Are there booms and busts in the UK housing market?

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Abstract

This paper examines the historical record of UK house prices to establish if there is evidence to suggest that there have been significant changes in the prices of houses. It does this be examining a measure of affordability. This is defined as the average UK house price over the Average wage.
This paper attempts to generate a simple model of the housing market and compares this with the actual data to make a forecast of likely movement.

Method

The data used comes from Halifax plc. (Halifax, 2004). There are other sources of house price data in similar form from all the major lending institutions in the UK. However, the particular data set was chosen because it covers nearly 50 years of data The data also has relevant other information such as average wage, interest rates, deposit rates etc. over the same period.

The data was plotted to establish the general shape of the general house price curve. This showed the increase in prices over the last 50 years, as well as the bulge in the late 1980's. It was not sufficient to distinguish any other major features apart from the general shape of the curve.

There are other measures of house price, housing market and affordability used in the literature. It was therefore decided to look particularly at a definition of affordability defined as the average house price divided by the average UK wage. Indeed it is used in The Nationwide Building Society analysis of the housing market as well as the Office of National Statistics reports. (Nationwide 2004 and ONS, 2004).

There have been other attempts at incorporating the house price into economic models. (Muellbauer, J.,Murphy, A., 1997). The same authors examine the volatility of the housing market and the 'Booms and Busts' since 1947. The following relevant quotation is taken from their paper.

"In the past 40 years, there have been two major booms in the UK's owner-occupied housing market: in the early 1970s and in the late 1980s. There were also smaller booms in the 1960s and, more briefly, in the late 1970s, while the early 1990s saw a bust on an unprecedented scale, at least for the UK. In the paper, we examine the causes of these booms and busts with an econometric model for the prices of second-hand UK houses in the period 1957-1994."

There are other measures of affordability that can be used as follows.(ODPM, 2004)

Affordability – raising the deposit
Affordability – repaying the loan

However, this paper uses the ratio of house price to average wage. Figure 1, shows the increase in the ratio between average wage and house price. The peaks are an increase

in this ratio so that the price of the average house is a multiple of the average wage. The figure displays several peaks over the period which are identified in Table 1.

Table 1

Peak	Year Max	Value Max	Year Min	Value Min Preceding	Up	Down
A	1967	3.46	1960	2.94	8	3
B	1973	4.49	1970	3.16	3	4
C	1980	3.71	1977	3.22	3	2
D	1989	5.06	1982	3.24	7	7
E*	2002	5.24	1996	3.47	6	N/A

Analysis of Affordability Ratio peaks from 1957 to 2002

The peaks labeled B and D are marked, as is the current raise E* at the time of writing there is mixed evidence that the maximum rise in house prices has been reached. Government statistics say that the peak was reached in October 2003. (Nationwide, 2003). Several figures for house prices in 2003 are available, as are approximate Average Wage figures., but were not included in this analysis. There is also some recent evidence from Halifax that there was renewal of price increases in general early 2004 (Halifax, 2004).

An examination of Table 1 shows that there is some consistency in the Up and Down swings of Figure 1. Essentially, the ratio rises a similar number of years, as is falls.

When a linear trend is plotted on the same scale Figure 2 the residuals can be analysed and shown in Figure 3. The regression model in Figure 2 gives an equation 1.

$$\text{Ratio} = (0.0259 \pm 0.0045) * \text{Year-No} + (-47.655 \pm 8.886) \qquad (1)$$

Where the standard error is 0.4175. The majority of the residuals lie in between -0.2 and + 0.2 as can be seen from Figure 3, which indicates that the expectation of house price affordability will return to the trend line. Similar results are obtained when using a power curve trend line but in this paper a linear relationship is assumed to aid simplicity.

The Maximum and Minimum values however seem to be diverging from the trend line, with the Maximum values showing a rate of around 5% per year, and the minimum values a rate of 1.4 %. The trend line indicates a rate of 2.6 % per year. The ratio has grown from 3.0 to 4.2 over 47 years. This can be compared with the lending ratios of the major mortgage providers Table 2. The figure of interest is the UK average of lending showing approximately 3.0 and 2.5 for single and joint borrowers respectively with quartiles of ± 0.5.

Figure 1 therefore indicates that affordability ratio is in general below 4, and has a tendency to revert to following a general trend of the amount mortgage lenders will allow.

The affordability chart Figure 1 can also be examined for the existence of multiple cycles.
The basic linear model can be extended to include cycles of the form.

$$y = a \sin(\frac{b+t}{2\pi l}) \qquad (2)$$

Equations (1) and (2) can be combined to form a model of the underlying time series (Chatfield, 1996). Estimations of the parameters of equation 2 can be made. ***a*** is the amplitude, ***b*** is the phase, ***l*** the length of cycle and ***t*** the period. The phase can either be guessed at by trial and error, or inspection. Fourier analysis gives the phase of each cycle directly. (Bloch, 2000) Experience has shown that two cycles are normally enough to model the cyclical effect. (Shearer, 1994)

An examination of the residuals after removing the trend calculated by OLS can be performed using Fourier Analysis and Autocorrelation show that there is some cyclical nature to the curve. These are presented as figure 4 and 5 respectively.

Table 2

Measure	Cycles	Period
Autocorrelations	2.8 to 4.4	11 to 17
FFT	4 to 5	9.4 to 11.75

Cycle analysis of Affordability ration residuals

By using the above examination of the cycles, and equation 2 a set of graphs can be produced that model the Affordability Ratio. An example is shown in Figure 6. The cyclical estimate is calculated using a lag of 16 and determining the average residual over that period.

Fourier analysis shows similar behavior. All show that the model tends to revert back to the trend, and that it is a mean reverting system. The question then arises where does the mean market affordability ratio come from. Is it due solely to the lending ratio as shown in Table 3?

Table 3

		Single borrower			Two borrowers	
Region	Lower		Upper	Lower		Upper
	Quartile	Median	Quartile	Quartile	Median	Quartile
North East	1.96	2.6	3.05	1.69	2.14	2.6
North West	2.16	2.68	3.13	1.78	2.23	2.67
Yorkshire & The Humber	2.09	2.61	3.06	1.77	2.24	2.71
West Midlands	2.33	2.86	3.3	1.98	2.44	2.89
East Midlands	2.38	2.89	3.34	1.93	2.4	2.88
East	2.68	3.17	3.6	2.22	2.7	3.07
London	2.86	3.35	3.8	2.37	2.77	3.15
South East	2.71	3.28	3.75	2.31	2.75	3.17
South West	2.69	3.22	3.68	2.25	2.73	3.15
Scotland	1.9	2.46	2.94	1.61	2.03	2.49
Wales	2.17	2.71	3.14	1.81	2.3	2.73
Northern Ireland	2.32	2.89	3.37	1.93	2.38	2.79
Average UK	2.35	2.89	3.35	1.97	2.43	2.86

Modified From Society of Mortgage Lenders Distribution of advance to income ratios for first-time buyers by region in 2002

The difference in general is made up of the deposit that has to be found by a buter. Table 4 shows the average amount of deposit required by first time buyers. The figures for existing borrowers are similar, and are not shown here. The affordability ratio shown in Table 4 is similar to that calculated by equation (1) and shown in figure 1.

Table 4

Year	Deposit	Average House	Average House Minus Average deposit	Average Wage	Affordability Ratio Deposit Adjusted
1990	7,902	69,500	61,598	15,252	4.0387
1991	8,131	68,600	60,469	16,441	3.6779
1992	8,057	66,000	57,943	17,426	3.3251
1993	8,431	64,300	55,869	17,968	3.1094
1994	8,126	66,200	58,074	18,618	3.1192
1995	5,099	66,600	61,501	19,202	3.2028
1996	4,831	69,000	64,169	19,886	3.2268
1997	6,107	75,500	69,393	20,736	3.3465
1998	10,423	83,700	73,277	21,801	3.3612
1999	14,240	93,300	79,060	22,847	3.4604
2000	15,389	106,700	91,311	23,895	3.8213
2001	17,984	115,700	97,716	24,928	3.9199
2002	23,448	135,300	111,852	25,841	4.3285

Modified From Society of Mortgage Lenders Average amount of deposit required for First Time Buyers 2002

Consequently if the mortgage lenders stick to a policy similar to current ratio of earnings to house cost. Firstly buyers without significant deposits will be priced out of the market.

Evidence of this is the analysis of first time buyers entering the market over the last few years. The figures from the Council of Mortgage lenders (CML 2004) show a decrease from over 50% in 1993 to under 30% in 2003. Secondly the mortgage market will consist of people raising equity on the property they already own, to finance other purchases.

This can be examined in the ODPM report. (ODPM, 2004), where the new purchase mortgages are converging with a rising request for re mortgages. Some commentators have suggested that there is a surge in ‘buy to let’. This is somewhat problematic since traditionally private lettings have only been approximately 10% of the total housing market. (Halifax, 2003). Currently 69.9% is owner occupied, Local council 13.8%, Housing Associations 6.7% and privately rented 9.9%. The reliance of agents on a buoyant Buy to Let market seems risky as a mechanism for maintaining current price levels given the historical proportion of properties bought for this purpose.

Similarly, other commentators prefer to use a ratio of rent to mortgage to evaluate the market. (Nationwide, 2003). A similar argument can be given in that First time buyers will not enter a market that is too pricey, and will tend to stay where they are. Either with parents, or in existing rented accommodation, hence paying rents on medium term contracts.

Returning to the results illustrated in table 1, table 2 and in figure 6. Can we use the model to predict the housing market?

For the Data in figure 6 the model gives the following.

Table 5

Year	Average Wage	Average House Price	Prediction
2002	25841	115243.8	
2003	26091	110240.8	-0.04341
2004	26341	123991.2	0.124731
2005	26591	135673.6	0.09422
2006	26841	129165.7	-0.04797
2007	27091	119602.7	-0.07404
2008	27341	114335.2	-0.04404
2009	27591	113818.1	-0.00452
2010	27841	116569	0.024169

Prediction in the variation from trend of affordability Ratio

The movements in affordability ratio obviously track house price changes shown in table 5, so equivalent rises in the ratio as well as falls will be reflected in house prices. Therefore the prediction is the average movement in house prices as a Year on year percentage.

As the model reverts to trend the fall will be of the order of 19%. From a peak in 2003/4 to a low in 2007. This is a four year drop. Based of the actual current market, house prices are significantly higher than the model suggests, suggesting that the mean revert ion of the market will be higher. Some caution must be exercised because the error in estimation of the percentage change is approximately 7%. So that the fall will be between 12% and 26%.

Examination of Table 1 gives similar predictive qualities. Assuming that a peak in the market was reached in 2003. The Rise continued for 7 years. From past data there will be an equivalent fall for 7 years. Also that the market will loose almost as much as it gained plus a small rise with trend. The average falls after peaks are approximately 25%; (at the major peak in 1989 the fall was 35%). These give annual falls between 3% and 5% per year. Given the period the market takes to fall is similar to the time it takes to rise. 7 years from 2003 gives 2010 before the market will start to rise above trend. Again the error is fairly significant at approximately 14%. In other words the predicted fall using this inspection method could be between 11% and 39%.

Conclusions

The housing market is not efficient, but is mean reverting, and that mean is determined by the amount of money lenders will forward as well as the deposit necessary.

The market also shows peaks and troughs when examined as an affordability ratio.

A simple model of trend plus cycles can be used to examine the behaviour of the market, and predict its possible movements.

If the market follows historical precedence the affordability ratio will improve, as the average house price reduces, adjusted by the underlying trend. The model gives price adjustments of around 19%, and inspection of the data gives 25%. The last peak gave 35% adjustments of the average house price.
The best case is a general improvement in affordability, and the worst case is for a crash similar to the one experienced in 1989. Factors mitigating against a 1989 crash are low inflation, low unemployment and low mortgage rates.

Factors for a crash are the disappearance of first time buyers as mentioned in the paper and by commentators, decrease in affordability and historical precedence as shown by the model.

The model gives only an indication of what may happen to the Housing market, and an examination of the driving factors is required to establish indicators of likely behaviour.

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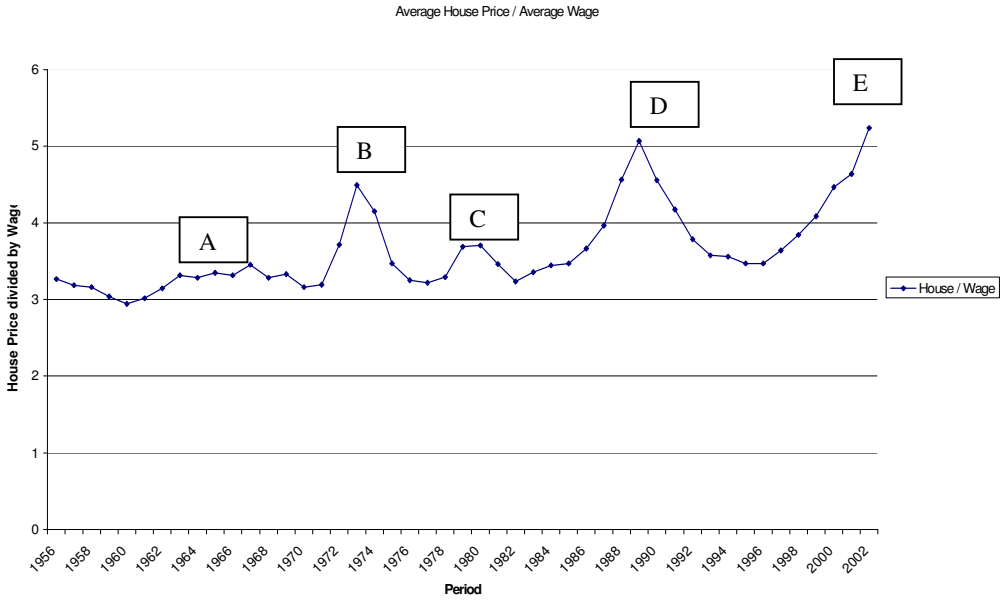
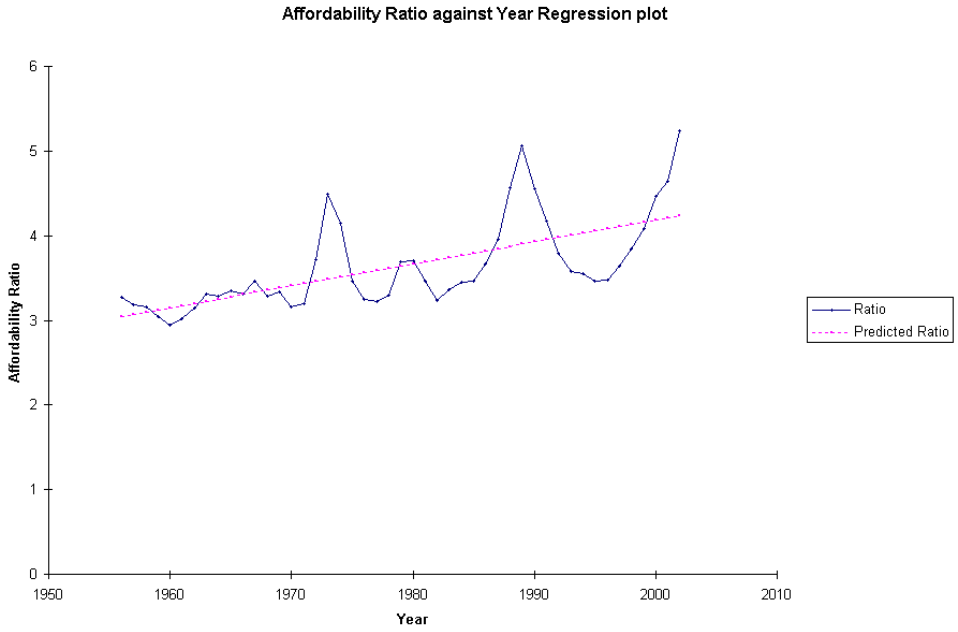
Figure 1



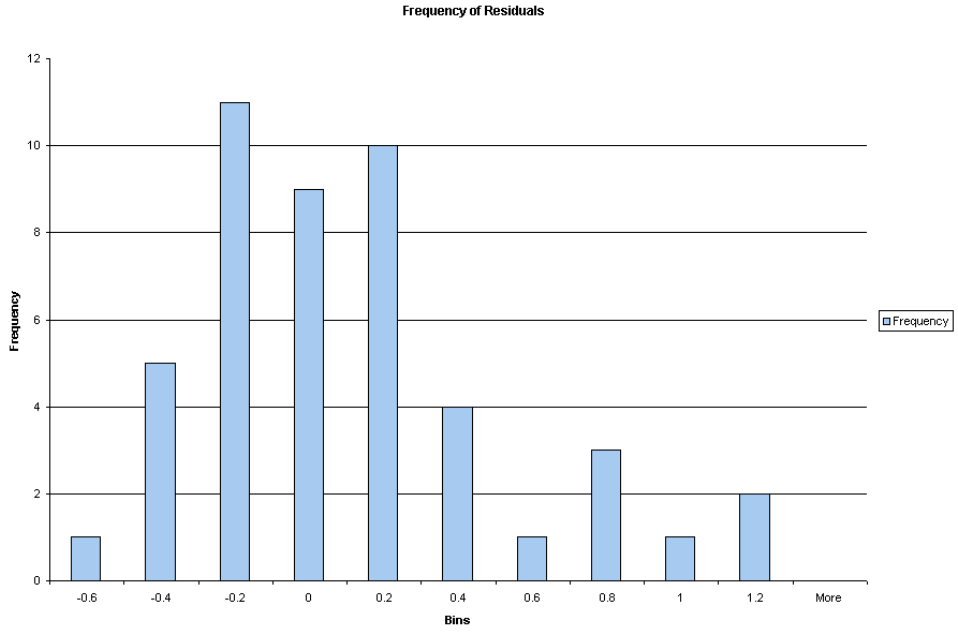
Affordability as defined Average House Price divided by Average Wage

Figure 2



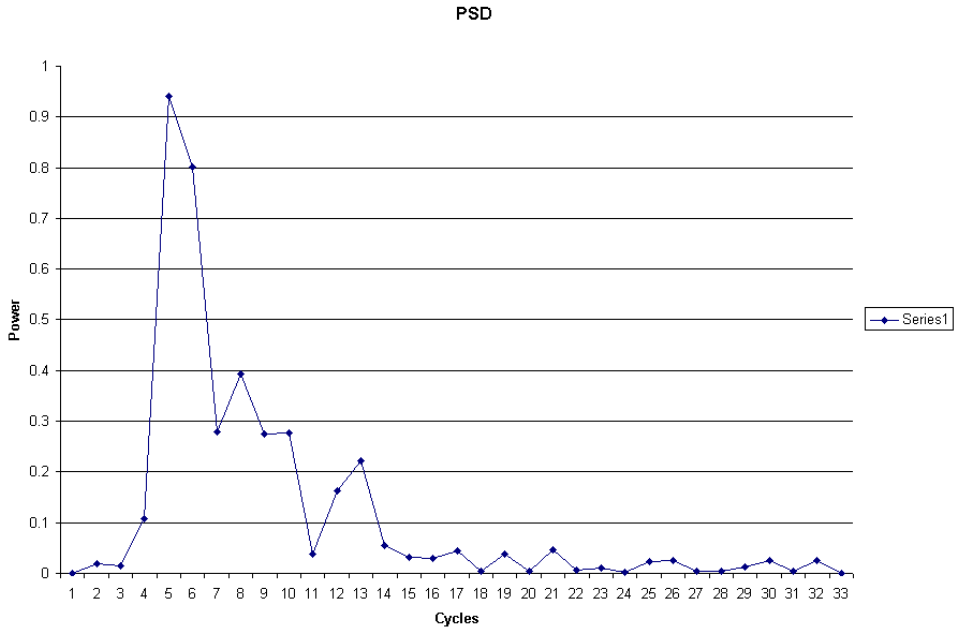
Affordability and linear regression line

Figure 3



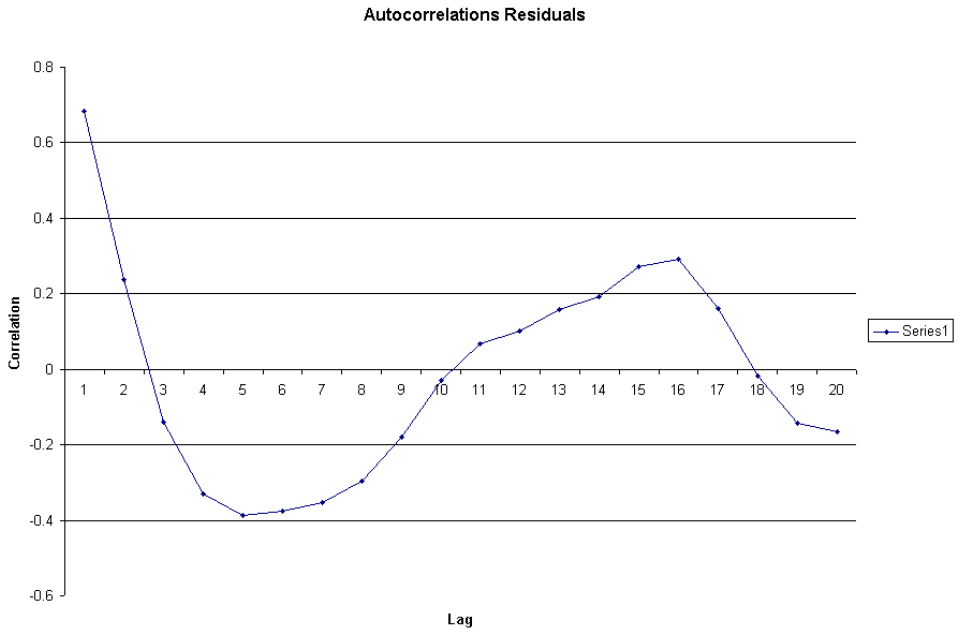
Histogram of residual values of Affordability index

Figure 4



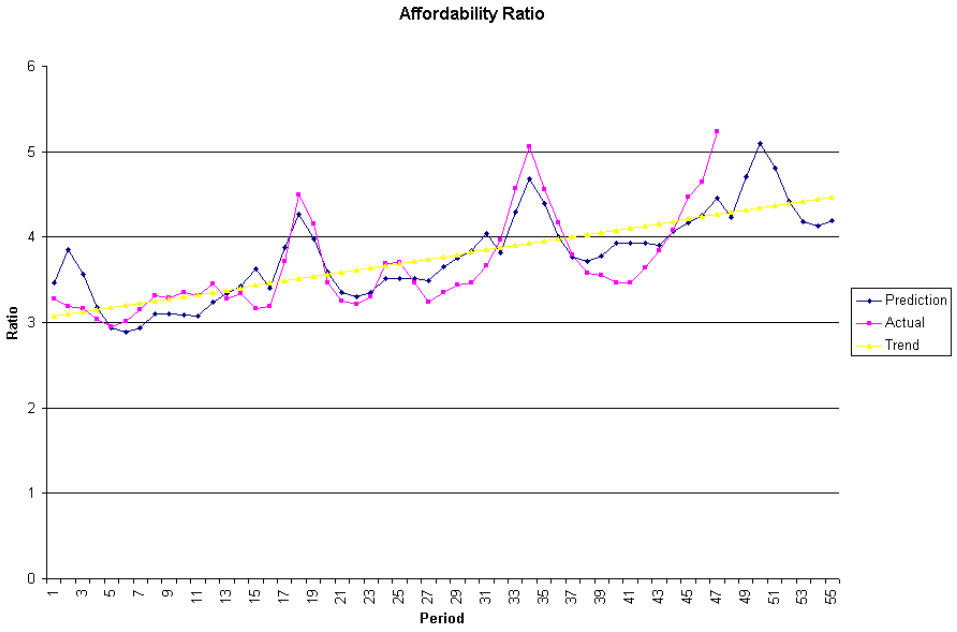
The power spectrum density of the residual affordability ratio

Figure 5



The autocorrelation of residuals from removing trend from the Affordability ratio

Figure 6



Affordability Ratio showing trend and added cyclical effect