Monetary Policy and Housing Booms*

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A multitude of factors contributed to the housing booms and crashes experienced in many countries and the ensuing global financial crisis. Much of the existing research on these issues assumes that agents have complete information about the economic environment and form rational expectations. This commentary argues that models with imperfect knowledge and learning provide a potentially rich avenue of research on issues related to housing bubbles and monetary policy. Such models open up an avenue for the endogenous emergence of bubble-like behavior and also provide channels by which monetary and supervisory policies can influence the development of bubbles.

JEL Codes: D44, E52, E83.

The housing booms and busts of the past decade have led economists to take seriously the housing sector and housing finance in macroeconomic models used for monetary policy. The two papers in this volume (Aspachs-Bracons and Rabanal 2011, Forlati and Lambertini 2011) exemplify this renewed appreciation of the role of housing in macroeconomic fluctuations and monetary policy. The basic approach is similar across the two papers. A housing sector is added to the description of preferences and technology in a dynamic stochastic general equilibrium (DSGE) model that incorporates various nominal, real, and financial frictions. Shocks to preferences, technology, and monetary policy are analyzed and alternative monetary policy strategies compared. This research has provided valuable insights into how shocks to fundamentals affect housing, the overall economy, and the proper role of monetary policy to accommodate

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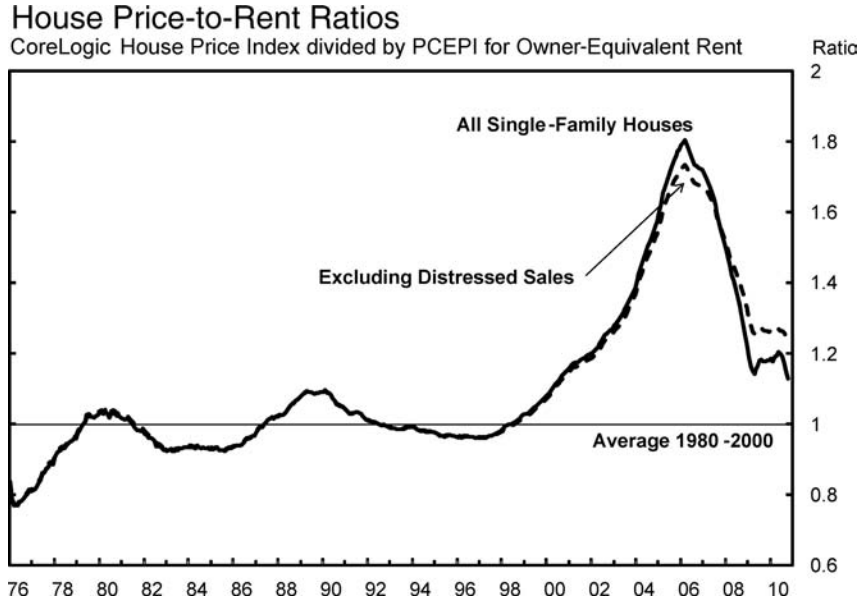
or offset these shocks, assuming agents have full information about fundamentals and form rational expectations.

But, at the end of the day, this line of research sidesteps what I believe is the critical $6 trillion question, where $6 trillion refers to the loss in U.S. household owner-occupied housing wealth between its peak in the fourth quarter of 2006 and the most recent value in the third quarter of 2010. Specifically, what factors contributed the massive run-up in house prices in the United States and many other countries over the past decade and what should monetary and supervisory policies have done about it? In this note I will argue that at least part of the answer to these questions lies outside the complete-information, rational expectations framework assumed in much of the recent research that examines the events of the past decade.

Economists have long recognized and studied the effects of house prices on the macroeconomy. Early contributions include Ando and Modigliani (1963) and Modigliani and Brumberg (1980), who analyzed the wealth effect on consumer spending. This channel is incorporated in many large-scale macroeconometric models that have been and continue to be used at central banks and elsewhere, including, for example, the Federal Reserve Board's FRB/US model (see Brayton et al. 1997). But, in the optimizing-agent DSGE models that have been developed and adopted at many central banks over the past decade, changes in house prices typically have little or no implications for the economy. Indeed, in the absence of financial frictions, these models tell us that house prices, like all asset prices, reflect economic fundamentals and have no effects on consumer spending or anything else, except to the extent that the change in house prices reflects changes in technology or preferences. More generally, in such models, the path of causation runs from the economy to asset prices, not the other way around.

Models with financial frictions provide an important channel by which changes in asset prices affect net wealth and thereby the collateral available for borrowing (see, for example, Bernanke, Gertler, and Gilchrist 1999; Aoki, Proudman, and Vlieghe 2004; Kajuth 2010; and references therein). Such models provide keen insights into the accelerator mechanisms associated with financial frictions and the effects of asset price changes on the availability of credit and on spending and represent a crucial element in future research in this area.

Figure 1. The Great Housing Bubble in the United States



Note: Ratios rescaled such that the average from 1980 to 2000 equals 1.

Despite these important strides in modeling the effects of the housing sector and housing finance on the macroeconomy, most existing macroeconomic models remain largely silent on the sources of and policy implications of extraordinary asset price movements of the type that many countries actually experienced. Figure 1 shows the ratio of house prices to rent in the United States, which reached an all-time peak of 80 percent above its long-run average in March 2006.[1] Between March 2002 and March 2006, the house price-to-rent ratio shot up by more than 10 percent per year on average. Such a massive rise in the house price-to-rent ratio is extremely difficult to generate in an optimizing-agent DSGE model with rational expectations. These models generally preclude the possibility of non-fundamental sources of movements in asset prices, such as bubbles,

[1] According to Shiller's (2005) time series of real U.S. house prices, the house price boom of the 2000s is the largest on record going back to the late nineteenth century.

and by extension preclude a role for monetary or supervisory policy to affect the development of asset price movements not driven by fundamentals.

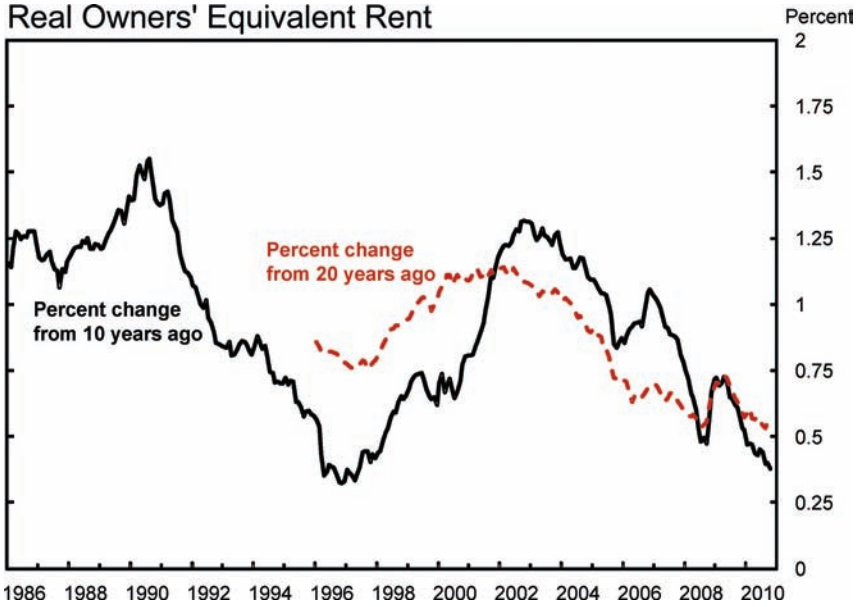
To confront the $6 trillion question in a serious way, we need models that allow asset price bubbles to develop and that include all channels by which monetary and supervisory policies affect asset prices, credit flows, and the real economy. Importantly, this must include endogenous dynamics—not just exogenous shocks—that can lead to asset price and credit run-ups and crashes. One promising approach, studied by Adam, Marcet, and Nicolini (2007) and Lansing (2010), assumes that agents do not have perfect information about economic fundamentals, but instead "learn" through experience. According to this learning approach, agents make rational, optimal decisions based on available information, but the information they possess at any point in time may be sending misleading signals regarding fundamentals.

The learning approach provides a potentially powerful propagation mechanism from economic shocks to large, sustained house price movements. According to standard asset pricing theory, the value of a house depends on the service flow from owning the house (rent), the after-tax interest cost, and expected economic appreciation (after deducting physical depreciation). Under complete information and rational expectations, expected appreciation is tied down by economic fundamentals—in particular, expected future real rents—and a transversality condition. But, in models with learning, agents' forecasts are not necessarily restricted in this way. Instead, agents may use simple forecasting rules based on past empirical observations. Importantly, such models yield asset prices that may deviate substantially from "true" fundamentals, especially following large shocks.

So, what does the learning model have to say about the U.S. housing bubble? First, you need a chain of events to get the ball rolling. In the case of the United States, potential candidates include the strong growth in housing demand that drove up real rents, innovations in mortgage finance, and low mortgage rates.[2] The learning

[2]See also Aspachs-Bracons and Rabanal (2011), who describe fundamental factors that drove up housing demand in Spain. See Taylor (2007) for a discussion of the effects of interest rates on the U.S. housing sector.

Figure 2. Trend Real Rents



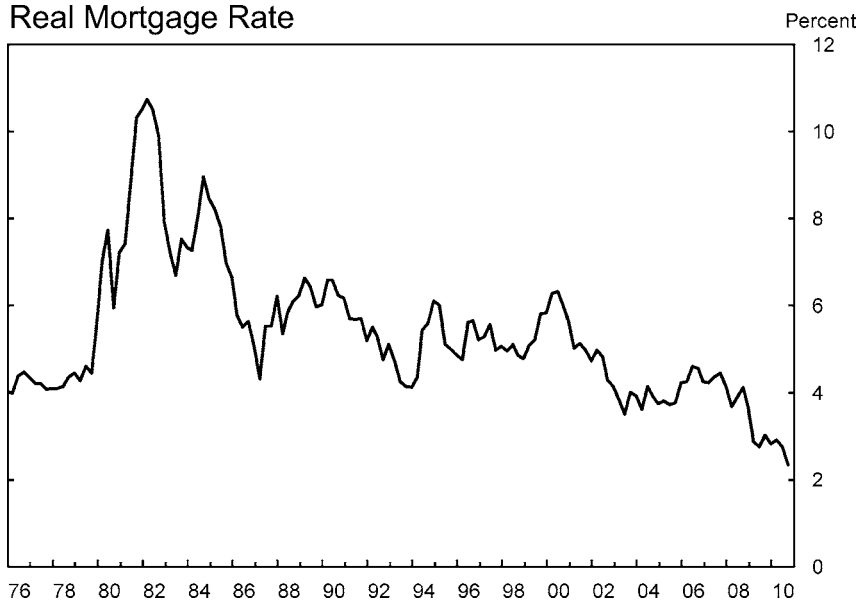
Note: Real OER is the PCE Imputed Rental of Owner-Occupied Non-Farm Housing Price Index divided by the overall PCEPI.

process then propagates and amplifies the shocks, potentially generating much larger swings in house prices than implied by the shift in fundamentals if knowledge were complete.

Trend real house rents accelerated in the late 1990s and early 2000s. The solid line in figure 2 shows the ten-year average annual growth rate of real owner-equivalent rents in the United States. From the mid-1990s to the early 2000s, this figure increased by 1 percentage point. Such an increase in the rate of growth, if viewed as permanent, implies a sizable increase in the equilibrium value of houses.[3] If the trend is instead measured by the twenty-year

[3]For example, consider the textbook Gordon (1959) formula for asset prices. Assume a 6 percent real required return on housing. The implied price-to-rent ratio for 0.25 percent growth in real rents is 17.4. The implied price-to-rent ratio for 1.25 percent growth in real rents is 21.1. Holding the current level of rents constant, the 1-percentage-point increase in the trend growth rate of real rents implies a 21 percent increase in house prices.

Figure 3. Real Mortgage Rates Decline in the 2000s



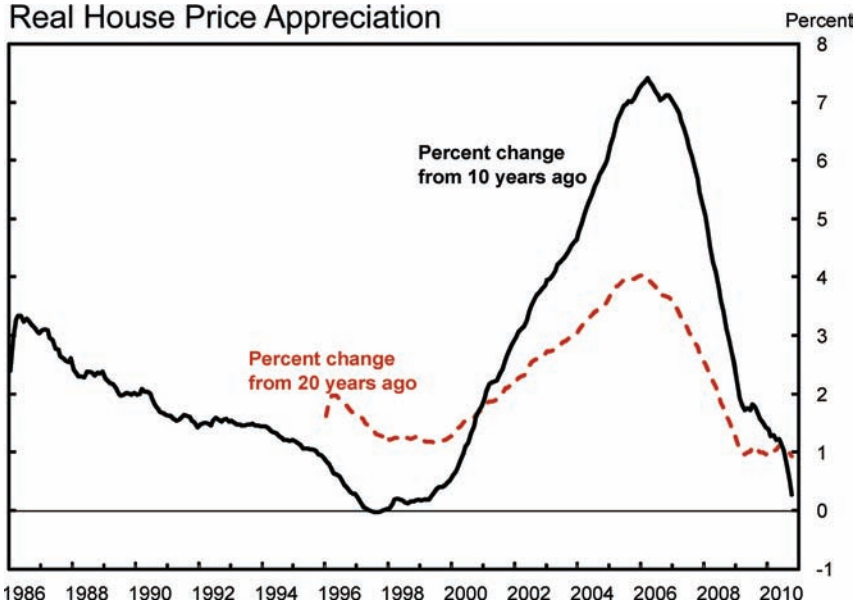
Note: Real mortgage rate is the conventional thirty-year mortgage rate less ten-year expected inflation (PTR) from the FRB/US model.

average annual growth rate (shown by the dashed line), the increase is only about one-third as large, but still implies a significant positive impulse to house prices.

Greater credit availability and low mortgage rates also likely contributed to the rise in house prices during the 2000s. Financial innovation in the form of increased securitization of non-conforming mortgages increased credit availability and arguably reduced costs of borrowing. Moreover, real mortgage rates for conforming loans fell by about a percentage point in the early 2000s, as seen in figure 3.[4] Taken together, these three factors could explain a sizable increase in the equilibrium value of house prices, but one that falls well short of the 80 percent increase in the house price-to-rent ratio actually observed.

[4]In computing real mortgage rates for figure 3, the measure of long-run inflation expectations from the Federal Reserve Board's FRB/US model is used as a proxy for expected inflation.

Figure 4. A Self-Reinforcing Bubble



Note: Real house prices are CoreLogic National Price Index divided by the PCEPI.

It is at this stage of the process that the learning model may play a key role in amplifying and propagating changes in fundamentals into a massive, runaway bubble. Figure 4 shows the ten- and twenty-year average growth rates of real house prices in the United States. Up until the end of the 1990s, trend real house price appreciation averaged about 1 percent. But, once house prices started rising in the late 1990s and early 2000s, this figure rose dramatically. Agents may have incorrectly extrapolated future real house price gains based on past performance. This increase in the expected future rate of house price appreciation raised the perceived value of houses, calling forth a further increase in the market prices for houses, and so on. Of course, in a full-information, rational expectations model, such a process of "irrational exuberance" will not take hold because agents know the true value of assets. But, in a world of imperfect information, agents do not know the true value of asset prices and must base their estimates on the information they have at hand.

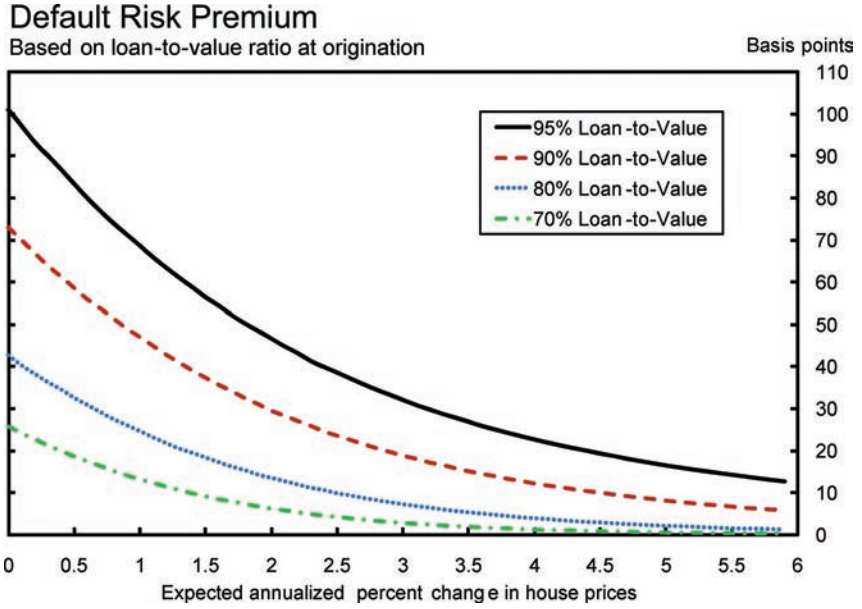
The preceding discussion provides a potential explanation of why households were willing to pay the very high prices for houses during the boom. But why did lenders agree to finance these high prices? After all, if lenders (or investors in mortgage-backed securities) recognized that houses were overvalued, they should have demanded a larger risk premium to compensate them for the higher probability that underwater borrowers would default. The learning model provides a possible answer to this question as well. If lenders followed the same learning algorithm as home buyers and became more optimistic about the rate of growth of future house price increases, then their perception of the probability of default and the associated equilibrium risk premium on mortgages would decline.

According to real option theory, the key factors determining whether a borrower will default are the loan-to-value ratio (LTV) at the time of the loan, the expected trend growth rate and variance of changes in house prices, and the costs associated with default. If the trend growth rate of house prices increases, the probability of default declines and the risk premium demanded by lenders declines as well. Figure 5 plots the risk-neutral risk premium for mortgages as a function of the initial loan-to-value ratios and the expected rate of increase in house prices, using the model of Krainer, LeRoy, and O (2009). As seen in the figure, the risk spread differentials for different LTV ratios shrink as the rate of growth of house prices increases. According to this model, optimistic lenders who base their expectations of future house price gains on past trends rationally make high-LTV loans with very narrow risk premiums.

The perception that defaults would likely remain low was reinforced by the data on mortgage delinquencies. Figure 6 shows the rate of seriously delinquent subprime mortgages over the past decade. During the period of the boom, the subprime delinquency rates remained relatively low. With house prices rising, borrowers were generally able to sell their houses at a profit and pay off their loans, which masked the looming problems in this sector. Of course, in the end, the assumption that real house prices would continue to rise several percent per year proved horribly wrong, and large-scale defaults did occur.

In the learning model, the development of what eventually proves to be a house price bubble is an endogenous reaction to economic events. Therefore, unlike models where the bubble is assumed to be

Figure 5. Real Option Model Implied Risk Spreads

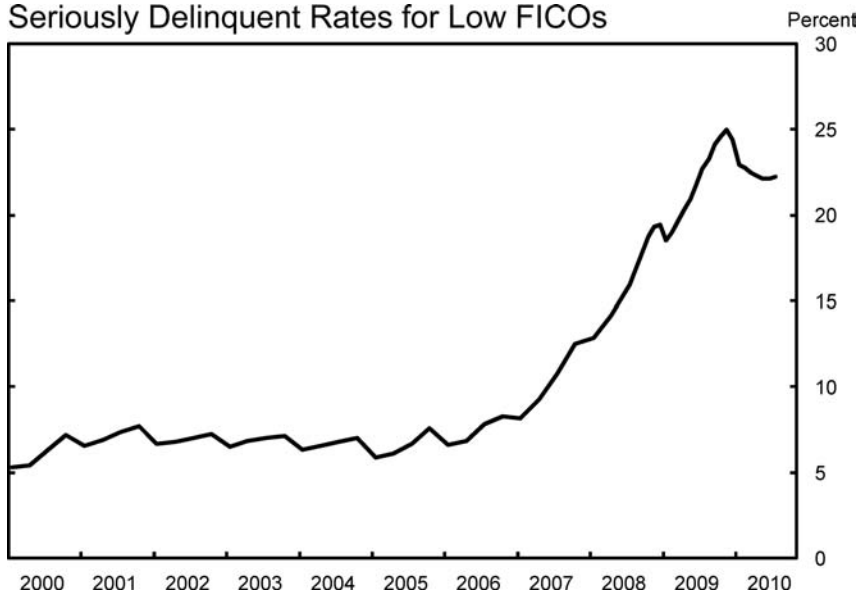


Notes: Based on Krainer, LeRoy, and O (2009). Ten percent volatility of house price changes; six percent borrower rate-of-time preference.

an exogenous process, monetary policy can affect whether a bubble builds up in the first place and can affect the speed at which it deflates. In addition, regulation and supervisory policy can affect the availability of loans during a boom, potentially restricting the supply of funds financing a bubble. Such models raise a number of interesting issues regarding the appropriate design of policies designed to avoid the formation of asset price bubbles and stabilize the economy and the financial system.

A multitude of factors contributed to the housing booms and crashes and the ensuing global financial crisis. There has been an outpouring of research on these issues. Given the extraordinary rise and fall in house prices in several countries and numerous past experiences with bubbles, models with imperfect knowledge and learning provide a potentially rich avenue for research. Such models open up an avenue for the endogenous emergence of bubble-like behavior and also provide opportunities for various policies to influence

Figure 6. The Housing Bubble Masked Looming Problems



Source: LPS Applied Analytics.
Notes: First liens only. Seriously delinquent is sixty-plus days past due or in foreclosure. Low FICO score is FICO less than or equal to 660.

the development of bubbles. Still, there are many unanswered questions about the events of the past decade, and researchers will be plumbing these issues for decades to come.

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