The Fed and the Housing Boom

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1. Introduction

The housing market has become a worldwide obsession. Discussions about house prices pop up in academia, policy circles, lunchtime discussions and cocktail parties. Having bought myself a home less than one year ago, and having done academic and layman's research on this issue, I find myself in the epicenter of this obsession.

This paper is about the relationship about monetary policy and the real estate market, but will touch upon other important issues along the way. Understanding the relationship between monetary actions and the housing market requires in fact that we make sense of have monetary actions transmit to the real economy, of how changes in the housing market affect monetary policy actions, of how the monetary policy stance affects the link between real estate and the macroeconomy.

Before we move to these issues, it turns convenient to briefly review the amazing performance of (quality-adjusted) house prices in the United States in the last 35 years. Figure 1 plots house prices in real terms starting in 1970, normalizing their initial value at 100. Although the path over time of house prices appears to have been irregular, one aspect that immediately stands out is that house prices in the United States have been on an upward trend well before the recent boom. A house bought in 1970 in the United States for 100 dollars could have been sold at the end of 2005 for twice as much, after adjusting for inflation.[2] Data from other countries (perhaps with the well-known exceptions of

[1] The results in the Section 4 are based on work in progress on the role of housing collateral in business fluctuations in an estimated two-sector model. Interested readers can email me for a copy of the research paper.
[2] Just in case you wonder: 100 dollars invested in the Dow Jones Industrial Average Index in 1970 would have generated 350 dollars in 2005, after adjusting for inflation. The comparison, of course, underestimates the returns to housing: including dividends in the form of rents makes housing returns very attractive compared to stocks. For instance, a rental

Germany and Japan) confirm this piece of evidence. Even more strikingly, data spanning as far back as the beginning of last century tell similar stories. That is, in most developed economies throughout the 20th century, house prices have been on a constant upward trend, both in nominal and in real terms.[3] This piece of evidence is something to keep in mind when trying to loosely connect the stance of monetary policy with long-run trends in house values. Although real long-term interest rates have been falling for the last 15 years (see Figure 2), for instance, the long-run increase in house values appears to go back much farther. To give an idea, Eitrheim and Erlandsen (2004)[4] have compiled a house price index for Norway based on repeat sales starting in 1819. Their real house price index has increased in real terms by 260% between 1819 and 2003, and has been rising for most of the sample period.

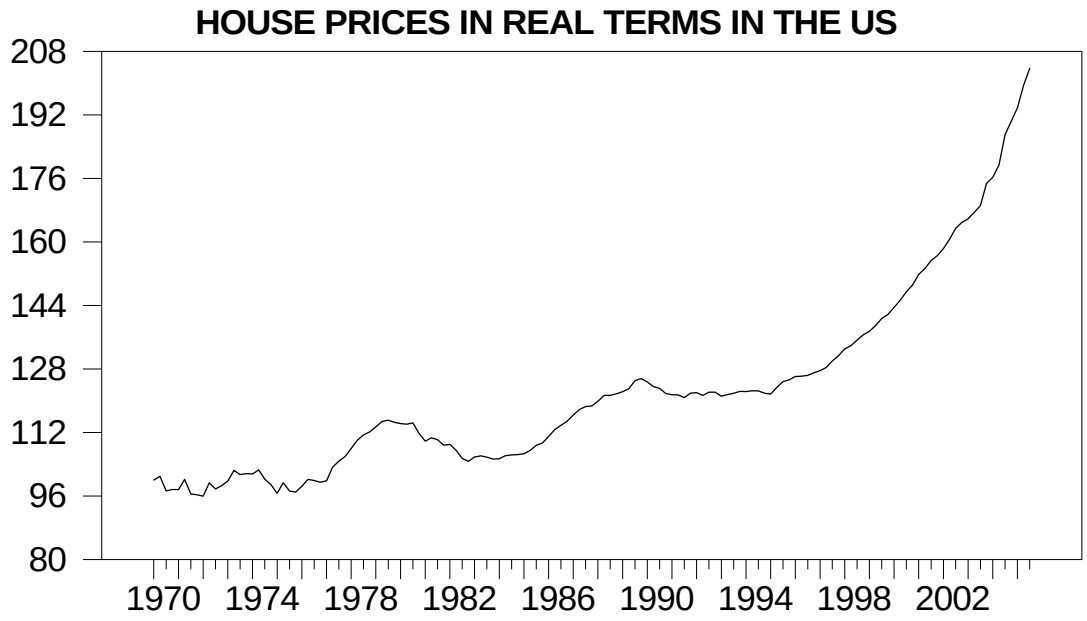

Figure 1: House prices (source: OFHEO) in real terms (1970=100).

Casual observations of the experience of most developed economies over shorter horizons confirms that this long-run trend appears far from being over. In this paper, I will cover mostly the U.S. experience, but it is conceivable to assume that most of the arguments apply to other developed economies as well.

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income (net of taxes, depreciation and maintenaince) of 1.5% per year since 1970 would have equated the returns on housing and on the Dow. Typically, rental income is estimated to be somewhat larger, of the order of 4% a year (see Englund, Hwang and Quigley, 2000, "Hedging Housing Risk").

[3] See for instance Miles (1992).

[4] See Eitrheim, Ø. and S. Erlandsen (2004). "House price indices for Norway 1819-2003", 349-376, Chapter 9 in Eitrheim, Ø., J.T. Klovland and J.F. Qvigstad (eds.), Historical Monetary Statistics for Norway 1819-2003, Norges Bank Occasional Papers no. 35, Oslo, 2004.

Despite this evidence, the experience of the last 10 or 15 years in many developed economies appears somewhat more puzzling. The main reason is that the growth rate of house prices has increased, despite any significant increase in the growth rate of many other macroeconomic variables. It is this therefore important to understand what risks the acceleration in house price inflation poses for the macroeconomy.

In 1998, I started my research on monetary policy and house prices motivated and stimulated by a quote I found in *The Economist* stating that, "while central banks have been able to declare the battle for 'price stability' won, there are growing doubts about whether they have been neglecting other sorts of inflation, especially in asset prices" (November 14, 1998). At that time, the increase in house prices in real terms relative to the 1980 baseline had been about 20%, that is a mere 1% per year: that increase already seemed puzzling and difficult to justify. Since then, house prices have risen a further 40% in real terms in the space of more or less seven years, puzzling economists, central bankers, and ordinary people alike.

2. The trend behavior of house prices

When economists try to explain the behavior of macroeconomic variables, they usually try to separate trends from cycles. The economics profession tends to agree that the stance of monetary policy cannot say much about the trends: technological changes, financial innovation, regulation, the propensity to save out of current income seem in general better candidates to explain long-run trends in quantities and the relative price of various goods.

We have instead a long list of candidates that can account for the cycle: monetary factors, demand factors, short-run changes in productivity, oil shocks, shifts in preferences, and so on.

I have shown in Figure 1 quality-adjusted data for house prices in the U.S since 1970. As the picture has shown, the data show an increase in the real price of housing over time. Figure 2 focuses on a shorter horizon (the last 25 years) to put the increase in house prices in a slightly broader perspective. To this purpose, it compares several macroeconomic variables for the period 1980-2005, normalizing the real variables to 100 in 1970.

In the last 25 years, annualized GDP has risen by 114% in real terms (that is, about 3% a year). The price index for residential investment (a rough measure of the cost of building new homes) has increased by 18% relative to the GDP deflator: that is an important candidate in explaining at least part of the secular increase in home values. Housing construction is in fact very labor intensive and technological advancements in the construction sector are less frequent than in other sectors of the economy.

Residential investment has risen by 125% in real terms (with a striking acceleration in the last 5 years: more on this below): prima facie, this evidence would seem to suggest that, despite the increase in construction costs, construction of new homes has kept pace with economic activity. Yet using

residential investment as a proxy for the physical quantity of housing is perhaps misleading. One item in the residential investment category is brokers' commissions on sale of structures. As a fraction of residential investment, brokers' commissions were 5% in the 1960's, 9% at the beginning of the 1980s, and 14.5% in the 2004. Once brokers' commission are taken out (as in Figure 3), residential investment as a share of GDP seems to be trending down since 1950's. It is realistic to conclude that the data signal that the quantity of housing is not keeping pace with the growth in real incomes. This is also shown in the bottom right panel of Figure 2, which shows housing wealth divided by GDP using Flow of Funds data (solid line): the dashed line plots housing wealth had housing prices remained constant, and shows how the quantity of housing relative to GDP is actually declining.

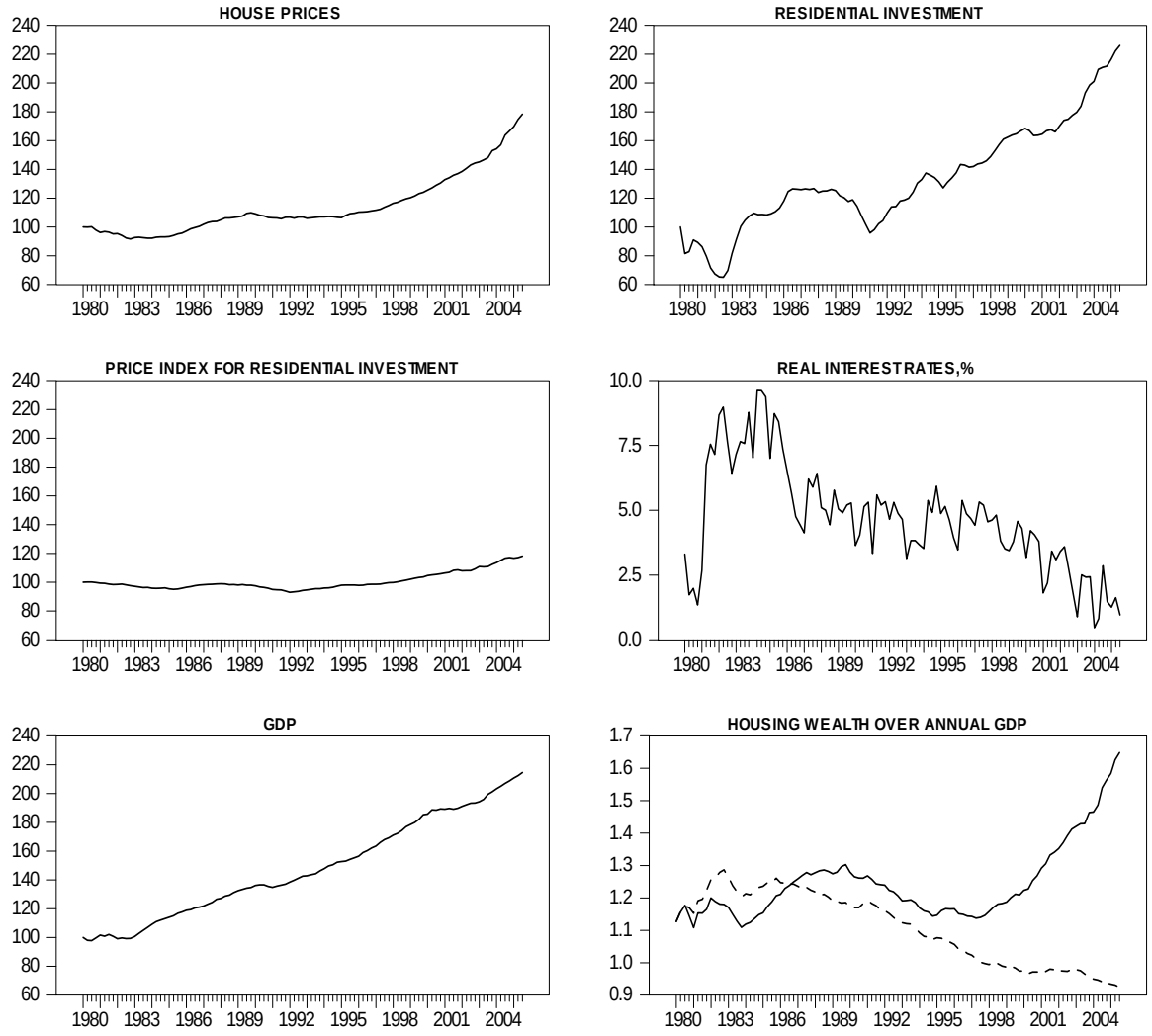

Figure 2: Real House Prices and other macro variables in the United States, 1980-2005. House prices, GDP, residential investment and the price index for residential investment are normalized to 100 in 1980. The real interest rates are in percentage points. The bottom-right panel is the ratio of households housing wealth over annual GDP (the dashed line is the same ratio if house prices had remained constant in real terms).

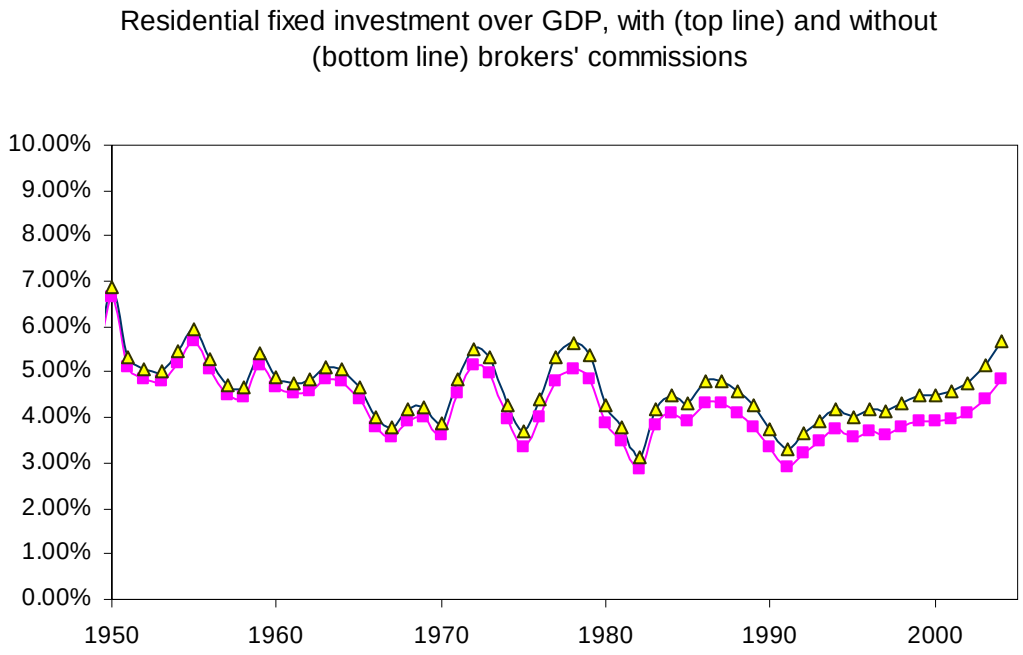

Figure 3: Residential investment as a share of GDP.

The facts above seem to highlight that the long-run supply curve for housing is not flat. Other factors that might be consistent with the trend have to do with regulation. Glaeser, Gyourko, and Saks (2005)[5] cite regulatory obstacles, such as stiffer zoning laws and the ability of existing owners to prevent new construction, as a primary reason why housing prices have risen so much since the 1970s.

One can easily add to this list other factors, such as demographics (the baby boomers of the 1960s) and financial innovation which has made mortgage lending easier and the secondary market for mortgages more liquid. All these factors can contribute to changes in housing values over longer horizons.

It is hard to believe that these factors will be reversed in the foreseeable future, although changes in some of these factors might affect how fast house prices will continue to rise. In my impression, however, it is safe to assume that long-run trends in real house prices are upwards, and this can be explained by the fact that faster technological progress in the non-housing sector, the scarcity of land in the areas where people want to live and increased regulation will continue to drive house prices up.

[5] See Glaeser, E., J. Gyourko, and R. Saks. (2004). "Why Have House Prices Gone Up?" Harvard University working paper.

3. The cyclical behavior of the housing market, and the role of monetary policy

So where is monetary policy? Once we set the long-run trends aside, one thing that immediately stands out is strong cyclical nature and the strong volatility of the housing market. At business cycle frequencies, it is well known that both residential investment and house prices are more volatile than real incomes.

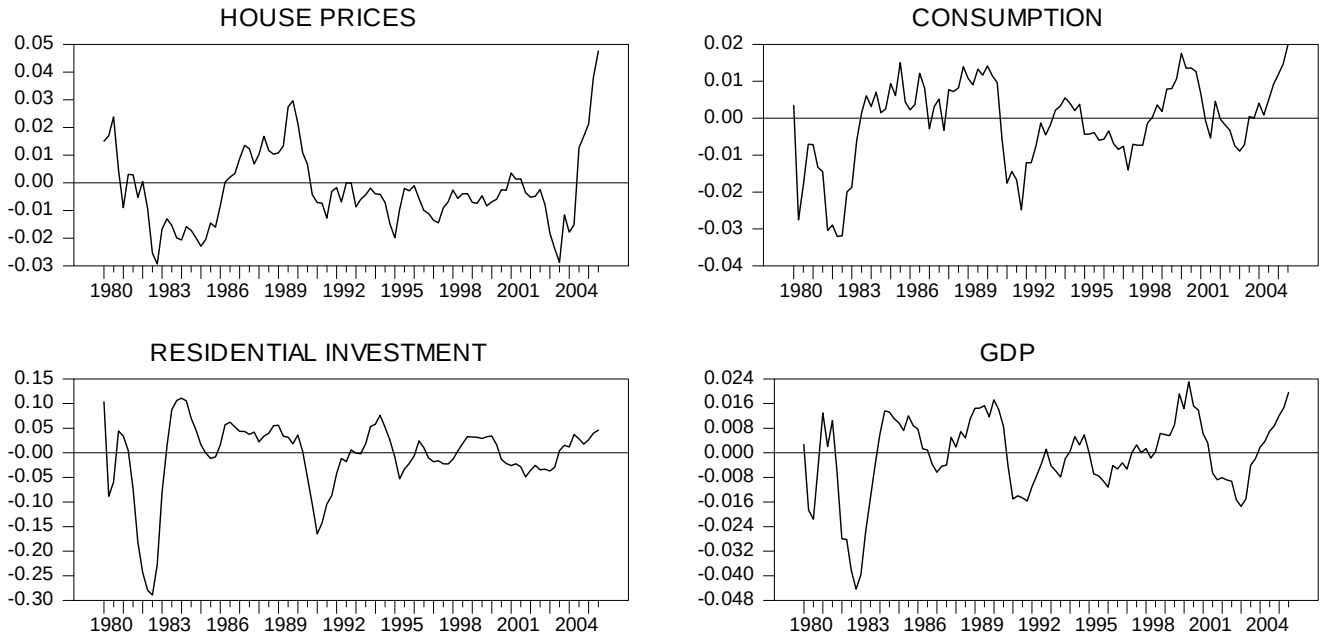

Figure 4: House prices, consumption, residential investment and GDP relative to trend. Vertical axis measures percent deviations from trend. All variables are in real terms. House prices have been deflated with the GDP deflator. Source of data: OFHEO for house prices. BEA for all other variables.

For instance, in Figure 4 I have removed the trends in consumption expenditure, real housing prices, housing investment and GDP[6] and I have plotted percentage deviation from trend of these variables. Aside from the strong volatility and cyclicality of the housing market, an immediate observation looking at the latest data is that house prices look, as of today, unusually high. As of the third quarter of 2005, house prices were about 5% higher than their long-run trend in real terms: to give an idea, if they were to return to their average path in just one year, this would correspond to a drop in nominal terms of about 8%, assuming 3% inflation. The increase in house prices is occurring in a period characterized also by higher consumption, higher economic activity, and higher investment, and despite short-term nominal interest rates (not shown in the Figure) being slightly above trend.

[6] The trend has been removed by applying a band-pass filter that isolates frequencies between 2 and 32 quarters as business cycle frequencies.

A natural question to ask is: what has prompted the rise in house prices of the last couple of years? A cursory look to the business press and to some academic papers points out to the usual suspects, in the following order of importance:

1) BUBBLES (243,000 Google web hits and 73 Google news hits[7]): House prices are high because there is a bubble: this means that no fundamental factor has driven house prices up, only self-fulfilling expectations of future gains from holding homes.

2) LOW INTEREST RATES (144,000 web hits and 52 news hits): House prices have increased because interest rates have fallen.

3) STRONG ECONOMY (15,600 web hits and 4 news hits): House prices have increased because high incomes have fuelled the demand for homes.

4) PREFERENCE SHIFTS: (62 web hits): House prices have increased because in recent years people have shifted their preferences from consumption goods towards housing: for instance, they go less frequently on holiday and to the restaurant and save the money to bid higher on their dream home.

These arguments are suggestive and are not mutually exclusive. Because I am a macroeconomist, my way of making sense of them to use formal econometrics and formal economic theory to give an unbiased account of their relative importance.

The purpose of the next section is therefore is use a formal dynamic stochastic equilibrium model[8] (which builds upon and extends the work by Iacoviello, 2005), to estimate the structural parameters of this model, and to assess what are the potential causes of the run-up in house prices and housing investment of the last few years.

In the next subsection, I first provide an informal overview of the model. I then describe some of the model results and what the model says about the recent housing boom.

Building blocks of the model

The foundation of the model is a standard dynamic new-keynesian framework.[9] The most important sectors are households and businesses. Agents are infinitely lived; they work, consume, save and invest. There is a central bank that manages monetary policy. Agents can invest in two technologies: they can either produce the final consumption-investment good, or produce new houses. All agents can finance their activities through equity (internal funds) or through access to the capital market, borrowing at the risk-free nominal interest rate.

[7] Obtained on January 14, 2006, by using the search terms << "house prices" bubbles >>: similarly for the other candidates.
[8] Iacoviello, Matteo (2006), "The role of housing collateral in an estimated two-sector model"
[9] See for instance Clarida, Gali and Gertler (1999). "The Science of Monetary Policy: A New Keynesian Perspective", Journal of Economic Literature

Following most of the literature, I assume the existence of staggered price setting. The resulting price stickiness allows monetary policy to have real effects on the economy through changes in the nominal interest rate.

An important feature of the model is that a fraction of the agents face liquidity constraints: in equilibrium, they would like to borrow more, but they are constrained in doing so by the amount of real resources they can pledge to lenders as collateral. This way, procyclical changes in the financial conditions of the borrowers (for instance, exogenous increases in house prices) translate into wider credit availability, and can potentially have real effects on the economy.

In the model, various disturbances compete as sources of business fluctuations. To make the discussion more concrete, I list them here:

1) Monetary shocks: one can interpret these shocks as random changes in the action of the central bank.

2) Shocks to demand for housing: these disturbances can stand in for a wide variety of shocks that shift the demand from non-housing goods (like good, movies, clothing and sports cars) towards housing. These shocks might stem from demographics, tax changes, or pure preference shifts.

3) Shocks to productivity. These shocks stand in for improvements in the overall technology. Good policies, good weather, good luck (and bad things such as war) are all reasons that can allow society to produce more goods (or less) for given capital and hours worked.

4) Shocks to productivity in the housing market. One can interpret these shocks as changes in the relative efficiency of the resources used to produce houses. For instance, advances in construction technology.

5) Shocks to inflation (like oil shocks).

6) Shocks to the availability of credit.

7) Shocks to preferences. For instance, agents become eager to buy goods and decide that it is time to spend money now, rather than another day.

The model therefore allows for lots of action, all coming from different sources. To understand the effects of the shocks do requires some understanding of macroeconomics but also a lot of common sense. In what follows, having described what these shocks are, I move on to describing what these shocks do.

1) Consider an adverse monetary shock. With sticky prices, an increase in short-term interest rates leads to a rise in real rates. Aggregate demand falls. The decline is stronger in interest-sensitive sectors of the economy like housing, because the demand for housing depends directly on the user cost. Therefore, both real housing prices and housing investment fall.

2) Consider now a shock to the demand for housing services. What would happen, in other words, if we all were to wake up one day and decide that we prefer to eat less food and instead want to live in nicer homes? Not surprisingly, the price of housing would go up, and the price of food would go down. Because we can also construct bigger homes, housing investment will increase. At the same time, however, the wealth effects of changes in housing prices kick in: the increase in house prices allows some agents to borrow and to spend more. These feedback effects imply that residential investment rises, consumption of non-housing goods temporarily increases, while goods inflation stays roughly unchanged.

3) A general technology advancement (if you wish, you can think of the productivity boom of the 1990s) will instead drive up aggregate output, consumption and housing investment. While goods prices fall, house prices go up.

4) A productivity shock specific to the housing market moves housing investment up and housing prices down. Intuitively, this is tantamount to say that constructing new homes is now easier. For the market to absorb the increased supply, the price of houses must fall.

5) Positive inflation surprises have a contractionary effect on the economy, depressing the supply of goods available to consumers.

6) Shocks to the availability of credit allow some agents to borrow and to spend more, and can generate positive effects on economic activity.

7) Positive shocks to demand lead to a rise in goods inflation and to a drop in asset price inflation. Intuitively, as agents value the future less, they will prefer to buy less durables (like housing) and to buy more stuff that satisfies their short-term needs.

This is a long (and perhaps) boring list, but it is important to understand why it is there in light of three important considerations.

1) A lot of research in macroeconomics has highlighted in recent decades that the one-shock-fits-all explanation of business cycles is almost dead. That is, it is too simplistic to assume that whatever the cause of business cycles, it must come from either demand disturbances only (as in the Keynesian tradition) or from supply disturbances only (as in the classical tradition).

2) In addition, recent advances in macroeconomic thinking have pointed out that explanations of business cycles not based on an underlying economic model are likely to be flawed.

3) Finally, any credible explanation of business fluctuations must account for the possibility that several potential candidates might have a role in explaining business cycle dynamics.

In light of these remarks, an advantage of the model is that it allows me to take a neutral stance on the sources of house prices fluctuations and to give a structural interpretation of what has driven the real estate market in the last 25 years, what role monetary policy has played, and where the housing market in the United States is headed in the near future. But, despite the fact that the

discussion in what follows will be very informal, it is important to acknowledge that it will be guided by the results of a *formal* macroeconomic model.

4. House prices movements and the Fed

One can combine the actual data and the theoretical model to let the data tell which model specification fits the data best. At that point, the theoretical model becomes an estimated model, and the estimated model can then be used as a laboratory to conduct a variety of experiments. An advantage of the estimated model is that not only does it offer an explanation of the causes of house price fluctuations over the cycle, but it also gives the possibility to run counterfactuals: being solidly grounded and microfounded, the model is robust to the so-called Lucas' critique more than the traditional, non-model based econometric exercises.

In particular, I focus next on four questions:

1) What are the driving sources of house price fluctuations at business cycle frequencies?

2) Why have house prices gone up so much in the last couple of years?

3) Could the Fed have prevented the rise in house prices? At which cost?

4) What would happens if house prices were to suddenly drop from their current levels?

In what follows, I will provide some answers to the above questions.

1) Random changes in preferences towards housing and productivity shocks in the non-housing sector are the main source of house price fluctuations in the last 25 years. Shocks in the non-housing sector drive up housing prices and economic activity (that is, output, consumption and investment), and lead to a slight decline in inflation. Shocks to the preferences towards housing lead to a direct effect on the price and the quantity of housing, and feed back to aggregate economic activity to higher investment and higher consumption, via the collateral effects already described in Iacoviello (2005).[10] Although any "accounting" exercise is complicated by the model's identification assumptions, a rough estimate seems to attribute about 40% of house price fluctuations to technology shocks, and about 25% to housing preference shocks. The remaining model shocks explain the rest, although to a lesser amount.

2) Figure 5 offers a reading key for the recent cyclical boom of the housing market in the United States over the last couple of years. By construction, the estimated model disturbances (to preferences, inflation, credit, monetary policy and technology) can account for *all* of the fluctuations in house prices over the sample period. Interestingly, one can show that the recent house price boom appears to have been driven by relative preference shocks (even though they have been less important than other shocks over the sample 1980-2005).

[10] Iacoviello, Matteo (2005). "House Prices, Borrowing Constraints and Monetary Policy in the Business Cycle", American Economic Review.

Whatever the deep interpretation of these shocks might be, the results single out housing preference shock as the main cause of the housing boom. Through its effects on residential investment and consumption, this shock has had a non-negligible impact on GDP, accounting roughly for a quarter of the post 9-11 GDP recovery. That is, had house prices not increased, GDP growth would have been about 1% lower. Figure 5 illustrates the model simulations.

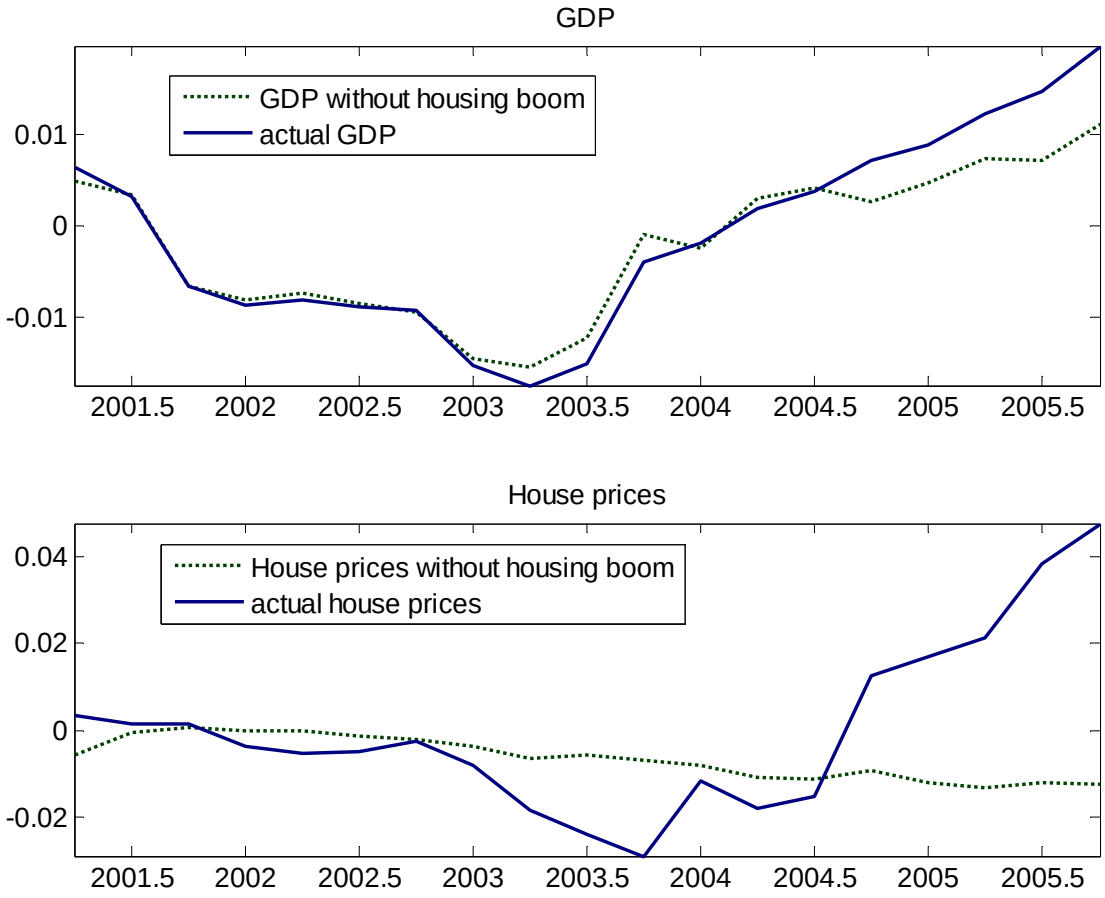

Figure 5: Path of house prices and GDP in the US since 2001. The solid blue lines plot the actual path of detrended house prices and GDP. The dashed green line plots the path of house prices and GDP if the housing boom had not occurred.

3) What about monetary policy? One experiment we can do with the model is to ask: what would have happened had the Fed been more obsessed about inflation?

In the estimated model, the Fed responds to inflation with a coefficient of 1.6 (that is, it raises nominal rates by 1.6 percent for each 1 percent rise in inflation), to output with a coefficient of 0.1.

Suppose we ask now the following question: what would have happened had the Fed being committed to a much stronger response to inflation, for instance with a (very large) coefficient of 3? Or instead, would have happened had the Fed tried to keep house prices constant, by responding directly to house prices movements (say, with a rather large coefficient of 3)?

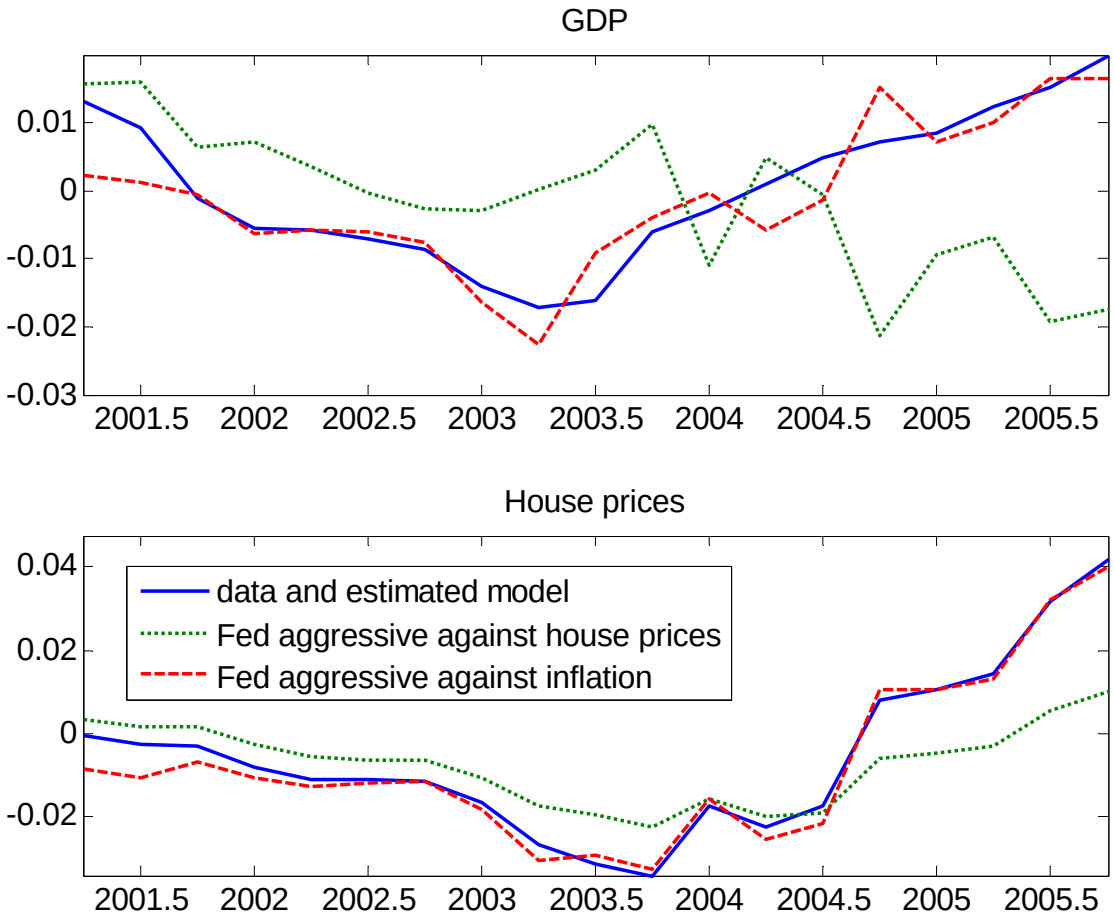

Figure 6: Model simulations and counterfactuals. Solid lines: Model and data. Dashed lines: Model counterfactuals with Fed aggressive against inflation. Dotted lines: Model counterfactuals with Fed aggressive against inflation and against house prices.

With an aggressive inflation response (the dashed lines), the Fed could not have stopped the increase in house prices, and would have made the path of economic recovery in the last couple of years more erratic.

Instead, with an aggressive response to house prices (dotted lines), the Fed could have indeed slowed down the acceleration in house prices. The cost, however, would have been very large in terms of output loss. Figure 5 shows that if the Fed had directly responded to the increase in house prices (through asset price targeting), it would have caused a deep recession.

4) One might be wondering what would happen if house prices were to suddenly drop. Figure 7 presents some simulations results assuming a shift in preferences away from housing that leads to a decline in house price of about 15 percent over a period of less than two years. Through its effects on consumption and residential investment, the drop in house prices could cause a significant decline in economic activity: GDP would fall by 1 percent relative to trend, and would drop by 3% relative to its current value.

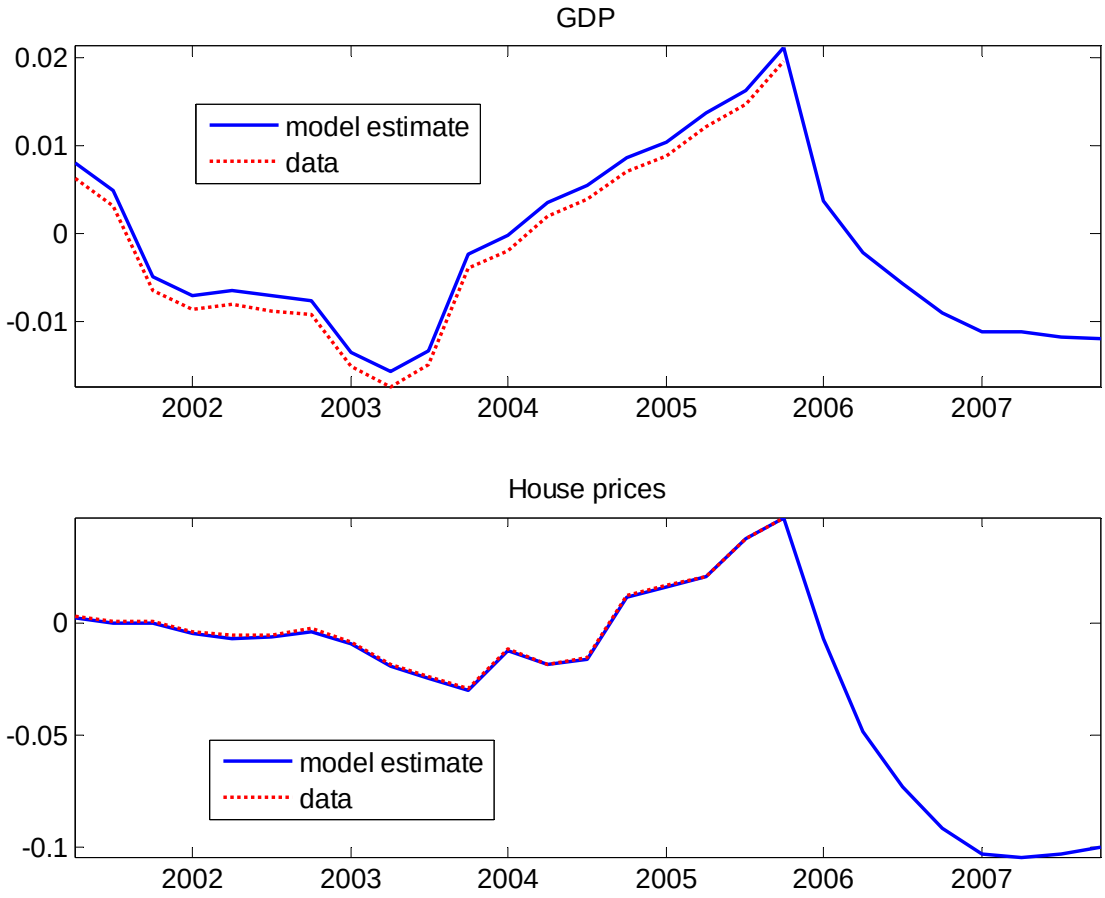

Figure 7: Simulated impact on GDP of a drop in house prices over 6 quarters caused by a shift in preferences away from housing.

5. Conclusions

When thinking about housing and monetary policy, one has to look first at the important distinction between trend and cyclical movements in the housing market.

If we accept the fact that monetary actions have little influence over the economy over the long-run, we have to concede that a chunk of the recent run-up in house prices is only part of a secular

phenomenon that is characterized by a slow but steady rise in the price of housing relative to that of other consumption goods. The scarcity of land (especially in cities), the slower pace of innovation in the construction sector, the tightening of regulatory barriers to new construction, for instance, can make sense of most of the trend rise in housing values.

When we look at business cycle frequencies, one aspect that immediately emerges is that both housing investment and housing prices are very volatile. A question that naturally arises is why this happens, and what are the consequences of this volatility for the wider economy. This is especially important in light of the experience of the United States of the last decades. For instance, detrended house prices have risen in real terms by about 7 percent between 2003 and 2005. In this paper, I have argued that most of this recent increase can be attributed to shifts in preferences away from consumption goods towards housing goods. I have also argued that, had the Fed tried to prevent the increase in house prices, its attempt would have had dramatic negative consequences on economic activity.