The Rôle of Price Expectations in the U.K. Housing Market

Abstract: The objective of this paper is to show the rôle of Survey data published by *Royal Institution of Chartered Surveyors (RICS)* in forecasting subsequent U.K. house prices, three-months ahead. Both the *Halifax* and the *Nationwide* indices are used to test the performance of the *RICS* Survey based on the process of bounded rationality. So far as the authors know, this is first academic use of the *RICS* Survey to explain and forecast U.K. house prices.

Bounded rationality means that various agents, such as buyers, sellers, estate agents and chartered surveyors, play differing rôles in the overall formulation of expectations of prices. An S-shaped logistic effect is shown to fit the data, assumed to be due to a diffusion path of expectations from surveyors to other agents. The empirical analysis makes use of the forwarding-looking price expectations data published by *Royal Institution of Chartered Surveyors (RICS)* with the actual observations produced by Mortgage lenders, the *Halifax* and the *Nationwide*.

The study provides further econometric evidence for the validity of the logistic formulation and shows that bounded rationality can explain the predictions of agents. One conclusion from this paper is that the logistic function is a superior approximation to the true data generating process compared with the standard Anderson/Pesaran/Thomas approach, although that has never previously been applied in this house price context. An adjustment to the Survey is used, which achieves perfect symmetry with 'up' and 'down' versions of the data, which is also tested. In that way, this paper builds on the methodology set out in the Economic Journal article *Quantification of Qualitative Firm-level Survey Data* by Mitchell, Smith and Weale (2002).

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Introduction[1]

The housing market is a complex entity of agents. The majority of participants in this market only rarely enter the market, and lack knowledge. They therefore seek expert advice from the main suppliers of guidance, which are estate agents, surveyors, solicitors and mortgage lenders. Mortgage lenders, however, are not informational aids, but provide the majority of buyers with loans to finance their purchase. These expert bodies may influence both behaviour and price expectations, which reflect the actual state of the market. In other words, forward-looking expectations play a crucial rôle with demand and supply in the determination of house prices.

Most articles with empirical investigations of the housing market can only include expectations as a backward-looking conceptualisation of the general price level and not the expected future values of the housing price (Meen, 2000). The relevant literature is limited when it comes to this field of study because it has not benefitted from the academic attention it deserves, even though there is a strong link between forward-looking expectations within the housing market and the state of the economy (Muellbauer and Murphy, 2008). The boom and bust cycles of rising and falling house prices have occurred on numerous occasions in the past (Garino and Sarno, 2004). One of the main factors which drove the latest recession was the expectation of falling house prices, which reflected the shortage of mortgages and credit offered by lenders, sparked by the U.S.A. sub-prime crisis.

There are some strong parallels between the situation developing out of 2007/08 leading to the "Credit Crunch" and the causes of the Great Depression: high levels of personal borrowing, the drop in share prices on Stock markets, house price bubbles bursting in the midst of overconfident in bank lending, inducing a rise in "toxic" (or bad) debts.

[1] The writers would like to thank Dr Nicholas Tsitsianis and Dr Timothy Parke for their constructive comments made on the content of the paper.

In the 1981 recession, house prices experienced a downturn along with the industries that supplied this sector. In other words, the boom and bust cycles of rising and falling prices have occurred on previous occasions in the housing market (Garino and Sarno, 2004), in particular during and after Lawson's Boom in the late 1980s. There had been a wave of deregulation in the banking industry, as a result banks rushed into housing and speculative lending. By 1992, the number of banks in difficulties was steadily rising, resulting in recession (Muellbauer and Murphy, 1997).

Moreover, housing equity withdrawals, which depend on house prices, boost growth as consumer spending is partly financed from wealth. In the 1990s and the early part of the 2000s this played an important part in amplifying consumption expenditure (Greenspan and Kennedy, 2008), although Attanasio et.al. (2009), argue there is no evidence of this relationship. According to Goodhart and Hofmann (2008), there is an association between the medium of exchange, borrowing, residential prices and economic activity in advanced economies over the past three decades.

There is a possibility that recessions could begin spontaneously as a result of the self-fulfilling prophecy that comes from expectations of falling house prices. This paper outlines the theory and provides a statistical explanation of the formation of house price expectations. The theory is then applied to the Survey data on expectations of house prices over the next three months provided by *The Royal Institution of Chartered Surveyors (RICS)* [2] in conjunction with the actual observations provided by the *Nationwide Building Society* and the *Halifax*, which are explained in the next Section. The theoretical approach adopted in this paper is derived from Bywaters and Thomas (2008, 2009). The Final Section of this article will report on the empirical findings and implications of the econometric study with the favoured forecasting model. The paper is not

[2] For an overview discussion of the Surveys see "Understanding the RICS Surveys", RICS Economics, June 2008, available on the following website: www.rics.org/economics.

concerned with any fundamental determination of house prices, but with expectations of future house prices, and their rôle in U.K. government housing policy.

The Data

There are several sources of data on actual house prices in the U.K., in particular mortgage suppliers such as the *Halifax*[3] and the *Nationwide*[4] as well as the *Land Registry*[5]. *The Financial Times House Price Index*[6] is based on the information recorded at the *Registry*. These give rise to four sets of indices giving estimates of actual movements in residential prices. The *Nationwide* and the *Halifax* house prices are derived from standardised indexes based on a basket (or mix adjusted); thus they follow representative house prices, which are weighted over time, using data extracted from monthly mortgage information (or lending), meaning that the sample size varies from month to month. The *Land Registry* derives a price index based on information provided from completed sales, and therefore lags behind the mortgage lenders' observations of the market. Furthermore, the method of calculation adopted means that the source can be influenced by a change in the mix, namely the proportion of different types of housing as well as the locations. In the case of the *Financial Times Index*, it is smoothed and seasonally adjusted.

The *Nationwide* and the *Halifax* produce very similar series because the statistical methods employed are comparable. In general, in both cases, the first step in the process of estimation is the calculation of the weights in the base period. The second one is to use Ordinary Least Squares to derive the coefficients on the qualitative (type of dwelling, region, et cetera.) and quantitative

[3] See website www.lloydsbankinggroup.com/media1/research/halifax_hpi.asp for a discussion of the Halifax "Index Methodology" and "Technical Details."
[4] For a discussion of the "price methodology" see www.nationwide.co.uk/hpi/methodology.htm.
[5] See website www1.landregistry.gov.uk/houseprices/housepriceindex/.
[6] See website www.acadametrics.co.UK/ftHousePrices.php.

(age of property, number of liveable rooms, garages, bathrooms, and so on.) explanatory variables that explain the price for all periods, including the base. The third step is to calculate the base-weighted index for the current period.

The *Nationwide* has the longest series, dating back to 1952 in the case of quarterly observations, with monthly observations beginning in 1991. The coverage includes thirteen regions as well as the whole of the U.K for various categories of houses. In the case of the *Halifax* Price index, it is the longest running monthly house price series, dating back to 1983, covering the whole of the U.K. with various categories of physical characteristics and location. Once again, the sample is derived from monthly mortgage data. The *Land Registry* monthly index starts from January 1995, which also determines the starting point of the *Financial Times Index*, although a statistical model generates monthly estimates of past values from 1971 to 1994.

The *Halifax* and the *Nationwide* indices are not fully representative of all U.K. prices and entail some bias because there are other mortgage providers within the economy. They are, however, large-scale, 'standardised' data sets of the lending leaders within the mortgage market, and therefore, are comparable 'indicators' of price behaviour taking place throughout the U.K. housing market. They provide information on price movements that is typical of all transactions financed by various mortgage lenders. Clearly, a more comprehensive index that takes into account all lenders of mortgages as well as their shares (or weights) of the total lending, but this is not feasible given the present state of information available within the housing sector.

The mortgage lenders' series of actual prices provide the longest run of monthly statistics, not seasonally adjusted, and therefore, are the actual data sets adopted in the empirical investigation. Using non-seasonally adjusted data in this context avoids introducing serial correlation when

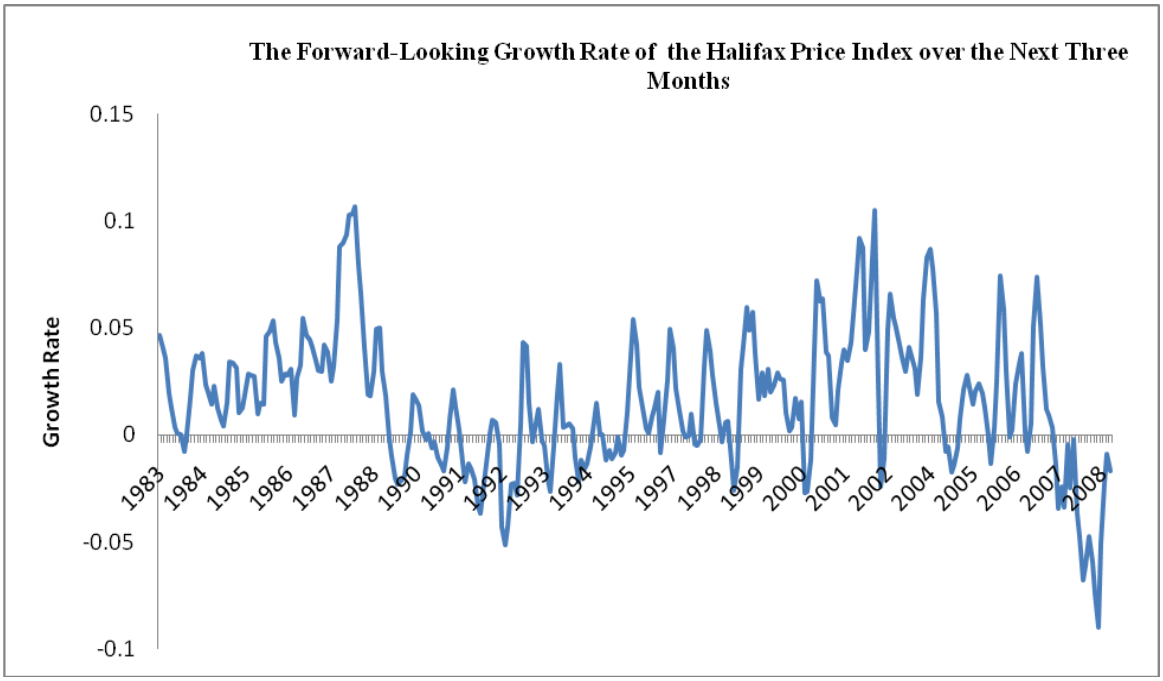

Figure 1: Forward-looking Growth Rate

assessing the forward- looking expectations provided by the *Royal Institution of Chartered Surveyors (RICS)*, which is an independent, representative professional body, regulating property professionals and surveyors in the U.K. and other countries[7]. These agents have expert knowledge of the housing market because they offer advice on mortgage valuations, and provide various surveying and auctioneering services to buyers and sellers. They are at the forefront of the market in providing survey information on a number of leading variables such as price, sales and stock that can be formulated by the Institution into meaningful data.

The Survey provides, in particular, details on the change in direction of price, either in the form of 'up' or 'down' or 'the same', over the next three months, which may indicate where the actual economic observations may be heading in the future. This is shown in Figure [1] above, exhibiting the peaks and troughs in the housing market price growth. This depicts the logarithmic growth of

[7] *RICS* is an institution in the U.K. housing market performing a similar function like the rôle of the Confederation of British industry (*CBI*) in U.K. manufacturing industry.

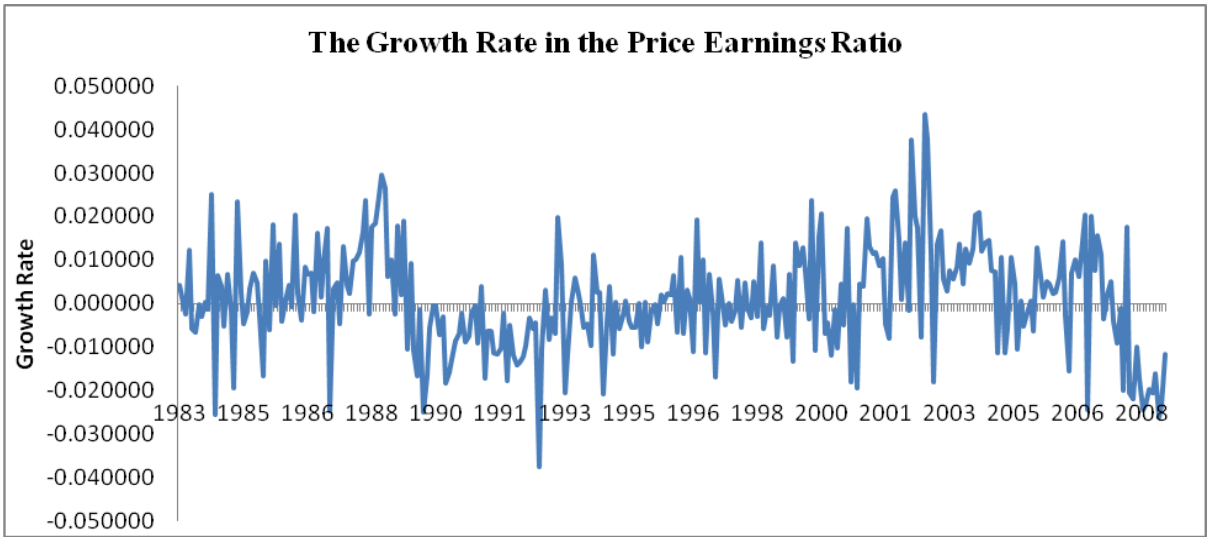

Figure 2: Growth of the Price Earnings Ratio

nominal Halifax house prices from one month ahead to the fourth month ahead, that is over three months. The highs and lows in 'affordability' of housing, namely the change in the Price Earnings Ratio are revealed in Figure [2] above and measured from the 'standardised' average price of housing divided by the national average (or mean) earnings of full-time, male workers[8]. In the empirical study below, it is shown that the forward-looking, adjusted 'ups' (or 'downs') of the price survey are a useful guide to forthcoming changes in the major house price indices of the mortgage lenders, presumably because of the diffusion process operating in the housing market. The adjustment for the 'sames' is explained under the heading of empirical estimation below.

[8] This is not used in the subsequent analysis.

The Theoretical Model

The formation and spread of forward-looking expectations of the price direction within the housing market can be modelled on the basis of bounded rationality and the inter-dependence of agents. It can be described as a process of diffusion, implying slow adjustment because the whole process of buying and selling of houses takes considerable time, and for most market participants, happens infrequently. The majority of agents may seek to minimise costs of obtaining expectations by relying on forecasts formed by others.

Those agents with the resources to form expectations from the available, imperfect information are likely to be the 'alphas' of the 'pack', by analogy with wolves. In this case, they are a small number of professional, chartered surveyors who possess the knowledge of the housing market and are part of an institution that can get their expectations published in the media.

The expectations are in the form of the change in direction of price (P^A) between periods t and $t+3$, either 'up' or 'down' or 'the same' over the next three months, that is $P^A_{t,t+3}$, based on previous values and the available information set, I, at period t, namely

$$P^A_{t,\,t+3} = (P^A_{t-i\,,t+3} / I_t), \qquad [1]$$

where $\hat{P}_{t+3-j}$ are the actual, current and previous periods of the forward-looking price growth rates that lie within I_t. There is, however, a firm linkage between the surveyors and some estate agents because the expertise of the latter will form part of the information set of the former on account of their unique place at the forefront of the market in negotiating prices of residential properties between buyers and sellers.

This 'alpha' group, however, is small relative to the majority of agents, which means that the distribution of expectations will initially be slow on publication to the media by the Institution, followed by a sudden increase in speed as the majority of smaller estate agents, buyers and sellers convert to the change in predictions in an adaptive manner. This asserts that the 'followers' of the 'pack' will formulate expectations from the 'alphas' by the extent to which their prior predictions have now changed. For example, a simplified version could be

$$P^{F}_{t,t+3} = P^{A}_{t-3,t} + \lambda(P^{A}_{t,t+3} - P^{A}_{t-3,t}), \qquad (0 \leq \lambda \leq 1), \qquad [2]$$

where λ equals the expectations coefficient of the 'followers', which translates the fraction of the extent that the current expectations have now changed for estate agents, or buyers and sellers, adding to the previous period's price to form the expected value in period t for $t+3$. This is followed by a slow-down, typically, as the mortgage lenders fall into line, adapting to the majority's expectations of the future price.

This sequence of dispersion of the initial expectations formed by the 'alphas' and the degree of interdependence implies a non-linear process of diffusion, captured by the logistic function outlined in Mitchell et.al. (2002), which according to Cramer (1991) "is the natural complement of the regression model", denoted as follows[9]:

$$P^{A}_{t,t+3} = \left(1 + \exp^{-(\beta_0 + \sum_{i=1}^{24} \alpha_i P^{A}_{t-i,\,t+3} + \sum_{j=0}^{24} \beta_j \hat{P}_{t+3-j} + \varepsilon_t)} \right)^{-1}. \qquad [3]$$

The expectations of the 'alphas', $P^{A}_{t,t+3}$, therefore, will clearly be a function of previous predictions of itself, $P^{A}_{t-i,t+3}$, representing partly its historical formation (or memory) embodied in the

[9] The inner bracket of [3] can be interpreted as a constant plus a matrix, X, of regressors that represent a rectangular array of elements of order T, rows and K, columns, that is (T×K).

information set, I_t, of the current forecast at time 't'. This information will also be incorporated into the actual forward-looking growth rate as well as past data observations of mortgage lenders, $\hat{P}_{t+3-j}$, over time. The ε_t represents the disturbance term in the form of a remainder because the analysis denotes an average "screening device" of empirical evidence. In addition, the expectations will be related to the proportional coefficients, α_i, β_j and a constant, β_0. Following the procedures outlined in Bywaters and Thomas (2008), the algebraic manipulation of expression [3] leads to the general form of

$$LP^{A}_{t,t+3} = \beta_0 + \sum_{i=1}^{24} \alpha_i \; LP^{A}_{t-i,t+3} + \sum_{j=0}^{24} \beta_j \; \hat{P}_{t+3-j} + \varepsilon_t, \qquad [4]$$

where $LP^{A}_{t,t+3}$ represents $In\left(P^{A}_{t,t+3} / 1 - P^{A}_{t,t+3}\right)$. Expression [4] is the logistic format that captures the diffusion process that is represented by a Sigmoid (or S-shaped) curve. Once predictions are announced to the media by the *RICS*, expectations will spread slowly because of the presence of uncertainty amongst numerous small estate agents, but at an increasing rate until the point of inflexion is reached, after which the rate of change of conformity declines as the process diffuses into official data sets of the mortgage lenders and the land registry, which in turn affects sellers' and buyers' asking and offering prices. The next section of this paper takes this analysis of diffusion and attempts to explain the empirical regularities of self-fulfilling expectations that lead to the actual observations of the housing market that give rise to cycles of economic activity within the economy.

Empirical Estimation of the Diffusion Model

A logistic model of expectation diffusion is estimated here using the *RICS* data on future price trends of the housing market. The percentages of 'ups' $\left(P^{A,U}_{t,t+3}\right)$ or 'downs' $\left(P^{A,D}_{t,t+3}\right)$ can be employed

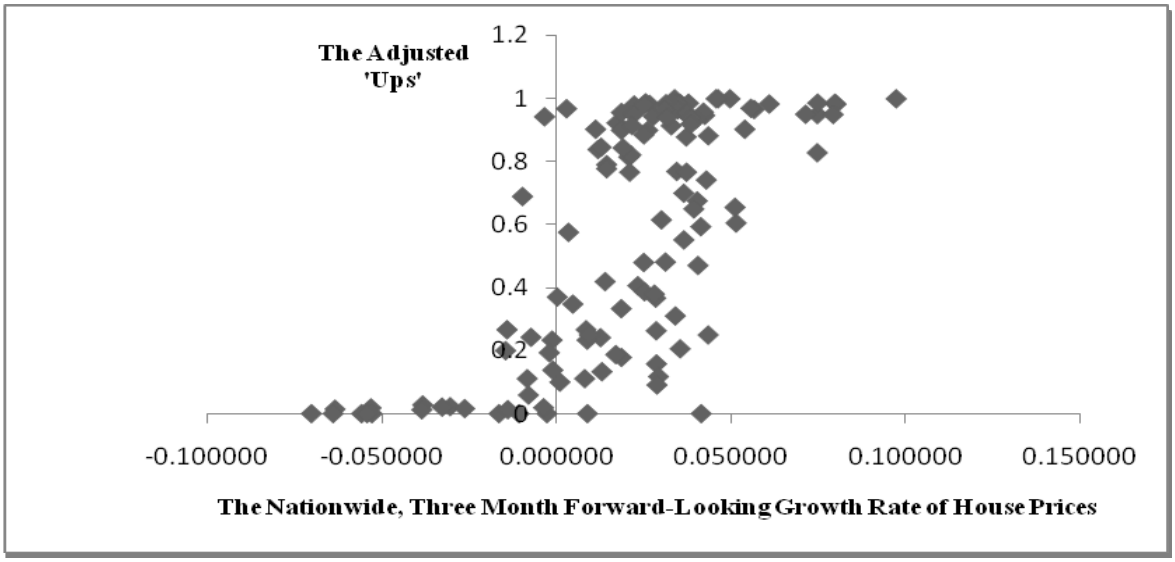

Figure 3: S-Shaped Curve

to quantify this non-linear process of $P^{A}_{t,t+3}$, but only if the proportion of the 'sames' $\hat{P}^{A,S}_{t,t+3}$ is constant within the Survey, otherwise the end results will differ between 'ups' and 'downs'. Given that the 'sames' have changed considerably over the time period, it is therefore necessary to make an adjustment. The 'ups' and 'downs' can be normalised so they sum to one (or hundred), by calculating $Z = 1 - P^{A,S}_{t,t+3}$ to derive the adjusted variables $u_t = P^{A,U}_{t,t+3} / Z$ and $d_t = P^{A,D}_{t,t+3} / Z$. Then, either normalised variable can be used in the empirical analysis, because each gives perfectly symmetric results. This builds on the analysis presented in Mitchell et.al. (2002).

If the adjusted 'ups' are plotted against the three-month, forward-looking house prices derived from the *Nationwide* observations in a scatter diagram, as in Figure 3 above, then it can be seen that the non-linear S-shaped path of diffusion manifests itself within the data sets in the form of a Sigmoid curve. This suggests that the theoretical discussion may well be along the correct lines of thought and should be in the form of expression [4] within the empirical analysis.

The difficulty, however, is that the expectation series of the adjusted 'ups' contains zero values, and therefore, cannot be logged as in the form of [4] on the right-hand side. To overcome this problem, the zeros were put to 0.005 and the ones reduced to 0.995 so that the logistic variable can be derived and the statistical analysis continues along the theoretical lines discussed in the previous Section.

The statistical study employs the Hendry methodology of general-to-specific in order to derive expression [4] with the normalized 'ups'. This captures the 'memory' embodied in the data sets that drives the short-run dynamics of the lag structure prevailing in the housing market. It arises from the interaction of demand and supply determining the future direction of the rate of growth of monthly house prices, namely

$$Lu_t = \beta_0 + \sum_{i=1}^{24} \alpha_i \, Lu_{t-i} + \sum_{j=0}^{24} \beta_j \, \hat{P}_{t+3-j} + \varepsilon_t, \qquad [5]$$

where Lu_t represents $In\left(u_t / 1-u_t\right)$ formed from the future adjusted 'ups' supplied by *RICS*, $\hat{P}_{t+3}$ denotes the three-month forward-looking growth rate of the mortgage lender's official unadjusted house price series in the form of $\left(P_{t+4} - P_{t+1}\right)$. In the first instance, the official data used is from the *Halifax* database.

The general form of [5] was simplified by imposing restrictions and removing insignificant variables, using formal t-statistics as diagnostic tests, while lowering the standard error of the regression and improving performance against the selection criteria. The restricted model overleaf in Table 1 represents the forward-looking, diffusion model. The R^2 is the multiple correlation coefficient with he adjusted one denoted by $\bar{R}^2$, σ is the estimated standard error of the regression, DW is the Durbin-Watson statistic, AIC is the Akaike Information and SBC is the Schwartz

Bayesian Criterions, LL represents the log-likelihood, RRS denotes the residual sum of squares and T is the number of observations used in the estimation.

Table 1: The Estimated Diffusion Model with Halifax Data Set

Dependent variable: ΔLu_t Time Period from 1999 M:10 to 2009 M:9			
Regressor	Coefficient	Standard error	T-Ratio
Constant	-0.089505	0.13186	-0.6788
Lu_{t-1}	-0.15986	0.041833	-3.8214
Lu_{t-5}	-0.10186	0.042325	-2.4066
Lu_{t-9}	-0.089411	0.037848	2.3624
$\hat{P}_{t+3}$	16.6843	2.9789	5.6009
$\hat{P}_{t+3-16}$	-11.1924	2.7083	-4.1326
$\hat{P}_{t+3-21}$	12.5227	4.6028	2.7207
$\hat{P}_{t+3-22}$	-9.9459	4.8145	-2.0658
D_1	3.4697	0.96401	3.5990
Dummy variable, D_1, for 2004: M9 = -1, otherwise zero[10].			
$R^2 = 0.46166$, $\overline{R}^2 = 0.42286$, $\sigma = 0.94016$, $DW = 1.9696$, $AIC = -167.1908$, $SBC = -158.1908$, $LL = -158.1908$, $RRS = 98.1138$, $T = 120$.			
$A: \chi_{12} = 8.0145$, $B: \chi_1 = 0.095212$, $C: \chi_2 = 4.4848$, $D: \chi_1 = 1.4576$.			
A: Lagrange multiplier test of residual serial correlation, compared to 12 months previous.			
B: Ramsey's Reset test for functional form, using the square of the fitted values.			
C: Lagrange multiplier test of normality, based on a test of skewness and kurtosis of residuals.			
D: Lagrange multiplier test of heteroskedasticity, based on the regression of squared residuals on squared fitted values.			

The diagnostic statistics in Table 1 are shown above and suggest a statistically well-defined model. The restrictions increased the AIC and SBC statistics along a fall in standard error of the equation and the residual sum of squares, when compared with the general model. The dynamic process embodied in the equation suggests a complex diffusion over a time span of twenty periods, although one of the most important theoretical variables when compared with expression [4], $\hat{P}_{t+3}$ on the right-hand side of [5], has the required positive value. Also, the summation of the

[10] If the estimated equation is left as Lu_t, then the $R^2 = 0.90663$.

Table 2: The Estimated Diffusion Model with Nationwide Data Set

Dependent variable: ΔLu_t **Time Period from 1999 M:10 to 2009 M:9**			
Regressor	Coefficient	Standard error	T-Ratio
Constant	-0.19006	0.14760	-1.2877
Lu_{t-5}	-0.14490	0.031623	-4.5821
Lu_{t-12}	0.19323	0.03851	5.7427
$\hat{P}_{t+3}$	10.6318	3.0228	3.5171
$\hat{P}_{t+3-14}$	-25.9521	5.4485	4.2199
$\hat{P}_{t+3-24}$	18.8206	4.4599	4.2199
D_2	3.0910	0.95660	3.2312
D_3	2.7173	0.96878	2.8049
Dummy variables: D_2, for 2004: M9 = -1, otherwise zero; D_3, for 2008: M12= -1, otherwise zero[11].			
$R^2 = 0.45714$, $\overline{R}^2 = 0.42321$, $\sigma = 0.93988$, $DW = 1.8521$, $AIC = -166.6930$, $SBC = -177.8430$, $LL = -158.6930$, $RRS = 98.9385$, $T = 120$.			
$A: \chi_{12} = 14.8243$, $B: \chi_1 = 0.19905$, $C: \chi_2 = 0.023373$, $D: \chi_1 = 0.94464$.			

values on the official coefficients is an overall positive one. The estimates of the dependent variable have a vital function to play in acting as an error correction process, stretching back nine months. The next task in the empirical analysis is to re-estimate the model with the substitute data set, the *Nationwide*.

Following the same procedures as before with the other data set substituted into the empirical analysis, the estimation leads to the restricted model Table 2 above. Both models have similarities, although the function of the dependent variable on the right-hand side of the equation in Table 2 is reduced to two lagged variables, but the official growth rate picture is not so complex in terms of the short-run dynamics and the lag-structure, which is a mix of positive and negatives on the lagged values. The summation of the values, however, gives rise to an overall positive effect with the pivotal role for $\hat{P}_{t+3}$ in the model along with previous values, which is the case suggested by the theory in [4].

[11] If the estimated equation is left as Lu_t, then the $R^2 = 0.92378$.

Moreover, if the sample period is reduced in Table 2 to aid comparison between the models derived, the differences between the two in terms of R^2's are slight, although a reduced standard error of the regression in the case of the *Nationwide*. The AIC is reduced further to -166.6930 along with the SBC at -177.8430. Clearly, it is difficult to choose between the two models at this stage, and therefore the analysis in the next section of the paper considers their forecasting properties, starting once again with the *Halifax* model.

Econometric Estimation of the Forecasting Models

The forecasting of future growth in house prices using the *RICS* Survey is causally quite different to the explanation of expectations in the previous section. Simple reversal of a regression equation in these circumstances is not possible. The forward-looking models, however, do indicate which dependent and which explanatory variables might be of particular interest. Given the empirical information in the two models, the dependent variable investigated was the log change in $(P_{t+4} - P_{t+1}) = \hat{P}_{t+3}$ explained by the relevant previous price changes and logistic variables with the same sample period in order to allow comparison. In the case of the *Halifax* representation, the following restricted form was estimated overleaf in Table 3:

Table 3: The Estimated Forecasting Model with Halifax Data Set

Dependent variable: $\hat{P}_{t+3}$ **Time Period from 2000 M:10 to 2009 M:10**			
Regressor	Coefficient	Standard error	T-Ratio
Constant	0.0049226	0.0022036	2.2339
Lu_t	0.0020858	0.0008749	2.3840
Lu_{t-11}	0.0025712	0.0010607	2.4241
Lu_{t-13}	-0.0030993	0.0009183	-3.3751
Lu_{t-22}	0.0028234	0.0008602	3.2824
Lu_{t-24}	-0.0024478	0.0009199	-2.6610
$\hat{P}_{t+3-1}$	1.0001	0.069483	14.3934
$\hat{P}_{t+3-3}$	-0.91318	0. 11392	-8.0158
$\hat{P}_{t+3-4}$	1.0086	0.12481	8.0808
$\hat{P}_{t+3-6}$	-0.90133	0.14876	-6.0590
$\hat{P}_{t+3-7}$	0.79849	0.15395	5.1866
$\hat{P}_{t+3-9}$	-0.75898	0.15251	-4.9766
$\hat{P}_{t+3-10}$	0.63516	0.14192	4.4754
$\hat{P}_{t+3-12}$	-0.38876	0.12143	-3.2014
$\hat{P}_{t+3-13}$	0.27688	0.10566	2.6205
$R^2 = 0.87639$, $\bar{R}^2 = 0.85798$, $\sigma = 0.014391$, $DW = 1.6698$, $AIC = 300.6886$, $SBC = 280.5035$, $LL = 315.6886$, $RRS = 0.019468$, $T = 109$. $A: \chi_{12} = 18.9804$, $B: \chi_1 = 0.0002768$, $C: \chi_2 = 0.73779$, $D: \chi_1 = 0.47610$.			

Keeping the same time period and the dependent variable, but substituting in the *Nationwide* series so that a comparison can be made between the models. The restricted form as estimated in Table 4 is shown overleaf. Clearly, when comparing the two forecasting models in Tables 3 and 4, it is the *Nationwide* one that is statistically superior in terms of the R^2 and $\bar{R}^2$ along with other statistics, although the Halifax model contains the current expectation in conjunction with lagged values whereas the other uses only backward-looking expectational variables from minus ten to twenty-four.

Table 4: The Estimated Forecasting Model with Nationwide Data Set

Dependent variable: $\hat{P}_{t+3}$ **Time Period from 2000 M:10 to 2009 M:10**			
Regressor	Coefficient	Standard error	T-Ratio
Constant	0.0006726	0.0016712	0.40248
Lu_{t-10}	0.0019744	0.0007623	2.5871
Lu_{t-14}	-0.0015691	0.0006082	-2.5800
Lu_{t-20}	-0.0025680	0.0008909	-2.8825
Lu_{t-21}	0.0031341	0.0012170	2.5753
Lu_{t-22}	-0.0033007	0.0012081	-2.7322
Lu_{t-23}	0.0052421	0.0011823	4.4337
Lu_{t-24}	-0.0026064	0.0008559	-3.0453
$\hat{P}_{t+3-1}$	1.2850	0.056202	22.8639
$\hat{P}_{t+3-3}$	-0.92930	0.11365	-8.1766
$\hat{P}_{t+3-4}$	0.85450	0.11366	7.5181
$\hat{P}_{t+3-6}$	-0.82729	0.11804	-7.0083
$\hat{P}_{t+3-7}$	0.74494	0.12164	6.1242
$\hat{P}_{t+3-9}$	-0.34255	0.086768	-3.9479
$\hat{P}_{t+3-11}$	0.25862	0.099226	2.6064
$\hat{P}_{t+3-12}$	-0.27439	0.089240	-3.0748
$\hat{P}_{t+3-17}$	0.13897	0.056942	2.4406
$\hat{P}_{t+3-22}$	0.18639	0.078668	2.3693
$\hat{P}_{t+3-24}$	-0.015496	0.078388	-2.0000
$R^2 = 0.94189$, $\overline{R}^2 = 0.93014$, $\sigma = 0.0086278$, $DW = 2.05484$, $AIC = 351.5020$, $SBC = 326.0218$, $LL = 370.5020$, $RRS = 0.0066251$, $T = 109$. $A: \chi_{12} = 9.0114$, $B: \chi_1 = 0.12997$, $C: \chi_2 = 3.6514$, $D: \chi_1 = 0.34384$.			

Keeping the sample period as before and taking the lagged values that are near one to the left-hand side as part of the dependent variable, with further restrictions imposed on the right-hand side, the following empirical model was estimated overleaf:

Table 5: Another Estimated Forecasting Model with Nationwide Data Set

Dependent variable: $\Delta\hat{P}_{t+3} = \hat{P}_{t+3} - \hat{P}_{t+3-1} + \hat{P}_{t+3-3} - \hat{P}_{t+3-4} + \hat{P}_{t+3-6} - \hat{P}_{t+3-7}$

Time Period from 2000 M:10 to 2009 M:10

Regressor	Coefficient	Standard Error	T-Ratio
Constant	0.0006385	0.0016618	0.38421
Lu_{t-10}	0.0020337	0.0007519	2.7048
Lu_{t-14}	- 0.0016636	0.0005712	-2.9123
Lu_{t-20}	- 0.0028699	0.0008334	-3.4434
Lu_{t-21}	0.0036259	0.0011592	3.1278
Lu_{t-22}	-0.0032687	0.0011984	-2.7277
Lu_{t-23}	0.0050217	0.011731	4.2807
Lu_{t-24}	-0.0025782	0.0008541	-3.0187
$\hat{P}_{t+3-1}$	0.28612	0.031094	9.2016
$\hat{P}_{t+3-7}$	-0.12454	0.051982	-2.3958
$\hat{P}_{t+3-9}$	-0.38753	0.077374	-5.0085
$\hat{P}_{t+3-11}$	0.27173	0.098476	2.7593
$\hat{P}_{t+3-12}$	-0.27659	0.88055	-3.1412
$\hat{P}_{t+3-17}$	0.14731	0.053692	2.7437
$\hat{P}_{t+3-22}$	0.18259	0.076953	2.3727
$\hat{P}_{t+3-24}$	-0.15759	0.077255	-2.0398

$R^2 = 0.75714$, $\overline{R}^2 = 0.71754$, $\sigma = 0.0086163$, $DW = 2.0549$, $AIC = 352.8559$, $SBC = 331.3989$, $LL = 368.8559$, $RRS = 0.0068301$, $T = 109$.

$A: \chi_{12} = 8.4641$, $B: \chi_1 = 0.28459$, $C: \chi_2 = 1.7082$, $D: \chi_1 = 1.2131$.

To make use of this model in Table 5 for forecasting requires the construction of an intermediate model of $\hat{P}_{t+3-1}$, clearly signalling the complexity underlying the *RICS* Surveys, which reflects the complicated dynamics of the housing market when it comes to expectation formulations that could be the initial trigger of booms and slumps. Thus, policy instruments should be focusing on manipulating forward-looking expectations that develop in the housing market. It should be noted that when the *Halifax* model in Table 3 is restricted further, the same dependent variable as in Table 5 appears.

The model in Table 4, in terms of $\hat{P}_{t+3}$, can be compared with the Pesaran/Thomas (1995) procedure for generating expectations. This estimation of the Pesaran/Thomas format was over the time period of 1999: M4 to 2010: M1 led to a well-defined, backward-looking statistical representation of the form:

$$\hat{P}_{t-3} = -0.016367 \quad + 0.061555\, U_b + \hat{V}_t,$$
$$\qquad\quad (0.0017731)\ \ (0.015736)$$

$$\hat{V}_t = 0.1.0086\hat{V}_{t-1} - 0.61791\hat{V}_{t-3} + 0.53420\hat{V}_{t-4} - 0.3805\hat{V}_{t-6} + 0.22747\hat{V}_{t-7} + 0.13304\hat{V}_{t-11} \qquad [7]$$
$$(0.058945)\quad (0.10000)\quad (0.10156)\quad (0.096773)\quad (0.082777)\quad (0.054187)$$
$$+ 0.13872\hat{V}_{t-14} + 0.16986\hat{V}_{t-23} + U_t.$$
$$(0.054278)\quad (0.056993)$$

$R^2 = 0.89533$, $\bar{R}^2 = 0.88748$, $\hat{\sigma} = 0.010388$, $DW = 2.0103$, $T = 130$, $\hat{S} = 0.030969$, $AIC = 404.4637$, $SBC = 390.1260$,
$A:\chi^2_{12} = 16.2345$, $B:\chi^2_1 = 0.43669$, $C:\chi^2_2 = 2.4723$, $D:\chi^2_1 = 2.4283$.

$\hat{P}_{t-3}$ is the backward-looking price growth, that is the log change in $(P_t - P_{t-3})$ with U_b, the past, adjusted 'ups'. The inclusion of the past residuals $\hat{V}_t$, was tested as instruments using the Hausman (1978) test, which could not reject the null-hypothesis of no error-correcting forecasts. Thus, it is necessary to include the past residuals as instruments for the self-correcting mechanism of forecasting errors. Furthermore, the diagnostic tests clearly indicate a well-defined statistical format.

According to Hansen (2005), in addition to the use of model selection statistics, the root mean-squared error or, in this case, the root mean squared forecast error (RMSFE) can be relevant in comparing models. The expected change in house prices over the next three months using the adjusted 'ups', u_t, is utilized in the following equation to create expectations from equation [7] to aid comparison:

$$\hat{P}^e_{t+3} = -0.016367 + 0.061555u_t + 1.008667V_t - 0.61791V_{t-2} + 0.5342V_{t-3} - 0.38085V_{t-5} + 0.22747V_{t-6}$$
$$+ 0.13304V_{t-10} - 0.13872V_{t-13} + 0.16969V_{t-22}.$$

[8]

Table 6: Another Estimated Forecasting Model with Nationwide Data Set, but Twelve Months Ahead

Dependent variable: $\Delta\hat{P}_{t+12} = \hat{P}_{t+12} - \hat{P}_{t+12-1}$ **Time Period from 2000 M:10 to 2009 M:1**			
Regressor	Coefficient	Standard Error	T-Ratio
Constant	-0.0010070	0.0020347	-0.49489
Lu_{t-1}	-0.0031463	0.0008732	-3.6031
Lu_{t-2}	0.0047452	0.0009147	5.1877
Lu_{t-6}	-0.0016784	0.0006789	-2.4720
Lu_{t-12}	-0.0035910	0.0008312	-4.3202
Lu_{t-13}	0.0026312	0.0009408	2.7969
Lu_{t-15}	0.0019840	0.0006026	3.2922
Lu_{t-23}	0.0012278	0.0004519	2.7169
$\hat{P}_{t+12-1}$	0.15290	0.021685	7.0508
$\hat{P}_{t+12-6}$	-0.17978	0.045207	-3.9769
$\hat{P}_{t+3-10}$	-0.21174	0.098920	-2.1405
$\hat{P}_{t+3-11}$	-0.45308	0.12454	-3.6380
$\hat{P}_{t+3-12}$	0.75898	0.10445	7.2662
$\hat{P}_{t+3-22}$	-0.59035	0.10937	-5.3979
$\hat{P}_{t+3-23}$	0.49213	0.10297	4.7796
D_4	0.037020	0.0091427	4.0492
Dummy variable: D_4, for 2007: M12 = -1, otherwise zero.			
$R^2 = 0.76156$, $\bar{R}^2 = 0.71898$, $\sigma = 0.0085057$, $DW = 1.8118$, $AIC = 357.5253$, $SBC = 306.6840$,			
$LL = 343.5253$, $RRS = 0.008057$, $T = 100$.			
$A: \chi_{12} = 18.2972$, $B: \chi_1 = 0.045388$, $C: \chi_2 = 1.0760$, $D: \chi_1 = 0.26786$.			

These are compared with the fitted-values of $\hat{P}_{t+3}$ derived from the equation in Table 4. In the case of equation [8], the RMSFE led to a value of 0.021323. For $\hat{P}_{t+3}$, from Table 4, the RMSFE was 0.0069912. The logistic function is shown here to have a lower RMSFE, compared with the Pesaran/Thomas method.

Given the complexity of the dependent variable that developed from the Hendry methodology of the true, data generating process of behaviour, it was decided to experiment with the lag structure. For example, when the lag length was put to twelve-months into the future, that is log change of $(P_{t+12} - P_{t+1}) = \hat{P}_{t+12}$, Table 6 above was derived from the estimation.

The estimation in Table 6 suggests that the Survey data set contains more than just three months of information, but could well contain a yearly sequence of events because agents are comparing the next three-months with the same three-month period in the previous year.

Policy implications

Policy implications in the housing market are normally analysed within the framework where prices are determined in the short term by demand and in the long term by an inelastic supply (Hendry, 1984). Supply will increase or decrease only to a limited extent in response to the changing effect of demand in the short run, but in the long term supply will expand if the price is above the marginal cost and will contract if price is lower, but slowly because of planning restrictions. Thus, demand and supply will be brought into equilibrium over a long period of time at a price equal to the long run marginal cost (Holmans, 1990). This process of adjustment towards the new equilibrium position could well take several years given the low elasticity of housing supply because the developer bases the decision of the level of starts on the predicted price on completion, which mirrors the future state of the market. Therefore, expectations are a critical factor along with other indicators: the flow of funds from mortgage institutions, the length of time for sale of existing and new houses.

The traditional instruments used to speed-up this process of adjustment to balance the market were monetary policy *via* the manipulation of interest rates and fiscal policy, for example giving tax allowances on mortgage interest payments, which ended in April 2000. Recent experience concerning the effects of interest rate policy is that, even though the Bank of England base rate stands at 0.5 per cent, the mortgage rate charged on the 'High street' is much higher with administrative fees on top. The standard variable mortgage interest rate stood at 3.95 per cent on the 30th of June, 2009, as measured for a composite of Banks and Building Societies, which is 7.9 times bigger than the Bank's base rate.

A further complication concerning monetary policy is that, it is set to achieve wider macroeconomic goals such as inflation, which are not necessarily consistent with stability in the housing market. Furthermore, the inflation rate as measured by the European harmonised index of consumer prices is selected as the target variable on which the Bank of England generally focuses its attention. By definition, this index excludes housing costs, including important factors that cause fluctuations in house prices such mortgage payments. In the case of the supply, government policy has largely failed in subsidizing construction of new stock, given the recession, and imposes planning restrictions.

Given the analysis and the empirical evidence found in this paper, the missing link for policy is to influence forward-looking house price expectations *via* the fundamentals of the information set. Expectations of falling prices are important for suppliers because they have choice of whether or not to trade. If sellers do not receive offers at the prices they think they should get, their first reaction is to wait: the volume of transactions falls and so the actual price level measured continues downward. At some stage, the difficulties of making sales lead sellers to revise their opinions about acceptable and expected prices. This information eventually finds its way into the Surveys, and later the actual house price indices.

A further distinctive and important influence of expectations is on the terms of mortgage lenders because the bulk of transactions for owner-occupation of houses are financed by loans. The volume of loans is likely to have a very considerable impact on the market. On the one hand, if expectations of falling prices are observed by lenders, they become reluctant to lend and involve themselves in the practice of mortgage-rationing with screening devices of credit-worthiness to 'weed-out' perceived high risk borrowers with higher down payments (Stiglitz and Weiss, 1981). This is discriminating against various groups such as the self-employed, even though they are prepared to pay higher interest charges, because they are regarded as more likely to default in a period of recession.

On the other hand, in the context of expectations that reveal the potential for rising prices, mortgage lenders are prepared to make loans to a greater range of borrowers. There is more value of collateral with rising house prices, and greater security that loans can be recouped if default takes place by the selling of properties by auction. Furthermore, as economic activity in the market picks up, then competition between various lenders and the lagged effect of monetary policy will force mortgage rates down unless there is informal price fixing to protect profit margins. Also, expectations of higher prices will encourage potential purchasers to enter the market. The implications for policy is that price expectations should be a focus variable of attention along with the physical volume of mortgage loans. The gaps in loan availability at some periods, and dangerous risky lending, for example hundred twenty five per cent mortgages, at other times, could be dealt with by appropriate banking regulation, and withdrawal of licences to operate from banks and other financial institutions, whose behaviour was deemed unacceptable. Normally, policy only addresses the issue of the cost of finance rather than the availability of loans (Meen, 2000).

The success or failure of lending policies and their regulation in the U.K. housing market should be the subject of public monthly reports by the Bank of England, evaluated in the context of expectations for future house prices indicated along the lines of this paper, from the RICS survey data because it indicates cycles of economic activity.

Conclusions/Summary

The paper has focused on the process of the formation of expectations of house prices underlying the *RICS* Survey. The study suggests that there is a diffusion process, captured by the logistic model. The empirical results from the estimation provide evidence supporting the logistic specification. This is in line with models of bounded rationality, where decision-making is uncertain, self-fulfilling, complex, and costly. The majority of agents follow the few, the alphas of

the pack, namely the Chartered Surveyors, who may use information provided by estate agents as part of their information set.

The policy implications discussion in the previous section suggests that the expectations of house prices could well be playing a pivotal part in the cycles of economic activity, and therefore, the forecasting model could be used as an early warning system of forthcoming 'swings and roundabouts' within the economy. Thus the forecasting model described should influence the Government, the Bank of England's decision over interest rate policy and the Treasury's choice of fiscal policy. The next stage in the research is expose the information set of the Chartered Surveyors by building a Var system of equations with the focal point of price expectations to determine the fundamentals.

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