

Media and Opinion Leaders in the Housing Market

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This paper analyzes opinion formation in the housing market. Building on theories of media influence where word-of-mouth is the final mechanism of opinion-change but media initiate discourse, I address whether news media affected house prices through opinion-formation and whether news media contributed to the house price boom in the UK in the 2000s. To address these issues, over 30,000 articles on the UK housing market from 1993 to 2008 are analyzed. The main finding of this paper is that media was a significant determinant of real house price changes over this period, suggesting the media influenced opinions on the housing market. However, media sentiment on the housing market did not change with the secular increase in house prices in the 2000s, and optimistic language in reporting actually decreased a full year before house prices started to fall, suggesting that the media did not contribute to the UK's housing boom and may have helped constrain it.

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1. Introduction

Purchasing a house is an important decision. In the UK, individuals were willing to pay 137% more to buy an average house in 2007 than seven years previous, an increase of over £115,000. For homebuyers the legacy of one decision can persist for many years as negative equity prevents the sale of their home and increased mortgage payments reduce their ability to purchase other goods. At an economy-wide level, property market booms are of importance given their effect on consumption through wealth effects, GDP through construction and bank lending through collateral value¹. What caused homebuyers to willingly undertake so much additional debt and pledge future income to mortgage repayments — why did so many make what turned out to be a bad decision?

This paper builds on the work of Foote *et al.* (2012) which showed how overly optimistic opinions about house prices better explain the recent US housing boom than the common explanations of cheaper and easier credit. Opinions are known to be important in markets and this is particularly the case when outcomes are uncertain; outcomes may be biased towards the beliefs of opinion-leaders who influence others (Loeper and Steiner, 2013). Since the media are known to influence the beliefs of opinion-leaders (Katz and Lazarsfeld, 1955), media may be the ultimate source of opinions in some markets. In this paper, I test whether news media were a cause of optimism in the UK housing market from 1993 to 2008.

This paper addresses two main questions: can increased optimism explain the dramatic house price rises in the UK, and did the media contribute to this optimism? The mechanism by which media influence the housing market builds on the two-step flow hypothesis of media influence where the media first influence opinion-leaders in society and they in turn influence the opinion-followers (Katz and Lazarsfeld, 1955). The influence of media is assumed to be neither direct nor passive, but informs personal discussions in society, and it is word-of-mouth that is the ultimate cause of opinion change. Media may influence markets either by influencing sentiment or providing information, this paper tests whether either of these factors influenced opinions in the housing market and thereby prices.

Media coverage was gauged by collecting nearly 30,000 articles on the housing market between 1993 and 2008. Housing market articles were identified in four UK

¹ See Calomiris *et al.* (2012) and Carroll *et al.* (2011) for a discussion on the housing wealth effect and Aßmann *et al.* (2013) on housing crises and the banking sector.

daily newspapers and on *BBC News Online*. Data is aggregated to a monthly level to measure how frequently the media were reporting on the housing market. The optimism of that reporting is analyzed using content analysis software, an approach similar to Tetlock (2007). The amount and optimism of housing market articles are incorporated with other variables known to influence house prices to assess whether the media contributed to house price changes.

The rest of the paper is structured as follows. Section two reviews the related literature of news media influence and gives some background to the UK housing market. Section three outlines how the news media coverage of the housing market is identified and details the frequency with which news media were reporting on the housing market. Section four explains how measures of media sentiment were constructed using content analysis software. Section five examines whether the news media had any effect on the housing market. Section six offers a series of robustness checks for the findings. The final section is a brief discussion and overview of the findings.

2. Related literature

Initial theories of media influence implicitly assumed the “atomized mass audience” (Katz, 1963, p.80)—individuals were connected to the media but not to each other. The media were thus seen as directly influencing individuals with no scope for criticizing or rejecting the opinions forwarded. Unsurprisingly, there was no evidence to argue what were essentially theories of propaganda and brainwashing, with Lazarsfeld (1944) finding media influence in the 1940 U.S presidential election “to be rather small”.

To better understand media influence subsequent studies recognized that media is not consumed in social isolation and mapped interpersonal networks. Personal influence of friends, family and co-workers was found to be the major source of opinion change. Those who influenced others were deemed opinion-leaders and those who were influenced by others were deemed opinion-followers. Opinion-leaders were found across different occupations, social and economic groups. The only different characteristic of opinion-leaders was media: opinion-leaders were more exposed to media and this influenced their opinions (Katz and Lazarsfeld, 1955).

Formalizing this, the two-step flow hypothesis states that the media influence a subset of opinion-leaders in society and they in turn influence others. This process was found across different settings, from voting, marketing, fashions, movie-going, public

affairs and even in the diffusion of prescribing new drugs among doctors (Katz, 1957). This paper applies this theory to a market setting, where we can assess media influence through interpersonal networks by using aggregated price. If the media influence a subset of society and these opinions are then shared with others, media coverage of the housing market will influence future average prices.

Media are important in other markets where opinions influence prices. One such market is the stock market. Focusing on the *Wall Street Journal's* Abreast of the Market column, Tetlock (2007) finds that media pessimism has downward pressure on stock prices, suggesting that the tone of media reporting influences trader opinion. Other studies highlight the importance of media in providing information to stock market investors (Fang and Peress, 2009; Niederhoffer, 1971; Peress, 2011), corporate governance (Dyck and Zingales, 2003a), earnings announcements (Dyck and Zingales, 2003b; Peress, 2008) and mutual fund performance (Fang *et al.*, 2011).

Media influence during an asset price bubble may be greater than at other times. Shiller (2000), Shiller (2008) and Shiller and Akerlof (2009), suggest that by the stories written, the sense of reality generated, or by making news interesting, the media are fundamental propagators of speculative price movements (Shiller, 2005, p.105). Bhattacharya *et al.* (2009) find that while media coverage of Internet IPOs was more positive during the dotcom boom, media hype is unable to explain the Internet bubble. Campbell *et al.* (2012) find that media coverage of the British Railway Mania of the mid-1840s was not hyped but the media played an important informational role in this market. Soo (2013) finds that local newspaper reporting predicts price variation and trading volume during the US housing market boom. That US reporting on the housing market became more optimistic as house prices increased is in contrast to the UK findings in this paper, offering a possible explanation as to why the house price boom was less severe in the UK than the US.

Various reasons such as low interest rates (Agnello and Schuknecht, 2011; Muellbauer and Murphy, 2008; Taylor, 2007), and increased credit availability (Muellbauer and Murphy, 2008; Mian *et al.*, 2008; Piazzesi and Schneider, 2009; Campbell *et al.*, 2011; Duca *et al.*, 2010, and Adams *et al.*, 2009) have been suggested as to the causes of the UK and international housing booms. This paper adds to this literature by recognizing that it was easier to obtain funds for house purchases during the boom phase and asking were individuals influenced by media optimism, thus making them willing to take on additional debt.

[INSERT FIGURE 1 ABOUT HERE]

3. News media data

Opinion-leaders are found across all groups in society (Katz, 1955), thus different socioeconomic groups must read the sample of newspapers. Furthermore, since the credibility of the information source matters only for short-run opinion formation, not for long-run opinions (Hovland *et al.*, 1953), we should not exclude any paper from our analysis on the grounds that it lacks credibility. The *Daily Mail*, *The Times*, *The Guardian* and the *Financial Times*, are included and constitute the sample as they will be read by different socioeconomic groups and have LexisNexis coverage dating to the early-1990s. LexisNexis coverage is incomplete for the *Daily Mail* and *The Times* from January 1996 to May 1998 and the period has thus been excluded from the sample with a corrective dummy variable included in subsequent analysis.

[INSERT TABLE 1 ABOUT HERE]

To ensure comprehensive and unbiased selection criteria, LexisNexis's own Housing Market industry tag is used to identify articles on the housing market. LexisNexis define its Housing Market industry tag as follows: "HOUSING MARKET targets financial conditions in the residential property industry, including statistics and forecasts for residential mortgage rates, home sales, property vacancies and other indicators." This is the broadest housing market filter that will not return irrelevant articles. Articles are not limited to those referencing any one indicator, but those that reference conditions and statistics in the general housing market.

By the late-1990s, traditional sources of news were developing a web-presence. To understand how this new media form was covering the housing market and to gauge its impact, web reporting is included in the analysis. *BBC News Online* has a large audience; a report of *BBC Online* published in May 2008, shows that weekly unique users increased from around 3,750,000 in January 2005 to around 6,500,000 in January 2008. *BBC News* has a relatively long history for a news website, dating back to 1997. News articles are identified on *BBC News Online* by using a search filter. To ensure that all relevant articles pertaining to the housing market were identified, a search filter was created in consultation with the *BBC News* Help-desk to generate a date-ordered list of stories with over 80% relevance to the housing market.

[INSERT FIGURE 2 ABOUT HERE]

Tables 1 and 2 show how many housing market articles the sampled news media published over the period 1993–2008. Unsurprisingly, the *Financial Times* is the newspaper that publishes the most articles on the housing market, averaging more than 50 articles a month. *The Guardian* is the newspaper that appears to have the least interest in the housing market, averaging 21.8 articles per month. *The Times* and the *Daily Mail* both averaged over one housing market article per publication, with, on average, 37.5 and 31.9 articles published per month respectively.

Table 2 shows that from 1993–2008, *The Guardian* more than doubled their housing market coverage, both *The Times* and *Financial Times* increased coverage by nearly 300%, and the *Daily Mail* by over 500%. This may be unsurprising, given that there was much more news pertaining to the housing market in the late-2000s than in the mid-1990s. However, the scale of the increase and the consistency of year-on-year increases is, perhaps, surprising. The *BBC* also significantly increased its coverage of the housing market. Table 1 shows that for the sample period, there was an average of 27.8 housing market articles published per month on *BBC News Online*, with a range of 0 to 106 articles published per month. Figure 1 shows the escalation in the amount of articles published on the housing market: increasing from an average of 11 from 1998–2002, to 53 from 2007–2008.

[INSERT TABLE 2 ABOUT HERE]

The increasing number of articles published on the housing market may be a result of increasing newspaper size and increasing scope of *BBC News Online*. To test for this, the monthly numbers of articles published on topics other than the housing market were calculated. Figure 2 shows a significant increase in newspaper coverage of most of these topics over the sample period. Coverage of Education and Training increased by 25%, Crime by 38%, Bond Market by 54%, while coverage of the Stock Exchange decreased by 15% over the sample period. However, Housing Market coverage increased by 309% indicating that it was more than just increasing newspaper size that explains increased coverage. Similarly for the *BBC*, Figure 1 shows that coverage of Education increased by 124%, Crime increased by 278%, Bond Market decreased by 55% and coverage of the Stock Exchange decreased by 26% over the sample period.

Housing Market coverage increased by 1,216%, which indicates that it is more than just increased scope that explains increased coverage.

4. Evaluating media sentiment

In addition to calculating the frequency with which the news media were reporting on the housing market, the sentiment of those articles is also assessed. The most obvious way to do this is to read and categorize articles as optimistic, pessimistic or neutral on the state of the housing market. This creates problems. The assessor's idea of what constitutes an optimistic article changes with each article read. It is necessarily overly simplistic; although it may be easy to categorize articles (optimistic, pessimistic or neutral), it is much more difficult to score articles based on how optimistic they are. It is subject to both intentional and unintentional bias. Thus, media content is quantified using an approach similar to Tetlock (2007) and Tetlock *et al.* (2008). A content analysis software program, Diction 5.0, which uses a 10,000-word corpus to score articles on semantic features, assesses each article. This removes the questions of bias, inconsistency and overly simplistic assessment.

Loughran and McDonald (2011) highlight how the use of psychosocial dictionaries in financial markets may be inappropriate since some negative words in psychosocial dictionaries are not negative in financial contexts, such as tax or liability. Given that this study focuses on articles read by the general public and not specialist traders, the use of psychosocial dictionaries designed to reflect the language use of the general public is more appropriate than a psychosocial dictionary designed to reflect the language use of specialist financial traders.

The optimism category in Diction 5.0 is defined as "Language endorsing some person, group, concept or event or highlighting their positive elements". This is the only category that has a clear theoretical relationship with opinions on the housing market. Because prices reflect expectations regarding the future prospects of the market, opinion-leaders, and subsequently opinion-followers, will be willing to pay more for houses as the media report more optimistically. Thus, the optimism score is aggregated to a monthly level to test the relationship between media content and the market.

[INSERT FIGURE 3 ABOUT HERE]

Diction 5.0 standardizes the optimism score to 50, and small variations in the score represent large variations in the sentiment of articles. For example, with an optimism

score of 48.10, the first paragraph of the article below, published in *The Times* on 15th December 2008, is a pessimistic article:

Bank Chief: house price fall may be 30%; Britain is only halfway through slump

One of Britain's most powerful bankers gave a grim economic forecast last night that the country was only midway through the housing slump and that unemployment was set to soar.

Whereas, with an optimism score of 51.26, the article below, published in *The Times* on 9th March 2007, is an optimistic one:

Terraced prices no longer slumming it

Once vilified as slums, terraced houses are now the darling of the property market. After decades lagging behind the market, prices for the two-up-two-downs have increased more than any other property since 1996, according to figures released today. The average terraced house is now worth £186,316, up £54,945 on 1996, and demand is being driven by first-time buyers who are eschewing flats for compact homes with period features and a scrap of garden.

Individual article optimism scores are aggregated for each newspaper to a monthly level. The individual newspaper monthly optimism scores are then aggregated to give a sample of British newspaper sentiment on the housing market.

[INSERT TABLE 3 ABOUT HERE]

Equal weights are used because, although the *Financial Times* has perceived credibility and expertness, it lacks a large readership, and although the *Daily Mail* has a large readership; it lacks perceived credibility and expertness. Therefore, assigning equal weights and using a simple mean has more appeal than all but removing the *Financial Times* coverage from the series. For the sake of robustness, however, different constructs of the media variables, including readership-weighted aggregation, are also used, generating similar results.

Figure 3 shows that newspaper media optimism was low in the early-1990s. The lowest level was in November 1993, with the average article score of 48.22. By the early-2000s, optimism increased dramatically, reaching its highest level in February 2001, with the average article score being 50.68. After 2001, media optimism does not escalate, but is constant until mid-2006 when optimism starts declining—a full year

before the housing market started to fall. Figure 3 shows that there is little evidence that British printed press became more optimistic about the property market as prices boomed from 2000–2007. The optimism of *BBC News Online* follows a similar trend to the newspaper optimism. Figure 4 shows *BBC News Online* was least optimistic about the housing market in the late 1990s, early 2000s and following the decline in house prices in 2007. Notably, the optimism of *BBC News Online* started declining more than a year before the decline in house prices.

[INSERT FIGURE 4 ABOUT HERE]

5. Do media affect the market?

5.1. Methodology and data

The two measures of media coverage of the housing market—the number of housing market articles published and the average optimism of those articles—are incorporated into a model of house price changes to test whether the media influenced the opinion of housing market participants. Applying Tetlock’s (2007) methodology to the housing market, real house price changes, changes in the volume of housing sales, media optimism and the amount of housing market articles published are included as endogenous variables. Following Choudry (2010), Hall *et al.* (1997), Porteba *et al.* (1992) and Leung (2004), real average income, the cost of borrowing and unemployment data are included as exogenous variables in the model. A dummy variable is also included, where appropriate, to correct for a break in LexisNexis coverage. While supply constraints may increase house price volatility (Paciorek, 2013), supply-side variables are excluded from the model, as they are only available at quarterly frequency. However, these variables were very stable over the sample period; the average annual dwellings completed from 1993–1999 being 47 178, only increasing to 48 955 from 2000–2008. Similarly, for the period when data is available (1999 to 2007), real private sector rent increased 42%, compared a 172% increase in real house prices.

[INSERT FIGURE 5 ABOUT HERE]

Given the causal ambiguity between house price changes and the news media, it is desirable to set up the model in such a way that in addition to capturing the effect of news media on house price changes, it also captures that of house price changes on the

media. By running separate equations with each of the endogenous variables as dependent variables, we have a system of equations that can better explain the nature of causality in the model. Thus, the four equations below together make a vector autoregressive (VAR) model:

$$d.HP_t = \alpha + \beta \cdot L\tau(d.HP_t) + \gamma_1 \cdot L\tau(d.MQuantity_t) + \gamma_2 \cdot L\tau(MOptimism_t) + \delta \cdot L\tau(d.Vlm_t) + \lambda \cdot Exog_t + \epsilon_{t-1} \quad (1)$$

$$d.MQuantity_t = \alpha + \beta \cdot L\tau(d.HP_t) + \gamma_1 \cdot L\tau(d.MQuantity_t) + \gamma_2 \cdot L\tau(MOptimism_t) + \delta \cdot L\tau(d.Vlm_t) + \lambda \cdot Exog_t + \epsilon_{t-1} \quad (2)$$

$$d.MOptimism_t = \alpha + \beta \cdot L\tau(d.HP_t) + \gamma_1 \cdot L\tau(d.MQuantity_t) + \gamma_2 \cdot L\tau(MOptimism_t) + \delta \cdot L\tau(d.Vlm_t) + \lambda \cdot Exog_t + \epsilon_{t-1} \quad (3)$$

$$d.Vlm_t = \alpha + \beta \cdot L\tau(d.HP_t) + \gamma_1 \cdot L\tau(d.MQuantity_t) + \gamma_2 \cdot L\tau(MOptimism_t) + \delta \cdot L\tau(d.Vlm_t) + \lambda \cdot Exog_t + \epsilon_{t-1} \quad (4)$$

Where $d.HP_t$ is Real Average House Price change in month t ; $L\tau$ is a lag operator (a model with 5-lags being denoted $L5$ and all variables with a lag operator being included from 1 to 5 lags in the model); $d.MQuantity_t$ is change to average number of articles published in month t ; $MOptimism_t$ is average article optimism score for month t ; Vlm_t is volume of housing sales for month t ; and $Exog_{t-1}$ represents exogenous variables i.e., real average income ($d.Income_{t-1}$), interest rates ($d.Interest_{t-1}$), a 1996 dummy ($Dum96$) and unemployment rate ($d.Unemploy_{t-1}$). Table 3 contains summary statistics for all variables.

[INSERT FIGURES 6 and 7 ABOUT HERE]

Halifax house price data are used because they are available at a monthly level. Other data sources are used for robustness, with the same qualitative results being found. The non-seasonally adjusted average house price index is used because newspaper coverage is not seasonally adjusted. Figure 5 shows real UK average house prices from 1969 to 2010. Real term price growth doubled from 1999 onwards, from 3.1% to 7.7%, demonstrating the scale of the UK house price boom.

Figure 6 shows non-seasonally adjusted data on the monthly number of total approvals for house purchase to individuals in the UK. The inclusion of this series in the model goes some way to capture the perceived increase in mortgage availability in the run-up to the house price crash in mid-2007 and serves as an approximation for the volume of housing sales. Figure 7 shows how property sales followed a similar trend to mortgage approvals from 1996 to 2008. Although there are some deviations, it is likely

that these are explained by sales data being only based on England and Wales, while mortgage approval data is based on the UK as a whole. The data on mortgage approvals appears to confirm what was widely suspected of the housing market over the sample period, which was that, more people were able to get mortgages in the run-up to the boom than before or after.

[INSERT TABLE 4 ABOUT HERE]

Figure 8 shows how the exogenous variables changed over the sample period. Average earnings data is sourced from the ONS, Average Earnings Whole Economy Index Series (January 2000=100) and converted to real terms using the ONS RPI All Items (January 1987=100). Unemployment data is also sourced from the ONS, Claimant Count Rate NSA (UK) %. Interest rate data is sourced from the Bank of England. Although the most suitable data would be the average interest charged on mortgages, this data is only available for a small part of the sample period, so the Bank of England base rate is used.

The distinction between endogenous and exogenous variables is based on the assumption that, although there exists a two-way relationship between the endogenous variables and the dependent variable ($d.HP_t$), there only exists a one-way relationship between $d.HP_t$ and the exogenous variables. That is, although media could affect house price changes and house price changes could affect media, changes in average earnings affect house price changes but not vice versa. Exogenous variables are included at one lag to capture this one-way influence.

Given the increasingly volatile nature of the data in the run-up to the summer of 2007, it is desirable and necessary to correct for heteroskedasticity and serial autocorrelation in the model. This is achieved by using Newey–West (1987) robust standard errors correcting for the aforementioned effects for τ -lags. As this cannot be done while running the system of equations simultaneously, the individual equations are run separately as the individual ADL models as per Tetlock (2007). Although this corrects for the heteroskedasticity and autocorrelation, the cost to the model is the assumption that the error terms of the individual ADL models are independent.

[INSERT FIGURE 8 ABOUT HERE]

5.2. Results

As Table 4 shows, the model cointegrates and so can be modelled in a vector autoregressive (VAR) framework. Initial results use a 3-lag model, based in part, on the economic reasoning of capturing two quarters in any given observation within the model and, in part, on what seems reasonable from an econometric point of view, as too many lags would reduce the degrees of freedom and too few lags would not correctly specify the model. For the sake of robustness, different lag selections are also used.

[INSERT TABLE 5 ABOUT HERE]

Table 5 shows the results of the four ADL models. The table shows that newspaper optimism is positively correlated with real house price changes, with both of the individually significant lags having positive coefficients. Collectively, previous period's newspaper optimism Granger-causes this period's house price change. The number of housing market articles published by the sampled newspapers does not appear to have an impact on real house price changes since the lags are neither individually or collectively significant. The model appears well-specified because previous real house price changes tend to be positively and significantly related to this period's house price change and unemployment rate changes and the dummy for the data break in 1996 are all significant exogenous variables. The fact that the coefficients of the exogenous variables are not always as expected (e.g., unemployment and interest rate changes are positively correlated with real house price changes) may reflect the fact that over the sample period, house prices were not behaving as per standard pricing models².

When Vlm_t is the regressand, Table 5 shows the relationship between newspaper optimism and volume changes is significant. All three of the individual lags are significant and, collectively, they Granger-cause volume changes. There is little evidence that the amount of newspaper housing articles published affected the volume of house sales, as only one of the lags is significant.

Table 5 also shows that real house price changes do not Granger-cause newspaper optimism. Thus, it may be inferred that newspapers are basing the sentiment of their reporting not on the past performance of the housing market, but on some other factor

² See Burnside *et al.* (2011), Coleman *et al.* (2008), Duca *et al.* (2010) and Fitzpatrick and McQuinn (2007) on the role of fundamentals in recent house price movements.

such as the future prospects for the housing market or how the housing market performs relative to the fundamental factors that determine house prices.

[INSERT TABLE 6 ABOUT HERE]

Turning to Internet news media, Table 6 shows the results of the four *BBC* ADL models. The table shows that *BBC* Optimism is positively correlated with real house price changes, with all of the individual lags having positive coefficients, and collectively, they Granger-cause this period's house price change. *BBC News Online* optimism influences the housing market. The amount of housing market articles published on *BBC News Online*, does not appear to have an impact on real house price changes. The lags are not significant individually or collectively. All three of the individual lags have a negative coefficient, which may appear surprising given that both house prices and *BBC News Online* coverage of the housing market increased dramatically over the sample period. However, this may reflect how coverage increased most dramatically when house prices started to fall in 2007.

The table also shows that there is a significant relationship between *BBC News Online* optimism and volume changes. Individually, all lags are significant and, collectively, *BBC News Online* optimism Granger-causes volume changes. The table also shows that real house price changes Granger-cause *BBC* optimism. This may suggest that the *BBC* are basing their reporting on the past performance of the housing market and that that coverage is then influencing the market.

Results of the VAR analysis show that the optimism of housing market reporting optimism is found to be a significant determinant of real house price changes and changes in housing market volume, even when controlling for past house price changes, past volume changes and a host of other factors. The number of housing market articles published by the sampled media, which increased dramatically over the sample period, does not appear to have an impact on real house price changes. These findings are present for both the newspaper and Internet media used in this study.

6. Robustness

To test the robustness of the findings, different house price variables, media variables and sample periods are used in the model. Given the sensitivity of findings to lag length selection, one to six lags are also used. For the sake of robustness, Table 7 shows Granger-causality results for the four ADL models for six different lag

specifications. The left-hand column gives the regressand, and the four panels, $d.HP_t$, $d.Vlm_t$, $MOpt_t$ and $d.MArt_t$, give the four variables being tested at lag specifications one to six. The main finding in Table 7 is in all six-lag specifications, newspaper optimism Granger-causes real house price changes. Previous period's newspaper optimism is significantly related to this period's house price change and volume changes; media reporting on the housing market appears to influence the future behaviour of the market. This finding is robust to using different sources for house price data, different constructions of the media variables, and different sample periods

Table 7 also shows that in none of the lag specifications considered is a Granger-causal relationship identified between the amount of newspaper articles published and real house price changes. Although the amount of housing market coverage may influence the volume of sales in the market since three of the four lag specifications identify a Granger-causal relationship.

The $d.HP_t$ quadrant shows that previous values of real house price changes Granger-cause this period's house price change for all lag specifications considered. Real house price changes also Granger-cause volume changes in all but the one-lag model. Real house price changes Granger-cause real house price changes and volume changes, but not the amount or content of newspaper articles on the housing market, and this finding is robust to different lag specifications.

Table 7 also shows that the changes in the volume of house sales Granger-causes newspaper optimism, a Granger-causal result identified in all but the one-lag models. This may suggest that increased volume in the market increases liquidity, benefiting both buyers and sellers of houses, and so the media report with increased optimism.

Table 8 shows the Granger-causality results for the *BBC News Online* regression for lag specifications one to six. For every lag specification considered, real house price changes Granger-cause *BBC News Online* optimism. It would appear that *BBC News Online* is basing the optimism of their reporting on the recent performance of the housing market. The impact of *BBC News Online* reporting on the housing market is identified as strong for shorter lag specifications and weak at longer lag specifications. Although the relationship between *BBC News Online* optimism and real house price changes deteriorates at longer lag specifications, at every lag specification considered, *BBC News Online* optimism Granger-causes changes in the volume of home sales in the market. As in the three-lag model, the relationship between the number of articles published and market performance is weak in all lag specifications.

[INSERT TABLE 7 ABOUT HERE]

Having used the Halifax house price index in the main analysis, the Nationwide house price index is used for robustness. Both series follow a similar long-term trend but can at times exhibit very different trends in the short-term. Using the Nationwide house price index does not affect the finding of media influence in the housing market. However, unlike the Halifax results, when Nationwide data is used, the model identifies dual-causality existing between media optimism and changes to real Nationwide house price index. One likely explanation for this is that the Nationwide's index is published two weeks earlier in the month than the Halifax index, and that the media report on Nationwide price figures more than Halifax figures.

As a further robustness check the median rather than the mean monthly optimism score is used in the analysis. For every lag specification studied, median media optimism Granger-causes real average house price changes. There is little evidence of a link between changes in the number of housing market articles published and changes in real average house prices. Thus, using median media optimism does not affect the result that media influence the housing market.

Having used a simple mean to aggregate individual newspaper score into composite media variables in the original model, readership-weighted figures are also used. With an estimated readership of over 5,000,000, the *Daily Mail* carries a weight of nearly 60.0%. *The Times* and *The Guardian* both have lower readerships and weights of 21.2% and 14.5% respectively. With a readership of less than 500,000, the *Financial Times* has the smallest weight of 4.9%. The model identifies a direct link between readership-weighted media optimism and changes to real house prices. In shorter-to-medium-lag specification models, one to four lags, there is a direct Granger-causality for media optimism on house prices. At longer lag-specifications, five and six lags, the model does not identify any direct causal relationship between the two variables. It may be the case that the *Daily Mail* coverage of the housing market is only able to have a short-term effect on the market, and when more lags are included in the model it is found that the initial effects are discounted and reversed over a period of five to six months. Changes to the amount of articles published by the media has no direct relationship with changes to real average house prices. Thus, using readership-weighted media variables does not affect the result that media influence the housing market.

In addition to the optimism category, Diction 5.0 produces aggregated and normalized output for four other categories — activity, realism, commonality and certainty. There is little theory to suggest that any of these categories would influence opinions in the housing market, thus they provide a falsification test for the finding of a relationship between the optimism category and house price changes. At no lag specification considered is a Granger-causal relationship identified between house prices and these alternative content categories. Thus the finding of a relationship between optimism and house prices appears non-spurious.

[INSERT TABLE 8 ABOUT HERE]

To ensure that the results thus far have not been driven by the decrease in media optimism after the events of mid-2007, the sample is split into different periods to ascertain the media influence during those periods. Excluding 2007 and 2008 does not affect my main finding that the media optimism influences the housing market. Splitting the sample in two — the 1990s and the 2000s — also does not alter this finding. With LexisNexis missing coverage of two of the sampled newspapers, *The Times* and the *Daily Mail* from January 1996 to May 1998, these papers are excluded from the media variables for those months. There is still evidence of a link between media coverage of the housing market and real house price changes when the period 1996 to 1998 is included in the analysis, thus, including the period 1996 to 1998 in the analysis does not alter the result that news media influence the housing market.

7. Conclusions

British news media significantly increased the frequency with which they published articles pertaining to the housing market over the period 1993–2008. This may be unsurprising given that there was much more news pertaining to this market in the late-2000s than in the mid-1990s. However, the scale of the increase is perhaps surprising. There was over a 1,000% increase in the amount of housing market articles published in the *Daily Mail*, the *Financial Times*, *The Guardian*, and *The Times* between 1998 and 2008. *BBC News Online* coverage of the housing market increased by over 1,200%, from 2000–2008. This finding confirms the prior expectation that the housing market came to be a hot topic for the UK news media, creating an increased public awareness on the performance of the market.

The results of this paper suggest that media did not publish more optimistic housing market articles as prices boomed. Average newspaper optimism on the housing market was at its lowest in the 1990s, highest in 2001, and started declining in mid-2006, a full year before house prices started decreasing. Similarly, *BBC News Online* optimism started declining in early 2006. The main finding of this paper is that the sentiment of past media coverage has a significant robust relationship with present real average house price changes. Analysis shows previous media optimism is a significant determinant of this period's real average house price change; media Granger-causes house price changes. While it is found that media optimism Granger-causes real house price changes, the reverse is not true. These findings are robust to different lag specifications and a battery of other robustness checks. I interpret this as evidence that the media influenced opinions in the housing market. While the media are assumed to have influenced homebuyers' expectations, the media may have affected prices by influencing lenders since Brueckner *et al.* (2012) showed that house price expectations of mortgage lenders influence credit availability. This is consistent with the two-step flow hypothesis of media influence. News media reporting on the broader performance of the market contributes to a discussion in society amongst opinion-leaders and opinion-followers on the current state of the market. Given that the house price reversal was not as severe as other countries, it appears that the media may have reduced expectations that price increases would continue indefinitely — the media might have helped some from making bad decisions.

REFERENCES

- Adams, W., Liran, E. and Levin J. (2009) Liquidity Constraints and Imperfect Information in Subprime Lending, *American Economic Review*, 99, 49–84.
- Agnello, L. and Schuknecht L. (2011) Booms and Busts in Housing Markets: Determinants and Implications, *Journal of Housing Economics*, 20, 171–190.
- Bagehot, W. (1873) *Lombard Street—A Description of the Money Market*, Cosimo Classics, New York.
- Banerjee, A. V. (1992) A Simple Model of Herd Behavior, *The Quarterly Journal of Economics*, 107, 797–87.
- Bardhan, A., Edelstein, R. H. and Kroll, C.A. ed. (2012) *Global Housing Markets, Crises, Policies and Institutions*. New Jersey: John Wiley and Sons, Inc.
- Bhattacharya, U. I., Galpin, N., Ray, R. and Yu, X. (2009) The Role of the Media in the Internet IPO Bubble, *Journal of Financial and Quantitative Analysis*, 44, 657–682.
- Brueckner, J. K., Calem, P. S. and Nakamura, L. I. (2012) Subprime mortgages and the housing bubble, *Journal of Urban Economics*, 71, 230–243.
- Brunnermeier, M. K. and Julliard, C. (2008) Money Illusion and Housing Frenzies, *Review of Financial Studies*, 21, 135–18.
- Burnside, C., Eichenbaum, M and Rebelo, S. (2011) Understanding Booms and Busts in Housing Markets, *National Bureau of Economic Research Working Paper*, 16634.
- Calomiris, C. W., Longhofer, S. D. and Miles, W. (2012) The Housing Wealth Effect: The Crucial Roles of Demographics, Wealth Distribution and Wealth Shares, *National Bureau of Economic Research Working Paper*, 17740.
- Campbell, G., Turner, J. D. and Walker, C. B. (2012) The Role of the Media in a Bubble: Evidence from the British Railway Mania, *Explorations in Economic History*, 49, 461–481.
- Campbell, J. Y., Giglio, S. and Pathak P. (2011) Forced Sales and House Prices, *American Economic Review*, 101, 2108–2131.
- Carroll, C. D., Otsuka, M. and Slacalek, J. (2001) How Large Are Housing and Financial Wealth Effects? A New Approach, *Journal of Money, Credit and Banking*, 43, 55–79.
- Choudry, T. (2010) Does Interest Rate Volatility Affect the US Demand for Housing? Evidence from the Autoregressive Distributed Lag Method, *The Manchester School*, 78, 326–344.
- Coleman, Maj. IV, LaCour-Little, M. and Vandell, K.D. (2008) Subprime lending and the housing bubble: Tail wags dog? *Journal of Housing Economics*, 17, 272–290.
- Duca, J. V., Muellbauer, J. and Murphy, A. (2010) Housing Markets and the Financial Crisis of 2007-2009: Lessons for the Future, *Journal of Financial Stability*, 6, 203–217.
- Dyck, A. and Zingales, L. (2003a) *The Bubble and the Media. Corporate Governance and Capital Flows in a Global Economy*, 83–104, Oxford University Press, New York.
- Dyck, A. and Zingales, L. (2003b) *The Media and Asset Prices*, Working Paper, HBS and University of Chicago.
- Engle, R. F. and Yoo, B. S. (1987) Forecasting and testing in co-integrated systems, *Journal of Econometrics*, 35, 143–159.
- Engle, R. F. and Granger, C. W. (1987) Co-integration and Error Correction: Representation, Estimation and Testing, *Econometrica*, 55, 251–276.
- Fang, L. and Peress, J. (2009) Media Coverage and the Cross-section of Stock Returns, *Journal of Finance*, 64, 2023–2052.

- Fang, L., Peress, J. and Zheng, L. (2011) Stock Media Coverage, Mutual Fund Trading and Performance, Manuscript submitted for publication.
- Fitzpatrick, T. and McQuinn, K. (2007) House Prices and Mortgage Credit: Empirical Evidence for Ireland, *The Manchester School*, 75, 82–103.
- Foote, C. L., Gerardi, K. S. and Willen, P. S. (2012) Why Did So Many People Make So Many Ex Post Bad Decisions? The Causes of the Foreclosure Crisis, *National Bureau of Economic Research Working Paper*, 18082.
- Glaeser, E. L., Gottlieb, J. D. and Gyourko J. (2011) *Can Cheap Credit Explain the Housing Boom?* University of Chicago Press.
- Hall, S., Psaradakis, Z. and Sola, M. (1997) Switching Error-Correction Models of House Prices in the United Kingdom, *Economic Modelling*, 14, 517–527.
- Katz, E. and Lazarsfeld, P. F. (1955) *Personal Influence, The Part Played by People in the Flow of Mass Communications*, The Free Press.
- Katz, E. (1957) The Two-Step Flow of Communication: An Up-To-Date Report on a Hypothesis, *The Public Opinion Quarterly*, 21, 61–78.
- Katz, E. (1963) *The Diffusion of New Ideas and Practices*, in Schramm, W. (Ed.) *The Science of Human Communication*, 77–93, Basic Books, New York.
- Keynes, J. M. (1936) *The General Theory of Employment, Interest and Money*, London: Macmillan (reprinted 2007).
- Lazarsfeld, P. F., B. Berelson and Gaudet, H. (1944) *The People's Choice*, Columbia University Press, New York.
- Leung, C. (2004) Macroeconomics and Housing: a Review of the Literature, *Journal of Housing Economics*, 13, 249–267.
- Loeper, A., Steiner, J. and Stewart, C. (2013) Influential Opinion Leaders, *The Economic Journal*, doi: 10.1111/eoj.12100.
- Loughran, T. and McDonald, B. (2011) When is a Liability not a Liability? Textual Analysis, Dictionaries, and 10-Ks, *Journal of Finance*, 66, 35–65.
- Mian, A., Sufi, A. and Trebbi, F. (2008) The Political Economy of the U.S. Mortgage Default Crisis, *National Bureau of Economic Research Working Paper*, 14468.
- Muellbauer, J. and Murphy, A. (1997) Booms and Busts in the UK Housing Market, *The Economic Journal*, 1701–1727.
- Muellbauer, J. and Murphy, A. (2008) Housing Markets and the Economy: The Assessment, *Oxford Review of Economic Policy*, 24, 1–33.
- Newey, W. and West, K. (1987) A Simple, Positive Definite, Heteroscedastic and Auto-correlation Consistent Covariance Matrix, *Econometrica*, 55, 703–708.
- Niederhoffer, V. (1971) The Analysis of World Events and Stock Prices, *Journal of Business*, 44, 193–219.
- Paciorek, A. (2013) Supply constraints and housing market dynamics, *Journal of Urban Economics*, 77, 11–26.
- Peress, J. (2008) Media Coverage and Investor's Attention to Earnings Announcements, Manuscript submitted for publication.
- Peress, J. (2011). The Media and the Diffusion of Information in Financial Markets: Evidence from Newspaper Strikes, Manuscript submitted for publication.
- Piazzesi, M. and Schneider M. (2009) Momentum Traders in the Housing Market: Survey Evidence and Search Model, *American Economic Review*, 99, 406–.
- Pollakowski, H. O. and Ray, T. S. (1997) Housing Price Diffusion Patterns at Different Aggregation Levels: An Examination of Housing Market Efficiency, *Journal of Housing Research*, 8, 107–124.
- Porteba, J. M., Weil, D. N. and Shiller, R. J.. (1992) House Price Dynamics: The Role of Tax Policy and Demography, *Brookings Papers on Economic Activity*, 2, 143–203.
- Shiller, R. J. (2000) *Irrational Exuberance*, Princeton University Press, New Jersey.

- Shiller, R. J. (2008) *The Subprime Solution*, Princeton University Press, New Jersey.
- Shiller, R. J. and Akerlof, G. A. (2009) *Animal Spirits: How Human Psychology Drives the Economy and Why It Matters for Global Capitalism*, Princeton University Press New Jersey.
- Soo, C. (2013) Quantifying Animal Spirits: News Media and Sentiment in the Housing Market, *Ross School of Business Working Paper*, No. 1200.
- Taylor, J. B. (2007) Housing and Monetary Policy, *National Bureau of Economic Research Working Paper* 13682.
- Tetlock, P. C. (2007). Giving Content to Investor Sentiment: The Role of Media in the Stock Market. *Journal of Finance*, 62, 1139–1168.
- Tetlock, P. C., Saar-Tsechansky, M. and Macskassy, S. (2008) More Than Words: Quantifying, Language to Measure Firm's Fundamentals. *Journal of Finance*, 63, 1437–1467.
- Whitehead, C. and Scanlon, K. (2012) *Global Housing Markets, Crises, Policies and Institutions*, ed. Bardhan, A, Edelstein, R. H. and Kroll, C. A. Chapter 8. John Wiley and Sons, Inc., New Jersey.
- Woodward, S. E. and Hall, R. E. (2010) Diagnosing Consumer Confusion and Sub-Optimal Shopping Effort: Theory and Mortgage-Market Evidence, *National Bureau of Economic Research Working Paper*, 16007.

Tables and Figures

Table 1—News Media Monthly Housing Market Coverage Descriptive Statistics, 1993–2008 (Excl. 1996–1998)

Variable	Mean	SD	Min.	Max.
Panel A: Articles Published per Month				
Daily Mail	31.90	26.09	3	114
The Times	37.46	20.84	0	102
The Guardian	21.82	11.73	2	73
Financial Times	54.26	34.83	16	200
BBC	27.75	22.68	0	106
Panel B: Monthly Mean Optimism Scores				
Daily Mail	49.70	0.72	46.39	52.08
The Times	49.48	0.61	47.41	51.65
The Guardian	49.29	0.77	45.30	51.90
Financial Times	49.49	0.53	47.90	50.60
BBC	49.57	0.75	47.49	51.36

Note: Newspaper figures calculated from 1993–2008 excluding 1996–1998. BBC News Online figures calculated 1998–2008

Table 2—Annual Housing Market Coverage: Number of Housing Market Articles Published, 1993–2008

Year	Daily Mail	The Times	The Guardian	Financial Times	Total
1993	156	249	194	398	997
1994	132	239	155	390	916
1995	184	316	204	422	1 126
1996	N/A	N/A	166	396	N/A
1997	N/A	N/A	145	423	N/A
1998	97	124	126	306	653
1999	157	261	316	350	1 084
2000	150	255	261	362	1 028
2001	146	251	138	334	869
2002	330	484	243	637	1 694
2003	321	551	243	682	1 797
2004	482	517	321	819	2 139
2005	385	472	253	682	1 792
2006	691	608	191	670	2 160
2007	918	829	391	1 282	3 420
2008	1 027	922	561	1 576	4 086
Percentage Increases					
1993-2008	558.33	270.28	189.18	295.98	309.83

Table 3—Summary Statistics of Model Variables, 1993–2008 (Excl. 1996–1998)

Variable	Units	Mean	Median	SD	Min.	Max.
Newspaper Articles	(Number)	36.36	32.62	21.80	9.25	108.75
Newspaper Optimism	(Standardized to 50)	49.49	49.54	0.44	48.22	50.68
BBC News Articles	(Number)	27.75	24.50	22.66	0.00	106.00
BBC News Optimism	(Standardized to 50)	49.57	49.66	0.78	47.49	51.36
House Price Index	(Jan 1993=100)	385.73	343.00	156.89	197.10	650.80
Volume	(£000s)	95 525	96 163	27 243	22 954	153 080
Interest Rate	(%)	5.13	5.13	0.96	2.14	7.50
Average Earnings	(Jan 2000=100)	106.51	107.65	19.12	74.60	144.40
Unemployment	(%)	4.33	3.10	2.35	2.40	10.20
Inflation	(Jan 1987=100)	176.96	175.80	21.67	140.60	218.40

Sources: Halifax, Bank of England and ONS

Notes: No data has been seasonally adjusted. Media articles identified using LexisNexis Housing Market Strong Reference Only Tag and a BBC Online search filter. Media optimism calculated using Diction 5.0. House price index is UK all buyers index. Volume is monthly mortgage approvals. Interest rate is the Bank of England base rate. Average earnings is based on the whole economy. Unemployment is claimant count rate. Inflation is retail price index all items.

Table 4—Testing News Media Model Cointegration

Variable	ADF Test Statistic	Critical Value (5%)	Order of Integration
Panel A: Newspaper Variable Orders of Integration			
Real House Price Changes	-8.26	-2.89	I(0)
Volume Changes	-12.36	-2.89	I(0)
Newspaper Optimism	-5.35	-2.89	I(0)
Newspaper Article Changes	-17.35	-2.89	I(0)
Real Income Changes	-11.85	-2.89	I(0)
Unemployment Changes	-12.91	-2.89	I(0)
Interest Rate Changes	-5.74	-2.89	I(0)
Panel B: Newspaper Model Cointegration			
Residual	-9.58	-4.76	Cointegrated
Panel C: BBC Variable Orders of Integration			
Real House Price Changes	-7.06	-2.89	I(0)
Volume Changes	-10.75	-2.89	I(0)
BBC Optimism	-7.18	-2.89	I(0)
BBC Article Changes	-15.79	-2.89	I(0)
Real Income Changes	-10.89	-2.89	I(0)
Unemployment Changes	-8.59	-2.89	I(0)
Interest Rate Changes	-3.31	-2.89	I(0)
Panel D: BBC Model Cointegration			
Residual	-9.09	-4.48	Cointegrated

Table 5—Determinants of Real House Price Changes: Newspaper (Three-Lag Model Results)

Variable	Regressand			
	$d.HP_t$	$d.Vlm_t$	$MOpt_t$	$d.MArt_t$
$d.HP_{t-1}$	0.32***	850.95**	0.00	0.15
	-0.09	-399.66	-0.01	(0.18)
$d.HP_{t-2}$	-0.02	-383.91	0.01*	0.31
	-0.11	-365.37	-0.01	(0.20)
$d.HP_{t-3}$	0.16***	-858.72**	0.00	-0.25
	-0.06	-333.22	-0.01	(0.18)
χ^2	6.23	5.02	1.47	1.98
p-value	0.00	0.00	0.22	0.12
$d.Vlm_t$	0.00	0.01	0.00	0.00
	0.00	-0.09	0.00	(0.00)
$d.Vlm_t$	0.00	-0.33***	-0.00***	-0.00
	0.00	-0.08	0.00	(0.00)
$d.Vlm_t$	0.00	0.01	0.00	0.00
	0.00	-0.08	0.00	(0.00)
χ^2	1.11	7.17	3.70	1.44
p-value	0.34	0	0.01	0.23
$MOpt_t$	1.68**	12,197***	0.39***	0.57
	-0.78	-4,386	-0.06	(1.28)
$MOpt_t$	1.38**	1,458	0.25**	-0.78
	-0.71	-3,903	-0.09	(2.02)
$MOpt_t$	-1.12	-5,686**	0.18***	0.98
	-0.85	-2,669	-0.06	(2.36)
χ^2	4.64	4.97	50.89	0.24
p-value	0.00	0.00	0.00	0.86
$d.MArt_t$	-0.02	-361.08**	-0.00**	-0.33***
	-0.04	-154.48	0.00	(0.12)
$d.MArt_t$	0.00	-100.32	0.00	-0.04
	-0.04	-196.71	0.00	(0.09)
$d.MArt_t$	0.01	-93.93	-0.01**	-0.25***
	-0.03	-179.39	0.00	(0.08)
χ^2	0.16	1.97	4.44	7.79
p-value	0.93	0.12	0.00	0.00
$d.Income_{t-1}$	0.16	-2,659**	0.00	0.73*
	-0.19	-1,080	-0.02	(0.37)
$d.Unemp_{t-1}$	0.86**	9,851**	0.04	4.30**
	-1.72	-4,077	-0.16	(2.17)
$d.Interest_{t-1}$	0.29	3,721	-0.06	3.35**
	-0.59	-3,502	-0.10	(1.32)
$Dum96$	16.31***	55,602***	-0.13	-6.15***
	-0.76	-3,968	-0.09	(1.91)
$Constant$	-95.90***	-394,290**	8.91***	-37.86
	-28.31	-164,540	-3.33	(69.23)

Note: $d.HP_t$ denotes Real Average House Price Change in Month t. $d.Vlm_t$ denotes the Change in Volume of Housing Sales in Month t. $MOpt_t$ denotes Average Newspaper Optimism on the Housing Market in Month t. $d.MArt_t$ denotes the Change in the Average Number of Housing Market Articles Published in Month t. $d.Income_{t-1}$ denotes Average Earnings Change in Month t. $d.Unemp_{t-1}$ denotes Unemployment Rate Change in Month t. $d.Interest_{t-1}$ denotes Bank of England Base Rate Change in Month t. $Dum96$ denotes a Dummy Variable for 1996 to correct for a break in the data. * Denotes significant at 10 percent, ** at 5 percent and *** at 1 percent.

Table 6—Determinants of Real House Price Changes: *BBC* (Three-Lag Model Results)

Variable	Regressand			
	$d.HP_t$	$d.Vlm_t$	$BBCOpt_t$	$d.BBCArt_t$
$d.HP_{t-1}$	0.32*** (0.09)	906.86*** (399.62)	0.02 (0.01)	0.42* (0.24)
$d.HP_{t-2}$	-0.02 (0.15)	-254.54 (363.5)	0.04* (0.02)	(0.38* (0.21)
$d.HP_{t-3}$	0.12* (0.07)	-1337.23*** (359.53)	-0.01 (0.01)	(0.05 (0.24)
χ^2	4.93	9.72	3.58	3.45
p-value	0.00	0.00	0.02	0.02
$d.Vlm_t$	0.00 (0.00)	-0.03 (0.11)	0.00 (0.00)	0.00 (0.00)
$d.Vlm_t$	0.00 (0.00)	-0.25** (0.10)	0.00 (0.00)	0.00 (0.00)
$d.Vlm_t$	0.00 (0.00)	-0.05 (0.08)	0.00 (0.00)	0.00 (0.00)
χ^2	0.72	2.26	0.03	0.37
p-value	0.54	0.08	0.99	0.77
$BBCOpt_t$	0.55 (0.36)	8 629*** (1 924)	0.26*** (0.10)	0.01 (1.09)
$BBCOpt_t$	0.91* (0.54)	3 475** (1 520)	0.25* (0.13)	-1.22 (0.85)
$BBCOpt_t$	0.05 (0.29)	-5 123** (2 111)	0.25* (0.10)	-0.67 (0.93)
χ^2	2.89	8.75	5.11	0.92
p-value	0.04	0.00	0.00	0.43
$d.BBCArt_t$	-0.03 (0.04)	-461.14** (184.01)	0.00 (0.01)	-0.44*** (0.12)
$d.BBCArt_t$	-0.04 (0.05)	-229.63 (154.32)	0.00 (0.01)	-0.20** (0.08)
$d.BBCArt_t$	-0.05 (0.04)	98.44 (167.64)	0.00 (0.01)	0.05 (0.08)
χ^2	0.54	1.97	0.11	5.08
p-value	0.66	0.12	0.95	0.00
$d.Income_{t-1}$	0.15 (0.21)	-2,547** (1 270)	0.04 (0.05)	0.61 (0.63)
$d.Unemp_{t-1}$	-0.74 (2.59)	20 637 (14 005)	1.21* (0.63)	-4.39 (8.13)
$d.Interest_{t-1}$	-0.11 (1.07)	6 039 (7 605)	-0.01 (0.47)	12.22*** (3.66)
Constant	-74.08** (33.85)	-345 062*** (121 357)	25.09*** (6.74)	94.27 (66.48)

Note: $d.HP_t$ denotes Real Average House Price Change in Month t. $d.Vlm$ denotes the Change in Volume of Housing Sales in Month t. $BBCOpt_t$ denotes *BBC News Online* Optimism on the Housing Market in Month t. $d.BBCArt_t$ denotes the Change in the *BBC News Online* Number of Housing Market Articles Published in Month t. $d.Income_{t-1}$ denotes Average Earnings Change in Month t. $d.Unemploy_{t-1}$ denotes Unemployment Rate Change in Month t. $d.Interest_{t-1}$ denotes Bank of England Base Rate Change in Month t. *Dum96* denotes a Dummy Variable for 1996 to correct for a break in the data. * Denotes significant at 10 percent, ** at 5 percent and *** at 1 percent.

Table 7—Granger Causality Results for Newspapers (1–6 Lag Specifications)

Regressand	Housing Market Variables											
	$d.HP_t$						$d.Vlm_t$					
	$\chi(6)$	$\chi(5)$	$\chi(4)$	$\chi(3)$	$\chi(2)$	$\chi(1)$	$\chi(6)$	$\chi(5)$	$\chi(4)$	$\chi(3)$	$\chi(2)$	$\chi(1)$
$d.HP_t$	4.30 (0.00)	5.32 (0.00)	4.95 (0.00)	6.23 (0.00)	6.90 (0.00)	3.25 (0.00)	2.57 (0.02)	2.30 (0.05)	1.66 (0.16)	1.11 (0.34)	1.39 (0.25)	1.43 (0.15)
$d.Vlm_t$	3.84 (0.00)	4.76 (0.00)	3.79 (0.01)	5.02 (0.00)	3.27 (0.04)	0.80 (0.43)	5.28 (0.00)	4.16 (0.00)	4.45 (0.00)	7.17 (0.00)	7.51 (0.00)	0.88 (0.38)
$MOpt_t$	1.70 (0.12)	1.75 (0.13)	2.08 (0.09)	1.47 (0.22)	1.84 (0.16)	1.12 (0.26)	4.00 (0.00)	2.81 (0.02)	3.64 (0.01)	3.70 (0.01)	4.55 (0.01)	1.02 (0.31)
$d.MArt_t$	1.72 (0.12)	1.47 (0.20)	2.03 (0.09)	1.98 (0.12)	1.60 (0.20)	1.60 (0.11)	1.37 (0.23)	1.15 (0.34)	0.70 (0.59)	1.44 (0.23)	0.33 (0.72)	0.42 (0.67)
Media Variables												
	$MOpt_t$						$d.MArt_t$					
	$\chi(6)$	$\chi(5)$	$\chi(4)$	$\chi(3)$	$\chi(2)$	$\chi(1)$	$\chi(6)$	$\chi(5)$	$\chi(4)$	$\chi(3)$	$\chi(2)$	$\chi(1)$
$d.HP_t$	2.53 (0.02)	3.51 (0.00)	4.48 (0.00)	4.64 (0.00)	7.37 (0.00)	3.88 (0.00)	0.64 (0.69)	0.74 (0.60)	0.27 (0.90)	0.16 (0.92)	0.12 (0.89)	-0.31 (0.75)
$d.Vlm_t$	1.91 (0.08)	2.23 (0.05)	2.82 (0.03)	4.97 (0.00)	3.35 (0.04)	2.11 (0.04)	1.23 (0.30)	2.16 (0.06)	2.41 (0.05)	1.97 (0.12)	5.13 (0.01)	-2.37 (0.02)
$MOpt_t$	27.38 (0.00)	32.71 (0.00)	39.76 (0.00)	50.89 (0.00)	82.87 (0.00)	10.48 (0.00)	3.90 (0.00)	2.92 (0.02)	3.88 (0.00)	4.44 (0.00)	1.92 (0.15)	-1.52 (0.13)
$d.MArt_t$	0.86 (0.53)	0.27 (0.93)	0.41 (0.80)	0.24 (0.86)	0.06 (0.94)	0.55 (0.59)	6.16 (0.00)	6.35 (0.00)	7.61 (0.00)	7.79 (0.00)	3.72 (0.03)	-2.50 (0.01)

Notes: $d.HP_t$ denotes Real Average House Price Change in Month t . $d.Vlm_t$ denotes the Change in Volume of Housing Sales in Month t . $MOpt_t$ denotes Average Newspaper Optimism on the Housing Market in Month t . $d.MArt_t$ denotes the Change in the Average Number of Housing Market Articles Published in Month t . P-values are given below test statistics in parentheses. P-values less than 0.10, 0.05 and 0.01 denote variables Granger-causing the regressand at 10, 5 and 1 percent significance respectively. T gives the number of lags of variables tested in $\chi(T)$, so $\chi(6)$ means the joint significance of lags one to six is assessed for the given variable on the given regressand.

Table 8—Granger Causality Results for BBC (1–6 Lag Specifications)

Regressand	Housing Market Variables											
	$d.HP_t$						$d.Vlm_t$					
	$\chi(6)$	$\chi(5)$	$\chi(4)$	$\chi(3)$	$\chi(2)$	$\chi(1)$	$\chi(6)$	$\chi(5)$	$\chi(4)$	$\chi(3)$	$\chi(2)$	$\chi(1)$
$d.HP_t$	3.93 (0.00)	3.98 (0.00)	4.56 (0.00)	4.93 (0.00)	8.20 (0.00)	3.54 (0.00)	0.58 (0.74)	0.51 (0.76)	0.48 (0.75)	0.72 (0.54)	0.78 (0.46)	1.56 (0.12)
$d.Vlm_t$	5.10 (0.00)	6.11 (0.00)	5.70 (0.00)	9.72 (0.00)	2.88 (0.06)	0.80 (0.42)	1.91 (0.09)	2.51 (0.03)	1.79 (0.14)	2.26 (0.08)	3.88 (0.02)	0.59 (0.56)
$BBCOpt_t$	3.12 (0.01)	3.27 (0.01)	3.14 (0.02)	3.58 (0.02)	6.07 (0.00)	2.27 (0.02)	0.38 (0.89)	0.18 (0.97)	0.18 (0.95)	0.03 (0.99)	0.04 (0.96)	0.22 (0.83)
$d.BBCArt_t$	1.00 (0.43)	1.17 (0.33)	1.15 (0.34)	3.45 (0.02)	3.50 (0.03)	0.71 (0.48)	1.91 (0.09)	0.89 (0.49)	0.24 (0.92)	0.37 (0.77)	0.00 (1.00)	-0.08 (0.94)

Regressand	$BBCOpt_t$						$d.BBCArt_t$					
	$\chi(6)$	$\chi(5)$	$\chi(4)$	$\chi(3)$	$\chi(2)$	$\chi(1)$	$\chi(6)$	$\chi(5)$	$\chi(4)$	$\chi(3)$	$\chi(2)$	$\chi(1)$
$d.HP_t$	1.51 (0.18)	1.80 (0.12)	2.00 (0.10)	2.89 (0.04)	5.40 (0.01)	2.57 (0.01)	0.71 (0.64)	0.83 (0.53)	0.36 (0.84)	0.54 (0.66)	0.40 (0.67)	-0.69 (0.49)
$d.Vlm_t$	4.03 (0.00)	4.71 (0.00)	5.93 (0.00)	8.75 (0.00)	3.20 (0.04)	4.13 (0.00)	3.95 (0.00)	4.59 (0.00)	2.84 (0.03)	3.59 (0.02)	4.56 (0.01)	-1.48 (0.14)
$BBCOpt_t$	2.29 (0.01)	2.87 (0.00)	3.49 (0.02)	5.11 (0.00)	8.39 (0.00)	3.40 (0.00)	2.04 (0.07)	2.07 (0.07)	0.71 (0.01)	0.11 (0.95)	0.19 (0.83)	-0.71 (0.48)
$d.BBCArt_t$	1.22 (0.30)	0.95 (0.45)	0.83 (0.51)	0.92 (0.43)	1.08 (0.34)	-0.41 (0.69)	10.89 (0.00)	11.53 (0.00)	7.67 (0.00)	5.08 (0.00)	7.34 (0.00)	-3.25 (0.00)

Notes: $d.HP_t$ denotes Real Average House Price Change in Month t . $d.Vlm_t$ denotes the Change in Volume of Housing Sales in Month t . $BBCOpt_t$ denotes *BBC News Online* Optimism on the Housing Market in Month t . $d.BBCArt_t$ denotes the Change in the *BBC News Online* Number of Housing Market Articles Published in Month t . P-values are given below test statistics in parentheses. P-values less than 0.10, 0.05 and 0.01 denote variables Granger-causing the regressand at 10, 5 and 1 percent significance respectively. The number of lags of variables tested is given by T in (T), so (6) means the joint significance of lags one to six is assessed for the given variable on the given regressand.

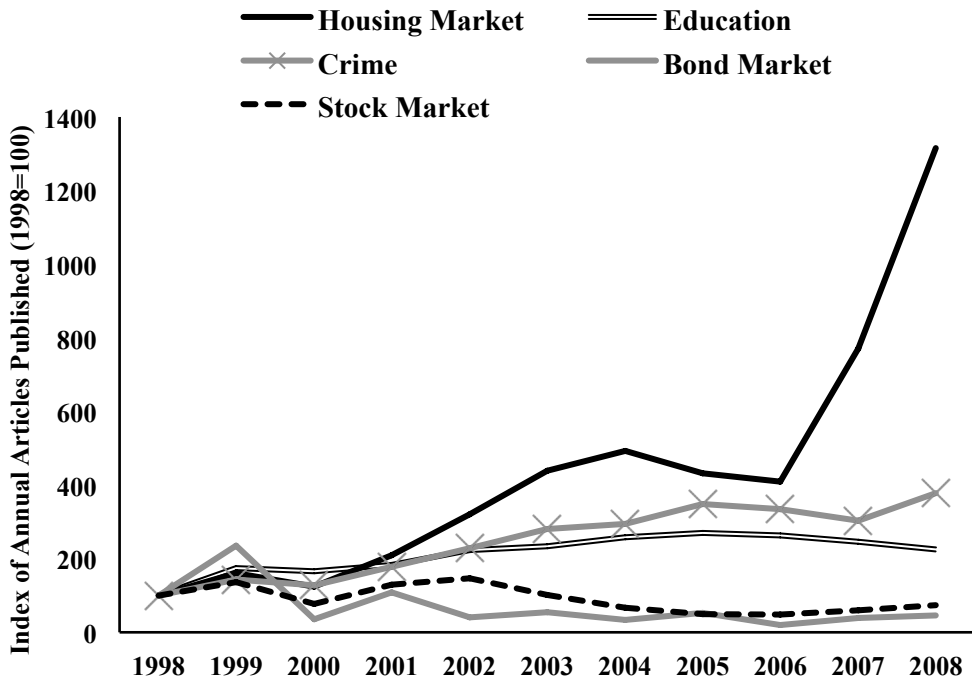


Figure 1. *BBC News Online*: Index of Annual Articles Published by Topic, 1998–2008

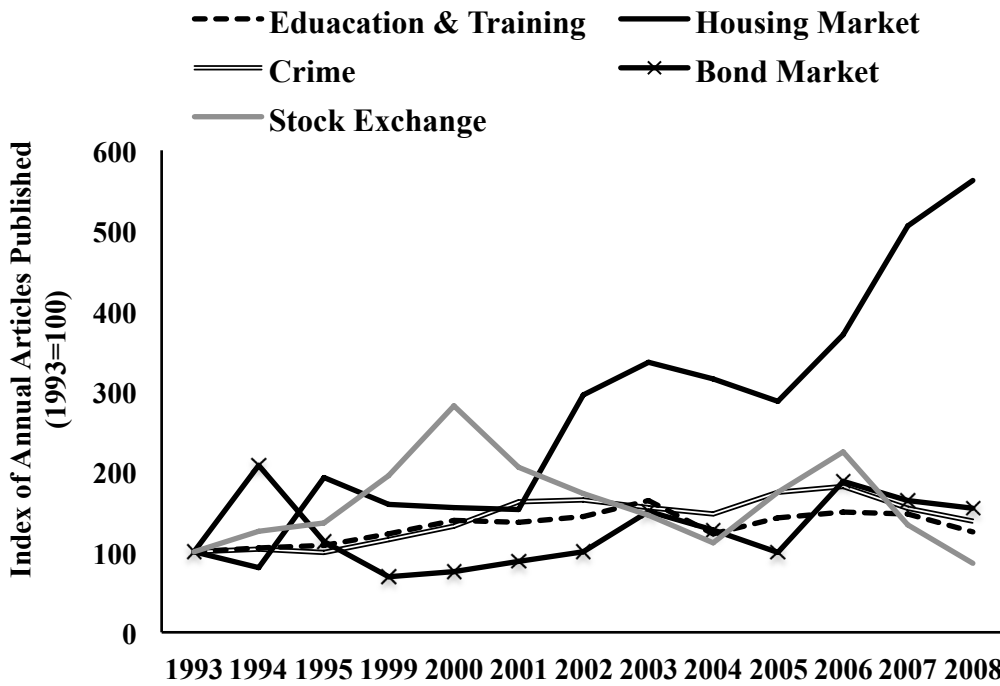


Figure 2. Increasing Newspaper Size: Average National Newspaper Coverage of Various Topics, 1993–2008 (Excl. 1996–1998)

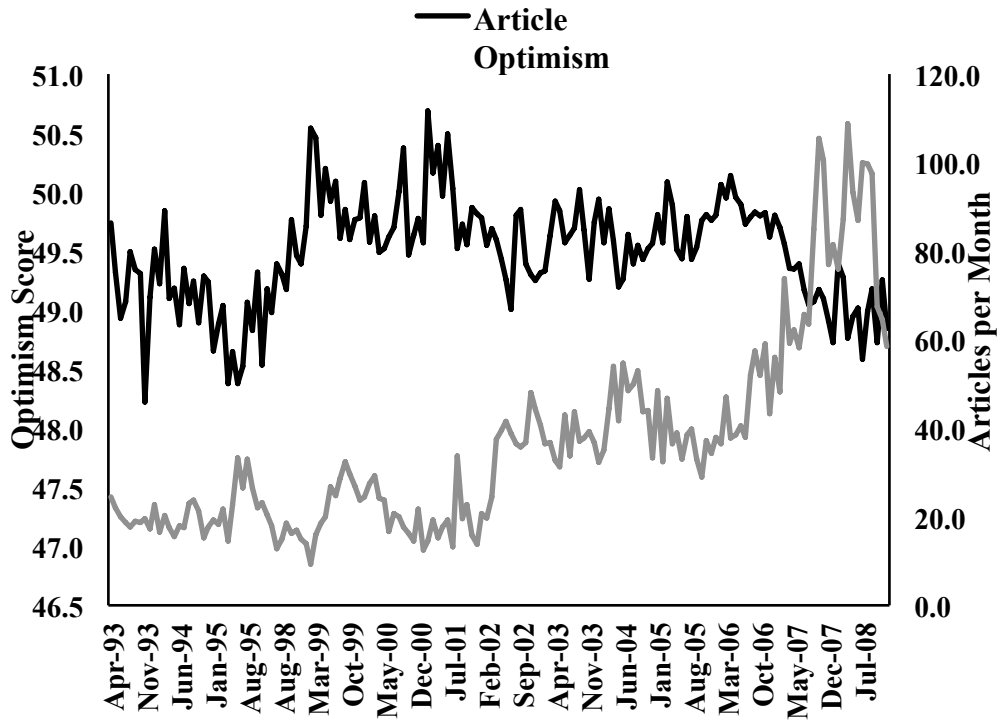


Figure 3. UK National Newspaper Coverage of the Housing Market, 1993–2008 (Excl. 1996–1998)

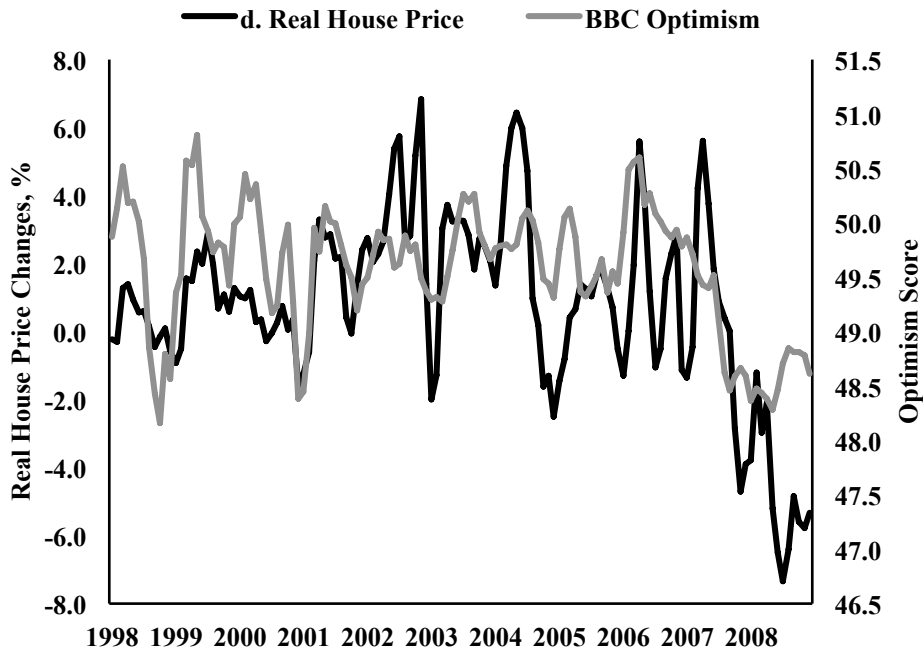


Figure 4. *BBC News Online*: Housing Market Optimism and Real House Price Changes, 1998–2008

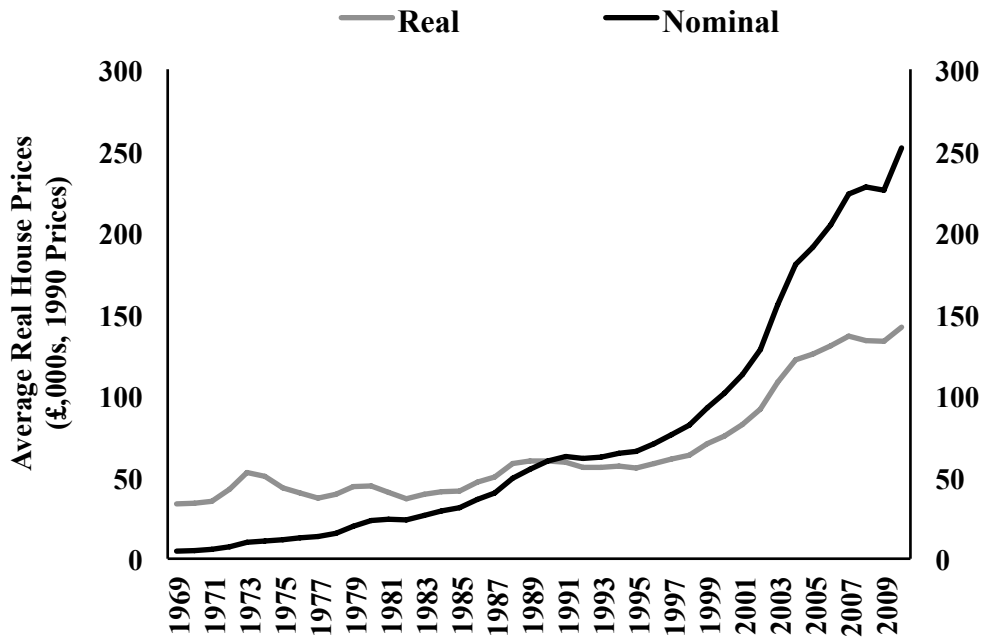


Figure 5. Nominal and Real All Buyers Average House Prices: UK, 1969–2010.
 Source: Department for Communities and Local Government

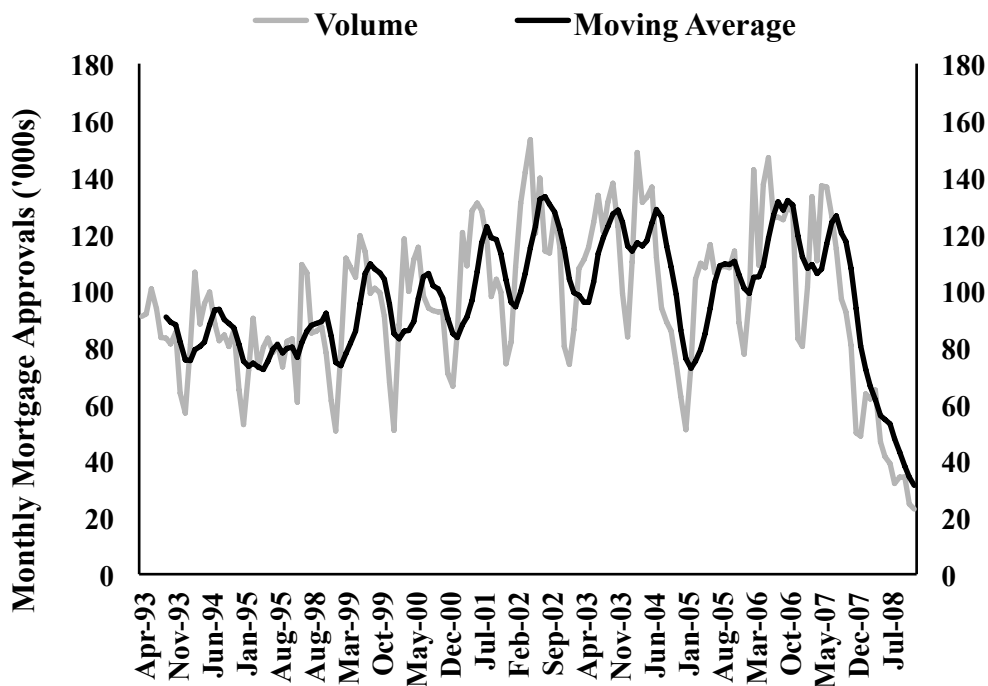


Figure 6. Approximating Housing Market Volume: Mortgage Approvals for the UK Housing Market, 1993–2008.
 Source: Bank of England

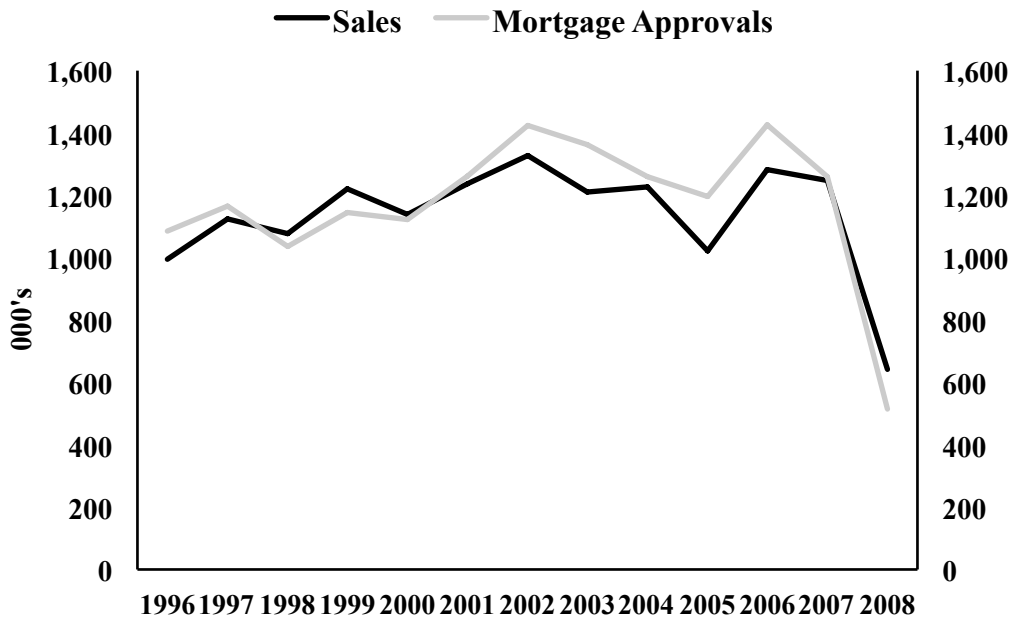


Figure 7. Property Sales and Mortgage Approvals, 1996–2008.

Note: Sales data is based on England and Wales only, mortgage approvals is based on the entire UK

Source: Department for Communities and Local Government and Bank of England

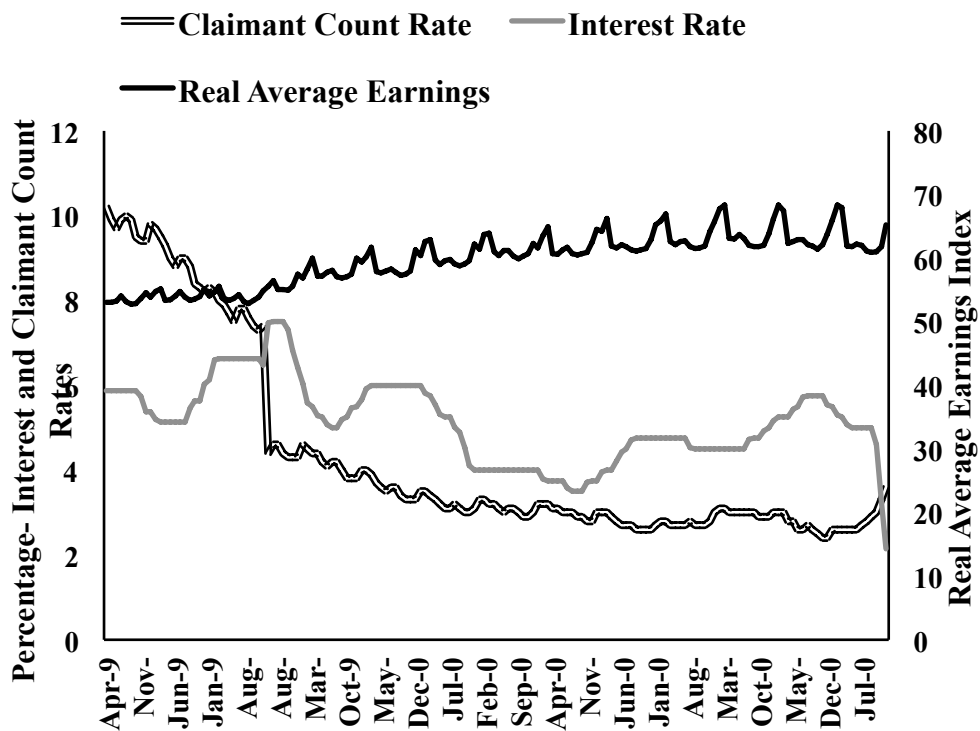


Figure 8. Exogenous Variables: Unemployment, Bank of England Base Rate and Average Earnings, 1993–2008.

Source: Bank of England and ONS