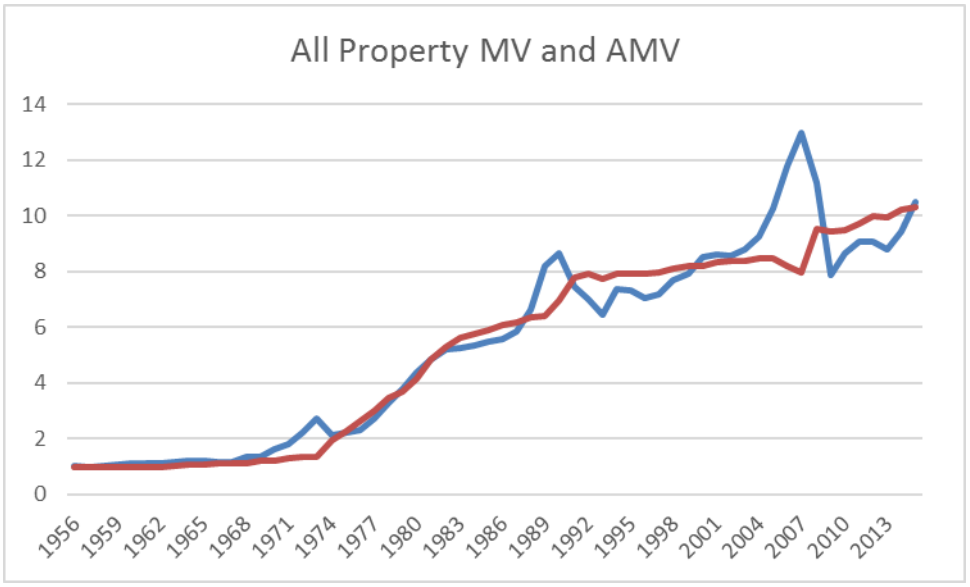


The above chart uses both capital value time series data from Peter Scott (up until 1971) and then the IPD from 1972 until end of Q4 2015. There is an interruption in the data due to the Second World War. The additional data gives us two insights:

Firstly: there is a property market cycle in the 1930s in addition to the 1973, 1990 and 2008 corrections. The market adjustment factor (MA) seems again to be highly correlated with subsequent market corrections – adding one more cycle to the evidence.

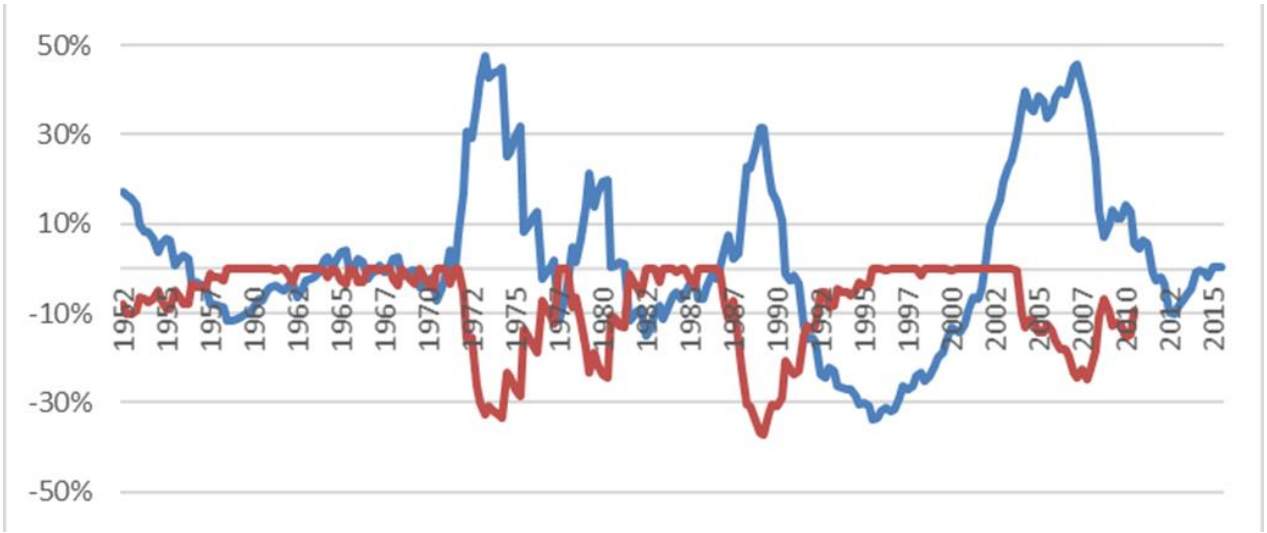
Secondly, the longer data history from 1946 (we need about 10 years to establish a trend) provides a better result for the 1973 correction than using the IPD data only from 1972.
In four property corrections, we have seen a rise in MA above the 20% level preceding a maximum real fall of over 30% in the subsequent 5-year period. In no cases did the MA rise above 20% without a subsequent correction and there were no corrections without a previous rise in MA.
Whilst the observation is still in the realm of correlation rather than causation, the extra data may add some level of confidence in the relevance of the approach.

6.4 Chart 4: MV and AMV compared: 1956 - 2015



6.5 Similar correlations are found with the Nationwide data series going back to 1952…

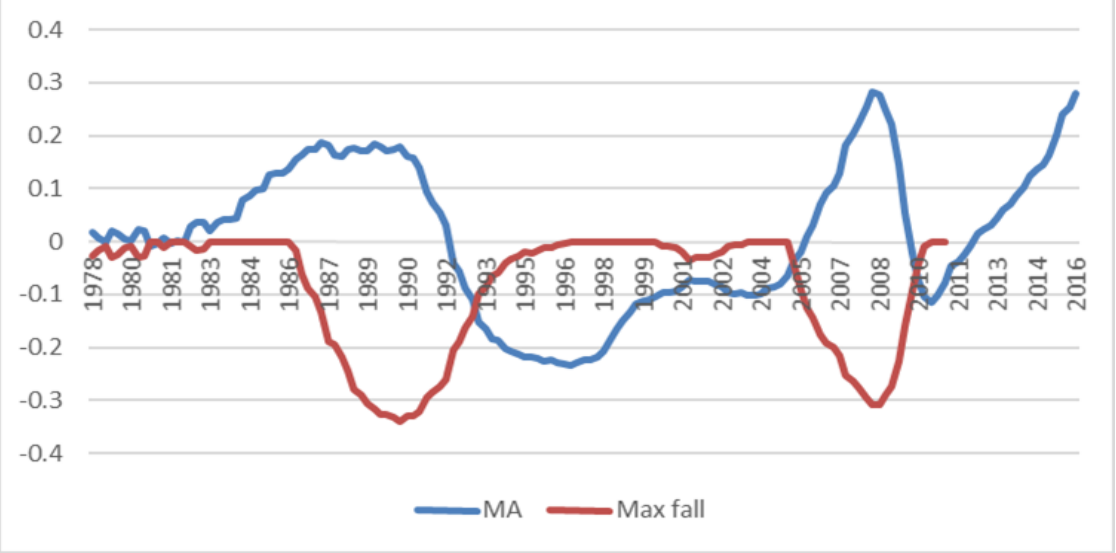
Nationwide UK Residential Property Index from 1952
AND Max change in Subsequent 5 Years



When analysed in the same way the data series for the Nationwide House Price Index attributed similar correlations with bubble measure to correction measure correlations of -69.7%

6.6 Similar correlations are found with the NCREIF data series in the US going back to 1976…

NCREIF US Commercial Property Index from 1976
AND Max change in Subsequent 5 Years



When analysed in the same way the data series for the NCREIF US Commercial Property Index also attributed similar correlations with bubble measure to correction measure correlations of -67.9%

6.7 Table 1: Full table of Correlations:

Table 1: Correlations

Data source	*Country*	*Series*	*Real/Nominal*	*From*	*Correlation (MA, Max Fall)*
IPD	UK	All Prop	Real	1972	-90%
IPD	UK	All property	Real	1982	-89%
IPD	UK	retailSoutheast	Real	1982	-93%
IPD	UK	retailrestUK	Real	1982	-89%
IPD	UK	shopping centres	Real	1983	-85%
IPD	UK	retailWarehouse	Real	1983	-75%
IPD	UK	officeSoutheast	Real	1983	-80%
IPD	UK	officeRestofUK	Real	1983	-68%
IPD	UK	industrialSoutheast	Real	1984	-85%
IPD	UK	industrialRestofUK	Real	1984	-61%
IPD	UK	midtown	Real	1987	-94%
IPD	UK	westEnd	Real	1987	-94%
IPD	UK	cityOffice	Real	1994	-86%
Nationwide	UK	Residential	Real	1956	-69.7%
NCREIF	US	Commercial	Real	1978	-67.9%
NCREIF	US	Commercial	Nominal	1978	-70%
PPR	US	Office	Real	1982	-61%
PPR	US	Office	Nominal	1982	-55%

Whilst recognising that the approach is backward looking and simple in construction, the correlation (high negative correlation) between the bubble measure and subsequent market corrections appears to be quite high for all of the indices examined including residential and international indices.

Index	Average Max Real Fall
All property	-40%
RetailSoutheast	-35%
RetailrestUK	-38%
Shopping centres	-45%
RetailWarehouse	-40%
OfficeSoutheast	-44%
OfficeRestofUK	-42%
IndustrialSoutheast	-38%
IndustrialRestofUK	-41%
Midtown	-40%
WestEnd	-40%
CityOffice	-44%

As can be seen above out of the 12 UK indices analysed in this way only 3 had a maximum real fall of less than 40% (RetailSoutheast, RetailrestUK & IndustrialSoutheast) in the following 5 years when the real index was 20% or more above the long term trend.

6.8 Table 2: GINI Coefficient Analysis to assess the level of predictiveness of the model:

Since the bubble measure appears to be predictive of subsequent market corrections, a GINI coefficient test was undertaken to view the predictiveness of the model.

Step 1: A market correction was defined, following time t if the real index fell by more than 30% at any time during the next 5 years. The choice of 5 years is arbitrary but reflects the average lending term for CRE lending and is a common investment horizon and is often described as 'medium term'.

MCt = 1 if (Min [CVIt/RPIt](t=0 to t+5)/CVIt – 1)<-30% else 0

Where:
MC = Market Correction
t = time
CVI = Capital Value Index
RPI = Retail Price Index

Step 2: We then ranked the bubble measure for each quarter in the time series and tested it for predictiveness of a market correction, calculating the GINI coefficient.

IPD Segment	***GINI***
All property	94%
retailSoutheast	96%
retailrestUK	89%
shopping centres	89%
retailWarehouse	87%
officeSoutheast	81%
officeRestofUK	83%
industrialSoutheast	94%
industrialRestofUK	71%
midtown	85%
westEnd	88%
cityOffice	73%

Results: The results show that the GINI coefficients are high, ranging from 71% to 94% with most series in the 80-90% range which is high by comparison, for example, with most bank credit models.

6.9 Survey Results: Property Beta: Monitoring, Managing and Mitigating Property Market Risk

The following questions were put to Institutional property fund managers and the answers were aggregated and collated as below:

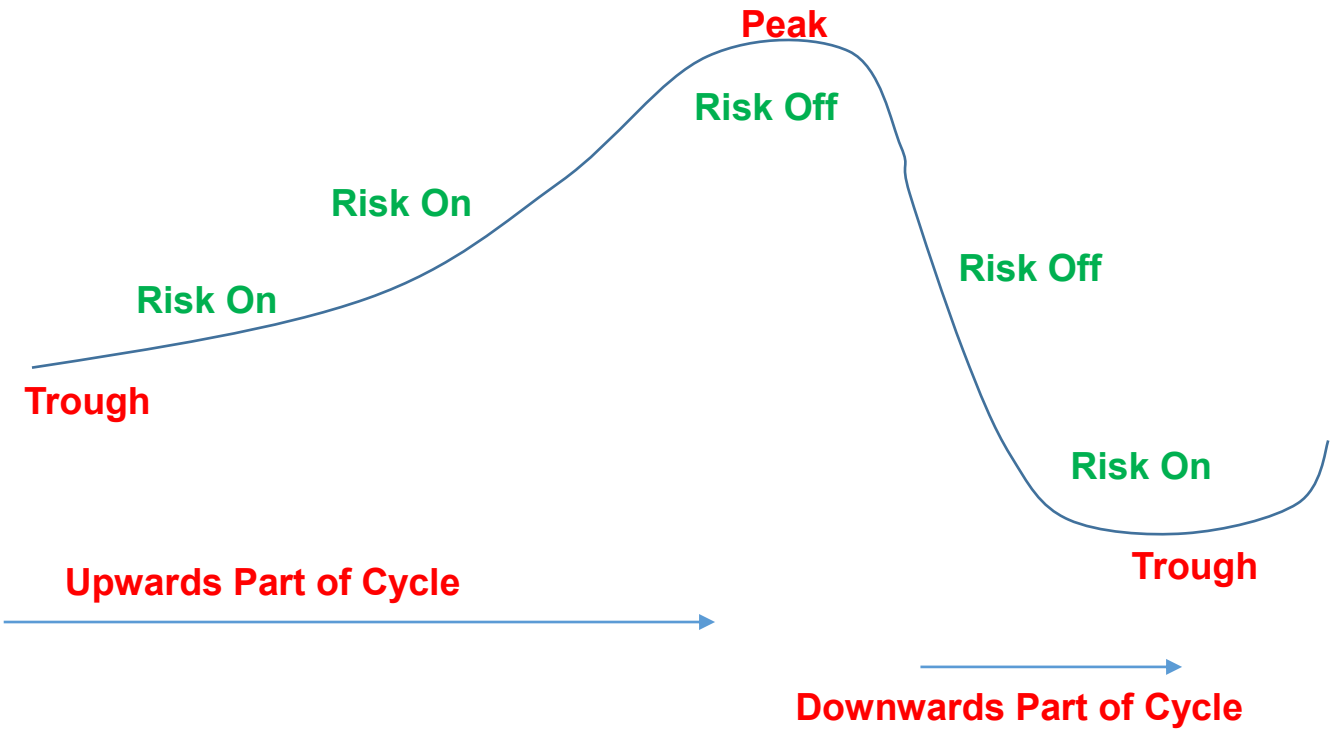
Structured Questions	**Answered YES**
1. Is your organization responsible for Strategic Asset Allocation?	20%
2. Is your organization responsible for Tactical Asset Allocation?	80%
3. Does your organization have a specific Risk Management Team	30%
4. Does your organization monitor where we are in the property cycle?	100%
5. Does your organization get paid to manage property market risk?	30%
6. What % of your funds have the ability to trade IPD Futures?	20% (average)
7. What % of your funds would you commit to trade IPD Futures?	15% (average)
8. What % of your funds would you expect to commit to trade IPD Futures in 5 years time?	25% (average)

From the answers above, it is clear that asset allocation is still largely devolved from the property teams. Once an allocation is made into real estate the money is processed by the property team who essentially add to their portfolio through tactical asset allocation. All respondents state that they monitor property cycles but that they do not get paid to mitigate property market risk.

Unstructured Questions	
1. What metrics do you use to monitor property market risk?	GDP, Cap Rates, Occupancy rates, sector switch, supply pipeline, capital flows
2. How do you track property market risk?	Tracking Error, Standard Deviation, capital flows, liquidity, risk web analysis.
3. How does your organization mitigate market risk?	Sell non-core assets, risk avoidance (exit market / stay away from over-valued segments), proprietary risk model, regular reviews, quarterly monitoring, more or less development exposure,

	asset selection, cash liquidity
4. What are the barriers to trading IPD Futures?	Trustees, IMA's, Understanding, organization is not set up to trade, not paid to manage market risk, no senior management sponsor, our mandates are for mainland Europe, do not fit in with our approach.

It is clear that houses use many and varied tools to track and monitor the property market. Action to mitigate market risk in a portfolio is still undertaken from the "bottom up" i.e. at the asset specific level despite the availability of tools to mitigate market risk at the portfolio level. Early adopters are using IPD Futures to perform "risk on" and "risk off" strategies as well as risk adjusted sector switches through the cycle but clearly there are several barriers to the widespread adoption of this technique.



7. Conclusion

7.1 Interpretation of Results:

This simple approach might be useful for market participants to help form judgements about the state of the property market cycle and especially when bubble territory is approaching thus giving practitioners the ability to review investment decisions, apply risk mitigation strategies and capital allocations to this highly volatile asset class. The approach identifies bubble territory as 20%+ above the long run average of the index and follows that once in bubble territory a fall of 30% or more is highly likely within the following 5 years. The approach gives foresight of where along the property cycle continuum the market is at, thereby giving practitioners the ability to dynamically manage property market risk using "risk on" / "risk off" tools such as IPD Futures. The approach uses 'ex post' historical data and this should be acknowledged as both a strength and a weakness. In addition to the foresight this approach imparts, a working knowledge of real estate and capital markets is essential in order to be able to track and make sense of the other key macro-economic variables and drivers impacting the property cycle. Using historical data and this approach assists in making investment decisions going forwards but is not sufficient in itself; other factors should be incorporated.

7.2 Caveats for the Approach:

The context, risks and drivers of each of these property cycles are completely different and the approach does not concern itself with the vagaries or idiosyncrasies of each cycle. This approach should not, therefore, be looked at in isolation. It is important for property practitioners to have a good understanding and handle on what the specific drivers and risks of the current cycle are. "This time it's different!" is generally heard at the end of the cycle referring to the expected continuation of the cycle by some market participants. If there is any truth in this phrase, it is only in the respect of what is driving the market to overheat in the bull market phase and what risks are converging and conspiring to bring about the subsequent collapse. The constant is that the market rises aggressively at the end of the bull cycle and then collapses. "Risk comes from a variety of sources and shows an alarming ability to morph" (Blundell, 2013). Strong arguments may be put cited in this cycle as to why 'this time is different': for example, it may be argued that lower risk free yields may permanently depress CRE yields keeping property values high in the medium to long term. However, risk is a probabilistic discussion by its nature and historic data is usually the only guide we have to the future. As well as looking backwards it is also essential to look forwards and to assess the impact of current distortions or readings of key macro-economic variables. For the UK property market these can be listed, in no specific order as: GDP growth, capital flows into real estate, banks propensity to lend, cap rates, development supply, occupier demand, property transaction volumes relative to long run average, and property yields relative to government bonds. Tracking these over time and knowing where these metrics are headed together with the bubble indicator approach should enable property practitioners to look both forwards and backwards at the same time to make as informed an investment decision as possible.

7.3 Users and Uses of the model

The model could be used by lenders and investors, as a countercyclical tool, to help them track and monitor the property market, flagging when a correction is likely in advance and thus assisting with the management and mitigation of systemic risk. Other users could include property investors / practitioners investing through the cycle. The model will give investors / practitioners an indication of where the market is on the property cycle continuum and flag whether the market is growing above or below its long run average (and by how much) thus giving indications of when to apply necessary "risk on" / "risk off" trading strategies.

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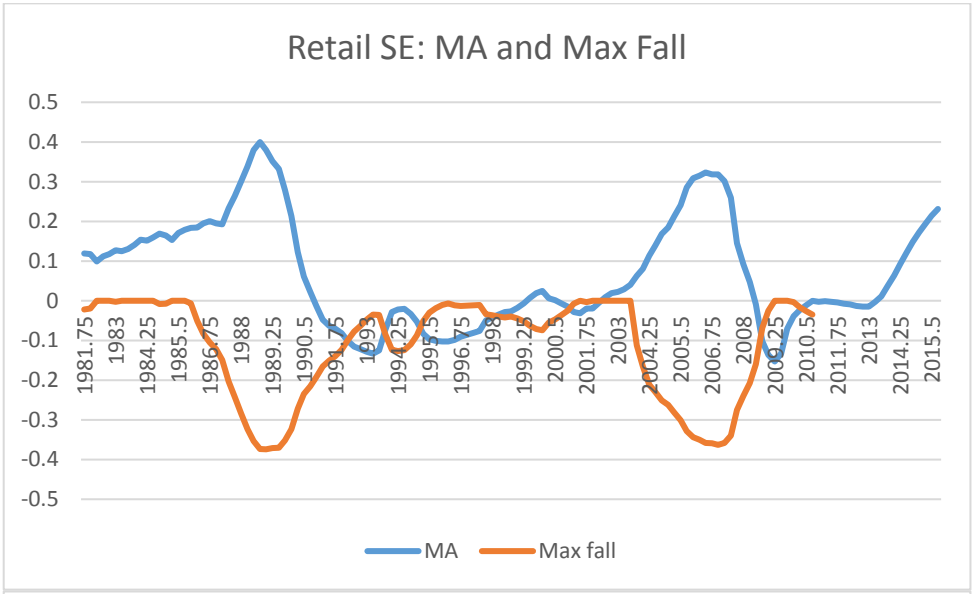
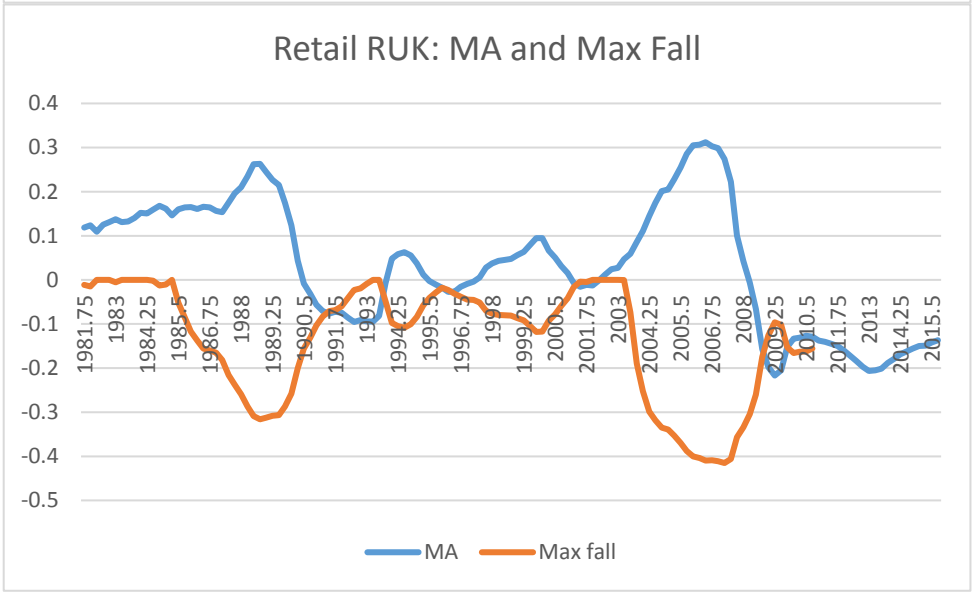
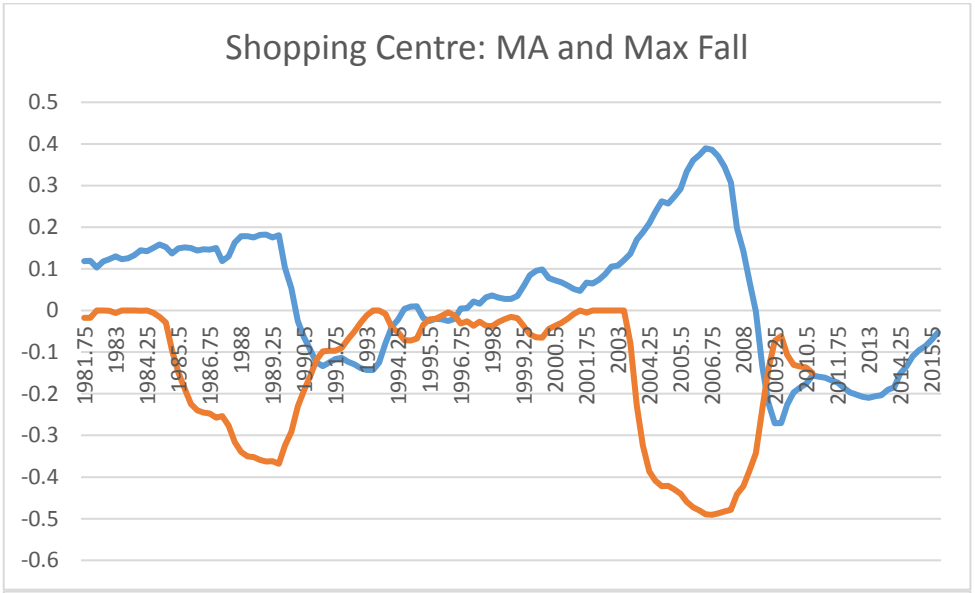
9. Appendices

9.1 IPD UK Segment CV Index relative to trend (MAt) and max change in real CV index in subsequent 5 years:






Shopping Centre: MA and Max Fall
0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
-0.4
-0.5
-0.6
1981.75
1983
1984.25
1985.5
1986.75
1988
1989.25
1990.5
1991.75
1993
1994.25
1995.5
1996.75
1998
1999.25
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2004.25
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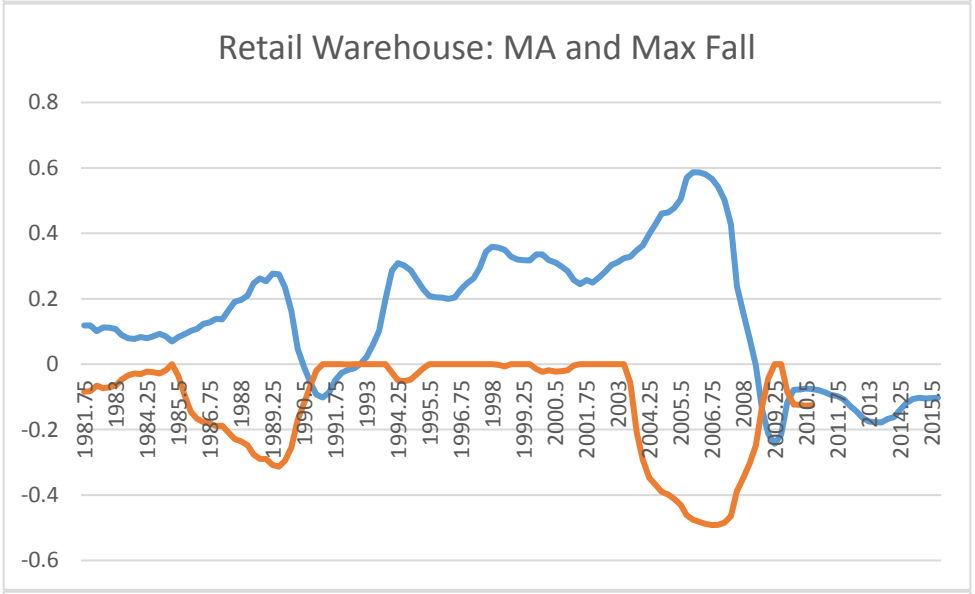
2008
2009.25
2010.5
2011.75
2013
2014.25
2015.5


Retail Warehouse: MA and Max Fall
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
1981.75
1983
1984.25
1985.5
1986.75
1988
1989.25
1990.5
1991.75
1993
1994.25
1995.5
1996.75
1998
1999.25
2000.5
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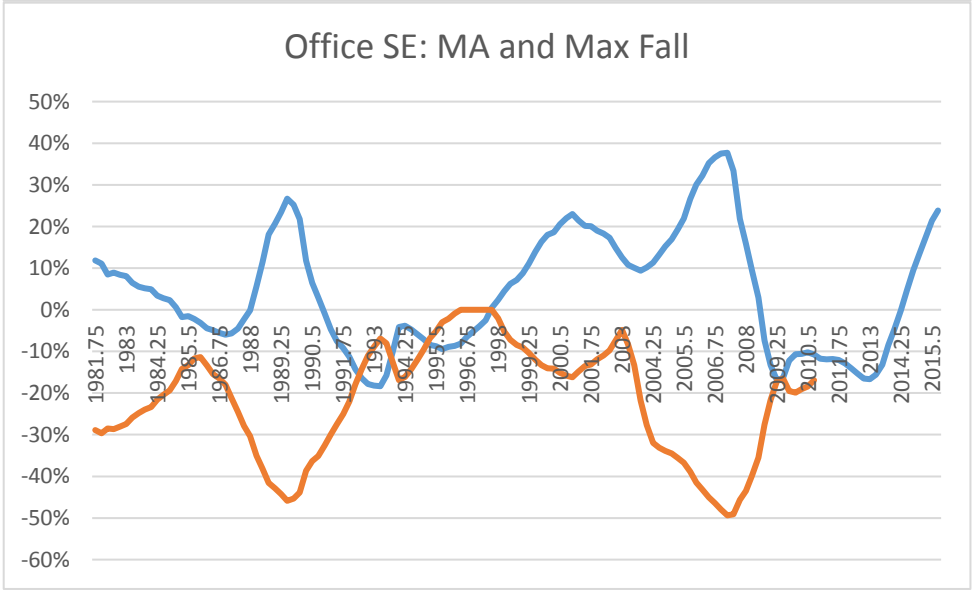
2008
2009.25
2010.5
2011.75
2013
2014.25
2015.5


Office SE: MA and Max Fall
50%
40%
30%
20%
10%
0%
-10%
-20%
-30%
-40%
-50%
-60%
1981.75
1983
1984.25
1985.5
1986.75
1988
1989.25
1990.5
1991.75
1993
1994.25
1995.5
1996.75
1998
1999.25
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2009.25
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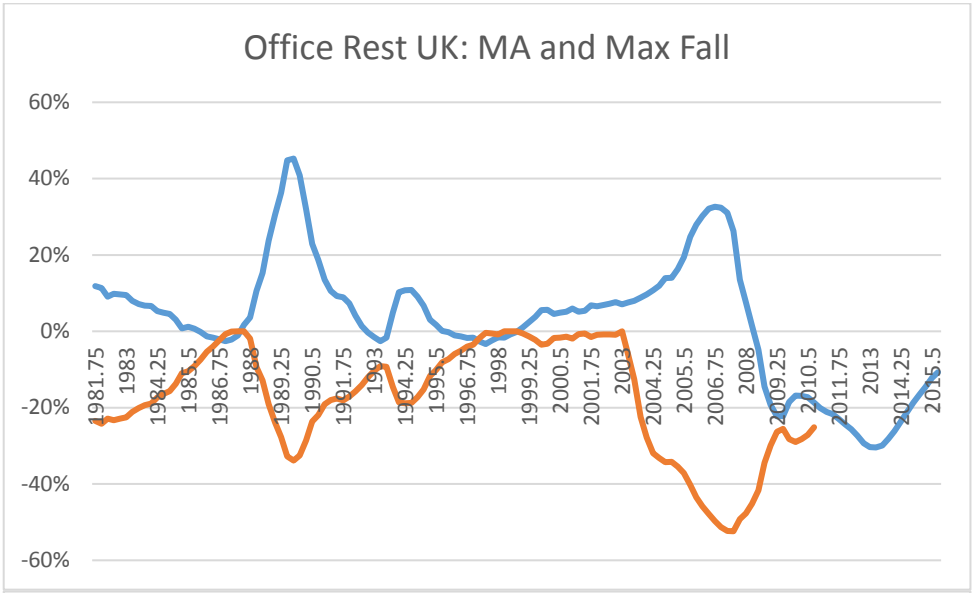
2013
2014.25
2015.5


Office Rest UK: MA and Max Fall
60%
40%
20%
0%
-20%
-40%
-60%
1981.75
1983
1984.25
1985.5
1986.75
1988
1989.25
1990.5
1991.75
1993
1994.25
1995.5
1996.75
1998
1999.25
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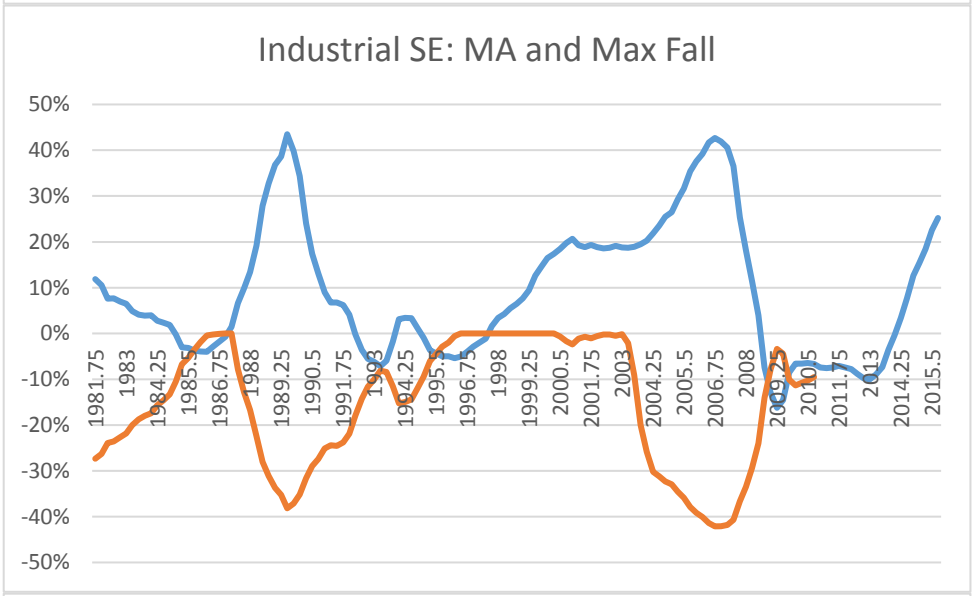
2013
2014.25
2015.5


Industrial SE: MA and Max Fall
50%
40%
30%
20%
10%
0%
-10%
-20%
-30%
-40%
-50%
1981.75
1983
1984.25
1985.5
1986.75
1988
1989.25
1990.5
1991.75
1993
1994.25
1995.5
1996.75
1998
1999.25
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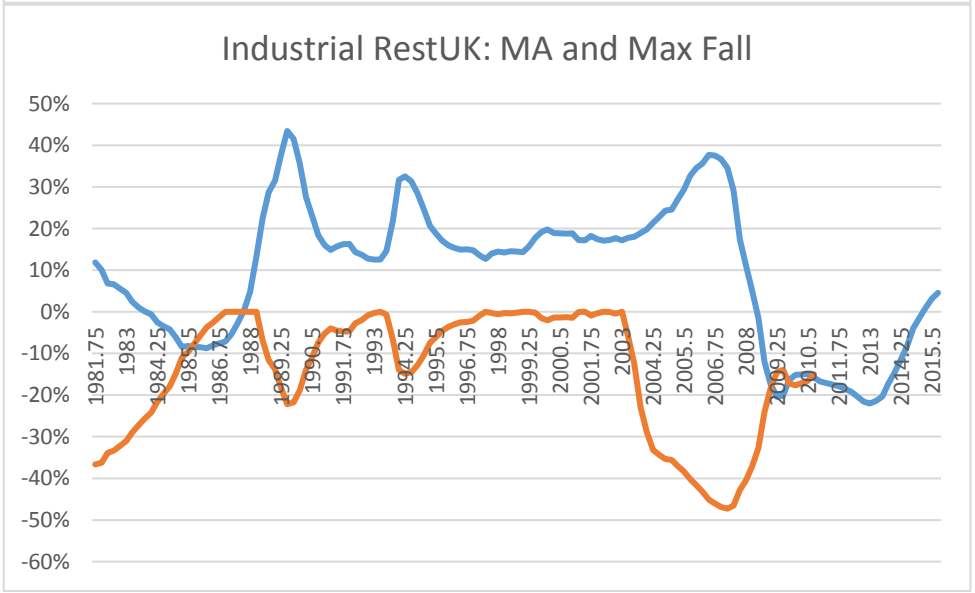
2010.5
2011.75
2013
2014.25
2015.5


Industrial RestUK: MA and Max Fall
50%
40%
30%
20%
10%
0%
-10%
-20%
-30%
-40%
-50%
-60%
1981.75
1983
1984.25
1985.5
1986.75
1988
1989.25
1990.5
1991.75
1993
1994.25
1995.5
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1998
1999.25
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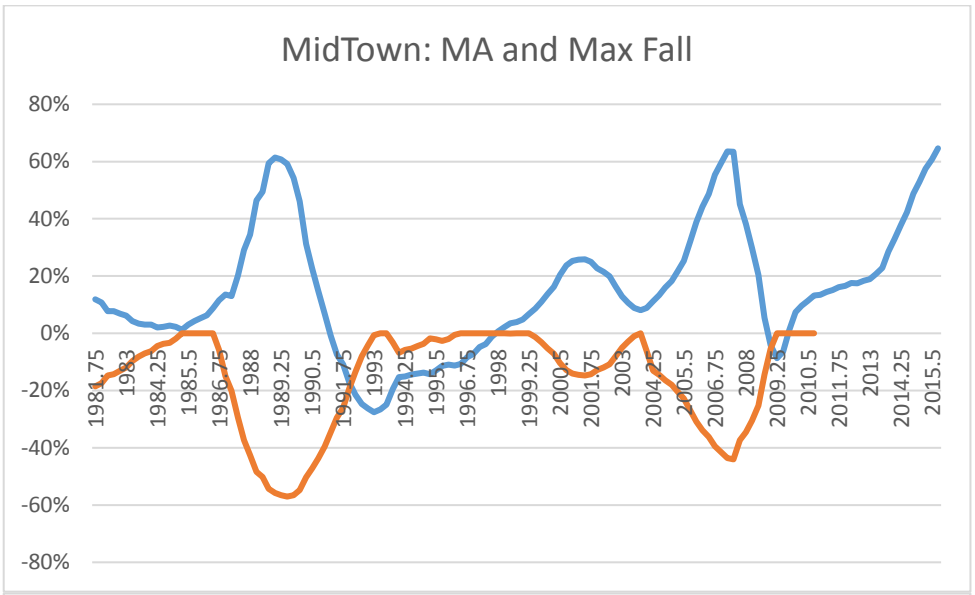
2013
2014.25
2015.5


MidTown: MA and Max Fall
80%
60%
40%
20%
0%
-20%
-40%
-60%
-80%
1981.75
1983
1984.25
1985.5
1986.75
1988
1989.25
1990.5
1991.75
1993
1994.25
1995.5
1996.75
1998
1999.25
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2009.25
2010.5
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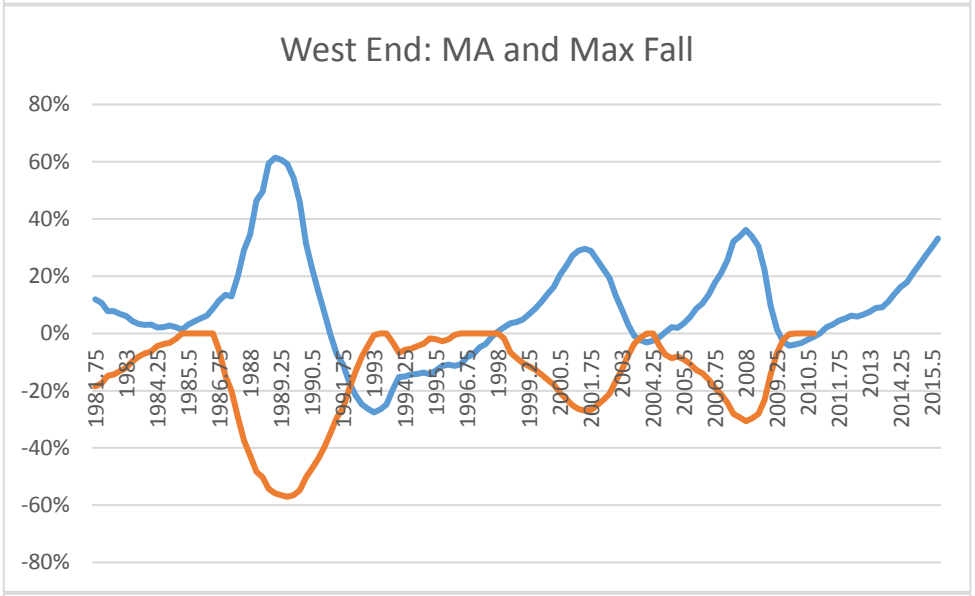
2013
2014.25
2015.5


West End: MA and Max Fall
80%
60%
40%
20%
0%
-20%
-40%
-60%
-80%
1981.75
1983
1984.25
1985.5
1986.75
1988
1989.25
1990.5
1991.75
1993
1994.25
1995.5
1996.75
1998
1999.25
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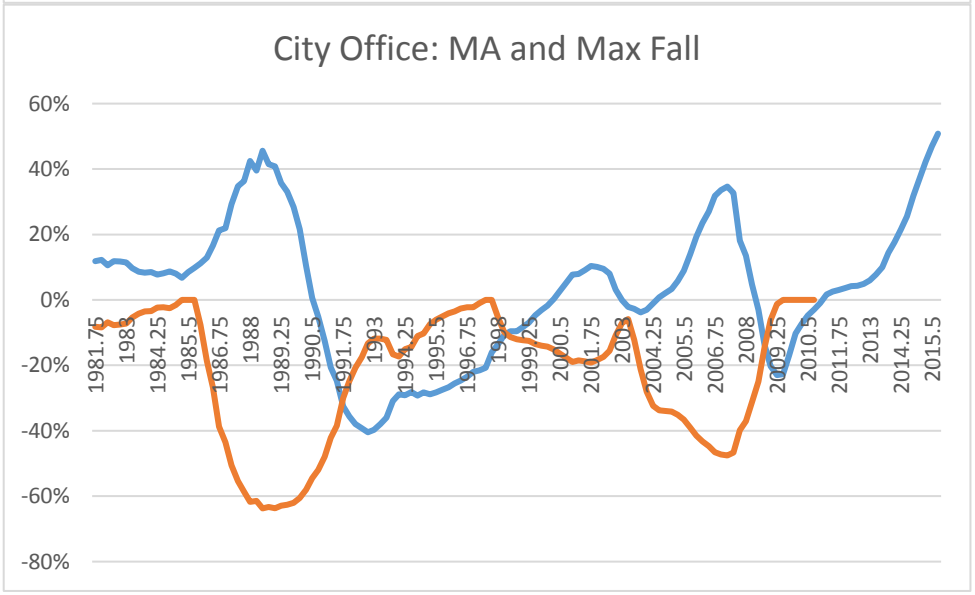
2013
2014.25
2015.5


City Office: MA and Max Fall
60%
40%
20%
0%
-20%
-40%
-60%
-80%
1981.75
1983
1984.25
1985.5
1986.75
1988
1989.25
1990.5
1991.75
1993
1994.25
1995.5
1996.75
1998
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2001.75
2003
2004.25
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2006.75
2008
2009.25
2010.5
2011.75
2013
2014.25
2015.5

9.2 Beta Questionnaire:

Name:
Organisation:
Fund:
AUM:
Introduction:
This Questionnaire explores the concept of property *market risk* or beta. It asks how your organisation deals with property *market risk* at the fund or portfolio level as opposed to risk at the property specific or asset specific level. It is broken into 4 parts:

1. General Questions
2. Monitoring Property Market Risk,
3. Managing Property Market Risk &
4. Mitigating Property Market Risk

General Questions:
Does your organisation look at Tactical Asset Allocation (TAA)?
Does your organisation look at Strategic Asset Allocation (SAA)?
Who in your organisation deals with TAA / SAA or both?
What do you understand by the term property market risk?
Does your organisation monitor where we are in the property cycle continuum?
Do you get paid, as a Fund Manager, to manage Property market risk?
If so, how are you incentivised?
Do you get penalised if the property market falls?
If so how?
Does your organisation have the mandate to trade IPD Property Futures?
What percentage allocation or notional amount would your fund be comfortable trading in IPD Property Futures today?
What percentage allocation or notional amount would your fund be comfortable trading in IPD Property Futures in 5 years time?

Monitoring Property Market Risk:
Does your organisation currently monitor market risk?
If so who does this, what metrics do they track and how is this information disseminated to Fund Managers and the wider organisation?

Managing Property Market Risk:
Does your organisation currently manage market risk?
If so who does this, how do they manage market risk and what tools do they use?

Mitigating Property Market Risk:
Does your organisation currently mitigate market risk?
If so how do they do this? What tools do they use?