Pricing risk in yields, and its impact on real estate market volatility*

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Abstract:

In the light of continued financial and economic turmoil, there has been a marked increase in the volatility in real estate markets. This has impacted the pricing of property assets, partly through market sentiment, particularly concerning risk. In a downturn, the perception of investment risk becomes increasingly important relative to overall total returns, and thus impacts on yields and performance of assets. In a recovery phase, and especially with low government bonds, risk and return compete for importance.

This paper specifically considers the modelling of property pricing within this economic environment. The theoretical context begins by analysing the relationship between property yields and government bonds, incorporating expectations for property market performance. The analytical context then moves on to specifically include a measurement of risk which stresses its importance in investment markets since the Great Financial Crisis. The model thus incorporates macroeconomic and real estate data, together with an international risk multiplier, which is calculated within the paper.

The paper considers the driving forces which have led to the volatile movements of yields, flying out in the crisis and falling to record lows since. It also looks at the impact this has had on investment in real estate and the driving forces behind investor decision making.

Key words: Real estate pricing, risk analysis, yield modelling.

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1. Introduction

The role of property as an asset class has been profoundly influenced in recent times by the economic turmoil that has impacted on the world's financial markets since 2007. The crisis, which started in a seemingly niche part of the residential lending market turned out to be one of the most severe economic shocks experienced in decades from which no economies in Europe or indeed the world were immune. Furthermore the global financial crisis has served to emphasise the inter-relationship that exists between property markets, financial markets and the economic performance of countries.

With real estate becoming more intertwined within international capital markets, low interest rates have been seen to increasingly put downward pressure on yields and thus encourage asset price inflation (see for example Hollies, 2007; Playton, 2009; Tsolacos et al, 2009, and further discussion in the literature review). Fiscal and monitory policies are therefore important influencers on the pricing of different asset classes. The impact of the Great Financial Crisis (GFC) was arguably most apparent initially in Europe. With the very slow recovery in the euro zone coupled with major concerns over the economies of several countries in the EU, it is clear to see why these effects have continued to influence financial markets and the performance of property.

However previous economic downturns have shown that a financial crisis also creates new opportunities. A side effect of the GFC was the clear highlighting of the importance of placing increased resources on quantification and yield model analysis in real estate relative to other capital markets. It also highlighted the interrelationships between property investment, market sentiment and risk analysis. The assessment of risk and the links to the volatility of the capital and real estate markets is important in the understanding the interrelationship between movements in commercial property yields and macroeconomic variables.

This paper considers the modelling of property pricing within this volatile economic environment. The theoretical context not only analyses the relationship between property yields and government bonds, but also specifically includes a measurement of risk which stresses its growing importance in real estate markets. The model then incorporates macroeconomic and real estate data, together with an international risk multiplier. The research further considers yield convergence or divergence in the office markets of selected European cities on a time series basis and assesses the implications for real estate investment.

The paper considers the time series analysis on yields and macroeconomic variables over the time period 2003-16 which signifies the boom years 2003-07 and the effects of the volatility experienced in 2007-11 period together with the after effects of the GFC.

2. Literature Review

The key macroeconomic and financial fundamentals underpinning the theoretical context of this paper relate to the interrelationship between yields, pricing, market sentiment and risk analysis in the property investment process. The finance literature starts from the premise that the dynamics of market efficiency apply, when market based economies are dominant in the production and distribution of goods and services, and where markets can take advantage of economies of scale by forming reliable and effective distribution networks (Rosch et al, 2016; Rao, 2017). Classical finance theory assumes that prices of assets traded in relatively frictionless markets reflect estimated risk-adjusted discount rates and future income streams. An efficient market is, therefore, one in which prices fully reflect available information and consequently should not diverge too far from true market value (Geltner & van de Minne, 2017). The market forces of competition and the balancing of demand and supply exert a stabilising influence on price convergence (Fama, 1991; Rao, 2017). In the financial markets convergence applies where the law of one price holds, whereas in the real estate markets, convergence implies a narrowing of rent and yield spreads on properties domiciled in different countries which generate similar cash flow (Adam et al, 2002). The role played by the financial markets is determined in terms of influence on the performance profile of real estate assets relative to bonds, equities and other commodities such as gold. Furthermore, investment theory postulates that capitalisation rates are determined by the risk free nominal rate of return, plus the risk premium less the expected rate of growth minus depreciation (Crosby et al, 2016).

In real estate markets, heterogeneous properties trade in illiquid, highly segmented and informationally inefficient local markets. As a consequence, a key challenge from a property perspective is the pricing of property in the context of volatility and risk in the financial and real estate markets. In the literature a number of papers (McAllister and Lizieri, 2006; Lee, 2009) consider the integration of European stock markets and real estate security markets before and after the establishment of the European Monetary Union based on rent and yield convergence analysis. Comparing property rents and yields across different countries to give insights into the degree of synchronicity between markets has also been the focus of analysis in the post 2009 literature (McAllister and Nanda, 2016). The global financial crisis brought a sharp shock to real estate markets with the result that interest rates and government bond yields fell in response whereas real estate yields (capitalisation rates) initially rose across the board.

A consideration of the drivers of yield movements has been used to investigate if the underlying property market or the wider investment market is responsible for the movement in yields (McGough and Tsolacos, 2001). In determining property pricing across and within markets, yields and hence capital values, are determined by expected rental growth and interest rate or the required rate of return. McGough and Tsolacos (2001, 2002) stress the point that property yields play a very significant input in real estate valuation,

development and investment. At certain stages of the economic and real estate cycles it has historically been possible to find markets where property yields are below bond yields and where real estate yields have been driven down by tranches of new investment and by investor sentiment. In considering the determinants of commercial real estate yields, it is argued that capitalisation rates can be predicted by macroeconomic and financial conditions combined with commercial real estate fundamentals and the effectiveness of these variables validates the integration of commercial real estate into global capital markets. Clayton et al (2009) also contribute to this debate by examining the relative influence of investor sentiment in explaining the time series variation in property specific capitalisation rates.

Playton (2009) also uses macroeconomic and interest rate fundamentals, credit risk pricing, investor risk aversion and bond credit spreads to assess capital market trends. The findings support the proposition that commercial real estate pricing is integrated into the global capital markets and endorse the use of these variables to determine adjustments in commercial real estate pricing. Evidence shows that the determinants of commercial real estate capitalisation rates do respond to both capital market forces and real estate fundamentals (Ambrose and Nourse, 1993; Chervachidze et al, 2009). Hendershot and MacGregor (2005) argue that property capitalisation rates should be linked to capital market capitalisation rates and to the expected rate of growth in cash flows. Clayton et al (2009) widens the research angle on capitalisation rate dynamics to include investor sentiment in explaining the time series variations in national capitalisation rates even after controlling for changes in expected growth, equity risk premiums, T-bond yields and lagged adjustments. In the model specification developed by Jud and Winkler (1995) it was found that real estate capitalisation rates are influenced by capital market returns and are positively related to the cost of debt and equity.

Analysing the gap between government bonds and real estate yields has also been used to determine whether there has been a structural break in the long-term relationship. The difference between the initial yield on property and the bond yield should represent the core differences between the two, namely the property risk premium, rental growth expectations and allowances for depreciation. Providing a conceptual model for assessing real estate risk factors as a way of predicting real estate yields still remains challenging. Consequently, the traditional approach to yield modelling has typically relied on explanatory variables such as GDP growth, rental growth and bond yields (Sivitanides and Sivitanidou, 1997). Hutchison et al (2011) consider the appropriate benchmark, the risk free rate as suitable for the pricing of property investment in the UK and consequently investigate the financial characteristics and performance of UK gilt yields. The paper analyses the stability, yield distribution and volatility of both conventional gilts and index linked gilts with different maturities over the period 1980-2010 (Hutchison et al, 2011).

Hollies (2007) argues that in terms of the methodologies employed to analyse the determinants of yield change there are three broad categories of literature embracing time-series analysis (Hendershot and MacGregor, 2006); cross sectional analysis (McGough and Tsolacos, 2001; Sivitanidou & Sivitanides, 1999); and panel approaches (Jud and Winkler, 1995). Most studies have used aggregated time series data in determining capitalisation rates. Applying a panel based approach, Hollies (2007) looks at yield levels across a number of office markets in a variety of global cities rather than looking at yield movements over time. The methodological design involved breaking down the yield into its constituent parts of the risk free interest rate, the risk premium and the income/value growth potential. The research showed that locations with higher interest rates have higher yields while liquid and/or transparent markets have lower yields. The panel regressions in the study found that yields are explained by short term interest rates, the annual lease length, market liquidity, GDP per capita, and average inflation.

Building upon the panel based approach; there are a number of studies which modelled commercial property yields at the urban level. Dunse et al (2007) for example consider the influence of exogenous and endogenous influences on urban office yields in major provincial office centres in the UK. They attempt to determine the city risk premium spreads relative to the City of London and related to the weight of money impacting on yield convergence in the respective provincial cities. Changes in yields should reflect anticipated city rental growth which is an endogenous relationship determined by the interaction of local demand-supply relationships and pressures, whereas the exogenous influences reflect changes in interest rates, stock market performance and investment flows at city level. The key findings of the Dunse et al study (2007) show evidence of local effects on city yields including the impact of investment funds on yield compression.

McAllister and Nanda (2016) consider the relationship between the activity of foreign investors and capitalisation rates in major European office markets, and specifically address the effects of the increased integration of real estate markets on real estate capitalisation rates. Focusing at city level, the research analyses the effect of foreign capital flows on capitalisation rates and finds that both foreign investment and capitalisation rates are jointly determined by the same variables; market maturity, market transparency and market risk. The research therefore concludes that there is a statistically significant negative effect of foreign investment on capitalisation rates. The outcome of the research is that cities with low capitalisation rates and high levels of foreign investment constitute the mature markets of the economically advanced global cities; where foreign investors prefer to invest (McAllister and Nanda, 2016).

This paper builds upon the existing body of research by specifically focusing on the modelling of property pricing to analyse the relationship between property yields and government bonds whilst explicitly incorporating market measures of risk. The analytical context includes a measurement of risk with the modelling component utilising

macroeconomic and real estate data to devise an international risk multiplier. In this regards we follow a two stage process of developing a yield model which considers investor sentiment and undertaking risk multiplier analysis based on corporate/government bond spreads. Using the international risk multiplier on real estate market data, the analysis also assesses yield movements including the spread of the yield gap between corporate and government bonds and property. The analysis determines which city centre office markets in Europe have been most impacted by globalisation including the magnitude of impact on real estate prices and volatility. The outcome of the paper provides important insights into how changes in risk preferences in the international capital markets have driven and continues to drive the yield movements in different markets.

3. Measuring Risk – The Risk Multiplier

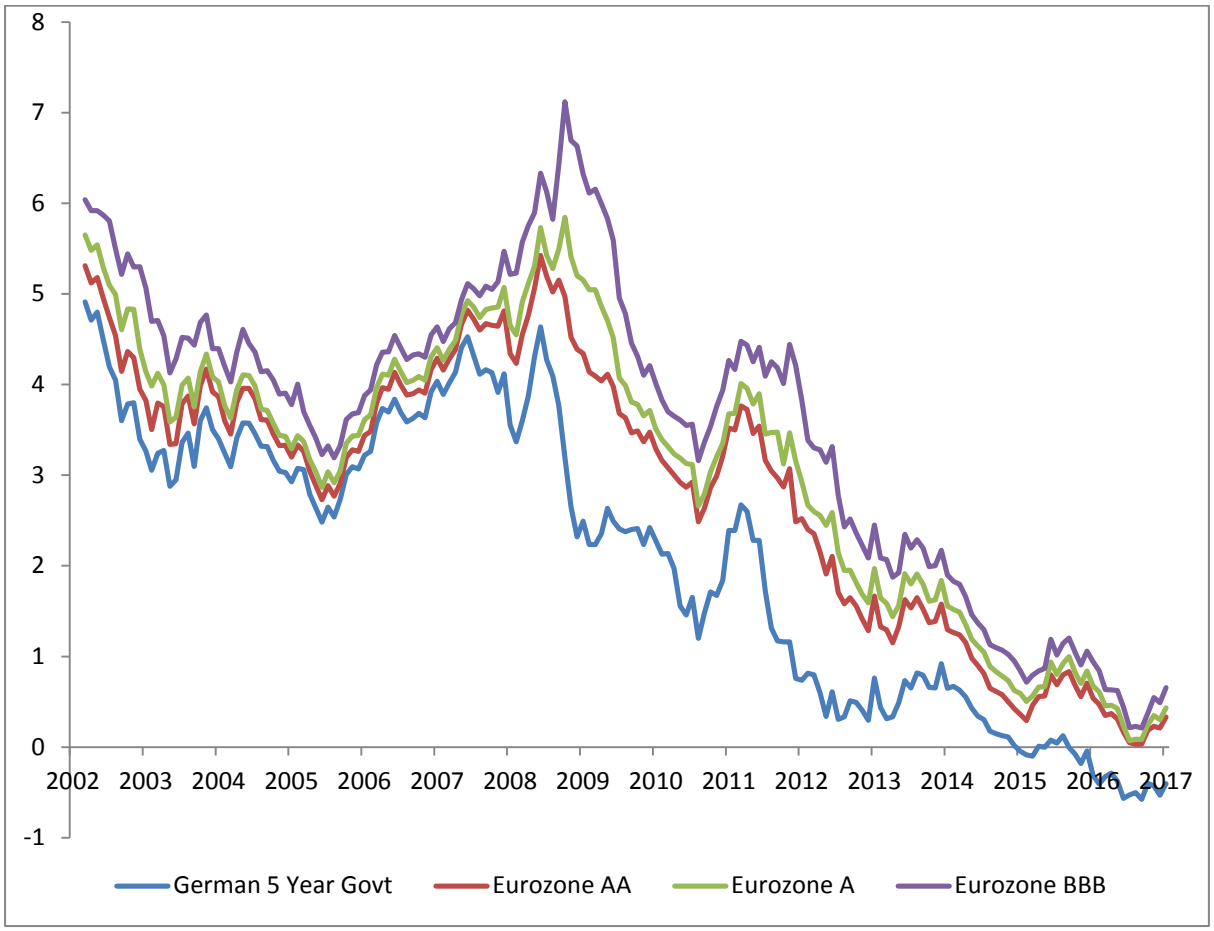
From the literature review it is clear that the main area of yield modelling incorporates cost of capital combined with some market expectations and market volatility measures. In this paper, we attempt to augment the traditional approach to yield modelling by adding an explicit risk multiplier as an additional explanatory variable. We aim to capture swings in market sentiment and the 'pricing of risk' which impact on international investors' willingness to pay for financial assets, including commercial property.

Initially we start off by considering the history of pricing for corporate bonds and their spreads (the difference between corporate bond yields and government bond yields) – as an indicator of changes in market sentiment, the markets' view on the compensation required to take on extra risk, and consequently, the basis for the risk multiplier.

Figure 1 illustrates corporate bond yields for different investment grade companies in Europe in comparison to the German government bond[1]. These yields change in response to shifts in economic conditions and consequently in market risk perception, though there is a clear relationship relative to government bonds. In times of economic buoyancy one would expect a minimal company risk premium as default is seen as unlikely for any investment grade company and with little perceived risk present the price for taking the risk on is negligible. Weaker sentiment and higher perceived risk tend to increase the premium investors are willing to pay for the relative safety of government bond yields and particularly penalise the weaker company bonds.

[1] German government bonds are generally considered the safest of the large economy fully liquid bonds in the Euro area.

Figure 1: Euro area corporate bond and government bond yields (5 year)

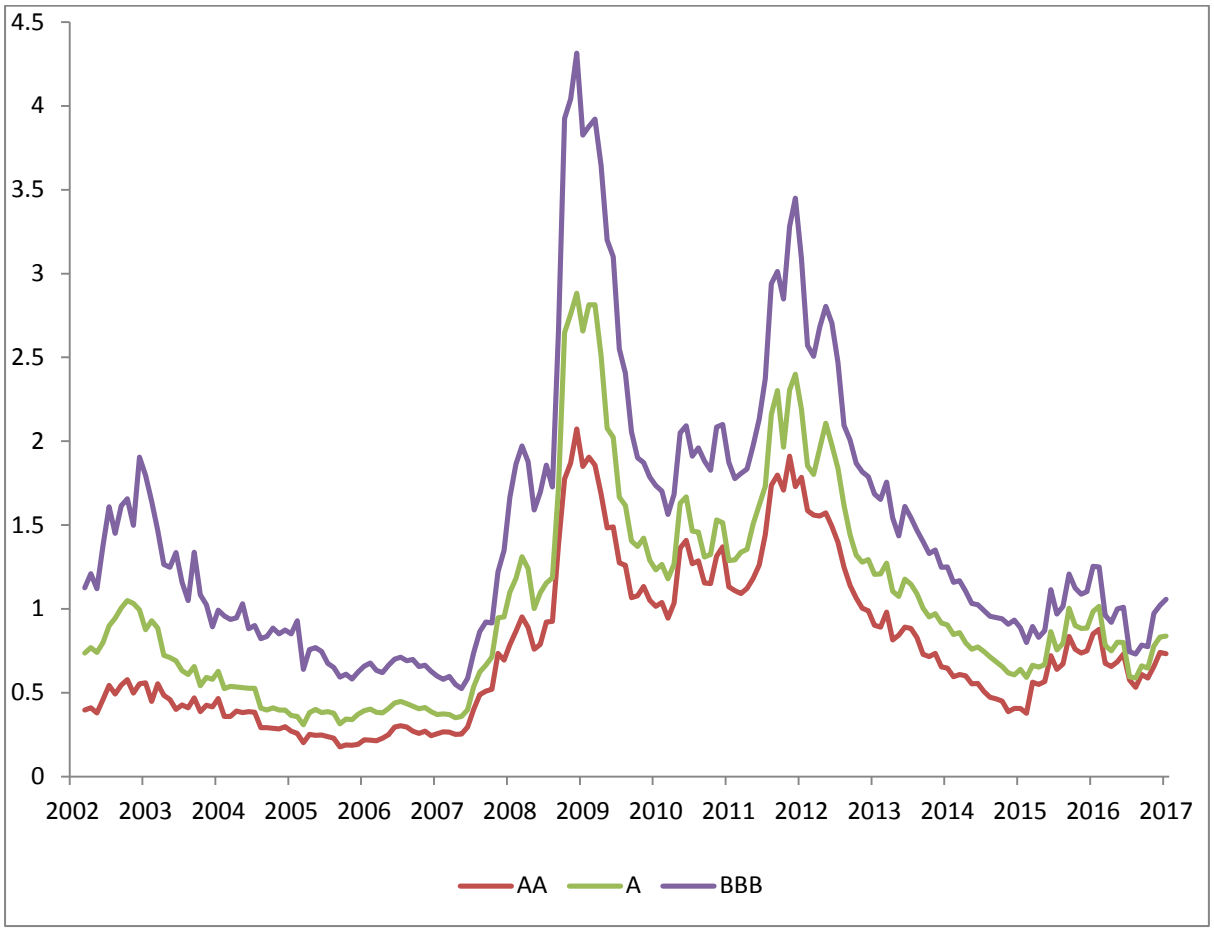


Source: Bloomberg

This change in the price of risk is more clearly reflected when directly considering corporate bond spreads (Figure 2). These tend to rise at times of market stress and economic downturn (flight to safety). During market stress the likelihood of companies defaulting relative to government bonds rise and thus more compensation is demanded for taking on the perceived greater risk. This is very notable in figure 2 during the financial crisis in 2008-09 and again for the sovereign debt crisis in 2011-12. Conversely when the economy is perceived to be strong and market and political sentiment is bullish, little compensation is required (2004-07). It is interesting to note that not only does the overall spread fall, but so does the relative spread between weaker and stronger companies. That is, little extra compensation is needed to take on the risk of a BBB company versus a AA company.

We can see that in recent times (2015-17) the relative spread has come together, even as the spread of the company bonds over the government bonds has widened. This may well be partly due to the German government bonds falling to negative yields and thus creating a floor below which the company bonds will not fall. This could thus cause an issue for the measuring of this risk pricing tool generally in the investment world, including real estate.

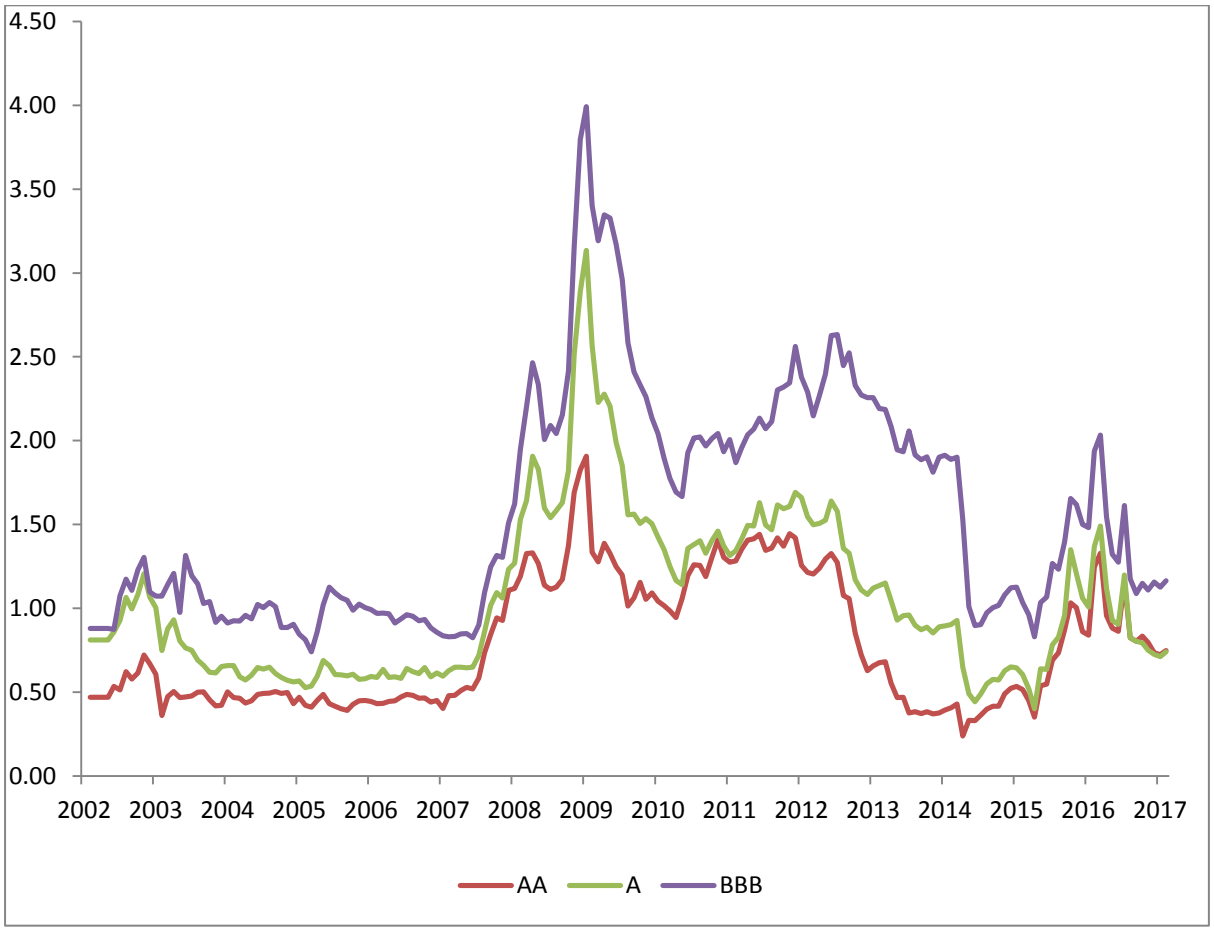
Figure 2: Euro area corporate bond spreads over German government bonds



Source: Bloomberg

The general spread pattern has been common in other countries, for example the UK (Figure 3). This is unsurprising given the international nature of capital markets, the globalisation of investor markets and the common experience of strong economic growth and strong investor sentiment over 2004-07 and recession and weak sentiment from mid-2007, when the financial crisis commenced. There are, however, some obvious differences and these can be seen as country specific economic and political events. Thus the UK spread dose not widen to such a great extent as that in Europe during the European sovereign crisis. Conversely, company spreads in the UK moved out on the back of the Brexit vote and the increased uncertainty that it created for the UK economy.

Figure 3: UK corporate bond spreads over UK government bonds



Source: Bloomberg

The paper is aiming to develop a measure of investment market sentiment, volatility and pricing of risk to augment the traditional approach to yield modelling. To this end, we wish to take advantage of the information contained within the revealed pricing of risk in the investment market provided by these spreads. Consequently, this corporate bond spread data can be used to construct a variable that provides a quantified measure of market sentiment. For each series, we take the average spread over time, and use this as benchmark against which to gauge whether the spread at any point in time is above or below its normal level. If the spread at a particular point in time is at its average level, then we assign the value one. If the spread is double, or half, its average level, then we assign the value two or 0.5 respectively. In this way the series is standardized around each level of risk for each respective grade of bond. Table 1 provides an example of the multiplier calculation based on a Euro area BBB corporate bond.

Table 1: Multiplier calculation for BBB corporate bond

	Euro area 5 yr BBB corporate bond yield (A)	5yr German government bond yield (B)	Spread (A-B) (C)	Multiplier C/Average
2002 Mar	6.04	4.91	1.13	0.76
Jun	5.87	4.49	1.38	0.93
Sep	5.22	3.60	1.62	1.09
Dec	5.30	3.40	1.90	1.29
2003 Mar	4.71	3.24	1.47	0.99
Jun	4.29	2.95	1.34	0.90
Sep	4.44	3.10	1.34	0.90
Dec	4.40	3.50	0.89	0.60
2004 Mar	4.03	3.09	0.94	0.63
Jun	4.45	3.57	0.88	0.59
Sep	4.15	3.32	0.84	0.56
Dec	3.91	3.03	0.88	0.59
2005 Mar	3.70	3.06	0.64	0.43
Jun	3.23	2.48	0.75	0.50
Sep	3.33	2.73	0.59	0.40
Dec	3.69	3.07	0.62	0.42
2006 Mar	4.22	3.59	0.63	0.43
Jun	4.54	3.84	0.70	0.47
Sep	4.33	3.63	0.70	0.47
Dec	4.55	3.92	0.63	0.42
2007 Mar	4.62	4.02	0.60	0.40
Jun	5.11	4.53	0.59	0.39
Sep	5.08	4.16	0.92	0.62
Dec	5.47	4.12	1.35	0.91
2008 Mar	5.57	3.60	1.97	1.33
Jun	6.33	4.64	1.70	1.14
Sep	6.43	3.77	2.66	1.80
Dec	6.63	2.32	4.31	2.91
2009 Mar	6.16	2.23	3.92	2.65
Jun	5.59	2.49	3.10	2.09
Sep	4.46	2.40	2.06	1.39
Dec	4.21	2.42	1.79	1.21
2010 Mar	3.70	2.14	1.56	1.06
Jun	3.55	1.46	2.09	1.41
Sep	3.37	1.48	1.88	1.27
Dec	3.94	1.84	2.10	1.42
2011 Mar	4.48	2.67	1.81	1.22
Jun	4.41	2.28	2.13	1.44
Sep	4.18	1.17	3.01	2.03
Dec	4.21	0.76	3.45	2.33
2012 Mar	3.30	0.80	2.51	1.69
Jun	3.32	0.61	2.71	1.83
Sep	2.52	0.51	2.01	1.35
Dec	2.09	0.30	1.79	1.21
2013 Mar	2.07	0.31	1.76	1.19
Jun	2.35	0.74	1.61	1.09
Sep	2.19	0.79	1.40	0.95
Dec	2.17	0.92	1.25	0.84
2014 Mar	1.80	0.63	1.17	0.79
Jun	1.37	0.34	1.03	0.69
Sep	1.10	0.15	0.95	0.64
Dec	0.95	0.02	0.93	0.63
2015 Mar	0.79	-0.10	0.89	0.60
Jun	1.19	0.08	1.11	0.75
Sep	1.20	-0.006	1.21	0.82
Dec	1.06	-0.045	1.10	0.75
2016 Mar	0.63	-0.328	0.96	0.65
Jun	0.44	-0.567	1.01	0.68
Sep	0.21	-0.576	0.78	0.53
Dec	0.49	-0.532	1.02	0.69
	Average spread from the monthly series		**1.48**	

Source: Bloomberg, Cushman and Wakefield

This methodology is repeated across the different grades in each region. The average of the multipliers across the grades is then taken to provide a risk multiplier for each region. We also construct an international multiplier based on the average across the three regions (Tables 2 and Figures 4 and 5). The time series on graded corporate bonds extend back to 2002, and so a composite corporate bond series for the US and UK has been used to extend the time series further back.

There are clearly several permutations of the multiplier that can be created and which may be useful in the future to examine specific countries/effects etc. However, for the aim of this paper a consideration of the principle of using the variable and the benefit it provides is the target.

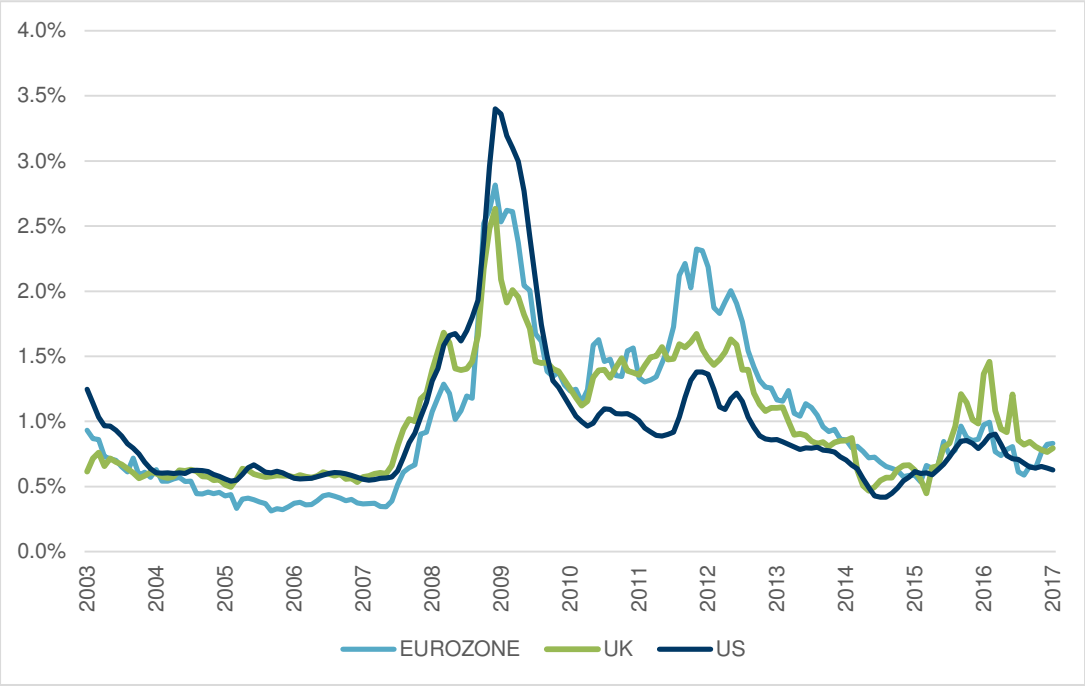
It is interesting to initially examine the charts to confirm they seem to tell the right story. A figure above one is providing above average risk (based on an average of risk measurement from 2002-2017). The international multiplier has been above one for an extended period from late 2007 slowly falling back. It has picked up again and the timing appears to support a view that it is on the fallout of the Brexit campaign/vote being driven particularly by the impact in the UK. The full impact of the perceived change of risk in the UK market is partly diluted by a more muted response elsewhere. Regardless though, risk measures rose in all the component parts of the multiplier versus. This clearly illustrates today's international capital market all markets responded to issues in the UK.

Table 2: Samples of risk multipliers

	EUROZONE MULTIPLIERS				Other Multipliers		
					UK	US	International
	AA	A	BBB	Average	All	All	3mma
2002 Mar	0.52	0.72	0.76	0.67	0.639		
Jun	0.60	0.78	0.93	0.77	0.735		
Sep	0.71	0.99	1.09	0.93	0.859		
Dec	0.72	0.97	1.29	0.99	0.798	1.273	1.119
2003 Mar	0.72	0.87	0.99	0.86	0.761	0.949	0.912
Jun	0.52	0.68	0.90	0.70	0.689	0.855	0.817
Sep	0.61	0.64	0.90	0.72	0.605	0.756	0.723
Dec	0.54	0.57	0.60	0.57	0.611	0.612	0.613
2004 Mar	0.47	0.53	0.63	0.54	0.565	0.618	0.590
Jun	0.51	0.52	0.59	0.54	0.620	0.608	0.591
Sep	0.38	0.39	0.56	0.44	0.580	0.601	0.583
Dec	0.39	0.39	0.59	0.46	0.554	0.558	0.543
2005 Mar	0.26	0.30	0.43	0.33	0.558	0.579	0.505
Jun	0.32	0.37	0.50	0.40	0.596	0.645	0.589
Sep	0.23	0.31	0.40	0.31	0.579	0.629	0.536
Dec	0.25	0.36	0.42	0.35	0.583	0.562	0.521
2006 Mar	0.28	0.38	0.43	0.36	0.577	0.565	0.517
Jun	0.38	0.43	0.47	0.43	0.611	0.608	0.540
Sep	0.35	0.41	0.47	0.41	0.597	0.600	0.558
Dec	0.32	0.38	0.42	0.37	0.534	0.555	0.521
2007 Mar	0.35	0.36	0.40	0.37	0.598	0.573	0.516
Jun	0.38	0.39	0.39	0.39	0.663	0.595	0.533
Sep	0.66	0.65	0.62	0.65	1.019	0.938	0.797
Dec	0.91	0.93	0.91	0.92	1.214	1.280	1.063
2008 Mar	1.24	1.29	1.33	1.29	1.681	1.813	1.472
Jun	1.03	1.07	1.14	1.08	1.395	1.640	1.452
Sep	1.80	1.69	1.80	1.76	1.660	2.037	1.688
Dec	2.70	2.83	2.91	2.81	2.633	3.363	2.970
2009 Mar	2.42	2.76	2.65	2.61	2.008	3.083	2.698
Jun	1.94	1.98	2.09	2.01	1.713	2.034	2.201
Sep	1.39	1.38	1.39	1.39	1.453	1.307	1.504
Dec	1.37	1.27	1.21	1.28	1.318	1.085	1.270
2010 Mar	1.23	1.16	1.06	1.15	1.122	0.955	1.098
Jun	1.84	1.64	1.41	1.63	1.391	1.147	1.221
Sep	1.51	1.28	1.27	1.35	1.415	1.055	1.234
Dec	1.79	1.48	1.42	1.56	1.375	0.993	1.244
2011 Mar	1.42	1.31	1.22	1.32	1.493	0.903	1.146
Jun	1.64	1.59	1.44	1.56	1.476	0.940	1.192
Sep	2.35	2.26	2.03	2.21	1.568	1.399	1.485
Dec	2.25	2.35	2.33	2.31	1.554	1.400	1.648
2012 Mar	2.03	1.77	1.69	1.83	1.475	0.998	1.413
Jun	1.95	1.94	1.83	1.90	1.589	1.134	1.491
Sep	1.49	1.41	1.35	1.42	1.217	0.897	1.205
Dec	1.29	1.27	1.21	1.26	1.104	0.879	1.025
2013 Mar	1.28	1.25	1.19	1.24	1.002	0.822	0.977
Jun	1.16	1.15	1.09	1.14	0.894	0.857	0.893
Sep	0.95	0.98	0.95	0.96	0.842	0.789	0.859
Dec	0.85	0.90	0.84	0.86	0.850	0.682	0.800
2014 Mar	0.79	0.84	0.79	0.81	0.626	0.607	0.720
Jun	0.72	0.76	0.69	0.72	0.497	0.413	0.521
Sep	0.60	0.67	0.64	0.64	0.570	0.499	0.530
Dec	0.53	0.60	0.63	0.59	0.665	0.586	0.599
2015 Mar	0.73	0.65	0.60	0.66	0.449	0.602	0.588
Jun	0.94	0.85	0.75	0.85	0.805	0.725	0.690
Sep	1.09	0.98	0.82	0.96	1.209	0.896	0.882
Dec	0.98	0.87	0.75	0.86	0.984	0.782	0.874
2016 Mar	0.88	0.77	0.65	0.77	1.081	0.820	1.005
Jun	0.95	0.78	0.68	0.81	1.206	0.750	0.807
Sep	0.79	0.65	0.53	0.66	0.844	0.657	0.689
Dec	0.97	0.82	0.69	0.82	0.766	0.618	0.703

Source: Bloomberg, Cushman and Wakefield

Figure 4: Risk multiplier by region (monthly)



Source: Bloomberg, Cushman and Wakefield

Figure 5: International risk multiplier (monthly 3 month moving average)

Source: Bloomberg, Cushman and Wakefield

Yield modelling methodology and results

Developing econometric models which relate movements in commercial property yields to movements in macroeconomic variables has been a challenge for property researchers. In some cases the time series available are only short, particularly in emerging markets, which limit the explanatory power and robustness of models. Moreover, even for markets for which longer times series are available, such as those in Western Europe, there are relatively few recessionary periods which can be analysed in terms of their impact on property yields. In general models have tended to struggle to explain the magnitude of swings in yields, such as the sharp compression in 2005-07 and subsequent rise in 2008-09).

The traditional approaches to yield modelling described previously have typically relied on explanatory variables such as GDP growth, rental growth and bond yields. Intuitively these are the key drivers of property yields given the fact that

Yield = Risk free rate + risk premium – growth

If the risk premium is fixed, then this, together with depreciation, transaction costs and the like can be incorporated in the constant of the equation. However, this does not explain marked swings in yields mentioned previously. This highlights the important role that investor behaviour, sentiment and the availability of credit play in determining yield trends and something which is missing from the standard analysis.

Below we outline the generic specification of the yield model for this paper:

$y_t = f(R_{t,} G_{t,} CPIG_{t)}$

Where:

R = nominal 10 year bond yield

G = year-on-year real GDP growth

CPIG = annual CPI inflation rate

The 10 year bond yield reflects the return from investing in government bonds. Admittedly real bond yields may drive commercial real estate yields than nominal bond yields. However, many countries do not issue index-linked bonds, meaning that real bond yields are not always available for modelling purposes. A possible solution would be to include current or expected inflation over the next ten years as an explanatory variable, thereby converting nominal bond yields to real bond yields. However, nominal bond yields can act as a proxy for real bond yields since the two variables are correlated. That is, movements in nominal bond yields are driven by movements in real yields and expected inflation (see for example Dunse et al 2015)). From experience, using real rather than nominal bond yields adds little explanatory power to equations.

Prior to the financial crisis government bonds were widely used as the risk-free rate. The euro crisis and ensuing sharp rise in bond yields in peripheral eurozone countries such as Spain and Italy means that government bonds can no longer be considered to be risk-free. However we still think that they are relevant for yield modelling. This is because the increase in bond yields in countries across Europe at the time of the crisis reflected not just an increase in the riskiness of investing in sovereign bonds, but also an increase in the riskiness of investing in all types of assets in these countries, commercial property included. GDP growth (contemporaneous or with a lag) picks up general trends in growth expectations.

The aim of the paper is to examine whether the risk measures created can be used as an additional extra variable to capture market sentiment in international markets. Consequently our modelling concentrated on the West End market, a main global investor destination[2].

After initial analysis of West End office yields showed them to be non-stationary. However tests showed a possibility of cointergration with the bonds variable. This makes some sense given that there has been an on-going, though not unbroken, downward trend in bonds and property yields in recent years.

The modelling continued using a fully modified least squares and a general to specific analysis of contemporaneous and lagged variables.

The yield model for London West End offices is shown below with all variables significant at 10% probability or better.

$$y_t = \underset{(0.3746)}{2.83} + \underset{(0.0950)}{0.51 * R_{t-1}} - \underset{(0.0473)}{0.13 * G_{t-1}}$$

Adjusted $R^2 = 0.5555$

Data quarterly 2001 Q4 – 2016 Q4

and the Augmented Dickey Fuller test on the error terms showed they were stationary.

This is generally a fairly reasonable explanatory power for a yield model and the coefficients are of the expected signs.

We then incorporated the risk multipliers into the equation. For the UK the international risk multiplier was the most significant. This may initially appear strange but given that London is an international hub for investors it may well be more relevant than the UK only risk multiplier.

[2] See end of paper for data appendix.

The yield model for London West End offices with the risk multipliers included is shown below with all variables significant at 10% probability or better.

$$y_t = \underset{(0.3078)}{1.92} + \underset{(0.0701)}{0.48 * R_t} - \underset{(0.0424)}{0.07 * CPIG_{t-1}} + \underset{(0.1690)}{0.99 * Intm_t}$$

Adjusted $R^2 = 0.6737$

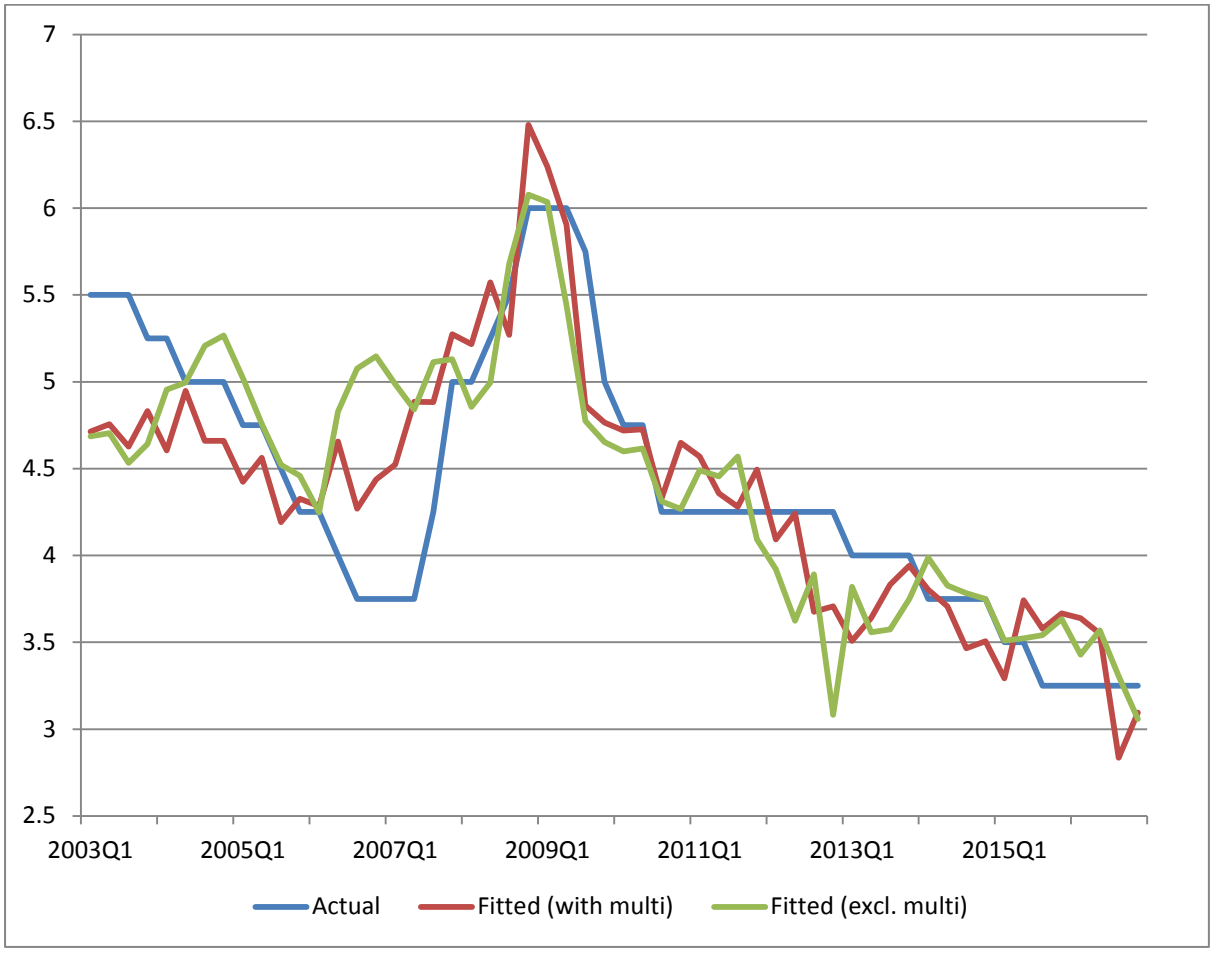
Data quarterly 2003 Q1 – 2016 Q4

again the error terms were stationary.

The model is clearly performing stronger and the inclusion of the multiplier removes the significance of growth and is more significant than the inflation variable, appearing to be a main explainer of the yield level.

If we examine the actual and fitted variables we can see that the benefit of including the variable is particularly useful at times of volatility in the investment markets (Figure 6).

Figure 6: London West End office yield model

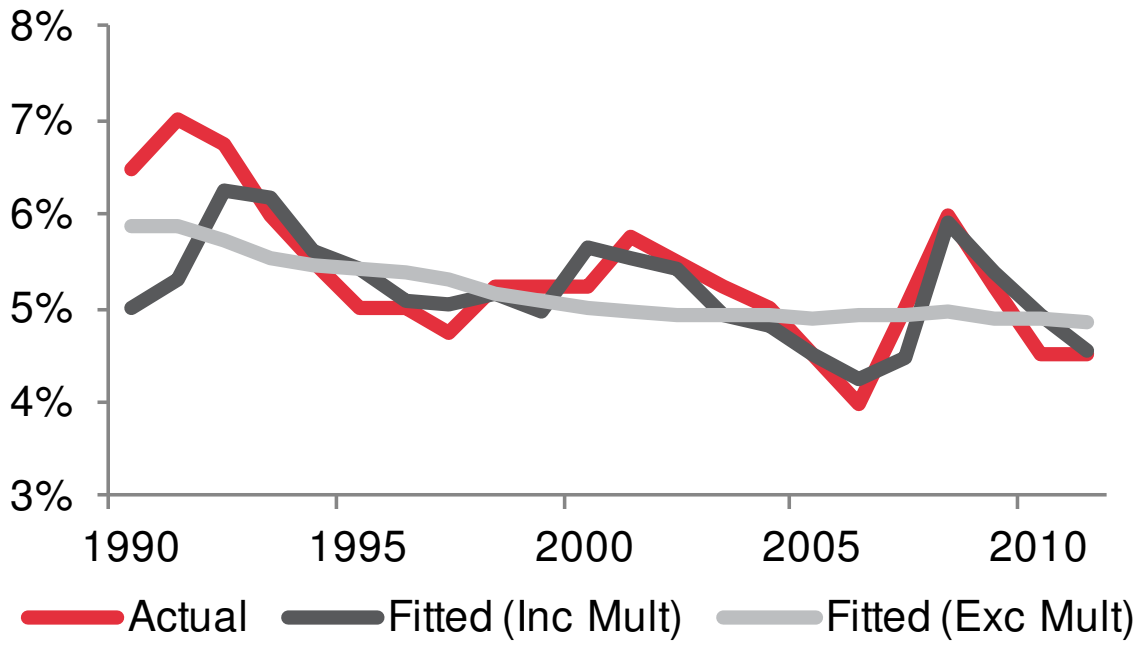


Source: Cushman and Wakefield, authors

Of particular note are the periods around 2007 when the model incorporating the multiplier strongly outperforms the standard model. Government bonds rose temporarily but this does not feed through into investor behaviour. Similarly in 2009, the actual data may well be underrepresenting the actual rise in yields. At this time the market was becoming very illiquid and it was difficult to sell even in London.

These findings reinforce previous findings presented by the authors which initiated the analysis (Berry et al 2012). Figure 7 highlight provisional findings from that time. Though based on annual data (making the benefits of the multiplier even more obvious) and over a different time period and specified model, the fundamental benefit of incorporating the sentiment/risk pricing indicator into the models are clear.

Figure 7: London West End office yield model



Source: Berry et al (2012)

Conclusions and Implications

This paper presents a methodology to attempt to incorporate sentiment and risk into the modelling of the commercial real estate market. Initial results indicate that the use of risk pricing indicators may well be a useful extra tool in understanding the drivers of yields.

If this is found to be more widespread the implication for investors would be interesting. During periods of high volatility sentiment appears to drive out more traditional fundamental variables. While more conventional models end up in a similar place the dynamics of the market mean they may indicate mispricing in the short to medium term.

Further analysis of more global markets needs to occur to examine whether this is fixed to the UK, global hubs or more generally around the real estate market. Also as negative government bonds become more widespread what is the impact of this on international investors and how they price real estate? The period's post 2015 in the risk indicators seem to be starting to show contrarian movements as some markets risk free rate moves into very low or negative territory.

Appendix Data

Quarterly 2000 Q1-2017Q1

Y = London West End Office Yields – Source: Cushman & Wakefield

R = nominal 10 year UK bond yield – Source: Oxford Economics

G = year-on-year real UK GDP growth - Source: Oxford Economics

CPIG = annual UK CPI inflation rate - Source: Oxford Economics

Multiplier – calculated as defined above - Source Bloomberg/Cushman & Wakefield/Author's own work

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