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From Property Companies to Real Estate Investment Trusts: The Impact of Economic and Property Factors on UK Listed Property Returns

Vitor Leone[1]

Abstract

A great deal of research has examined comovements between commercial real estate returns and macroeconomic variables in the US economy. These relationships have attracted less research interest for the UK real estate market, despite this being the largest European Market. This study targets this gap in the literature by investigating the impact of economic and property factors — e.g. the UK IPD all property returns, the FTSE all share index returns, and the term structure of interest rates — on listed property returns. It examines a sample of UK property companies which converted to real estate investment trusts (REITS) following the introduction of the UK legislation permitting this from January 2007. By applying structural time-series modelling and the Kalman filter to obtain unexpected changes or innovations in selected economic and property variables it was found that economic and property variables influence commercial property returns in the UK. Specifically, unexpected changes in the FTSE All Share Index returns, the UK IPD All Property Returns, Industrial Production, the UK IPD All Property Rental Growth, and the UK All Property Equivalent Yield all had a positive impact on property returns. In contrast the term structure of interest rates and the sterling US dollar exchange rate exerted a negative influence. It was also found that by converting property companies into REITS their returns quickly acquired common features of both equities and commercial property backed assets.

1. Introduction

In recent years, interest in the performance of real estate investment markets represented, for example, by real estate investment trusts (REITS) and general securitised real estate indices has become increasingly popular. Most research has emphasised the impact of economic and financial factors on real estate returns — proxied by REITS — which then frame the investment and risk management strategies of property investors. As such, previous studies attempt to find exogenous influences which will help determine the risk structure of commercial real estate returns through time. The overwhelming focus of research in this area has been on the US market.

The objective of this paper is to address the limited research linking commercial real estate returns to unanticipated changes in economic and property variables in the UK real estate investment market. In addition we explore the idea that these links — between unanticipated changes or innovations and real estate returns — are likely to change when a sample of UK listed property companies opted to convert into REITS with the introduction of the UK REITS legislation in January 2007.

In order to analyse these changes we focus this research on three sample periods which cover the period before REITS (2001 to 2006), after (2007 to 2009) and the whole sample (2001 to 2009). We apply panel data analysis to a sample of listed property companies before and after they convert to REITS. Unexpected changes or innovations on the selected economic and property variables were obtained by using the residuals generated from unobserved components time-series models; this was achieved by applying the Kalman filter.

The remainder of this paper is organised as follows. Section 2 surveys the relevant literature on the impact of economic and financial variables on commercial property returns; Section 3 discusses the selection of data and the generation of innovations in the economic and property variables; Section 4 provides summary and analysis of the empirical results. Section 5 concludes.

2. Literature Review

Studies aiming to find the links between real estate investment returns, economic and financial factors have been overwhelmingly carried out using US data. Chan *et al.* (1990) showed that changes in the default risk and the term structure of interest rates within a multifactor arbitrage pricing model helped to explain real estate returns movements proxied by returns on REITS. Also targeting the US market, McCue and Kling (1994) applied an unrestricted VAR model to explore the linkages between the macroeconomy and real estate returns through time. Their aim was to determine the extent to which macroeconomic variables explain real estate returns and how these returns react to shocks in those variables. Their approach considered prices (measured by the consumer price index), short term nominal rates (proxied by the three-month treasury bill-rate), output (measured by the Federal Reserve Industrial Production Index) and investment (using the McGraw Hill Construction Contract Index). The results showed that macroeconomic variables explained approximately 60 per cent of the variation in real estate returns (proxied the National Association of Real Estate Investment Trust, NAREIT, equity REIT index), with nominal interest rates explaining approximately one third of this variation.

Ling and Naranjo (1997) looked into the links between economic risk factors and commercial real estate returns in the US market and found that the growth rate in real per capita consumption and the in real treasury-bill were consistently priced according to the arbitrage pricing theory model (APT) test framework with fixed coefficients. The term structure of interest rates and unexpected inflation were significant when sensitivities and risk premia were allowed to vary over time.

Chen *et al* (1998) investigated the cross-sectional variation in equity real estate investment trusts using a pooled cross-sectional time-series approach as an alternative to the two-step Fama-MacBeth (1973) regression. Four pricing models were used to explain real estate returns: (i) the capital asset pricing model (CAPM), (ii) a firm-specific model based on the Fama and French (1992) three-factor model, where firm-specific attributes are presumed pricing factors; (iii) a macroeconomic variable model where the chosen economic time-series based on Chen *et al* (1986) were assumed to be pricing factors, and (iv) a combined model including all the variables associated with the other three models. The results rejected the CAPM explanation with the beta coefficient not being significantly different from zero, but found size to be significantly priced among REITS in the firm-specific model, and the term structure of interest rates in the macroeconomic model. The combined model showed size as the only significant variable, i.e. size appeared to be the dominant factor in explaining real estate returns.

Chen *et al* (1997) also used a multifactor approach by applying the (APT) on monthly returns of equity real estate investment trusts using two empirical models — a factor loading model constructed by the factor analytical approach, and a macroeconomic model using the same economic factors as Chen, Roll and Ross. The aim of the study was to find the priced macroeconomic variables and to compare the performance of the two empirical versions of the APT. Using three sample periods they found that unanticipated inflation, a market residual factor, unanticipated change in the term structure and the unanticipated change in the risk premium were significant variables. They also found the macroeconomic model generally superior to the factor loading model in explaining real estate returns in two of the three analysed sample periods. Sing (2004) used a multifactor asset pricing model (MAP) to examine the effects of systematic and common risk factors on the fluctuations in excess returns of direct and securitised real estate investments. Using the seemingly unrelated regression (SUR) technique and the Fama-MacBeth (1973) two stage regression approach, Sing estimated the risk premia in the MAP models, establishing that macroeconomic risk factors are priced quite distinctly in direct and securitised real estate markets.

Payne (2003) investigated the effects that shocks to macroeconomic variables would have on the excess returns of three broad classifications of REITS (equity, mortgage and hybrid) by using an unrestricted vector autoregressive (VAR) model and general impulse response analysis which did not impose the ordering of the variables in the VAR. The results showed that unexpected changes in the broad stock market index were positively significant to all three types of REITS. They also found the following: unexpected changes to the growth of industrial production was negatively significant for hybrid and mortgage REITS; unexpected changes to inflation and default risk insignificant for all three types; unexpected changes to the term structure negatively related to equity and hybrid REITS; and, unexpected changes to federal funds rates adversely affect mortgage and hybrid mortgages. Ewing and Pane (2005), also using an unrestricted VAR and generalised impulse response analysis on the NAREIT index for all-public traded REITS in the United States, found that unanticipated changes or innovations to monetary policy, economic growth, and inflation are all associated with a fall in REITS returns, while innovations to the default risk premium are associated with raises in REITS returns.

Bredin *et al* (2007), applying a GARCH model to focus on the impact of innovations in the US monetary policy on returns and the volatility of equity REITS, found indications of strong responses in both returns and volatility to the innovations, although the volatility trend remained unchanged. The importance of monetary policy for REITS returns is also the focus of the research by Simpson *et al* (2008) who found a significant response of equity REITS returns to inflation, and highlight a dependence on the predominant monetary policy environment, during expansionary periods, equity REITS are influenced by both raising and reducing inflation.

In the UK, the links between economic, financial variables and commercial real estate returns have attracted much less research interest. Lizieri and Satchell (1997), using a threshold autoregressive model (TAR), investigated the relationship between real interest rates and property prices. They concluded that property company share prices, proxied by the DataStream UK property price index, are sensitive to real interest rates. Specifically, the price effects of high relative interest rates are much sharper than those of lower interest rates. That is, where there were high interest rates property prices fell very sharply with low volatility, and with lower rates the increase in prices was less pronounced.

Brooks and Tsolacos (1999) employed a VAR model to investigate the impact of macroeconomic and financial variables on a UK real estate return series, represented by the FTSE Property Total Return Index and a set of economic variables which are commonly used in studies of stock returns predictability. That is, by stating that the same assumptions linking movements in stock returns to macroeconomic and business conditions apply to real estate returns, changing trends in the economic and business environment were examined by the following variables: the rate of unemployment, nominal interest rates, the term structure of interest rates, unanticipated inflation and the dividend yield. They concluded that the UK real estate returns cannot, in general, be explained by the set of variables used in their study; however, there were indications that the term structure and unexpected inflation have some effect on property returns.

Hoskins *et al* (2004) compared the relationships of macroeconomic variables on the commercial property markets in Australia, Canada, the UK and the US to find that GDP, unemployment and inflation are main determinant factors. Schatz and Sebastian (2009) looked into empirical evidence on the dynamic interactions between the property markets in Germany and the UK and their country-specific macroeconomic environment. Deviating from traditional research, this study was focused on appraisal-based property indices (the UK IPD and the German IMMEX). Applying a vector error correction model (VECM) the authors examined the development of real estate prices while considering the influences of a wide range of macroeconomic risk factors. They found that long-run equilibria for the property markets in Germany and the UK showed comparable results in terms of significance, order, magnitude and sign. Specifically, they found a negative relationship between the property indices and unemployment rates, and a positive link with both property markets and the respective consumer price index and government bond yields.

3. Data and Methodology

3.1. Real estate returns

In examining the relationship between UK real estate investment returns and unanticipated changes in economic and property variables this study considers all property companies traded on the London Stock Exchange (LSE) which converted to REITS. The advantages of this for the companies concerned are as follows: (i) property companies which enter the REITS regime can take advantage of the lower tax burden offered. That is, the income generated through the rental business and gains arising on the sales of rental properties generally have a lower incidence of taxation; (ii) in line with the US, UK REITS are required to distribute at least 90 per cent of tax-exempt profits to shareholders, and consequently to property investors there may be greater attraction in REITS than in property companies.

According to UK REITA[2] the current UK REITS MARKET consists of 21 companies. From these 21 companies, three companies were ruled out of our study because of thin, or almost nonexistent trade, and an additional two because they did not exist as property companies before 2007. Therefore 16 of the 21 currently listed REITS were included. It is important to note that, according to the European Public Real Estate Association (EPRA), the estimated UK REITS market represents 6.5 per cent of the global REITS market and had a market capitalisation of 18.7 billion euros (June, 2009). Time series monthly returns on the 16 selected property companies, listed in Table 1, were collected for the 2001-2009 period from DataStream Thompson Financial.

Table 1: Listed UK REITS

Company	*Sector*	*Sample data*
Big Yellow	Self Storage	2001m1-2009m12
British Land	Diversified	2001m1-2009m12
Derwent London	Offices	2001m1-2009m12
Great Portland Estates	Offices	2001m1-2009m12
Hammerson	Diversified	2001m1-2009m12
Hansteen	Industrial	2004m12-2009m12
Highcroft Investments	Diversified	2001m1-2009m12
Land Securities	Diversified	2002m10-2009m12
Liberty International	Retail	2001m1-2009m12
Mckay Securities	Offices	2001m1-2009m12
Muclow (A&J) Group	Industrial & Offices	2003m2-2009m12
Primary Health Properties	Healthcare	2001m1-2009m12
Shaftesbury	Retail	2003m2-2009m12
Town Centre Securities	Retail	2003m2-2009m12
Warner Estate Holdings	Retail	2003m2-2009m12
Workspace Group	Industrial & Offices	2003m2-2009m12

Source: DataStream Thompson Financial

3.2. Economic and property variables

In choosing the economic factors to include in our analysis we borrow from the literature that investigated the relationship between stock market returns, as well as real estate returns and economic factors. Here we follow both traditional practice and published empirical findings[3] to select macroeconomic variables thought to influence prices of an asset, P_0, via either expected dividends $E(D_t)$, or the discount rate, R, of the stock valuation model:

$$P_0 = \sum_{t=1}^{\infty} \frac{E(D_t)}{(1+R)^t} \tag{1}$$

Therefore any economic or property variable which influences the right hand side of equation (1), will have an impact on prices and observed returns.

The selected economic variables we use are shown in Table 2. In addition to the variables commonly selected in other studies, we included the following property variables: (i) the UK IPD All Property Index Return which is an appraised-based commercial property index; (ii) UK IPD All Property Rental Growth; and, (iii) UK IPD All Property Equivalent Yield. By using these property variables as explanatory variables we deviate from the majority of academic literature linking commercial real estate returns to economic factors; other approaches do not usually use direct property measures to explain equity based commercial property returns. We think such property variables would be relevant to capture the transition of property companies' returns to REITS returns, especially rental growth and equivalent yields, as they are likely to help to explain REITS returns but not property companies' returns. The latter should have features of equities whereas the former is likely to have the features of both equities and property-backed assets. The justification for including the UK FTSE All Share Index and its dividend yield is explained by the fact that the market index return is generally a powerful explanatory variable, and its exclusion could lead to an omitted variables bias. While the economic variables are expected to have an impact on the valuation of cash flows, they are also intended to capture economic growth, the impact on the demand and supply for commercial property (industrial production and unemployment respectively), portfolio balance (exchange rate between sterling and the US dollar) and risk premium (term structure of interest rates calculated as the difference in yields between UK 20 years Government Bond and the UK Three-Month Treasury Bill). Monthly data was collected from 1998M1 to 2009M12. Information previous to 2001 was needed to apply the Kalman filter to fit the unobserved components models and obtain the innovations in the economic and property variables for the investigation period considered in this study (i.e. 2001M1-2009M12).

Table 2: Selected Economic and Property Variables

Variable	*Symbol*
UK Ftse All Share Index Returns	FTSE
UK Ftse All Share Dividend Yield	DIV
UK Consumer Price Index	CPI
UK IPD All Property Returns	IPD
UK Industrial Production	INDP
UK All Property Rental Growth	RENT
UK Monthly Average Yields on 20 years Government Bonds	LTB
UK 3Month Treasury Bill Rate	3MTB
Term Structure of Interest Rates	TERM=LTB-3MTB
UK Unemployment Rate	UNEMP
UK All Property Equivalent Yield	EQY
Sterling-US Dollar Exchange Rate	EXRATE

Source: The UK IPD, Office of National Statistics (ONS), DataStream Thompson Financial, and from the Bank of England (BOE).

3.3. Generating Innovations in the Economic and Property Variables

Research on the relationship between stock and/or commercial property returns and economic variables, is often focused on the idea that the way these returns are valued is underpinned by the real economic and business outlook. As Chen *et al.* (1986) have argued, if this is the case, it is only the unexpected component of economic news or 'innovations' that should have any impact on asset prices in efficient markets. It is therefore of considerable importance to use an appropriate method of estimating the unexpected changes, or innovations, in any econometric investigation of the relationship between commercial property returns and economic variables, since this will likely have a strong bearing on the results.

In such analyses innovations should be categorised as genuine shocks and should therefore be zero-mean, serially-uncorrelated, white-noise processes. The most common approach is initially to calculate the first differences in order to render the variables under investigation as stationary. However, Priestley (1996), Garrett and Priestley (1997), Antoniou *et al.* (1998), Cauchie *et al.* (2004), Leger and Leone (2008), and Leone and Leger (2008), have shown that first differences usually fail to produce serially-uncorrelated white-noise processes when trying to generate unexpected changes on macroeconomic and financial variables. A structural time-series analysis with the Kalman filter algorithm embodies an updating process whereby investors can change their expectations in response to economic news. That is, economic agents learn and update their expectations recursively each period as more information becomes available, such that the problem of estimating an expectation series and generating the unanticipated component becomes, in the simplest case, one of signal extraction which can be achieved through the use of the Kalman filter.

Structural time series or unobserved components modelling using the Kalman filter is a state-space approach to time-series modelling. It involves the decomposition of the series under investigation into unobserved components, specifically the presence or absence of the level; trend seasonality; cyclicity; autoregressiveness; or irregularity inherent in the series.

The model can be written as:

$$y_t = \mu_t + \gamma_t + \nu_t + \varepsilon_t \tag{2}$$

and ε_t is NID (0, σ^2_ε), $t = 1,\ldots,T$, where y_t is the series under investigation, μ_t is the trend, γ_τ is the seasonal, υ_t is a first order autoregressive component, and ε_t is the irregular. The stochastic trend component is specified as:

$$\mu_t = \mu_{t-1} + \beta_{t-1} + \eta_t \tag{3}$$

and η_t is NID $(0, \sigma^2_\eta)$;

$$\beta_t = \beta_{t-1} + \zeta_t \tag{4}$$

and ζ_t is NID ($0,\sigma_\zeta^2$), where β_t is the slope of the trend μ_t . The irregular ε_t, the level of disturbance η_t and the slope disturbance ζ_t are mutually uncorrelated.

In the investment context it permits optimal updating of economic information and could therefore be a useful way to model innovations in economic variables (economic 'news'). Durbin and Koopman (2002) note that structural time-series models built using a state space format are very general (subsuming ARIMA models) and allow for an underlying structure that changes over time. The 'Structural Time Series Analyser, Modeller and Predictor' software (STAMP) of Koopman, *et al.* (1999) was used to apply the Kalman filter, specifying stochastic level, stochastic slope, stochastic trigonometric seasonal and irregular components and lags of the dependent variable, included if necessary. Estimation was performed by maximum likelihood.[4] Unlike the Box-Jenkins ARIMA models, none of the variables are adjusted by first differencing (Durbin and Koopman 2002; Schatz and Sebastian, 2009; argue that using first differences may lead to loss of information and to distortions of the results). Table 3 gives the final models, showing the number of iterations necessary to achieve convergence and the strength of convergence. 'VERY STRONG' convergence signalled by the STAMP programme indicates that successful maximum likelihood estimation has been carried out by numerical optimisation. Failure to achieve convergence may be an indication of a poorly specified model.

Table 3: Structural Time-Series Models of the Economics and Property Variables

Variable	*Selected model*
FTSE	Level+Slope+Irregular (Very Strong Convergence After 8 Iterations)
DIV	Level+Slope+Lags(1,2,4,10)+Irregular (Very Strong Convergence After 6 Iterations)
CPI	Level+Slope+Trigonometric Seasonal+Irregular (Very Strong Convergence After 10 Iterations)
IPD	Level+Slope+Lags(2,3,4,7,9,12)+Irregular (Very Strong Convergence After 13 Iterations)
INDP	Level+Slope+Irregular (Very Strong Convergence After 4 Iterations)
RENT	Slope+Level+Lags(1,3,4,9)+Irregular (Very Strong Convergence After 48 Iterations)
TERM	Slope+Level+Lags(1,3,10)+Irregular (Very Strong Convergence After 11 Iterations)
UNEMP	Level+Slope+Irregular (Very Strong Convergence After 17 Iterations)
EQY	Level+Slope+Irregular (Very Strong Convergence After 6 Iterations)
EXRATE	Slope+Level+Lags(1,2,3,5,7)+Irregular (Very Strong Convergence After 4 Iterations)

The residuals from the final models constitute the unexpected changes or innovations in selected economic and property variables used in this paper. Table 4 shows the Ljung-Box test results for serial correlation and the Augmented Dickey-Fuller (ADF) and Phillips-Perron stationarity tests for both the first differences and the residuals of the final selected unobserved components models. It alsoshows that first differencing succeeds in creating stationary innovations, but dramatically fails to generate serially uncorrelated series since unexpected changes in all variables under investigation reveal the presence of serial correlation.

3.4. The Linear Panel Data Model

Our analysis uses traditional panel data methods because they provide regression analysis with both spatial and temporal dimensions, facilitating an increase in sample size. The spatial dimension pertains to a set of cross-sectional observations — in this case the returns on 16 UK REITS. The temporal dimension pertains to periodic observations of these cross-sectional units through time, focussing on the unexpected changes, or innovations, on the selected economic and property variables. Following Greene (2008) the basic model using pooled data is:

$$Y_{i,t} = \alpha_i + \beta X_{i,t} + \varepsilon_{i,t} \qquad (5)$$

The panel data have multiple observations, viz., $t = 1,\ldots,T$ (time periods) of each $i = 1,\ldots, N$ cross-sectional observations (UK REITS) in the sample. There are k regressors in $X_{i,t}$ (explanatory variables), not including the constant term. The individual effect, α_i, is assumed to be constant over time and specific to the individual cross-sectional unit in the one-way fixed firm effects model. There is a stochastic error term, $\varepsilon_{i,t}$, which is assumed to have mean of zero and constant variance. For two of the three sample periods (2001M1 to 2009M12 and 2001M1 to 2006M12) unbalanced panels were applied because of missing observations for some of the cross-sectional units.

To define whether a fixed effects model which allows for different constants for each cross-section was preferred to a simple pooled regression, the standard F-test was used (Likelihood Ratio test results are reported in Table 5). The tests indicate the fixed effects model was most appropriate for the 2001M1-2009M12 and 2007M1-2009M12. As our explanatory variables are the same for all UK REITS, the random effects estimate of the cross-sectional variance term is likely to be zero and therefore there is no evidence of individual effects in the data. This was confirmed by the Hausman test for random effects, which are available on request from the author.

Table 4: Economics Property Variables Innovations Serial Correlation and Stationarity Diagnostics

	First difference innovations			*Structural Models-Kalman filter Innovations*		
Variable	*Ljung Box (lag 24)*	*ADF*	*PP*	*Ljung Box (lag 24)*	*ADF*	*PP*
FTSE	***50.289 (0.001)***	(-12.213)***	(-22.692)***	24.803 (0.417)	(-8.857)***	(-8.998)***
DIV	***45.942 (0.004)***	(-3.425)**	(-8.996)***	9.433 (0.997)	(-9.733)***	(-9.719)***
CPI	***283.29 (.0000)***	(-5.071)***	(-57.822)***	29.108 (0.216)	(-8.877)***	(-8.845)***
IPD	***34.708 (0.073)***	(-9.235)***	(-9.223)***	19.336 (0.734)	(-9.394)***	(-9.400)***
INDP	19.103 (0.751)	(-11.927)***	(-11.813)***	19.777 (0.709)	(-9.706)***	(-9.730)***
RENT	***113.16 (0.000)***	(-4.436)***	(-13.772)***	***47.538 (0.003)***	(-4.796)***	(-8.8467)***
TERM	***38.979 (0.027)***	(-6.194)***	(-6.148)***	9.517(0.996)	(-9.512)***	(-9.473)***
UNEMP	***107.88 (0.000)***	(-4.048)***	(-6.829)***	21.181 (0.628)	(-9.868)***	(-9.866)***
EQY	***234.0 (0.000)***	(-2.808)*	(-2.681)*	14.024 (0.946)	(-8.401)***	(-8.423)***
EXRATE	***41.405 (0.015)***	(-6.867)***	(-6.929)***	23.323 (0.501)	(-10.380)***	(-10.527)***

Note: Values in bold and italics with attached probabilities indicate significant presence of serial correlation.
***; **; * indicates the rejection of unit root at 1%, 5%, and 10% significance levels.

Table 5: Test Cross-Section Fixed Effects (Likelihood Ratio Test)

Sample periods	*Effects tests*	*Statistic*	*Prob.*
	Cross-section Chi-square	**30.941**	**0.009**
2001m1-2006m12	Cross-section F	1.162	0.296
	Cross-section Chi-square	17.757	0.276
2007m1-2009m12	Cross-section F	**1.476**	**0.108**
	Cross-section Chi-square	**22.746**	**0.090**

Note: Values in bold indicate the rejection of the common constant model in favour of the fixed effects model.

4. Empirical evidence and analysis

The regression results for each of the three sample periods are reported in Table 6. A preliminary analysis indicates that UK REITS returns are sensitive to macroeconomic and property variables for the sample periods investigated. This result contradicts the findings of Brooks and Tsolacos (1999), who found that the variation in UK property returns, net of stock market influences, could not be explained by any of the main macroeconomic or financial variables they used, for the period 1985M12 to 1999M1. Brookes and Tsolacos suggested that one explanation for this result was that their choice of variables did not capture the necessary information about the macroeconomy and business conditions, needed to reflect the determinants of inter-temporal behaviour of property returns. We concur with this view. However, their result also supports some of our findings related to the relevance of property factors, such as rent and yields, by conjecturing that they were likely to influence property returns — which, unfortunately were omitted from their research.

Although the R-squares of the panel regressions were not high this did not come as a surprise, because of volatile events embraced in the sample period, such as 9/11 and the recent financial crisis. As a matter of fact, we would not be surprised if none of the selected variables were relevant, since during periods of extreme volatility asset prices tend not to follow economic and business conditions because of irrational behaviour from investors.

Innovations in the FTSE All Share Index returns (FTSE), the UK IPD All Property Returns (IPD), Industrial Production (INDP) and the term structure of interest rates (TERM) influence UK commercial property returns before and after property companies converted into REITS. This pattern is manifest cross-sectionally and through time. Returns on our broad market index (the FTSE) are positively related to commercial property returns since both property companies' shares and (subsequently) REITS are compulsorily traded on the London Stock Exchange; as a consequence we would expect their variation to positively track the variations in the market.

Table 6: Panel Data Multiple Regression Results

	Sample Period 2001m1-2009m12			*Sample Period 2001m1-2006m12*			*Sample Period 2007m1-2009m12*		
	Coefficient	*t-statistic*	*Prob.*	*Coefficient*	*t-statistic*	*Prob.*	*Coefficient*	*t-statistic*	*Prob.*
C	0.0003	0.1088	0.9133	0.0131	3.9303	0.0001	-0.0226	-4.0031	0.0001
DIV	-0.0012	-0.2560	0.7979	0.0041	0.4677	0.6401	-0.0014	-0.2259	0.8213
FSTE	**0.0334**	**6.9073**	**0**	**0.0305**	**3.8308**	**0.0001**	**0.0358**	**4.7025**	**0**
CPI	0.0022	0.6023	0.5471	0.0052	0.9898	0.3225	0.0028	0.4850	0.6279
IPD	**0.0076**	**2.5945**	**0.0096**	**0.0115**	**2.6911**	**0.0072**	**0.0201**	**3.7794**	**0.0002**
INDP	**0.0112**	**3.7879**	**0.0002**	**0.0071**	**2.1971**	**0.0283**	**0.0211**	**3.7085**	**0.0002**
EXRATE	**-0.0056**	**-1.9301**	**0.0538**	**-0.0018**	**-0.5101**	**0.6101**	**-0.0191**	**-3.7741**	**0.0002**
RENT	**0.0121**	**3.3995**	**0.0007**	**-0.0003**	**-0.0574**	**0.9542**	**0.0245**	**4.1688**	**0**
EQY	**0.0069**	**1.8369**	**0.0664**	**-0.0009**	**-0.1602**	**0.8727**	**0.0302**	**3.8223**	**0.0001**
TERM	**-0.0164**	**-5.4328**	**0**	**-0.0200**	**-3.7377**	**0.0002**	**-0.0115**	**-2.6556**	**0.0081**
UNEMP	0.0035	1.1368	0.2558	0.0038	1.05970	0.2896	0.0028	0.5283	0.5975
R^2	0.1905			R^2	0.0952		R^2	0.2868	
Adjusted R^2	0.1770			Adjusted R^2	0.0855		Adjusted R^2	0.2544	

Note: This table gives the cross-sectional slope coefficients, t-statistics and probabilities derived from running a fixed pooled cross-sectional time-series regression for 2001m1-2009m12 and 2007m1-2009m12 and a general pooled regression (no fixed effects) for 2001m1-2006m12 of individual UK REITS returns against unexpected changes or innovations on selected economic and property variables which are the residuals obtained from using the Kalman filter to fit unobserved components time-series models to those variables.

The same can be said for the positive relationship between the IPD and commercial property returns: since positive returns on a non-equity based real estate index imply appreciation of property capital values, we would expect investors and property developers to (directly or indirectly) increase their investment into real estate.

Industrial Production (INDP), used here as a proxy for economic growth, was also found to be positively related to property returns. As has been observed frequently in real estate research, we expect a positive link between both property prices and rents, vis-à-vis economic growth, as the latter is likely to stimulate the demand for real estate investments, thereby boosting property prices. In addition, higher expected cash flows ensure relaxed credit standards and facilitate the increase in profit margins of property companies.

As for the term structure, the negative coefficient with property returns indicates an inverse relationship with increases in the long term rates of interest over the short term rates of interest. That is, as TERM measures a change in the long-term rate of interest, decreases would imply a subsequent lower return on any form of capital. These decreases will drive investors to look for protection against this possibility and, consequently, are likely to put a relatively higher value on assets whose price increases when the long term rate declines.

Our results followed an analysis of different economic and property variables being sensitive to UK property returns after property companies converted to REITS. Specifically, the unexpected changes on UK IPD All Property Rental Growth, the UK IPD All Property Equivalent Yield and the Sterling US dollars exchange rate, were all significant for the 2007M1 to 2009M12 period associated with REITS, and the 2001M1 to 2009M12 period which incorporated both the pre- and post-REITS returns. The same variables did not show any explanatory power for the 2001M1 to 2006M12 period which includes the pre-REITS returns only.

REITS are assumed to be an attractive investment vehicle for investors who want exposure to property investment, but do not want to purchase property directly. REITS provides features of equity investments which are not available in direct property, including liquidity, lower transaction costs, lower cost of entry for investors and access to a diversified portfolio. Therefore, this could explain similar economic and property variables being sensitive to both returns on property companies and REITS. Nevertheless, what explained the emergence of other variables when these property companies converted to REITS?

REITS are publicly listed companies which purchase and manage property in order to deliver income and capital growth for investors. In the UK REITS have to split themselves into a ring-fenced REIT business and a non ring-fenced business, and the ring-fenced business must have at least 75% of its income and assets held within a property letting business. The positive and significant relationship between property returns and UK IPD All Property

Rental Growth suggest that investors put greater emphasis on rental increases, since it will increase the income generated and, subsequently, the price and return on REITS. The interesting point to emphasise here is the quick incorporation of this variable as an important factor to measure REITS returns, as suggested by the results for the whole sample and for the REITS period only. As a matter of fact, Giliberto (1990) argues that REITS returns are derived both from factors that influence both stock and bond markets, and by some unspecified fundamental pure real estate factor or factors that also affect direct real estate investment.

The same principle can be used to explain the sensitivity of equivalent yields to REITS returns. Equivalent yield is defined as a weighted average of the initial yield[5] and the reversionary yield[6] and represents the return a property will produce based upon the timing and income received. The positive relationship between REITS returns and equivalent yield, portray these dynamics of time and income and the REITS performance. That is, higher and longer income is likely to generate higher REITS returns.

The UK REITS appeared quickly to acquire the features of equities and real estate assets by having RENT and EQY, plus the other economic variables, as significant factors in explaining UK property returns (cross-sectionally and through time). Finally, the exchange rate was also significant in explaining property returns for the whole sample (2001-2009), and for the REITS sample period (2007-2009). This might be attributed to the high number of international private and institutional investors diversifying, or balancing their real estate portfolios by investing in both direct and indirect real estate in the UK.

5. Conclusions

This paper has employed traditional panel data analysis to investigate the impact of economic and property variables on property investment returns in the UK. The main motivation for focusing on the UK market was the lack of listed property research covering what is the largest European real estate investment market. Property investments returns in the UK were proxied by real estate investment trusts. Prior to January 2007 these were listed as property companies, latterly as REITS.

The selection of economic and property variables were based on previous studies. As only unexpected changes or innovations in economic and property variables were likely to affect returns, structural time-series modelling was applied to obtain these innovations. That is, we applied unobserved components time-series models and the Kalman filter to fit the models to our selected economic and property variables, and used the residuals of these models as our innovations. The generated residuals using this technique differ from the unexpected changes generated with first differencing the data, in that they are serially uncorrelated white-noise processes, with the economic and property variables used generating unexpected economic news or shocks.

The results showed that for the periods 2001M1-2009M12 and 2007M1-2009M12 economic and property variables helped to explain commercial property returns in the UK (cross-sectionally and through time). Specifically, unexpected changes in the FTSE All Share Index returns, the UK IPD All Property Returns, Industrial Production, the UK IPD All Property Rental Growth, and the UK All Property Equivalent Yield all had a positive impact on property returns. In contrast the term structure of interest rates and the sterling US dollar exchange rate exerted a negative influence.

Of special interest were the comparative results for 2001M1-2006M12, which covers the period before introduction of REITS, with the whole, and the after-REITS periods. Specifically, innovations in rental growth and equivalent yield did not show any power in explaining property companies' returns. Also of note was the quick incorporation of direct property factors (rental growth and equivalent yield) in explaining REITS returns with the introduction of the REITS legislation. The incorporation of these property factors appears to confirm the combined features of the UK REITS as both equity and property backed assets.

Overall, this research has shown that unexpected changes in economic and property variables have an impact on the UK property investment returns. By identifying these factors, the implication of this research is that practitioners and institutional investors targeting the UK property investment market could better evaluate their exposure to real estate investment trusts according to economic and business conditions.

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Endnotes

1. Dr Vitor Leone, Division of Economics, Nottingham Business School, Nottingham Trent University, Burton Street, Nottingham, NG1 4BU, United Kingdom. Email: vitor.leone@ntu.ac.uk. I gratefully acknowledge valuable comments on earlier versions of this paper from colleagues, anonymous referees and editors of this journal.

2. Reita has been created to provide an impartial source of expert information on quoted property investment, REITs, the funds that invest in them and the wider property investment market. Reita is funded and supported by the leading companies in the commercial property and financial services industry, as well as the London Stock Exchange, the British Property Federation and other key property bodies from the UK and around the world.

3. See for example: Chen *et al.*, 1986; Chan *et al.*, 1990, McCue and Kling 1994; Clare and Thomas, 1994; Priestley, 1996; Ling and Naranjo, 1997; Brooks and Tsolacos, 1999; Payne, 2003; Ewing and Payne, 2005; Leger and Leone, 2008; Schatz and Sebastian, 2009.

4. Detailed description of unobserved components modelling and the Kalman filter can be found in Cuthbertson, 1988; Harvey, 1989; Durbin and Koopman, 2002, Harvey *et al.* 2004; Harvey and Proietti, 2005; Commandeur and Koopman, 2007.

5. The annualised net rent generated by the portfolio expressed as a percentage of the portfolio valuation, excluding development properties.

6. Defined as the anticipated yield, which the initial yield will rise to once the rent reaches the estimated rental value.

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Revisiting the Relationship between Inflation and Growth: A Note on the Role of Exchange Rate Regimes

Andrew Abbott and Glauco De Vita[1]

ABSTRACT

Drawing from recent advances in the classification of exchange rate regimes, this note revisits empirically the relationship between inflation and growth under alternative exchange rate regimes. The results, based on a panel of 125 industrialised and developing countries over the period 1980-2004, indicate that the costs of inflation for economic growth are significant only in the case of developing countries, and are higher for floating exchange rates than they are under fixed or intermediate regimes.

1. INTRODUCTION

FOR BOTH INDUSTRIALISED AND DEVELOPING COUNTRIES a key policy objective is to sustain high economic growth alongside low inflation. Not surprisingly, for decades, there has been considerable debate on the nature of the relationship between inflation and growth. Economic theories reach a variety of conclusions. Traditionally, the consensus view was that inflation lagged changes in growth, with theory postulating a positive relationship between the two whereby as growth increased, so did inflation (a prediction also postulated by the standard aggregate supply — aggregate demand framework). However, in the 1970s, the emergence of stagflation, the simultaneous presence of low or negative output growth and high inflation, highlighted the inadequacy of the widely held view, and the validity of the positive relationship between inflation and growth began to be questioned. In the 1990s, several theoretical models emerged predicting a negative relationship (see, *inter alia*, De Gregorio, 1993; Jones and Manuelli, 1995; Roubini and Sala-i-Martin, 1995; Wu and Zhang, 1998) and most empirical studies (Kormendi and

Meguire, 1985; Barro, 1991 and 1995; De Gregorio, 1992; Fischer, 1993; etc.) found significant, albeit small, negative coefficients of inflation in growth equations. According to these studies, a 10 per cent increase in inflation a year, reduced the growth of GDP by 0.2 per cent to 0.7 per cent per year.[2]

However, an important contribution by Andrés, Hernando and Krüger (1996) pointed out that many of these econometric studies did not control for the influence of exchange rate regimes and, because of this, were likely to have underestimated the costs of inflation. The argument Andrés *et al* (1996) put forward for this downward bias finds its theoretical underpinnings in the Balassa-Samuelson model (Balassa, 1964; Samuelson, 1964). One prediction of the model is that growth and inflation should be positively correlated in economies with pegged currencies since, under fixed rates, the appreciation induced by high productivity growth can only manifest itself through higher inflation. By contrast, under flexible rates, fast productivity growth leads to a (real) currency appreciation. Given the widespread adoption of fixed exchange rates by most industrialised countries in the past (during the 1960-1973 period nearly all of them pegged their currencies in the Bretton Woods system), Andrés et al (1996) argued that the previous findings of a negative relationship between inflation and growth are surprising. Using 1961-1992 data for a sample of OECD countries, they estimated different specifications of a growth model augmented with the inflation variable as well as dummy variables to reflect periods of fixed and floating currencies. They found that the negative impact of inflation on the growth of real per capita GDP was higher for floaters than it was for countries pegging their currencies. However, it should be borne in mind that their analysis is exclusively reliant upon the IMF classification of exchange rate regimes, neglects potential differences between developing and industrialised countries, and omits the examination of intermediate exchange rate regimes. Although it has been argued that intermediate regimes are not sustainable in the long run as they lack credibility and make economies more susceptible to currency attacks (Fischer, 2001), Williamson (2000) suggests that, especially in developing countries, regimes are often of the intermediate type and will continue to be seen as a viable option to reap the benefits of fixed and flexible rates without having to incur some of their costs.

In this note we aim to extend the analysis of the role of exchange rate regimes on the relationship between inflation and growth by addressing the above issues. Using data for 125 industrialised and developing countries over the period 1980-2004, we exploit recent developments in the classification of exchange rate regimes that allow us to compare the costs of inflation on economic growth under fixed, intermediate and flexible rates according to both de jure and de facto classification schemes.

The remainder of this note is organised as follows. The next section formalises the specific hypothesis of the Balassa-Samuelson effect that forms the theoretical justification for the analysis that follows, and provides a discussion of the methodology and data employed. Section 3 presents and discusses the