The Flow of Funds Through Residential Real Estate Markets

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ABSTRACT

This paper intends to use flow of funds analysis to see if bubbles and crashes in the residential mortgage market could have been predicted by examining the flow of funds through key institutions such as Fannie Mae and Freddie Mac. Conducting a simple event study we find that increased flow of funds does not have an impact on housing prices. However, any decrease in the flow of funds leads to a significant downward market correction. This indicates that government sponsored entities such as Freddie Mac or Fannie Mae have the ability to cool down an overheated housing market.

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1. Introduction

In light of the housing market crisis that began in late 2007, it is useful to consider new ways in which real estate markets may be monitored in order to predict and ultimately prevent future surges in foreclosure activity. Given evidence that the 2007 residential real estate market crisis was due in part to a housing bubble that had developed in the preceding decade, one approach to predicting future catastrophes is to monitor the flow of funds into the real estate market. Just as supply-side economists argue that production drives the economy because supply creates its own demand, our argument for a flow of funds approach to monitoring the real estate markets is based on the basic tenets of supply and demand. We argue that an excess supply of funds to the real estate market and easy access to credit artificially inflates demand and forces market prices higher than their intrinsic values resulting in a ‘market bubble’.

A flow of funds monitoring system seeks to identify surges in the flow of funds to real estate markets in order to prevent the negative ripple effects of this imbalance. Given this premise, our primary research question is ‘Can housing market bubbles and crashes be predicted by monitoring the flow of funds through government sponsored enterprises (GSEs) such as the Federal Housing Finance Agency (FHFA – formerly Fannie Mae and Freddie Mac)’?

In order to test the feasibility of such a system, we conduct an event study to determine if surges in the supply of funds to the real estate markets – the ‘events’ in our study – are subsequently followed by upward shifts in aggregate real estate prices. Confirmation of a relationship between surges in the flow of funds and real estate prices would suggest that a flow of funds monitoring system would be a feasible means of predicting future housing bubbles. Further, examination of our results may enable us to make policy recommendations regarding key limits that, if surpassed, could lead to a repeat of the 2007 housing crisis.

2. Review of the Literature

Flow of funds analysis is widely used in economic research and analysis, because it provides a framework for studying the financial sector and its relationship with the real economy. Our paper intends to use flow of funds analysis to see if bubbles and crashes in the residential mortgage market could have been predicted by examining the flow of funds through key institutions such as Fannie Mae and Freddie Mac. If indeed one can forecast such events through the flow of funds, one could develop a monitoring system to aid public policy.
The flow of funds arises from the transactions within an economy. These transactions generate flows from one agent to another. The national flow of funds account could be regarded as a source and uses statement for the whole economy. Copeland (1952) was the first to show that by creating what he called “moneyflow” accounts one could analyze the US economy. In particular, the flow of funds accounts allows us to examine how activities in the financial markets affect the macroeconomy (Reid and Schreft, 1993). For example, Bernanke (1983) shows how reduced credit flows contributed significantly to the great depression. In another example, Dawson (2004) uses flow of funds analysis to explain the case of Thailand during the 1996-97 Asian crisis. The leading source for this research are the Flow of Funds Accounts (FOFA). They reveal how a sector finances its investments in excess of its savings. The Federal Reserve publishes quarterly FOFA data since 1959.

This paper focuses on the impact of flow of funds through the mortgage markets on property prices. There is a vast literature on the effect of capital flows on asset prices and this string of literature has been expanded mostly in the commercial real estate and real estate investment field. Tse (1996) shows in a study focusing on Hong Kong that there is a direct relationship between residential property prices and mortgage lending. However, the study finds that in the case of Hong Kong house prices lead mortgage flows. Arsenault and Peng (2009) show that real estate investment performance has a positive effect on mortgage fund flows, which in turn has an almost immediate effect on property valuation\(^1\). Fisher, Ling and Naranjo (2009) show that capital flows predict future returns in commercial real estate investments. They further show that returns are a predictor of future institutional capital flows. Ling and Naranjo (2003) find similar results for REITs. They show that REIT capital flows have a significant impact on REIT returns. Very few studies use flow of funds data to analyze the effect of the housing boom on homeowners. Weller and Sabatini (2007) use flow of funds data to analyze the effect of the housing boom on homeowners. They define financial vulnerability of homeowners grew significantly during the boom. The define financial vulnerability as variable mortgage debt in excess of 50% of income, home equity of less than 25% of home value, residential real estate representing more than 90% of total assets and/or debt to income ratios exceeding 30%. This paper is the first to our knowledge that uses flow of funds analysis to predict/monitor housing price bubbles.

\(^1\) For a detailed discussion on the literature on capital flows and asset values, please see Clayton, 2003
3. Data and Methodology

We obtain quarterly flow of funds data from the Board of Governors of the Federal Reserve System from 1952 to 2009. The sample period ends in 2009 to exclude quantitative easing by the Federal Reserve which would have skewed the results given the artificial demand created. This data is available in the quarterly document entitled “Flow of Funds Accounts of the United States.” We focus on Table F.1 which summarizes the flow of funds related to total net borrowing and lending in credit markets and F.124, F.125 and F.126 which break down our three specific sectors of interest: Government-Sponsored Enterprises, Agency- and GSE-backed Mortgage Pools and Issuers of Asset-Backed Securities. We shorten the timeframe of our study to account for the fact that house price data is available beginning in 1975. Therefore, we analyze the 140 quarters from 1975 to 2009. We calculate mean quarterly flows across the sample period and the standard deviation of those flows. We focus on the real estate related flows within each sector. Based on this analysis, we identify any quarter where the change in the flow of funds within a particular sector is outside the range of ±1 standard deviation from the mean change as a significant ‘event’. We employ standard event study methodology for our analysis.²

After identifying our series of events – those quarters where there is a significant surge in the flow of funds to real estate markets – we determine our sample periods. For each event, we use an estimation period of the 20 quarters prior to the event quarter which equates to a 5-year sample period for determining ‘normal’ mean quarterly real estate market price appreciation. In order to determine mean rates of return in the residential real estate market, we use the quarterly housing price index from the FHFA. This data is available quarterly beginning in 1991 when constructed based solely on purchase data and beginning in 1975 when constructed based on both purchase data and appraisal data. We use this latter data, the ‘all-transactions’ dataset, in order to be able to analyze a longer time period.

After identifying our estimate periods and the mean, aggregate returns to residential real estate in those periods, we analyze the post-event returns for the one year following the event quarter. Following a similar approach by Tkac (1999) we estimate our expected return as the 5-year rolling average return over the estimation period. Abnormal returns ARt are simply the difference between the observed return Rt and the 5-year rolling average E(Rt).

\[
AR_t = R_t - E(R_t)
\]

² Please, see Petersen (1989) for a review of event study methodology
The cumulative abnormal return, CAR, is the sum of all abnormal returns during the event window.

\[ \text{CAR} = \sum_{t=\text{start}}^{T} \text{AR}_t, \]

where: \( \text{start} = \) first day in event window
\( T = \) last day in event window

Subsequently, we calculate abnormal returns to real estate as the difference between the realized and the 5 year rolling average followed by cumulative abnormal returns and then we aggregate these values to find the mean cumulative abnormal return to real estate following a significant shift in the flow of funds. To determine the significance of the cumulative abnormal returns a t-test is conducted.

\[ t_{\text{CAR}} = \frac{\text{CAR}}{\sigma(\text{CAR})/\sqrt{n}} \]

Finally, we analyze the abnormal returns to real estate in order to determine the factors that explain them. We hypothesize that occupancy costs and homeownership rates are key factors that could explain these housing price bubbles. Therefore, we estimate an OLS regression equation as follows:

\[ \text{Abnormal Return} = \alpha + \beta_1 \text{OccupancyCost} + \beta_2 \text{Homeownership Rate} + \text{CONTROL} \]

We use the average United States fair market rent (FMR) for a two-bedroom apartment as established by the Department of Housing and Urban Development as a proxy for occupancy costs.\(^3\) We use homeownership data from the U.S. Census. In our vector of control variables, CONTROL, we include other variables that are commonly considered to be correlated with housing prices such as interest rates and changes in economic output as measured by the gross domestic product (GDP).

We believe that other unobservable factors also drive abnormal returns in the housing market. Most importantly, we believe that absorption rates and the average length of time required to sell a property impact prices. Because our study is nationwide in scope, it is not possible to incorporate these factors as they tend to be collected and maintained at the regional level. For example, time to sell is typically tracked in the Multiple Listing Service (MLS) as days on the market (DOM). Those with access to the MLS can then run reports to determine the

\(^3\) The data is provided annually and therefore we extrapolate to estimate quarterly values.
average DOM for a ZIP code or a city. Unfortunately, the MLS does not publish these average figures for nationwide study use.

4. Results

Table 1 describes the data we used in the study. Due to differences in data availability across the various sources, the study period is limited to the 35 years from 1975 to 2009. Fluctuations in the data are relatively limited throughout the study period with the exception of the flow of funds data. In our FoFChange variable, we aggregate all flows related to home mortgages and then calculate the quarterly changes in those flows. During the sample period, the quarterly change in this aggregate flow of funds to the single-family housing market can be quite dramatic as indicated by the minimum (maximum) change value of -334 (121)% and a standard deviation of 47.99%. Such a high degree of fluctuation in this variable could suggest that at certain times during the sample period, government agencies briefly and dramatically either ramped up or scaled back their activity in this market.

Table 1. Descriptive Statistics
This table presents the key variables used in the study. All data is quarterly. The sample period is the 140 quarters from 1975 to 2009. HPIChange is a variable measuring the degree of change in the national house price index. FoFChange measures the change in the flow of funds related to home mortgages. FMRChange measures the change in fair market rent which serves as a proxy for occupancy costs. HOChange measures the change in nationwide homeownership rates.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Median</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>HPIChange (%)</td>
<td>-2.41</td>
<td>4.69</td>
<td>1.27</td>
<td>1.31</td>
<td>1.18</td>
</tr>
<tr>
<td>FoFChange (%)</td>
<td>-334.11</td>
<td>121.41</td>
<td>4.63</td>
<td>2.70</td>
<td>47.99</td>
</tr>
<tr>
<td>FMRChange (%)</td>
<td>-1.22</td>
<td>1.59</td>
<td>0.75</td>
<td>0.82</td>
<td>0.58</td>
</tr>
<tr>
<td>HOChange (%)</td>
<td>-1.09</td>
<td>1.39</td>
<td>0.03</td>
<td>0.00</td>
<td>0.45</td>
</tr>
<tr>
<td>MortRateChange (%)</td>
<td>-13.79</td>
<td>15.67</td>
<td>-0.36</td>
<td>-0.65</td>
<td>5.21</td>
</tr>
<tr>
<td>GDPChange (%)</td>
<td>-7.90</td>
<td>16.70</td>
<td>2.94</td>
<td>3.10</td>
<td>3.35</td>
</tr>
</tbody>
</table>

Further, a cursory glance at our two key data series, HPIChange and FoFChange, provides some indication of co-movement between these two variables over time. Figure 1 compares these two variables throughout the study period. Our hypothesis is that the change in the flow of funds leads the change in home prices. That is, we argue that the impact of an increase in governmental funds allocated to the residential real estate market is an increase in housing prices but that this increase in home prices is not realized immediately. We argue
that it may take as much as six months for the impact of these funds to be fully evidenced in the residential real estate market.

Visual examination of the levels of the flow of funds and home prices gives further indication of a correlation between the two. Based on Figure 2, we hypothesize that the steep increase in flows to residential real estate in 2005 will provide a significant explanation for the housing market collapse that began in late 2007. Here, the flow of funds to the residential real estate market spikes dramatically until reaching a peak in 2006. At this same time, quarterly increases in housing prices were at record highs. This period coincides with the point in time when the subprime real estate market was gaining momentum prior to its crash in late 2006 and early 2007. This latter period also coincides with a ‘cooling’ of the housing market as is also shown in Figure 2.
Again, it is also evident that there is a significant lag between any change in the flow of funds and its subsequent impact on the real estate markets. We will account for this lag in our analysis of subsequent returns.

Over our 140 sample quarters, we identify 21 quarters as significant event dates where the change in the flow of funds to residential real estate markets was greater than ±1 standard deviation from the mean change of 4.63%. Recalling the large standard deviation in the change in the flow of funds, that means that we identify 21 quarters where the change in the flow of funds to housing markets was either less than -43% or greater than 53%. In 14 of these events, the flow of funds increases significantly and in the remaining seven events, the flow of funds decreases.

In order to determine the proper post-event window for our study, we conduct regression analysis to test our hypothesis that changes in the flow of funds lead changes in house prices by three months or more. We estimate the following regression equation: \( HPI_{\text{Change}} = \alpha_0 + \beta_1 FoF_{\text{Change}} + \epsilon \). The results of this analysis are shown in Table 2 below.
Table 2. Co-Movement of House Prices and the Flow of Funds

This table presents the results of ordinary least squares regressions to estimate the degree to which the change in the flow of funds explains changes in house prices. The base model is re-estimated after allowing changes in the flow of funds to lead changes in house prices by one, two and three quarters, respectively. t-statistics are given in parentheses. The dependent variable in all regressions is HPIChange.

<table>
<thead>
<tr>
<th>Variable</th>
<th>No Lead</th>
<th>One Quarter Lead</th>
<th>Two Quarter Lead</th>
<th>Three Quarter Lead</th>
</tr>
</thead>
<tbody>
<tr>
<td>FoFChange</td>
<td>0.0015 (0.7103)</td>
<td>0.0054 (2.6754)***</td>
<td>0.0064 (3.3064)***</td>
<td>0.0033 (1.7262)*</td>
</tr>
<tr>
<td>Intercept</td>
<td>0.0127 (12.5873)***</td>
<td>0.0126 (12.8834)***</td>
<td>0.0128 (13.6878)***</td>
<td>0.0133 (14.2294)***</td>
</tr>
<tr>
<td>R²</td>
<td>0.0037</td>
<td>0.0500 (1.0877)***</td>
<td>0.0749 (3.2756)***</td>
<td>0.0218 (0.0494)***</td>
</tr>
<tr>
<td>N</td>
<td>139</td>
<td>138</td>
<td>137</td>
<td>136</td>
</tr>
</tbody>
</table>

*** significant at the 1% level, ** significant at the 5% level, significant at the 10% level

Based on these results, we estimate that the full impact of changes in the flow of funds on housing prices can take up to one year to be fully realized in residential housing markets.

Using this data, we conduct an event study to determine the degree to which housing prices react to significant changes (“events”) in the flow of funds. The results of our event study are shown in Table 3 below.

Table 3. Cumulative Abnormal Returns Following Flow of Funds Events

This table presents the cumulative abnormal returns to housing for the four quarters following an economic event. We define an economic event as any quarter in which the change in the flow of funds to the residential mortgage market is ± one standard deviation from the mean change in the flow of funds for the 35-year period from 1975 to 2009. There are a total of 21 event dates in the study where 14 are categorized as “positive” events and seven are characterized as “negative”.

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>z-statistic</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Events</td>
<td>-0.0183</td>
<td>0.0373</td>
<td>-1.8355</td>
<td>0.0664</td>
</tr>
<tr>
<td>Positive Events</td>
<td>-0.0076</td>
<td>0.0261</td>
<td>-1.0877</td>
<td>0.2767</td>
</tr>
<tr>
<td>Negative Events</td>
<td>-0.0432</td>
<td>0.0494</td>
<td>-3.2756</td>
<td>0.0011</td>
</tr>
</tbody>
</table>

We find that in the four quarters following a significant increase in the flow of funds, the change in housing prices is insignificant. However, when there is a significant decrease in the flow of funds, we find that there is a statistically significant decline in home prices of 4.32%.

We use regression analysis to attempt to explain the factors related to the abnormal returns in the housing market. The results of our analysis are shown in Table 4.
Table 4. Explanation of Abnormal Returns

This table presents the results of an ordinary least squares (OLS) regression to estimate the degree to which abnormal returns in the housing market can be explained by various factors. t-statistics are shown in parentheses. The dependent variable in this regression is abnormal returns to housing.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>FMRChange</td>
<td>-0.0398</td>
<td>(-0.2379)</td>
</tr>
<tr>
<td>HOCChange</td>
<td>0.4842</td>
<td>(2.1085)**</td>
</tr>
<tr>
<td>MortRateChange</td>
<td>-0.0815</td>
<td>(-3.8838)***</td>
</tr>
<tr>
<td>GDPChange</td>
<td>0.1738</td>
<td>(4.1651)***</td>
</tr>
<tr>
<td>Intercept</td>
<td>-0.0070</td>
<td>(-3.3683)***</td>
</tr>
<tr>
<td>R²</td>
<td>0.2238</td>
<td></td>
</tr>
<tr>
<td>Adjusted R²</td>
<td>0.1908</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>99</td>
<td></td>
</tr>
</tbody>
</table>

*** significant at the 1% level, ** significant at the 5% level

These results indicate that home prices increase significantly with increases in the homeownership rate and the GDP and decreases in mortgage interest rates. This confirms that spikes in the housing markets are created by a growing economy and increased demand for housing. At the same time an increase in mortgage rates will lead to a decrease in home prices. All our results are in line with previous findings.

5. Summary and Conclusion

The objective of our study was to create an early housing bubble alert system using the flow of funds through the government sponsored enterprises. We hypothesized that a significant spike in the flow of funds create the housing bubble and thus, that by controlling the influx of government sponsored mortgage flow future housing bubbles could be averted. Our results do not support that hypothesis. However, the findings of our study are nevertheless of importance. According to our results the housing bubble was not created by a spike in the flow of funds. Any event that showed a significant spike in the flow of funds did not spark a reaction on the housing price index. However, whenever the flow of funds abnormally decreased the housing price indexed decreased by an average of 4.32%. This seems to indicate two things. First, while increased lending by the Federal Housing Agency did not cause the rapid increase in the housing price index, it appears as if the Agency could have prevented the bubble by slowing down the flow of funds into the mortgage market. Thus, if policymakers can spot an abnormal upward movement in the housing market that could

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4 While a growing economy can partially explain an increased demand for housing, we hypothesize that easy access to mortgages also fueled demand.
create a speculative bubble, they can stop the trend by pulling away from the market for mortgage backed securities. Secondly, it can now be argued that the housing bubble might have been created by non-agency security flow. The flow of funds through that segment of the mortgage market are not captured by the federal flow of funds accounts. Assuming that most of the activity in the non-agency market is based on non-conventional, possibly high risk mortgages, that sector might have fueled the housing price index at that time.

This study provides a useful policy tool in that it identifies a mechanism with which the Federal Housing Agency could prevent future housing bubbles. Going forward it would be helpful to develop a model that allows the policymakers to identify an overheated housing market ex-ante. This would give them the opportunity to stop the rapid increase before a dramatic market correction occurs.

References


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