

THE CRUMBLING FOUNDATION OF  
**U.S. House Prices**  
MAY 2009 UPDATE

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In this paper we update the analysis from our Investment Research paper, “*The Crumbling Foundation of U.S. House Prices*,” to include two new quarters of observations. Using the new information, we revise our predictions on house prices, and suggest some additional caveats to the analysis.

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In our earlier paper, we predicted house prices as a function of changes in mortgage debt three quarters earlier.<sup>1</sup> We went on to predict changes in mortgage debt based on changes in real estate asset values, also three quarters earlier. In light of the relationships we identified between these three variables, we were then able to forecast the level of real house prices based on changes in real estate asset values six quarters earlier.

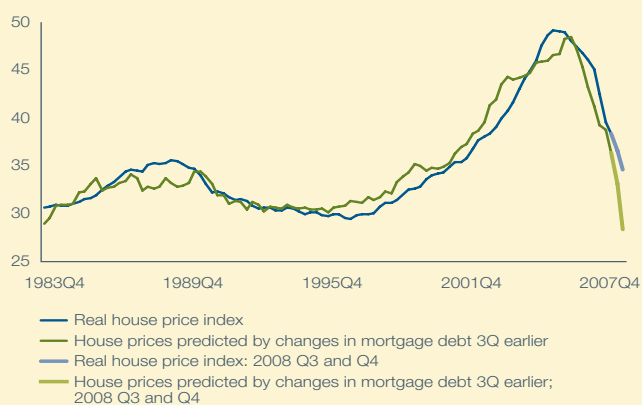
Exhibit 1 shows that our earlier model (refer to Exhibit 9 in *The Crumbling Foundation of U.S. House Prices*) seems slightly too pessimistic based on new observations over the last two quarters of 2008. The model relating “lagged” (three periods later) house prices to mortgage debt seems to predict an overly dramatic house price downturn. The heavy green line (showing predicted house prices for the last two quarters of 2008, based on our earlier model) is lower than the heavy blue line (showing the actual house price index in the last two quarters of 2008).

There are a number of explanations for the overly pessimistic predictions, all of which can help us to refine and improve future forecasts. In particular, as with any model, the output is based on a “best fit” of existing data. As we noted in our earlier paper, the relationship between changes in mortgage debt and house prices was derived during a period in which (nominal) house prices were almost always increasing. There was no reason to be confident that house prices would fall at the same rate that they had increased, relative to changes in mortgage debt, but our analysis was limited by a lack of sufficient observations during a regime of declining house prices.

With two additional data points in a falling housing market, we are now in a better position to re-estimate the model, using data subsequent to the peak of the housing market in the fourth quarter of 2005. As expected, the implications of reductions in mortgage debt are less severe for house prices<sup>3</sup> than what was predicted by the earlier model.

Exhibit 2 shows the output of this new estimate. As the chart illustrates, the relationship between lagged house prices and mortgage debt changes during down markets. Specifically, mortgage debt appears to drop off more dramatically than house prices (at least until the fourth quarter of 2008), and our updated model captures this relationship more effectively. This change may partially be caused by the “stickiness” of house prices in the downside; homeowners may be unwilling to sell their property at current market levels if this means taking a loss relative to the purchase price.

**EXHIBIT 1: REAL HOUSE PRICES CAN BE EXPLAINED BY CHANGES IN MORTGAGE DEBT THREE QUARTERS EARLIER: JANUARY 2009 MODEL AND ACTUAL OBSERVATIONS**



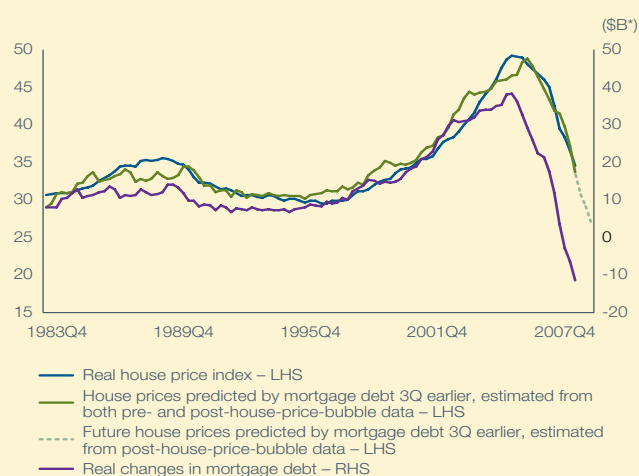
As of 31 December 2008

Source: Board of Governors of the U.S. Federal Reserve System, Flow of Funds Accounts of the United States, Section B.100 Balance Sheet of Households and Nonprofit Organizations, OFHEO, Standard & Poor's/Case-Shiller Home Price Indices, Bureau of Labor Statistics, Bloomberg

Seasonal adjustments were made using a linear moving average.<sup>2</sup>

Predicted changes in mortgage debt based on a single-factor linear regression model developed by Emma Rasiel.

**EXHIBIT 2: REAL HOUSE PRICES CAN BE EXPLAINED BY CHANGES IN MORTGAGE DEBT THREE QUARTERS EARLIER: MAY 2009 MODEL UPDATE**



As of 31 December 2008

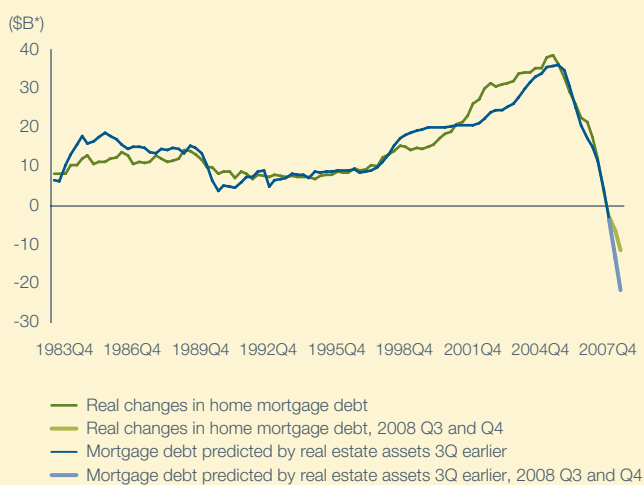
\* Inflation adjusted and indexed to 1952 dollars

Source: Board of Governors of the U.S. Federal Reserve System, Flow of Funds Accounts of the United States, Section B.100 Balance Sheet of Households and Nonprofit Organizations, OFHEO, Standard & Poor's/Case-Shiller Home Price Indices, Bureau of Labor Statistics, Bloomberg

Seasonal adjustments were made using a linear moving average.<sup>2</sup>

Predicted changes in mortgage debt based on a single-factor linear regression model developed by Emma Rasiel.

**EXHIBIT 3: CHANGES IN MORTGAGE DEBT CAN BE EXPLAINED BY CHANGES IN REAL ESTATE ASSETS THREE QUARTERS EARLIER: JANUARY 2009 MODEL AND ACTUAL OBSERVATIONS**



As of 31 December 2008

\* Inflation adjusted and indexed to 1952 dollars

Source: Board of Governors of the U.S. Federal Reserve System, Flow of Funds Accounts of the United States, Section B.100 Balance Sheet of Households and Nonprofit Organizations.

Seasonal adjustments were made using a linear moving average.

Predicted changes in mortgage debt based on a single-factor linear regression model developed by Emma Rasiel.

This psychological element to home prices has been discussed much in the past and may well reflect a transition from a “seller’s market” to a “buyer’s market.” The unwillingness of sellers to realize losses can only be sustained, however, to the extent the seller has the financial wherewithal to make monthly payments on his home. Given the sharp increase in U.S. unemployment, it will be important to watch for a shift to a situation where sellers no longer have a choice in terms of realizing losses; that is, if they lose their job and cannot sustain the monthly payments, they may be forced into a distressed sale or foreclosure.

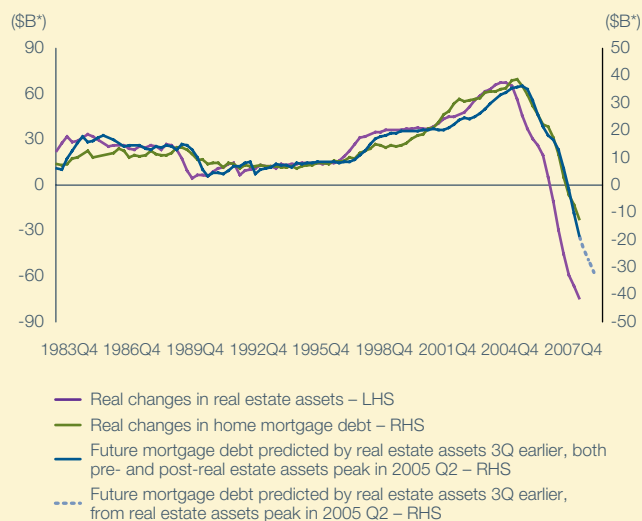
Exhibit 2 also provides an updated estimate of the path of house prices for the first three quarters of 2009—the dashed green line—based on real changes in mortgage debt through the end of 2008.

In our earlier paper, we had also predicted changes in mortgage debt in relation to changes in household real estate assets three quarters earlier. As with the estimation of house prices based on mortgage debt, we were previously constrained to assume that the relationship between real estate assets and

mortgage debt would remain consistent following the recent house price peak.<sup>4</sup> Adding the two most recent observations (the third and fourth quarters of 2008) demonstrates that this is not entirely correct, as shown in Exhibit 3. Our previous model overestimated the extent to which mortgage debt would decrease, relative to decreasing values of household real estate assets. The heavy blue line (showing estimated change in mortgage debt) is lower than the heavy green line (showing actual change in mortgage debt). We propose that this reflects the reality that it is harder for consumers to “de-lever” in response to falling real estate asset values than it was to increase their borrowing during the house price boom.

We then used the two most recent quarters of data on changes in household real estate assets to predict changes in mortgage debt through the third quarter of 2009.<sup>5</sup> Exhibit 4 shows the results of this analysis. The dashed blue line indicates our updated prediction for changes in mortgage debt as a result of changes in real estate assets on homeowners’ balance sheets observed three quarters earlier.

**EXHIBIT 4: CHANGES IN MORTGAGE DEBT CAN BE EXPLAINED BY CHANGES IN REAL ESTATE ASSETS THREE QUARTERS EARLIER: MAY 2009 MODEL UPDATE**



As of 31 December 2008

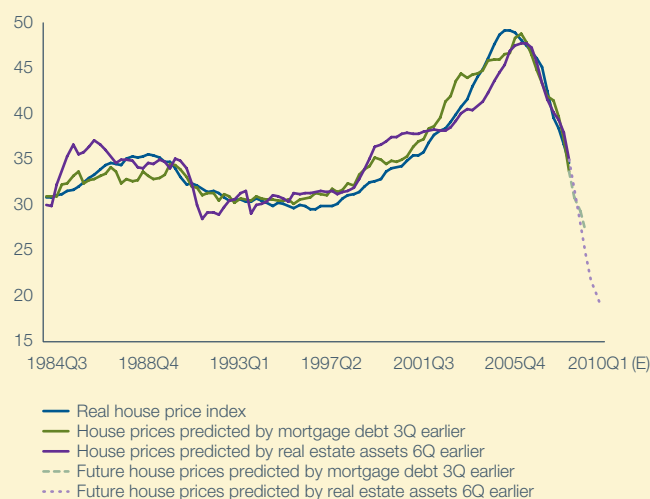
\* Inflation adjusted and indexed to 1952 dollars

Source: Board of Governors of the U.S. Federal Reserve System, Flow of Funds Accounts of the United States, Section B.100 Balance Sheet of Households and Nonprofit Organizations.

Seasonal adjustments were made using a linear moving average.

Predicted changes in mortgage debt based on a single-factor linear regression model developed by Emma Rasiel.

**EXHIBIT 5: REAL HOUSE PRICE INDEX VS HOUSE PRICE PREDICTED BY CHANGES IN REAL ESTATE ASSETS AND MORTGAGE DEBT**



As a result of all of these updates, we can now project house prices for three additional future quarters, through the second quarter of 2010, based on changes in mortgage debt three quarters earlier and changes in real estate assets six quarters earlier. The green dashed line<sup>6</sup> and the purple dashed line show, respectively, our updated expectations in Exhibit 5.

Exhibit 6 summarizes our original and updated forecasts on house price declines.

**EXHIBIT 6: PREDICTED HOUSE PRICE CHANGES**

House Price Change	Original January 2009 Forecast (%)	Updated May 2009 Forecast (%)
2008 Q2 to 2009 Q4	-58	-43
Peak* to 2009 Q4	-67	-56
2008 Q4 to 2010 Q2		-46
Peak* to 2010 Q2		-62

As of 31 December 2008

\*Fourth quarter of 2005

Source: Board of Governors of the U.S. Federal Reserve System, Flow of Funds Accounts of the United States, Section B.100 Balance Sheet of Households and Nonprofit Organizations, OFHEO, Standard & Poor's/Case-Shiller Home Price Indices, Bureau of Labor Statistics, Bloomberg Seasonal adjustments were made using a linear moving average.<sup>2</sup>

Clearly there are still caveats associated with these projections, including:

- As noted earlier, any model is only as good as the data and assumptions that are put into it. Our data is taken from the U.S. Federal Reserve Flow of Funds data, which is released quarterly. In each release, earlier estimates of aggregate household balance sheet and income statement data are often revised, suggesting that we are likely to see minor adjustments in the future.
- We make no explicit provision for changes in interest rates, which will have a significant impact on all of the above predictions. Changing interest rates appear implicitly in the estimates of changing mortgage debt—but a significant change in rates could alter the relationships that we derive between mortgage debt and both real estate assets and house prices. Further, these changes may take several quarters to manifest themselves, as there is inevitably a lag between changes in mortgage rates and its impact on changes to aggregate mortgage debt. Mortgage borrowing rates declined nearly 200 basis points over the last six months; we have yet to see the full impact of these changes on aggregate changes in mortgage debt. We anticipate that this is likely to cause our updated model predictions of house prices to still be overly negative.

Importantly, the decrease in mortgage borrowing rates was most extreme in the final two months of 2008, as they declined 114 basis points from October 31 to December 31. The impact of this decreased cost of debt is almost certainly not reflected in the data from the final quarter of 2008, as mortgages typically are not closed for periods of 30 to 90 days after the loan is originated. As a consequence, we would expect the data from the first quarter of 2009 to demonstrate most clearly the importance of this variable.

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**NOTES**

1 We estimated house prices using the following single-factor regression model:

$$\text{EHP}(t) = 26.02 + 0.59 \cdot \text{MD}(t-3) \quad (1)$$

where  $\text{EHP}(t)$  = Estimated house price index in quarter  $t$ ;  $\text{MD}(t-3)$  = change in mortgage debt three quarters earlier;  $R^2 = 0.92$ ;  $t$ -stat = 34.8; and time  $t$  ranged from the first quarter of 1982 to the second quarter of 2008.

2 Aggregated U.S. house price data were obtained from two sources, the Office of Federal Housing Enterprise Oversight (OFHEO) (<http://www.ofheo.gov/hpi.aspx>), and the Case-Shiller Home Price Index (available from Robert Shiller's website: <http://www.econ.yale.edu/~shiller/>). The OFHEO data begins in the first quarter of 1975, while the Case-Shiller Index begins in 1987. We chose to merge the two series, because the Case-Shiller Index provides a more pessimistic (and, we think, more accurate) assessment of U.S. house prices over the last few quarters. We used a simple regression model to "backdate" the Case-Shiller Index from its starting point in 1987 back to the OFHEO data starting point in 1975.

3  $\text{EHP}(t) = 32.10 + 0.44 \cdot \text{MD}(t-3) \quad (2)$

where time  $t$  ranged from the fourth quarter of 2005 to the fourth quarter of 2008;  $R^2 = 0.93$ ;  $t$ -stat = 11.4.

Note that the slope coefficient in this model, equal to 0.44, is 25% smaller than in the earlier model (0.59, as shown in note 1), indicating that a given decrease in mortgage debt has a less severe impact on house prices than an increase of similar size. For all observations prior to the fourth quarter of 2005, we used the coefficients in the earlier model (see note 1) to predict house prices.

4  $\text{EMD}(t) = 0.82 + 0.53 \cdot \text{REA}(t-3) \quad (3)$

where  $\text{EMD}(t)$  = Estimated change in mortgage debt in quarter  $t$ ;  $\text{REA}(t-3)$  = change in real estate assets three quarters earlier;  $R^2 = 0.85$ ;  $t$ -stat = 23.7.

5  $\text{EMD}(t) = 3.65 + 0.48 \cdot \text{REA}(t-3) \quad (4)$

$R^2 = 0.97$ ;  $t$ -stat = 30.6.

6 Note that this is the same projection as shown by the green dashed line on Exhibit 2.

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**IMPORTANT INFORMATION**

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