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Working Papers in Real Estate & Planning 13/10

"Oft Expectation Fails"

A Time-Series Analysis of Construction Starts in the London Office Market

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Acknowledgment:

This research would not have been possible without the generous assistance of DTZ who provided the data for this study.

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Abstract

Expectations of future market conditions are generally acknowledged to be crucial for the development decision and hence for shaping the built environment. This empirical study of the Central London office market from 1987 to 2009 tests for evidence of adaptive and naive expectations. Applying VAR models and a recursive OLS regression with one-step forecasts, we find evidence of adaptive and naïve, rather than rational expectations of developers. Although the magnitude of the errors and the length of time lags vary over time and development cycles, the results confirm that developers' decisions are explained to a large extent by contemporaneous and past conditions in both London submarkets. The corollary of this finding is that developers may be able to generate excess profits by exploiting market inefficiencies but this may be hindered in practice by the long periods necessary for planning and construction of the asset. More generally, the results of this study suggest that real estate cycles are largely generated endogenously rather than being the result of unexpected exogenous shocks.

Introduction

The way in which developers form their expectations of development values, costs, and hence profitability, plays a crucial role in influencing their decisions to develop (Henneberry and Rowley, 2000). Much of the research done on development cycles and on developers' expectations supports the assertion that present and past trends remain the dominant influence on the formulation of developers' profit expectations rather than rational expectations.

This paper tests empirically whether developers active in London City and London West End between 1986 and 2009 have responded to current or past trends, or whether evidence of rational expectations can be found in their decision making. The main hypothesis to be tested is that developers predominantly respond to past trends when forming their profit expectations and hence exhibit adaptive rather than rational expectations. This paper also seeks to uncover whether different patterns of developer behaviour can be identified between the market cycles that occurred during the period under review and whether developers have behaved differently in the two submarkets. The paper also aims to investigate whether there is a 'memory effect' among developers, which would mean that following a severe downturn in the City and the West End office markets development activity would stay below the levels suggested by current market conditions for a number of years, in essence confirming the assumption of adaptive expectations.

This paper is structured as follows. After a discussion of the extant literature on expectations in the real estate literature, we describe the analytical strategy used to detect whether developers exhibit adaptive or rational expectations. Next, the results of the empirical analysis of the London office market are presented and interpreted. Finally, the wider implications of these findings are explored with a view towards developing an agenda for future research.

Previous studies

The cyclicality of both property markets and construction activity is one of the best researched phenomena in the real estate literature. Most empirical studies use an equilibrium framework to analyse and predict cycles. The underlying assumption is typically that a deviation from equilibrium prices as for example reflected in prices above replacement value will trigger a development response (see Hendershott et al, 1999 and Hendershott et al ,2002) albeit with a time lag.

The scope of this paper is more narrowly defined in that it focuses on developers' expectations and their impact on construction activity. To this end, we test for the presence of three types of expectations. Under *rational expectations,* developers are said to use the best currently available information to form their expectations where the best information may involve forecasts that need to take into account the likely actions of their competitors given the current market consensus. *Naive expectations* (also called myopic expectations) imply that developers expect that future market prices equal current market prices adjusted for expected inflation and thus assume current real prices and rents for future cash flows in their development appraisals. Finally, *adaptive expectations* future expectations are a simple extrapolation of past values. Both naive and adaptive expectations can lead to overbuilding and, in turn, to lower capital values and rents but adaptive expectations in particular may also lead to supply below the equilibrium level as developers tend to be overly pessimistic and cautious in their outlook following a downturn.

Rational expectations

The rational expectations theory was originally developed by John F. Muth in response to perceived flaws in theories based on adaptive expectations. Muth (1961) argued that averages of expectations are a more accurate indicator of expected future values than naive or adaptive models such as the cobweb model. According to the rational expectations theory, optimal forecasts about the future are made using all available information. As a result of rational expectations, changes in real estate asset prices over time should be unpredictable and thus follow a 'random walk' (Malpezzi and Wachter, 2005). Rational expectations play a central role in the Efficient Market Hypothesis (EMH), developed by Eugene Fama in the mid-1960s. According to this hypothesis, if market participants compete for information then current asset prices will rapidly adjust (through trading) and leave no room for arbitrage and excess profits on the basis of the information. In essence, an efficient market is one where all market prices fully and instantaneously reflect all relevant information and rational expectations act to ensure that any new relevant information is quickly embedded into current prices.

According to Gatzlaff and Tırtıroğlu (1995:161), "in real estate markets, information efficiency implies that the distribution of market prices accurately reflects the spectrum of characteristics and risks associated with each asset". In other words, any errors associated with pricing real estate assets are random which makes it impossible for developers to earn excess profits based on past trends and hence there is little incentive for speculation (Malpezzi and Wachter, 2005). Therefore, in an efficient real estate market where developers exercise rational expectations, real estate cycles cannot normally be generated endogenously but are rather the result of exogenous shocks (Wheaton, 1999). However, there is a considerable amount of evidence to suggest that real estate markets are inefficient. Indeed, much of the literature supports the argument that real estate developers form their expectations based on current and past trends with the result that real estate prices do not form a 'random walk'. If the 'random walk' proposition does not hold, it is arguably possible to predict future pricing based on past trends and excess profits could be earned by developers who know this is how other developers form their expectations (Malpezzi and Wachter, 2005).

Naive and adaptive expectations

In his study of the City of London office market over the period 1970 to 2004, Barras (2005) identified a link between change in rents and the rate of building starts. Effectively, the higher the rate of rental growth, the higher the profitability of new developments, and thus the higher the rate of new construction starts. Barras also found that the addition of development cost variables and real interest rates into his development supply equation caused no significant improvement. His findings confirm his earlier study which showed that a change in capital values is transmitted into variations in development profitability, which in turn determine the level of development starts. In essence, a direct response to contemporary values by developers is suggested (Barras, 1983).

Typically, in adaptive expectations some element of error transfer could also be expected from the previous year's forecast to the subsequent forecast. McGough and Tsolacos, (1999) argue that developers revise their forecasts in the light of the error made in forecasting the most recent observation.

Wheaton et al (1997) reached similar conclusions in their study of the Greater London office market over the period 1970 to 1995. They found that the building boom of the 1980s appeared to be a reaction to strong occupier demand and increasing real rental growth during the period, confirming the assumption that developers respond to current market signals. The results reinforced Wheaton's earlier findings that the current state of the economy influences the formation of developers' expectations. By studying how closely real estate cycles are interlinked with the national economy, Wheaton (1987) found that both demand and supply seem to respond directly to current macroeconomic changes, with current growth in office employment having a particularly significant impact on the supply side.

Key *et al* (1994) confirm these results in their study of development activity in the United Kingdom. Using regression analysis the authors tested how well current prices, past market values of one or two years ago, building costs and financing costs explain changes in the volume of construction orders in the office sector since 1968. The results confirmed that current and past prices show a positive impact on building whilst rising construction costs are found to depress new development. Similarly, high interest rates were found to dampen new construction, although their influence was not found to be statistically significant. Although the authors acknowledge the impact financial liberalisation had on development activity in the 1980s, they conclude that no more than a production lag and a blind response to current price changes are needed to construct a model of highly erratic cycles.

In line with the other arguments outlined in this paper, Antwi and Henneberry (1995) have highlighted how developers' reactions to the market environment may differ from those prescribed by the rational expectations theory and EMH. The authors argue that developers may display a non-linear response to property market signals. Computer-based behavioural modelling is applied to imitate alternative strategies that developers might adopt to formulate profit expectations and, hence, to make development decisions. Their paper focuses on the analysis of three different decision-making strategies. Firstly, current price-taking, which the authors acknowledge remains the traditional approach adopted by developers; secondly, formal forecasting for which Antwi and Henneberry find little evidence of widespread adoption; and thirdly, habit-persistence, a strategy found to be common in markets exhibiting strong growth. The authors find that not all developers are current-price takers but rather adopt a number of different strategies to formulate the expectations upon which their decision to build are based on. During periods of extreme market change habit-persistence strategies are more likely to be incorporated into development appraisals leading to inflated profit expectations and subsequently increasing the amplitude of the development cycle.

Henneberry and Rowley (2000) also found that in determining development profitability, the method whereby costs and values current at the time of the appraisal remains the dominant approach in residual valuations. The authors emphasise that development values, which vary more than developments costs over time and between locations, are the main influence on development profitability. However, they also acknowledge Antwi and Henneberry's (1995) argument that trend extrapolation becomes more widespread in markets exhibiting strong growth and is more likely to be adopted by less experienced developers. Thus, they find that estimates of development profitability produced by residual valuations and based on cost and values at the time of the appraisal can depart significantly from profits actually achieved, especially around cyclical turning points. This difference is magnified when trend extrapolation is incorporated into the valuation. The authors point out that it is precisely because developers' behaviour is influenced by these decision-making techniques which misrepresent profit opportunities that so many companies are bankrupted in property market down-turns.

Fuerst and McAllister (2010) studied the relationship between supply and demand in 18 European office markets during the period of 1996 to 2006 in order to test whether new supply is a function of current or lagged demand. The authors' aim was to establish whether developers respond to current market signals when making investment decisions or whether they try to anticipate future market conditions in their decision making process which would indicate rational expectations. The authors confirm Antwi and Henneberry's (1995) proposition that while there is some evidence of myopic behaviour evident in a proportion of the markets examined scant evidence was found to support the argument that developers systematically display myopic expectations. By studying supply elasticities in these markets using data on rental growth, take-up and completions they found considerable diversity in developer responses to demand signals. The authors also propose the hypothesis that myopic behaviour may be fuelled by competition between developers, whereby unrealistically high prices are adopted in development appraisals to justify higher site costs.

Adopting an option pricing approach, Grenadier (1995, 1996) seeks to explain developers' expectations using assumptions of rationality. He argues that although the risk of overbuilding is higher when construction times are longer, developers will continue to develop in the knowledge of this risk because the benefits of good outcomes are believed to outweigh the costs of poor outcomes. Moreover, when developers see the market beginning to turn negative, they realise that if it erodes any further and if any of their competitors begin to build, they will be shut out of the market. Before this comes to fruition, each developer builds simultaneously in an attempt to avoid pre-emption. Grenadier justifies this reaction by arguing that whilst building in a downturn is harmful to developers, it is less harmful that the alternative of becoming a follower in a down market. Whilst his argument tries to provide some rational for developers' decisions to build in a downturn, the developers in his model are essentially "panicked" into building by the market conditions current at the time, which implies myopic rather than rational expectations.

Grenadier's arguments can also be seen to have some elements of disaster myopia and herd behaviour that reinforce the concept of myopic expectations. Herring and Wachter (1999) argue that developers demonstrate a particular form of adaptive expectations and myopic pricing behaviour, 'disaster myopia', due to the low-frequency and non-observation of negative events, which leads them to underestimate the possibility of market downturns.

It can also be argued that as the projection of future market conditions is so difficult, developers may merely opt to "go with the herd" in their decisions as the safest option. In essence there is a tendency for developers to respond collectively to the same signals which can be interpreted as an example of herd behaviour (Fuerst and McAllister, 2010).

Notwithstanding these arguments, developers are not completely autonomous in their decisions and instead depend crucially on an adequate supply of development finance (Antwi and Henneberry, 1995). Lenders, similar to developers, have been found to exhibit adaptive expectations in their decisions and tend to be too optimistic in market upturns and too pessimistic in downturns and thus exacerbating the boom and bust cycle (Ball *et al*, 1998). Table 1 provides a summary overview of the key theories discussed in this literature review.

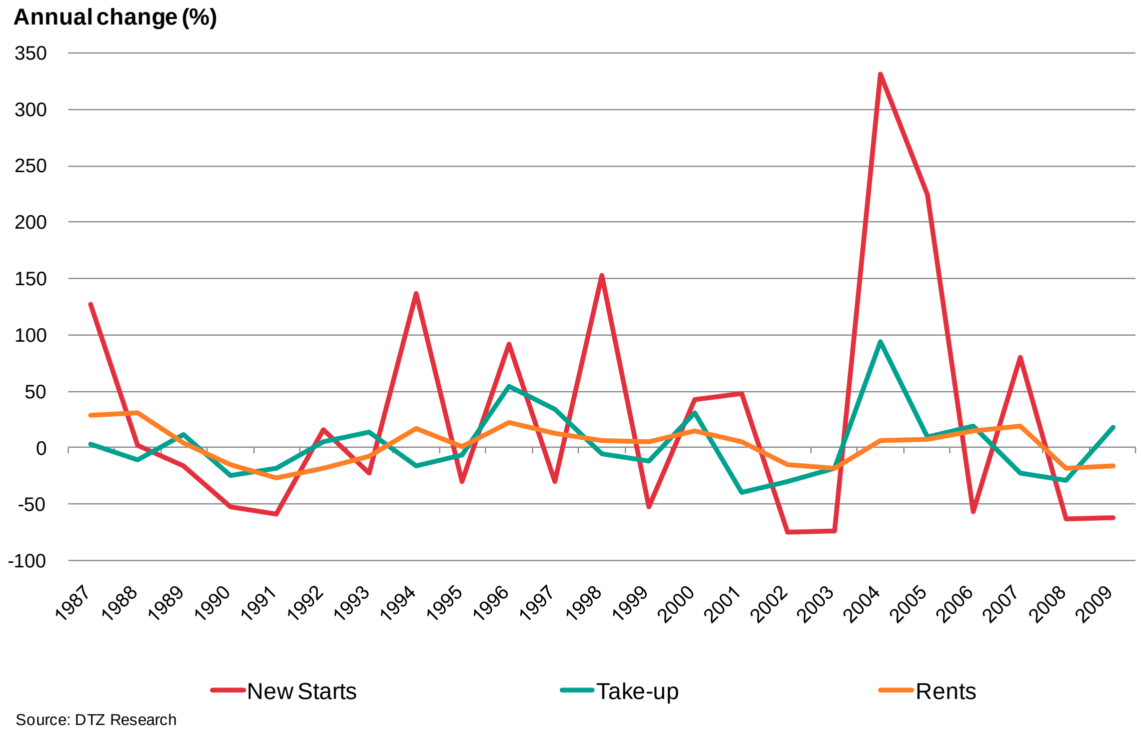
Table 1			
Theory	**Rational expectations**	**Naive expectations**	**Adaptive expectations**
Key argument	The best currently available information is used to form future expectations. Expectations are assumed not to be systematically biased and hence any errors associated with pricing are random. As a result of rational expectations, changes in asset prices over time should be unpredictable and follow a 'random walk'.	Future prices = Current prices + expected inflation	Future prices = f(past values) adjusted for past errors.
Authors quoted	**Muth (1961);** **Gatzlaff and Tırtıroğlu (1995)**	**Barras (2005 and 1983);** **Wheaton *et al* (1997);** **Key *et al* (1994)** By studying the changes in the volume of construction orders in the UK office sector since 1968 Key *et at* (1994) found that current and past prices of one or two years ago show a positive impact on building. evidence of both naive and adaptive expectations.	**Antwi and Henneberry (1995)** current price taking (naive expectations) remains the traditional approach adopted by developers, during periods of strong growth, adaptive expectations are more likely to be incorporated into development appraisals. **Henneberry and Rowley (2000)** adoption of current prices in development appraisals remains the dominant approach but adaptive expectations more common in markets exhibiting strong growth and are more likely to be adopted by less experienced developers. **Fuerst and McAllister (2010**) no systematic evidence of myopic expectations. idiosyncratic rather than systematic factors more important for supply-side responses to market signals. Myopic behaviour may be fuelled by competition between developers.

Exploratory data analysis

The empirical analysis of this paper draws on a database containing the volume of new starts, prime headline rents, take-up and availability ratios for both London submarkets from 1987 to 2009 provided by DTZ. Additionally, data on service employment was obtained from Oxford Economics.

Before proceeding to formal econometric testing, an exploratory analysis of the data appears in order. In particular, graphing of time series variables may help to identify initial evidence of a 'memory effect' in development activity in the City and West End office markets over the last two decades. A memory effect would entail that development activity stays below the levels suggested by current market conditions for a number of years, in essence confirming the assumption of adaptive expectations. Figures 1 and 2 show the annual change in new starts, prime headline rents and take-up in London City and London West End over the study period.

Figure 1: City



In both markets, the first significant downturn over the period under review was experienced following the building boom in the late 1980s. As shown above, no clear indication of a 'memory effect' can be seen in the garphs following this downturn. While the timing of the recovery differs in both submarkets, new starts appear to recover in line with rents. The second significant downturn in both markets was seen around 2000-2002. Again, no evidence of a subsequent memory effect is evident. Instead, developers appear to have responded rapidly to improved market conditions. Another pronounced market downturn occurred in 2008-9 but the available time series does not yet allow a study of the recovery pattern.

Although the historical data analysis does not indicate the presence of a 'memory effect' among developers, it suggests that developers exercise adaptive expectations as a lagged relationship of one to three years is identified between changes in demand (proxied by take-up and prime headline rents) and changes in new starts in both the City and West End markets.

Figure 2: West End

Source: DTZ Research

Econometric analysis

Two parallel approaches are used to test the hypothesis that developers predominantly respond to past trends when forming their profit expectations: a Vector Auto-Regressive (VAR) model with subsequent Granger causality modelling and a recursive ordinary least square (OLS) model with one-step forecasts.

VAR model and Granger causality

Following a stationarity test on all the variables in London City, it was found that the level of new starts is stationary while the rest of the variables are non-stationary. As cointegration can only be tested when all the endogenous variables are non-stationary, it was concluded that it would not be possible to test for a cointegrating relationship in London City. As a result, a VAR model to test for Granger causality was chosen. First differences were taken for the variables that were found to be non-stationary (prime headline rents, take-up and availability ratio) in order to achieve stationarity. For the sake of consistency, a VAR model was applied to the London West End time series data although these were found to be non-stationary.

To test for Granger causality, three VAR models were estimated using one year and two year lags, taking care to include only stationary series. Each of the VAR models includes the new start variable and one of the other three variables (prime headline rents, take-up or availability ratio). The models also include a dummy variable to capture the different phases of the property cycles in London City and London West End:

$$x_t = \beta_1 + \beta_2 x_{t-1} + \beta_3 x_{t-2} + \beta_4 y_{t-1} + \beta_5 y_{t-2} + \beta_6 Dum(1)_t + \beta_7 Dum(2)_t + \xi_{1,t}$$
$$y_t = \alpha_1 + \alpha_2 x_{t-1} + \alpha_3 x_{t-2} + \alpha_4 y_{t-1} + \alpha_5 y_{t-2} + \alpha_6 Dum(1)_t + \alpha_7 Dum(2)_t + \xi_{2,t}$$

Where x_t represents the new start variable and y_t represents one of the other variables. $Dum(1)_t$ *and* $Dum(2)_t$ are included in order to capture the upturns and downturns of the property cycles respectively. To establish whether changes in the explanatory variables induces (thus Granger causes) developers to build during property cycle upturns the following hypothesis tests were carried out:

Null hypothesis: $\beta_4 = \beta_5 = \beta_6 = 0$

Alternative hypothesis: $\beta_4 \neq \beta_5 \neq \beta_6 \neq 0$

In London City, the following property cycle upturns were identified by the presence of positive rental growth: 1986 to 1989, 1994 to 2001, 2004 to 2007. The following downturns were identified by the presence of negative rental growth: 1990 to 1993, 2002 to 2003 and 2008 to 2009. In London West End, the corresponding periods were 1986 to 1989, 1994 to 2000, 2004 to 2007 and 1990 to 1993, 2001 to 2003 and 2008 to 2009 respectively.

Recursive OLS model

The stationarity test carried out on the variables to be included - Output of Service Industries (OSER) and real rents - established that OSER is a non-stationary variable while real rents is a stationary variable. For this reason, real rents in the model have been assessed in levels whilst changes in OSER have been observed. The model incorporates a two year lag. The recursive OLS model was run over the whole period of 1986 to 2009 as it was decided that the data period under study was too short to be broken up into cycles.

Tables 2 and 3 show the recursive OLS model that has been applied, with new starts as the endogenous variable and real rents and changes in OSER as the explanatory variables. The first test on the model calculates a correlation coefficient between the recursive forecast errors and the explanatory variables. If forecast errors are found to be uncorrelated with the explanatory variables, it would indicate that at the time of decision making all available information is used, such that developers do not appear to be making systematic errors.

The second test on the model aims to establish whether the forecast errors themselves are correlated across time (serial correlation). The absence of serial correlation would indicate that past forecast errors are included in the information set used by developers in order to inform their decision making. The test is carried out by using the Ljung- Box Q- test to assess whether the *ex post* forecast errors are correlated across time.

Table 2

CITY		
Variable	Coefficient	t-statistic
Constant	-5.637	-4.370
Δlog(OSER)	17.891	3.155
LOG(RCRENT)	1.583	4.418
R-square	0.63	
F-stat (2,20)	18.59	
DW-statistic	1.99	
RESET test	0.43	

Table 3

WEST END		
Variable	Coefficient	t-statistic
Constant	-4.666	-2.540
Δlog(OSER)	24.932	3.718
LOG(RWRENT)	1.209	2.561
R-square	0.57	
F-stat (2,20)	9.35	
DW-statistic	1.68	
RESET test	0.22	

Results of expectation tests

The results of the Granger causality test with the VAR model (Tables 4 and 5) suggest that developers adopt adaptive expectations in both markets. In London City, the number of starts has been influenced by the change in prime headline rents and particularly by the change in take-up over the previous two years. In London West End, the change in prime headline rents has had less of an impact on the change in the number of new starts, with the change in the previous two years' take-up showing a significant effect on developers' expectations. Although, the cyclical swings in prime headline rents have been more pronounced in the West End than in the City, West End rents have consistently remained above those in the City due to the restrictive size of the development market in the West End, which means that there is a smaller chance of over-supply of new space in comparison to the City. Moreover, during the study period, prime headline rents in the West End never fell below the level where it would become uneconomical to develop based purely on rents. Arguably, these reasons help to explain why a change in prime headline rents has had less of an impact on new starts in the West End than in the City. In both submarkets, a change in the level of the availability ratio has had the least impact on new starts of all the explanatory variables. However, this could be due to the fact that the availability ratio used in the model refers to total availability in the market, rather than to availability of newly built premises or refurbishments.

Somewhat in contrast to the observations of Antwi and Henneberry (1995) and Henneberry and Rowley (2000) that adaptive expectations are more likely to be occur during periods of strong growth the results of the VAR model demonstrate that past explanatory variables are found to be similarly significant in both downturns and upturns.

Overall, the results suggest that developers' decisions are systematically biased to past trends, meaning that real estate prices do not form a 'random walk'. Arguably, it is therefore possible to predict future pricing based on past trends and excess profits could be earned by developers who know this is how other developers form their expectations (Malpezzi and Wachter, 2005). Hence, based on the results from the Granger causality test with the VAR model we reject the hypothesis that developers exercise rational expectations in the London office market.

Results from the Granger causality test with the VAR model

Table 4: London City

Hypothesis: Change in prime headline rents Granger causes the number of new starts		
Test period	**t-statistic**	**p-values**
1986-1989	20.94	0.0001
1990-1993	5.92	0.12
1994-2001	5.85	0.12
2002-2003	10.15	0.02
2004-2007	6.20	0.10
2008-2009	7.86	0.05
Hypothesis: Change in the level of take-up Granger causes the number of new starts		
Test period	**t-statistic**	**p-values**
1986-1989	30.00	0.000

1990-1993	20.00	0.0002
1994-2001	9.12	0.03
2002-2003	12.37	0.01
2004-2007	10.99	0.01
2008-2009	13.50	0.004
Hypothesis: Change in the level of the availability ratio Granger causes the number of new starts		
Test period	**t-statistic**	**p-values**
1986-1989	24.99	0.0000
1990-1993	7.47	0.06
1994-2001	3.21	0.36
2002-2003	5.05	0.17
2004-2007	2.98	0.40
2008-2009	3.12	0.37

Table 5: London West End

Hypothesis: Change in prime headline rents Granger causes a change in the number of new starts		
Test period	**t-statistic**	**p-values**
1986-1989	2.94	0.40
1990-1993	3.42	0.33
1994-2000	16.53	0.0009
2001-2003	10.79	0.01
2004-2007	6.00	0.11
2008-2009	5.85	0.12
Hypothesis: Change in take-up level Granger causes a change in the number of new starts		
Test period	**t-statistic**	**p-values**
1986-1989	13.24	0.004
1990-1993	11.81	0.008
1994-2000	16.07	0.001
2001-2003	13.02	0.004
2004-2007	13.55	0.003
2008-2009	13.71	0.003
Hypothesis: Change in availability ratio Granger causes a change in the number of new starts		
Test period	**t-statistic**	**p-values**
1986-1989	5.26	0.15
1990-1993	4.20	0.24
1994-2000	5.53	0.14
2001-2003	3.57	0.31
2004-2007	8.64	0.03
2008-2009	8.78	0.03

The results from the first test City presented in Table 6 demonstrate that past forecast error terms are not correlated with the past values of the forecast explanatory variables (changes in OSER and real rents). This indicates that developers are not making systematic errors in using the information they have available to inform their decisions regarding whether to build. The results from the second test (Table 6) suggest that forecast errors are not correlated with the forecast errors from the previous time periods. This implies that developers are taking into account their past forecast errors while examining new information which is used to formulate new forecasts of future market conditions.

Table 6

City

		ΔOSER	RCRENT
Test 1	error	-0.097	0.0787
Test 2	LB Q-statistic (2lags)	2.3666 (0.306)	

West End

		ΔOSER	RWRENT
Test 1	error	-0.167	0.082
Test 2	LB Q-statistic (2lags)	2.2717	(0.321)

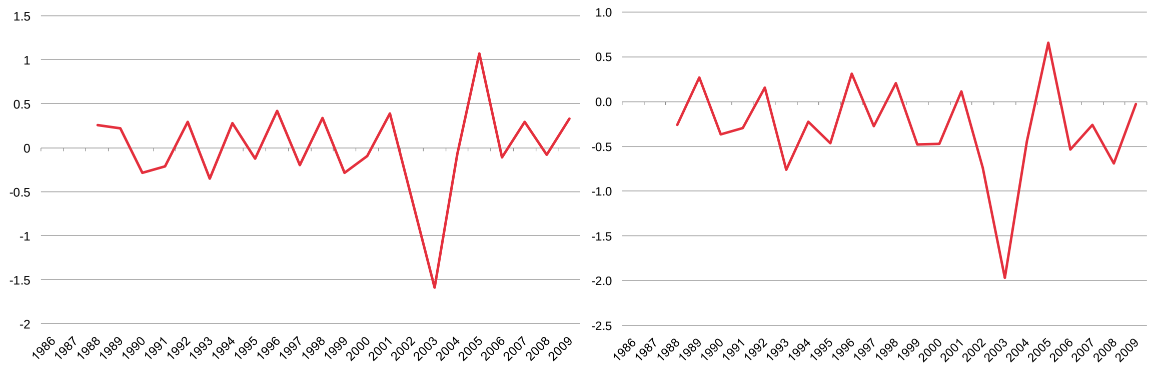
Finally, the residuals from the recursive OLS model were used to estimate an Auto-regressive model with one lag, AR(1), with the following specification:

$$\mu_t = \rho * \mu_{t-1} + \xi_t$$

The estimated coefficients from the model were found to be -0.03 in the City and -0.003 in the West End. Both had a probability value of greater than 0.80 and were therefore found to be statistically insignificant.

The test for serial correlation and the subsequent regression using the residuals from the previous model suggest that the residuals are not serially correlated. In essence, these results would imply that developers exercise rational expectations in the sense that previous forecast errors are not systematically carried over to subsequent forecasts. However, these findings could be due to small sample size; different results might be obtained if the period under study were longer. Having plotted the residuals from the model, Figure 3 suggests a potential relationship between the error terms. In essence, although the error is not partially carried over as is typically the case in adaptive expectations, the charts appear to suggest that developers revise their expectations (either from positive to negative, or vice versa) based on the previous year's forecast error. As a result, it could be argued that developers are demonstrating adaptive expectations as they are learning from their past mistakes. This would imply that the forecasts that are produced are systematically biased to past information, which in turn indicates that any errors associated with pricing real estate assets in development appraisals are not random and hence the assumption of rational expectations is rejected.

Figure 3: Residuals from the recursive OLS model – City (left) and West End (right)



Conclusions

This paper set out to expand and update empirically the substantial body of literature on real estate cycles by conducting an empirical analysis of the Central London office market incorporating data from the severe market downturn in 2008-9. More specifically, it tested whether the market-level data exhibit evidence of adaptive and naive expectations. The empirical evidence covering the period 1987 to 2009 suggests that developers exercise adaptive and naïve, rather than rational expectations when making the decision to build. Although the results from the Granger causality test based on the VAR model indicate that the strength of factors driving the development decision vary over time and development cycles, we find evidence that developers' decisions have mainly been based on backward-looking decision criteria in both London submarkets.

The corollary of this finding is that developers may be able to generate excess profits by exploiting market inefficiencies but this may be hindered in practice by the long periods necessary for planning and construction of the asset which prevents an effective timing strategy in the marketplace. Hence, it is possible to argue that real estate cycles are largely generated endogenously rather than being the result of exogenous shocks.

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