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HOUSING AND THE MONETARY TRANSMISSION MECHANISM

Frederic S. Mishkin

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Cambridge, MA 02138
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ABSTRACT

The housing market is of central concern to monetary policy makers. To achieve the dual goals of price stability and maximum sustainable employment, monetary policy makers must understand the role that housing plays in the monetary transmission mechanism if they are to set policy instruments appropriately. In this paper, I examine what we know about the role of housing in the monetary transmission mechanism and then explore the implications of this knowledge for the conduct of monetary policy. I begin with a theoretical and empirical review of the main housing-related channels of the transmission mechanism. These channels include the ways interest rates directly influence the user cost of housing capital, expectations of future house-price movements, and housing supply; and indirectly influence the real economy through standard wealth effects from house prices, balance sheet, credit-channel effects on consumer spending, and balance sheet, credit-channel effects on housing demand. I then consider the interaction of financial stability with the monetary transmission mechanism, and discuss the ways in which the housing sector might be a source of financial instability, and whether such instability could affect the ability of a central bank to stabilize the overall macroeconomy. I conclude with a discussion of two key policy issues. First, how can monetary policy makers deal with the uncertainty with regard to housing-related monetary transmission mechanisms? And second, how can monetary policy best respond to fluctuations in asset prices, especially house prices, and to possible asset-price bubbles?

Frederic S. Mishkin
Governor Frederic Mishkin
Board of Governors of the Federal Reserve System
20th Street and Constitution Ave., N.W.
Room B-2052
Stop 47
Washington, DC 20551
and NBER
frederic.mishkin@frb.gov

The housing market seems to be on everybody's mind these days, and for good reason: Developments in the housing market have a major effect on economic activity. For example, as single-family housing starts in the United States dropped from their peak of 1.84 million units in January 2006 to the current level of 1.15 million units, the accompanying contraction in residential investment is estimated to have lowered the growth of gross domestic product over the last four quarters by a full percentage point. The big gains in housing prices we have seen here and in many other countries (figure 1) have raised concerns about what might happen to economic activity if those price gains are reversed. Developments in the housing market can also affect credit markets. In the United States, rising delinquencies of subprime residential mortgages have led to substantial losses to holders of securities backed by those mortgages and to sharp increases in credit spreads for those securities. Furthermore, problems in the subprime mortgage market have led investors to reassess credit risk and risk pricing, thereby widening spreads in general and weakening the balance sheets of some financial institutions. Fortunately, the overall financial system appears to be in good health, and the U.S. banking system is well positioned to withstand stressful market conditions.

Given its important role in the economy, the housing market is of central concern to monetary policy makers. To achieve the dual goals of promoting price stability and maximum sustainable employment, monetary policy makers must understand the role that housing plays in the monetary transmission mechanism if they are to appropriately set policy instruments.

In this paper, I examine what we know about the role of housing in the monetary transmission mechanism and then explore the implications of this knowledge for the conduct of monetary policy.

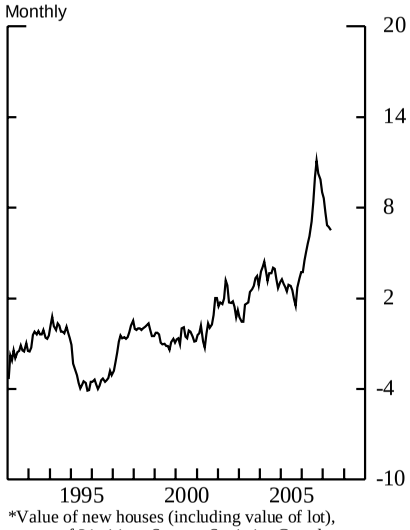
Figure 1: Real House Prices in the Advanced Foreign Economies

(Deflated with CPI; Percent change from year earlier)

Australia*

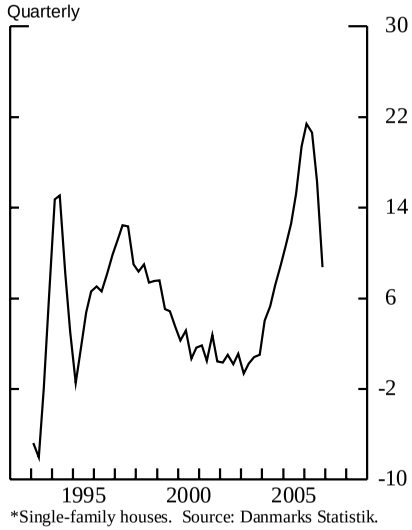
*Established homes, weighted average of 8 cities. Source: Australian Bureau of Statistics.

Canada*



*Value of new houses (including value of lot), survey of 21 cities. Source: Statistics Canada.

Denmark*

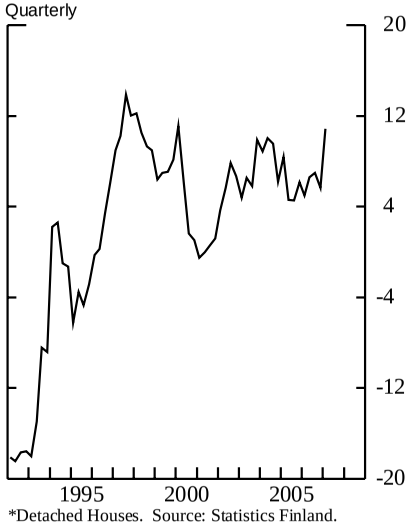


*Single-family houses. Source: Danmarks Statistik.

Euro Area*

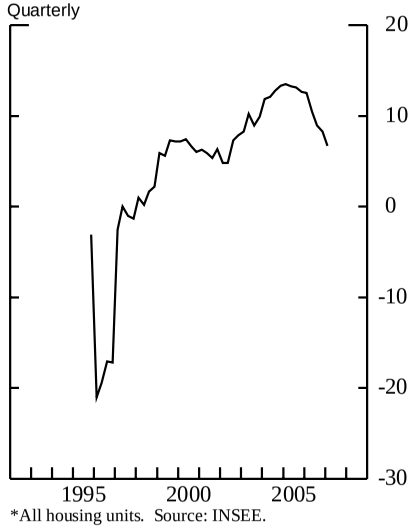
*Residential Property Prices. Source: European Central Bank.

Finland*



*Detached Houses. Source: Statistics Finland.

France*

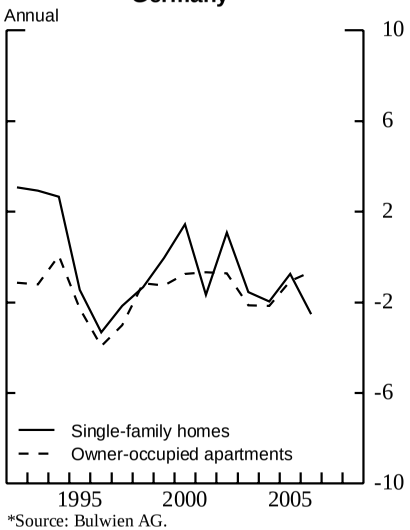


*All housing units. Source: INSEE.

Figure 1: Real House Prices in the Advanced Foreign Economies

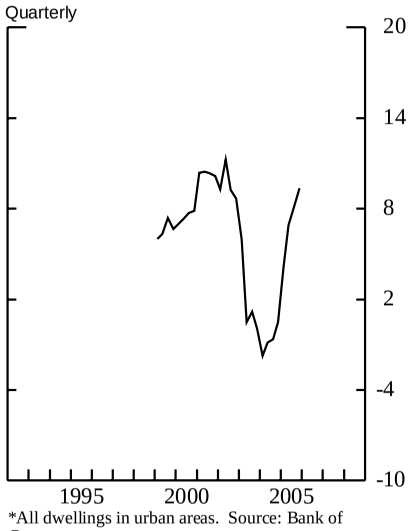
(Deflated with CPI; Percent change from year earlier)

Germany*



*Source: Bulwien AG.

Greece*

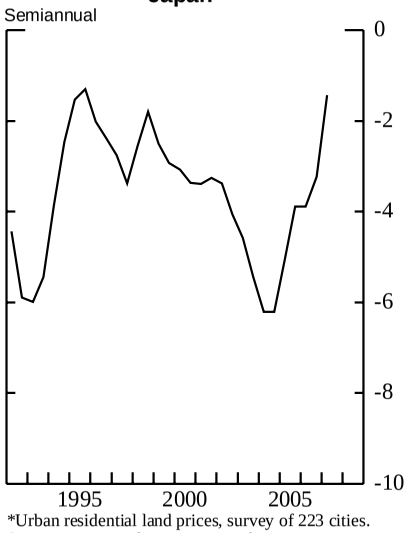


*All dwellings in urban areas. Source: Bank of Greece.

Ireland*

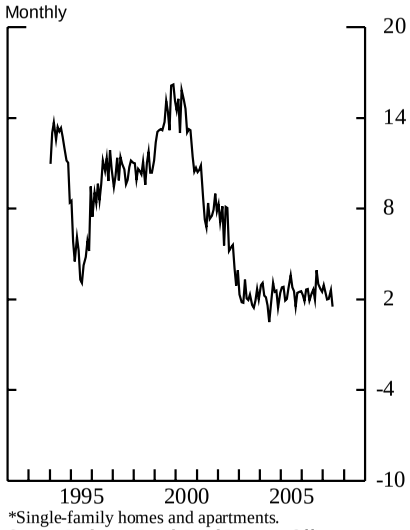
*Source: Department of the Environment, Heritage and Local Government.

Japan*



*Urban residential land prices, survey of 223 cities.
Source: Japan Real Estate Research Institute.

Netherlands*



*Single-family homes and apartments.
Source: Kadaster, Dutch Land Registry Office.

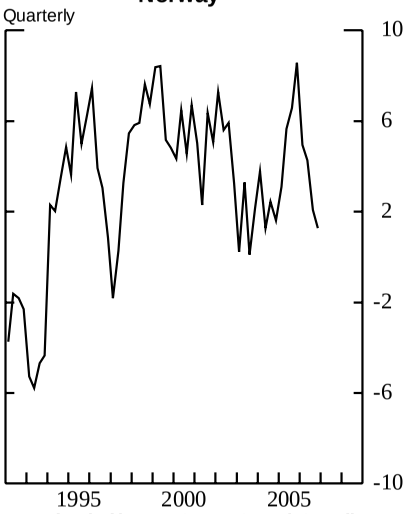
New Zealand*

*All households. Source: Reserve Bank of New Zealand.

Figure 1: Real House Prices in the Advanced Foreign Economies

(Deflated with CPI; Percent change from year earlier)

Norway*

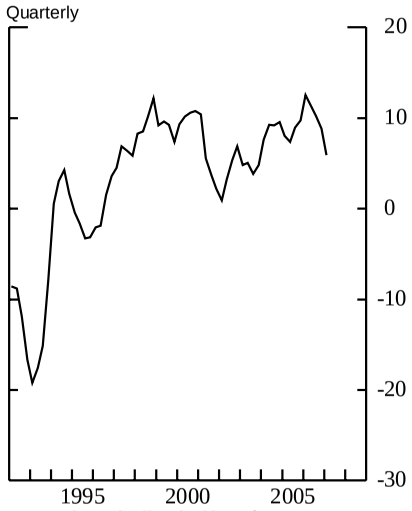


*New detached houses. Source: Statistik Sentralbyra.

Spain*

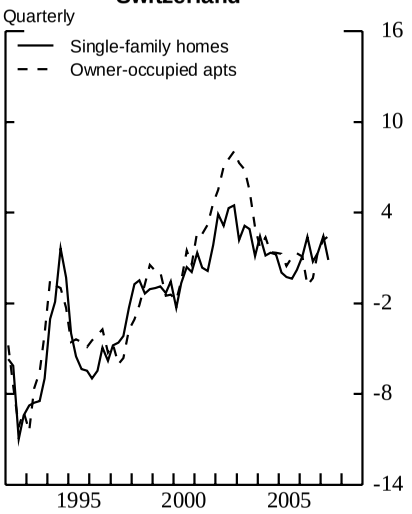
*Non-protected housing. Source: Ministerio de Vivienda.

Sweden*



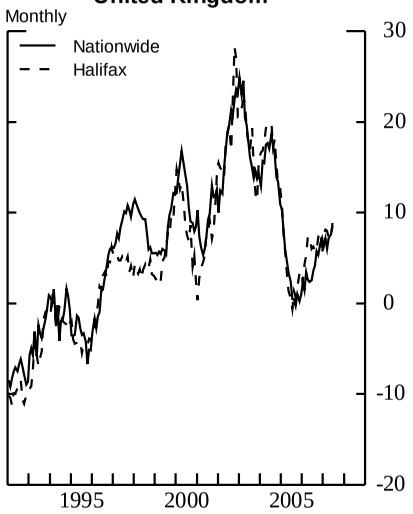
*One and two-dwelling buildings for permanent living. Source: Statistiska Centralbyran.

Switzerland*



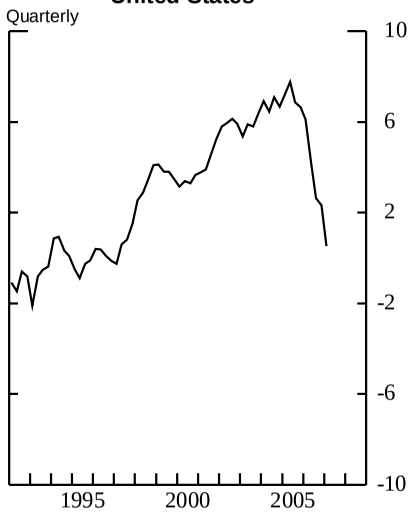
*Source: Swiss National Bank.

United Kingdom*



*Source: Nationwide and Halifax, two of Britain's largest lenders.

United States*



*House price index, purchase only. Source: OFHEO.

I.

Basic Monetary Transmission Mechanisms

By raising or lowering short-term interest rates, monetary policy affects the housing market, and in turn the overall economy, directly or indirectly through at least six channels: through the direct effects of interest rates on (1) the user cost of capital, (2) expectations of future house-price movements, and (3) housing supply; and indirectly through (4) standard wealth effects from house prices, (5) balance sheet, credit-channel effects on consumer spending, and (6) balance sheet, credit-channel effects on housing demand.

Direct Interest Rate Effects through the User Cost of Capital

Standard neoclassical models of housing activity view the user cost of capital as an important determinant of the demand for residential capital.[1] The user cost of capital (*uc)* takes account of several factors and can be written as

$$uc = ph\ [(1\text{-}t)i - \pi_h^e + \delta]$$

where *ph* is the relative purchase price of new housing capital, *i* is the mortgage rate, π_h^e is the expected rate of appreciation of housing prices, and δ is the depreciation rate for housing. The formula also controls for the deductibility of mortgage interest (where applicable) by adjusting the nominal mortgage rate by the marginal tax rate, *t*. By regrouping terms, the user cost of capital can be rewritten in terms of after-tax real interest rates, $\{(1\text{-}t)i - \pi^e\}$, and the expected real rate of appreciation of housing prices, $\{\pi_h^e - \pi^e\}$, where π^e is the expected inflation rate:

$$uc = ph\ [\{(1\text{-}t)i - \pi^e\} - \{\pi_h^e - \pi^e\} + \delta]$$

[1] The classic reference is Jorgenson (1963); alternatively, see Poterba (1984).

An important issue in this user-cost framework is the correct horizon for specifying both the real mortgage rate and the expected real appreciation of the price of housing. Underlying the derivation of *uc*, the implicit rental rate, is the assumption that investors in each period arbitrage away any difference between that period's interest rate and the expected return to owning a house. Thus, *i* in the user cost formula can be written as a short-term rate, with all longer-run considerations affecting the demand for housing — such as expected future changes in interest rates and rents — entering through the short-run house price appreciation term. However, the same arbitrage condition can be used to derive a different but equivalent specification in which the implicit rental rate depends on the long-term mortgage rate and the expected long-run growth rate of housing *rents*.[2] The latter expectation, in turn, is essentially the same as the expected long-run growth rate of home prices given that housing rents and prices tend to move together over the long term. Although either formulation for *uc* is theoretically correct, conventional practice in estimating U.S. housing demand equations is to use the one that employs long-term mortgage rates and price expectations.[3] Note that this specification is equally valid for homeowners with variable-rate mortgages, because arbitrage links the price of the house to the expected average value of the variable short-term rate over the entire life of the asset.

When monetary policy raises short-term interest rates, long-term interest rates also tend to rise because they are linked to expected future short-term rates; consequently, the user cost of capital rises and the demand for housing falls. The fall in housing demand leads to a decline in housing construction and thereby lowers aggregate demand in the economy. This channel of monetary policy transmission is an important one in macroeconometric models used by central banks, but the range of estimated elasticities of residential investment to the user cost of capital is wide. For U.S. data, the elasticities

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[2] Assuming efficient capital and housing markets, real house prices equal the present discounted value of expected future rents less depreciation. In a manner akin to that used to derive the Gordon dividend growth model of stock prices, one can show that $ph \approx R / [(1-t)i - \pi^e - g + \delta]$, where R denotes real rents, g the expected long-run growth rate of R, and i and π^e now refer to the long-run interest rate and expected overall inflation, respectively. Noting that $g \approx \pi_h^e - \pi^e$ over the long run, one obtains the alternative user cost specification by substituting *uc* for R and rearranging terms.

[3] In practice, this specification may work better empirically because of a lack of good data on short-term expectations for house price changes and because most homeowners finance their investment using fixed-rate 30-year mortgages.

range from -0.2 to -1.0 (for example, Hanushek and Quigley, 1980; Case, 1986; Henderson and Ioannnides, 1986; McCarthy and Peach, 2002; Brayton and Tinsley, 1996; and Reifschneider, Tetlow, and Williams, 1999). In the FRB/US model, used at the Federal Reserve Board, the elasticity is -0.3.

Interest Rate Effects through Expected Appreciation of House Prices

The second term of the user cost of capital, the expected real rate of appreciation of housing prices, $\{\pi_h^e - \pi^e\}$, provides another way for monetary policy to affect housing activity. Changes in these expectations can have an important effect on the user cost of capital and thus on housing demand, as Case and Shiller (2003) have emphasized. When monetary policy tightens and interest rates rise, house prices soften because the demand for housing declines through the user-cost transmission mechanism described above. Expectations of a future tightening of monetary policy could therefore lower the expected real rate of appreciation of housing prices, thereby raising the *current* user cost of capital, which would then lead to a decline in the demand for housing and a decline in residential construction.[4]

A subtle issue about how this channel might work is the recognition that a house price is made up, not only of the value of the structure, but also the land on which the house sits. If housing prices were only about the cost of residential structures, then one might not necessarily expect much fluctuation in the home price appreciation term in the user cost formula. In principle, residential structures can be supplied to the market quite elastically, so that price changes would primarily reflect changes in building costs (labor and materials) which historically have exhibited small swings.

Two factors, however, have generated substantial fluctuations in home-price appreciation during the past several decades that are unrelated to changes in the cost of building residential structures. First, in most municipalities, land-use restrictions (zoning) limit the number and size of residential structures allowed on any given existing lot, limiting the supply of new homes in developed areas. Several studies demonstrate

[4] Of course, holding constant the expected real appreciation, a decline in the current price of housing, *ph,* reduces the user cost and raises the demand for housing.

that land-use regulations have reduced the elasticity of housing supply.[5] Second, even though unoccupied land is abundantly available in some parts of the country, land near where people want to live often is not.[6] Both of these supply restrictions have led to rapid appreciation in the value of the land attached to the houses in many regions of the United States, raising house prices in these locations. Davis and Heathcote (2007) show that the real price of residential land in the United States rose 270 percent between 1975 and 2006, whereas the real price of housing structures increased only 33 percent during the same period. Moreover, land's share of home value rose substantially from the mid-1980s through 2004 in almost every large metropolitan area in the United States (Davis and Palumbo 2007).

The fact that housing prices capture both the value of the structure and the land on which the house is built raises the issue whether it is appropriate to include land prices in housing prices in calculating the expected rate of appreciation in the user cost measure. If expected appreciation of housing prices is mostly due to appreciation of the land value, as is argued above, and the value of the land is separable from the value of the structure, then the demand for structures might be relatively unaffected. In this case, large swings in the expected appreciation of house prices might have little effect on housing construction.

However, because a home typically bundles land with a structure (land and structure are not separable) and the supply of land on which a new home can be built is relatively inelastic, an argument can be made that swings in expected home price appreciation have a significant influence on the user cost of residential structures. Not only could an increase in expected land-price appreciation raise the quantity of housing demanded, but also, rapid land appreciation could also alter the size and location of homes as builders economize on a key input that has become relatively more expensive. Thus, rapid land price appreciation might stimulate new construction in the outer suburbs of metropolitan areas, where land tends to be much cheaper.

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[5] Katz and Rosen (1987), Malpezzi (1996), Mayer and Somerville (2000), and Glaeser, Gyourko, and Saks (2005).

[6] This is also true for Australia, which has far lower population density than the United States, but has crowding in certain coastal cities, such as Sydney (Robertson, 2006).

Expectations of house-price appreciation are hard to measure, so evaluating the importance of this monetary transmission mechanism is by no means easy. That said, analysis at the Federal Reserve Board has found some evidence that fluctuations in the (lagged) trend growth rate of house prices (which include the value of both land and structures) help explain future movements in residential investment in the United States.

Interest Rate Effects on Housing Supply

I will now turn from demand to the supply factors that affect housing activity. Because builders construct houses relatively quickly, the interest rates that are relevant to the cost of financing house construction are short-term rates. Higher short-term rates, which increase the cost of producing new housing, reduce housing activity. Supply effects therefore provide an additional reason that short-term interest rates have an important influence on housing construction, and empirical research, such as that by McCarthy and Peach (2002), supports that judgment.

Wealth Effects on Consumption from Changes in House Prices

Standard applications of the life-cycle hypothesis of saving and consumption, first developed by Modigliani and Brumberg (1954) and later augmented by Ando and Modigliani (1963), lead to the view that all sources of an increase in wealth, whether from stocks, real estate, or other assets, should have the same positive effect on household consumption, an effect derived from a long-run marginal propensity to consume out of wealth that is slightly higher than the real interest rate. This view is embedded in the macroeconometric models used at the Federal Reserve Board and elsewhere, in which the long-run marginal propensity to consume out of wealth in the United States is currently estimated to be about 0.0375, i.e., 3¾ cents per dollar,for both housing wealth and stock market wealth.[7] Catte and others (2004), in a study of OECD

[7] An overview of the monetary transmission mechanism in the FRB/US model is in Reifschneider, Tetlow, and Williams (1999). The wealth effects estimated by the staff of the Federal Reserve Board have varied importantly over time. As discussed in Brayton and Mauskopf (1985), in the MPS model (the predecessor to FRB/US), the propensity to spend real estate wealth ranged from an estimate in the 1970s of 2.9 cents

countries, find that the long-run marginal propensity to consume out of financial wealth ranges from 0.01 in Italy to 0.07 percent in Japan; their estimate of the OECD average is about 0.35, and their estimate for the United States is 0.03.

As I mentioned earlier, expansionary monetary policy in the form of lower interest rates will stimulate the demand for housing, which leads to higher house prices; the resulting increase in total wealth will then stimulate household consumption and aggregate demand. Standard life-cycle wealth effects operating through house prices are thus an important element in the monetary transmission mechanism.

The life-cycle view that wealth effects are the same for all types of wealth has, however, been challenged. One objection is that the consumption effect derived from changes in housing wealth should be larger than that derived from other assets, particularly equities, because housing wealth is spread much more evenly over the population than is stock market wealth.[8] If the marginal propensity to consume out of wealth is lower for the rich, as economic theory and empirical evidence suggest (Lusardi, 1996; and Souleles, 1999), then changes in housing wealth might have a larger effect on consumption than changes in stock market wealth. In addition, because house prices are much less volatile than stock prices, changes in housing wealth might be viewed as much longer lasting than changes in stock market wealth, another reason that housing wealth should have a greater effect on consumption than stock market wealth.

Another challenge to the life-cycle view would work through a bequest motive, leading one to think that the consumption effect derived from housing wealth could be *smaller* than that derived from other assets. Consider a case in which homeowners plan to live in their house (or an equivalent one) until they die, plan to pass on their home to their children as a bequest, and value their children's utility as much as their own. For such homeowners, a rise in wealth from an increase in the value of their home will be matched by an increase in the implicit cost of living in their house (their consumption of

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per dollar to an estimate in the 1980s of 8.4 cents. The source of that variation appears to have been a lack of variation in the ratio of real estate wealth to aggregate income. In contrast, historical fluctuations in stock market wealth have been sufficient to allow a more precise estimation of the propensity to spend that wealth; the Board staff's estimates of this propensity have stayed within a narrow range of 3 cents to 4 cents per dollar for the past forty years.

[8] In the United States in 2001, for example, the top 1 percent of stockholders held one-third of total stock market wealth, while the top 1 percent of homeowners held only one-eighth of housing wealth (Belsky and Prakken, 2004).

housing services); thus, an increase in the value of their home should not raise their nonhousing spending.[9] Higher house prices could even reduce current consumption for those planning to buy a house if they believe they will need to save more to do so. The consumption effect of rising house prices is thus uncertain and subject to distributional effects, depending on who is getting the increased housing wealth.

Another reason that increases in housing wealth might have a smaller effect on consumption than increases in stock market wealth is that the latter are more clearly connected than the former to future increases in the productive potential of the economy. The possibility that rising house prices might not reflect an increase in future productivity is supported by the recognition that, as mentioned earlier, rising house prices may primarily be the result of supply constraints in the housing market. For example, supply restrictions have been very severe in some countries, such as the United Kingdom, that have had the largest appreciation in real house prices, so the actual housing stock has not changed very much in those countries.[10] In those instances, the huge increase in housing wealth is clearly not an indication that the overall economy is better off. In addition, relative to housing wealth, much more of stock market wealth is in the hands of older people, and life-cycle considerations suggest that older people should have a higher propensity to consume out of wealth.

Balance Sheet, Credit-Channel Effects on Consumer Spending

Despite the previously mentioned theoretical reasons that housing wealth might have only small effects on consumption, the empirical work discussed in the next section generally finds economically significant effects. That said, in contrast to the standard life-cycle view, the channel behind these large effects may be the easing of credit constraints on households brought about by rising home equity, which can provide additional means to finance higher consumer spending.

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[9] Clearly, for older homeowners who plan to sell or downsize their houses in the near future, the increased wealth from higher house prices gives them more resources with which to increase their consumption spending.

[10] The number of dwellings in the United Kingdom rose 7.6 percent from 1995 to 2005; the comparable figure for in the United States is 40 percent.

The central problem in credit markets (Mishkin, 2007, chap. 8) is asymmetric information. Lenders are reluctant to make loans because they have difficulties determining whether a prospective borrower has the resources to repay the loan and, if the loan is made, whether the borrower will engage in risky behavior that will lower the probability that the loan will be repaid. Collateral reduces these information problems because good collateral (that is, easily valued and easy to take control of) significantly decreases losses to the lender if the borrower defaults on the loan and reduces the incentives for the borrower to take on excessive risk because the borrower now has something to lose.

If residential mortgages or home equity loans are readily available to homeowners, then a rise in house prices necessarily leads to more potential collateral for the homeowner, which may improve both the amount and terms of credit available to these households. Another way of expressing this is in terms of the financial accelerator framework of Bernanke and Gertler (1995) and Bernanke, Gertler, and Gilchrist (1999). Higher house prices reduce the wedge between the default-free interest rate and the effective interest rate facing the homeowner, the so-called finance premium. A rise in house prices, which improves a household's balance sheet, then leads to a decline in the finance premium.

Another way to think about the effect of higher home equity is to consider its ability to relax credit constraints. When house prices rise, homeowners have additional collateral against which they can borrow, a phenomenon that is referred to as mortgage equity withdrawal (also called home equity extraction). Mortgage equity withdrawals provide a route through which rising house prices can stimulate consumption spending. Some economists see this channel as playing a very important direct role in determining spending (Greenspan and Kennedy, 2005; Hatzius, 2005; and Benito and others, 2006). Hatzius (2005), for example, presents estimation results implying that mortgage equity withdrawals in the period from 1990 to 2004 lowered the personal saving rate by anywhere from 2½ to 5 percentage points. Given that personal consumption expenditures account for about two-thirds of aggregate spending in the United States, such a causal effect, if true, would imply a direct impetus of as much as 0.3 percentage points to average annual real GDP growth over the past decade and a half.

Theoretical considerations, however, cast doubt on the direct role of mortgage equity withdrawals in determining consumer spending. Homeowners with substantial appreciation of their property are much less likely to be credit constrained than other households. Furthermore, for standard life-cycle reasons, households with more housing wealth should spend more, so mortgage equity withdrawal may simply be the last step on the way to higher consumer spending, just as going to an automated teller machine is the last step before some consumers go shopping. We do not think that ATM withdrawals drive consumer spending, so one must doubt whether mortgage equity withdrawals do so.

The importance of rising house prices in relaxing credit constraints and stimulating consumer spending is clearly dependent on how costly it is to withdraw housing equity and thus on the efficiency of mortgage markets that enable homeowners to overcome credit constraints. In countries with better-developed mortgage markets, consumer spending may therefore be more sensitive to increases in house prices.[11] Indeed, Calza, Monacelli, and Stracca (2007) find that the correlation of consumption growth with changes in house prices is higher in economies with more-developed mortgage finance systems. They also find that the magnitude of the output response to monetary policy shocks in country-specific VAR models is positively correlated with country-specific measures of mortgage market size, depth, and completeness. (These results may be sensitive to changes in the specification of the VAR.)

Even in countries, like the United States, with an advanced financial infrastructure, improvements in information technology have led to financial innovations that have been making mortgage markets more efficient. Down-payment requirements have been falling, along with refinancing costs, and the use of credit scoring has widened access to housing loans (as illustrated by the subprime market, which I will discuss further below). These developments suggest that the cost of mortgage equity withdrawals in the United States has declined over time, thereby potentially increasing

[11] Major differences exist across mortgage markets in advanced industrial countries (Calza, Monacelli, and Stracca, 2007). Mortgage markets in the United States are considered to be among the most efficient; in some other countries, mortgage lending is hobbled by relatively weak bankruptcy laws and difficulties in seizing collateral. In Italy, for example, where procedures to repossess collateral are lengthy and expensive, the average loan-to-value ratio on mortgages is relatively low (50 percent, versus 70 percent for the United States), and the ratio of mortgage debt to GDP is likewise low (15 percent, versus 70 percent for the United States).

the responsiveness of consumer spending to changes in house prices (for example, Aoki, Proudman, and Vlieghe, 2002).

Evidence on the Differential Effect of Housing versus Nonhousing Wealth

Given the contrasting views outlined above, the question of whether consumption is affected more by changes in housing wealth than by changes in other sources of wealth is inherently empirical. Unfortunately, the evidence is not clear cut. Evidence from time-series data on the differential consumption effects of housing and nonhousing wealth is inconclusive. Research at the Federal Reserve Board, for example, does not find statistically significant differences regarding housing wealth versus stock market wealth. But the statistical tests have low power because U.S. real housing values have, until very recently, been fairly stable relative to income, and so estimates of the effect of housing wealth on consumption are very imprecise. The Board staff's standard consumption models—which restrict the propensity to consume out of housing wealth to equal the propensity to consume out of nonhousing wealth—continue to track aggregate consumption spending well, even when the models are estimated with data ending in 1995. Thus, these models do not suggest that an increased sensitivity of consumption to housing wealth is needed to explain the low rates of personal saving in recent years. Like the Board staff, Belsky and Prakken (2004) have found that the propensities to consume housing and financial wealth are about the same in the long run; however, Belsky and Prakken (2004) estimate that spending reacts to housing wealth more quickly than it does to financial wealth.

Other research is more favorable to the view that housing wealth has a larger long-run effect on consumer spending that does stock market wealth. In general, research based on pooled cross-country time-series data tends to be more favorable to the view that housing wealth has a greater effect on consumer spending than does stock market wealth. Case, Quigley, and Shiller (2005) find that the elasticity of consumer spending to housing wealth is between 11 percent and 17 percent, while it is only 2 percent for stock market wealth. Bayoumi and Edison (2003) find that the marginal propensity to consume out of a dollar increase in housing wealth is 7 cents, while it is 4½ cents for stock market

wealth. Ludwig and Slok (2002) find that effects from housing wealth exceed those from stock market wealth in the sixteen OECD countries they examine and that the difference has been growing. Case, Quigley, and Shiller (2005), who conduct a similar analysis on state-level data for the United States, find that the elasticity of consumer spending to housing wealth is between 5 percent and 9 percent, while the elasticity with respect to stock market wealth is not statistically different from zero. In addition, Carroll, Otsuka, and Slacalek (2006), using time-series data for just the United States, estimate that the long-run marginal propensity to consume out of a dollar increase in housing wealth is 9 cents, compared with 4 cents for nonhousing wealth. Finally, using household-level data for the United States, Bostic, Gabriel, and Painter (2004) estimate that consumer spending is twice as sensitive to changes in housing wealth as it is to financial wealth.

There is also a body of empirical research that reports results less favorable to the view that housing wealth has a bigger effect on consumer spending than does stock market wealth. Girouard and Blondal (2001) do not find consistent results across countries: In some countries the stock market effect is larger, while in others the housing effect is larger. Dvornak and Kohler (2003)—applying techniques similar to those in Case, Quigley, and Shiller (2005) to Australian state-level data—find that stock market wealth has a larger effect than housing wealth. Attanasio and others (2005) present evidence for the United Kingdom that homeowners and renters change their spending in similar ways in response to movements in house prices—a result they view as inconsistent with the standard wealth channel for housing and the collateral channel, as well. Rather, their results suggest that house prices and consumer spending tend to respond to a common factor that is not directly measured—it could be something like income expectations.

Overall, the empirical evidence on the possibly differential effects of housing and financial wealth on consumer spending is all over the map. In my view, the evidence is too mixed to confidently contradict the standard life-cycle view that the long-run effects from housing and financial wealth are about the same size. It seems to me that limitations in the available data—for example, limitations that inhibit strict comparability in measurement across countries—have made it difficult to reach firm conclusions. Moreover, I am skeptical of the cross-country results in the literature because they do not

account for the fact that housing-wealth effects should be expected to vary considerably across countries, given substantial institutional differences in the structure of their financial systems and distributions of income and assets across households.

In addition, I am not entirely sure that the micro-level evidence in Case, Quigley, and Shiller (2005) and in Bostic, Gabriel, and Painter (2004) are well suited to estimating stock market effects. In the latter paper, holdings of common stocks are concentrated in a relatively small number of households that are probably underrepresented in the data set. In the former paper, the state-level data on holdings of financial assets are quite unreliable. The shortcomings of the financial-assets data are likely to lead to the usual errors-in-variables problem of understating the effect of financial wealth. The fact that real estate values are strongly influenced by local economic conditions means that the correlation between housing values and consumer spending in particular states may be driven by local conditions that affect income prospects for residents. In part, the resulting strong correlation between housing wealth and consumer spending may then be spurious.

Finally, let me turn to the empirical research on mortgage equity withdrawals and consumer spending, which some have interpreted as indicating that house price movements have very large effects on consumer spending. Regressions of U.S. consumption on mortgage equity withdrawals can yield coefficients ranging from zero to as high as 0.62 for the long-run propensity to spend.[12] For other economies, such as that of Australia, Catte and others (2004) and Klyuev and Mills (2006) report sensitivities to mortgage equity withdrawals that in some cases are even larger. The upper bound of these estimates suggests a much larger effect on consumer spending from increases in housing values than from stock market capital gains. (However, Belsky and Prakken, 2004, note that these coefficients are very sensitive to changes in the sample period and equation specification and that they often are statistically insignificant.) Citing survey responses, Greenspan and Kennedy (2005) suggest that homeowners spend up to one-half of the proceeds they obtain in a mortgage equity withdrawal, although most of the expenditure is for home improvements—which have an investment component—not for consumption per se.

[12] Catte and others (2004), Belsky and Prakken (2004), Hatzius (2005), and Klyuev and Mills (2006).

However, there are reasons to be skeptical of large estimated effects. Mortgage equity withdrawals are clearly not exogenous. Indeed, homeowners who decide to increase spending are more likely to tap the equity in their homes by engaging in a mortgage equity withdrawal. Thus, the high correlation between spending and mortgage equity withdrawals likely reflects a causation that goes from spending to withdrawals rather than the other way around—in short, mortgage equity withdrawals are not likely a driving force behind consumer spending. The survey results also tell us little because the issue is not whether a household is engaging in a mortgage equity withdrawal to get the cash for spending but rather whether they are making purchases with the extracted equity that they otherwise would not have made.

Balance Sheet, Credit-Channel Effects on Housing Demand

Although it has not received as much attention in the literature, the fact that households might be credit constrained suggests the existence of additional balance sheet, credit channels that work through effects on housing demand. Credit-constrained households are affected by current cash flows, that is, by the difference between their income and their expenses. When short-term rates on a variable-rate mortgage increase, households will have higher interest rate payments and reduced cash flow.[13] This relationship leads to two possible credit channels.

The first channel, from a literature that is more than twenty years old, suggests that nominal, and not just real, interest rates can affect housing demand. Higher nominal rates, even when real interest rates remain unchanged, reduce current cash flow. The reduction in current cash flow, in turn, reduces the demand for housing because, in effect, the higher expected inflation tilts the real stream of interest payments to the present (Poole, 1972; and Kearl, 1979).[14] The reduced cash flow cuts the size of the mortgage that credit-constrained households can afford or qualify for, so the amount of housing

[13] In the United States, this effect is attenuated by the fact that as short-term rates rise, many borrowers refinance their adjustable-rate mortgages into fixed-rate mortgages.

[14] A related balance sheet channel that operates through stocks rather than flows is described in Kearl and Mishkin (1977). They find that as the stock of debt relative to financial assets increases, households are more likely to experience financial distress, and those that do will lower their demand for illiquid assets, such as housing.

they can purchase is smaller than before the cash-flow reduction. Empirical evidence on this cash-flow effect has been mixed (Kearl, 1979; Hendershott, 1980; Schwab, 1982; and Peach, 1983), and modern structural macro-econometric models such as FRB/US do not have cash-flow variables in their residential investment equations. However, to the extent that innovations in the residential mortgage market are enabling people with less savings to become potential homebuyers, empirical evidence for a cash-flow effect of this type might become stronger over time.

In the neoclassical framework, only long-term interest rates should affect housing demand, and it does not matter whether a homeowner has a variable-rate or a fixed-rate mortgage. If a homeowner has a variable-rate mortgage, the relevant interest rate in the user cost of capital is still the long-term rate because it embodies expectations of the average variable rate over the period of homeownership, as was pointed out earlier. The second balance sheet, credit channel suggests that if households are subject to credit constraints or engage in rule-of-thumb behavior, then it does matter whether homeowners have variable-rate mortgages, and movements in short-term interest rates can affect housing demand. When short-term rates on a variable-rate mortgage are higher, credit-constrained households will have higher interest rate payments and less cash flow and, again, the size of the mortgage they will be able to afford, or qualify for, will be reduced. If a large proportion of households purchase houses with variable-rate mortgages, then an increase in short-term rates, even with long-rates unchanged or increasing less, can significantly affect housing demand. Given that variable mortgage rates tend to move more with the short-term interest rates that monetary policy makers use as their policy instrument, countries with a higher proportion of households using variable-rate mortgages could have a large response to changes in monetary policy.

As documented in Calza, Monacelli, and Stracca (2007), different institutional features of residential mortgage markets in OECD countries lead to differing degrees of adjustability of mortgage interest rates. These researchers classify interest rate adjustments on residential mortgages in three categories: fixed, in which interest rates are fixed for more than five years or until expiry; mixed, in which interest rates are fixed for one to five years; and variable, in which interest rates are renegotiable after one year, or tied to market rates, or adjustable at the discretion of the lender. For the United States,

they estimate that 85 percent of residential mortgages are fixed, 15 percent are mixed, and none are variable. The United States has the highest percentage of fixed-rate mortgages, but a number of other countries also issue mostly fixed-rate and mixed mortgages, among them Belgium, Denmark, Germany, Spain, France, the Netherlands, Austria, and Canada. Countries with mostly variable-rate mortgages include Greece, Ireland, Luxembourg, Portugal, Finland, Australia, and the United Kingdom.[15]

Given the above reasoning, we might expect that, in countries with a higher share of variable-rate mortgages, residential construction would be more sensitive to changes in short-term interest rates and have a more powerful monetary transmission mechanism in general (as conjectured by Debelle, 2004). We might also expect that countries with higher proportions of variable-rate mortgages would experience more volatility in housing activity. Although I am unaware of any direct evidence for a link between the proportion of variable-rate mortgages and residential investment volatility—in fact, IMF (2006) finds no cross-country correlation between the interest-sensitivity of housing and the structure of housing finance—there is evidence that house prices and real GDP are more volatile in economies with a high ratio of variable-rate mortgages (IMF, 2004; and Tsatsaronis and Zhu, 2004).

Countries differ in the adjustability of their mortgage interest rates in large part because of differences in their policies toward mortgage markets. One reason the United States has the highest percentage of fixed-rate mortgages is that, in the aftermath of the Great Depression, the government aggressively promoted fixed-rate mortgages. As discussed in Green and Wachter (2005), legislation in the 1930s created GSEs (government-sponsored enterprises) like the Federal Housing Administration and Fannie Mae (and later Ginnie Mae) to promote fixed-rate mortgages at what was then very long terms. These fixed-rate mortgages were viewed as safer for households than the variable-rate and balloon-payment mortgages that were prevalent before the Great Depression and would therefore encourage homeownership.

Other countries have regulatory environments that encourage variable-rate mortgages by limiting the funding of financial institutions that issue mortgages to short-

[15] Japan is listed as having 64 percent of mortgages mixed and variable and 36 percent fixed; Italy is listed as having mostly mixed mortgages and 28 percent fixed (table 1 in Calza, Monacelli, and Stracca, 2007).

term deposits. Because these institutions do not have the ability to hedge interest rate risk, the mortgages they issue must be tied to short-term interest rates.[16]

With the growth of mortgage securitization, however, originators are increasingly able to issue fixed-rate mortgages, as the funding takes the form of fixed-coupon mortgage-backed securities. The result is that the percentage of mortgages that are fixed rate has been increasing in some countries. On the one hand, this change in the institutional structure of mortgage markets suggests that the interest rate transmission mechanism could weaken over time. On the other hand, as pointed out by Estrella (2002), a higher level of securitization causes the mortgage market to be more closely linked to the broader capital markets, resulting in a more direct transmission of current and expected changes in the policy interest rate to mortgage rates. Securitization therefore has the potential to strengthen the interest rate channel.

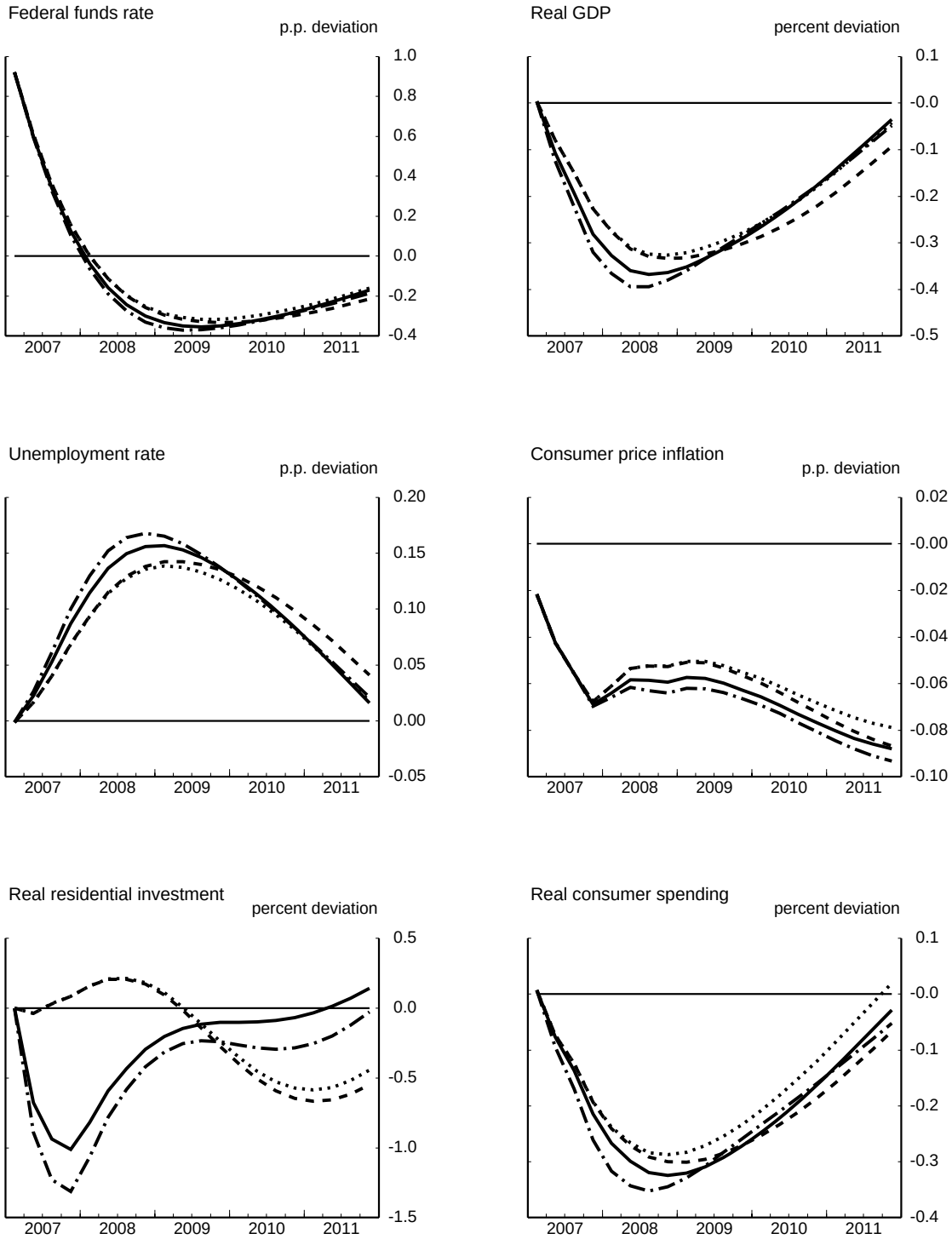
How Important is Housing in the Monetary Transmission Mechanism?

To get a feel for the role that housing plays in the monetary transmission mechanism, we can look at simulations of macroeconometric models used by central banks. The main macroeconometric model used at the Federal Reserve Board is the FRB/US model. Although FRB/US does not include all the transmission mechanisms outlined above, it does incorporate direct interest rate effects on housing activity through the user cost of capital and through wealth (and possibly credit-channel) effects from house prices, where the effects of housing and financial wealth are constrained to be identical. To illustrate how important these transmission mechanisms are, we can ask how this model responds to a monetary policy shock when the direct interest rate effect on housing and the housing-wealth effects are shut down.

Figure 2 shows these simulations, with a 1 percentage point shock to the Taylor rule for the federal funds rate, estimated over the 1987 to 2005 period, starting at the beginning of 2007. The solid lines in this figure report the effects on the economy with all housing-related transmission mechanisms operating. The dashed lines show the

[16] Germany, however, is an example of a country that has primarily fixed-rate mortgages but a fairly underdeveloped mortgage finance system.

Figure 2
Effects of a Monetary Policy Shock in the FRB/US Model



Solid: benchmark model, all monetary transmission channels operating
Dashed: benchmark model, no housing investment response to interest rates
Dotted: benchmark model, no housing investment response to interest rates, consumption response to real estate wealth
Dot-dashed: model with magnified housing-related transmission channels

effects when the direct effects of interest rates on residential investment are not operating, and the dotted lines show the effect when the housing-wealth channel is also shut down. As can be seen in the figure, shutting down these channels reduces the peak GDP response by about 5 basis points, or 14 percent of the total response, which indicates that the housing sector plays a moderate role in the transmission mechanism. However, residential investment accounts for only 5 percent of GDP, so these simulation results indicate that the sector is about three times more responsive to monetary policy in the short run than is overall spending.

As the above survey of empirical evidence on the transmission mechanisms suggests, the strength of the direct interest-rate and housing-wealth-effect channels is subject to a great deal of uncertainty. As shown by the dotted-dashed line in figure 2, the economy responds to the monetary policy shock when the two channels are magnified in a plausible way. Relative to the benchmark model, in this simulation (1) the long-run propensity to consume out of housing wealth is 7.6 cents, and the rest of wealth retains the benchmark setting of 3.8 cents; (2) the speed of the consumption response to housing wealth is one and a half times faster; and (3) unlike the benchmark case, the user cost of capital responds to the trend appreciation in housing prices. As can be seen from the dotted-dashed line, magnifying these channels makes housing more important in the transmission mechanism. Magnifying these channels leads to an additional 5 basis points of peak GDP response, doubling the role that the housing sector plays in the transmission mechanism to about 25 percent of the total monetary policy response.

Changes in Mortgage Finance and the Monetary Transmission Mechanism

Improvements in the efficiency of mortgage finance described earlier have the potential to affect the monetary transmission mechanism, not directly through the housing market but rather by affecting the sensitivity of consumer spending to transitory income shocks. Dynan, Elmendorf, and Sichel (2005) argue that innovations in housing finance make it easier for consumers to smooth their consumption by borrowing on the equity in their homes. As a result, consumption should respond less to transitory income shocks, and they do find evidence that the sensitivity of consumption to transitory income shocks

has fallen in the United States since the mid-1980s. Support for that view also comes from microeconomic evidence that households use mortgage refinancing to buffer their spending from income shocks (Hurst and Stafford, 2004) and that the propensity to refinance mortgages has increased as a result of structural changes in the mortgage market, such as the development of credit scoring (Bennett, Peach, and Peristiani, 2001).

Although a decreased sensitivity of consumption to transitory income shocks would not change the direct response of consumption to changes in short-term interest rates, it might reduce the indirect response of consumption to income. Thus, the innovations we have been seeing in mortgage markets have the potential to weaken the response of overall aggregate demand to changes in income driven by monetary policy, thereby altering the overall transmission of monetary policy shocks to the economy.

II.
Financial Stability and the Monetary Transmission Mechanism

So far, I have discussed monetary transmission mechanisms working through the housing sector when the financial system is operating normally. However, exceptionally unfavorable conditions in the housing sector have the potential to create instability in the financial system—instability that could magnify problems for the overall economy. Two questions thus arise: Through what channels might the housing sector at times be a source of financial instability? And could such instability affect the operation of the transmission mechanism, affecting the ability of a central bank to stabilize the overall macroeconomy?

A breakdown in financial stability occurs when shocks to the financial system cause disruptions to the credit intermediaries that are so severe that the system can no longer channel funds fluidly to creditworthy households and businesses with productive investment opportunities. Without access to financing, individuals and firms must cut their spending, which will have consequences for overall economic activity.

As I noted in my 1997 Jackson Hole paper (Mishkin, 1997), collapsing asset prices are among the types of shocks that in the past have created instability in the

financial systems of some countries. The typical channel has been that sharp asset-price declines have seriously deteriorated the balance sheets of key financial institutions, inhibiting them from using their advantage of information capital to make loans to firms and individuals. In many instances, however, a sharp decline in asset prices has not produced conditions of financial instability (Mishkin and White, 2003). But it bears asking whether the sharp slowing in U.S. home price appreciation, and in some areas of the country a turn to outright declines, has created a substantial risk of financial instability with adverse implications for macroeconomic performance.

Figure 1 presented the backdrop for this question: From 1996 through 2005, nominal prices for existing homes in the United States doubled, rising at an average annual rate of 7 percent.[17] Not only was the average rate of increase high from a historical perspective, but house prices were actually accelerating rather steadily over most of that ten-year period—indeed, the annual rate of increase peaked near 11 percent at the end of 2005. As you know, since early 2006, house prices in the U.S. have decelerated sharply: For example, in 2007:Q1, OFHEO's national price index for purchased homes was just 3 percent above its level a year earlier. And, the cities that experienced the faster rates of price appreciation during boom have generally also experienced the sharpest decelerations recently: In May of this year, S&P/Case Shiller's house price index that covers 20 large U.S. cities was almost 3 percent *below* its level a year earlier and indexes for 15 of those same 20 cities showed nominal price declines over the prior year.

Figure 1 showed that the recent U.S. house-price experience was far from unique—many industrialized countries experienced historically rapid price appreciation in the late 1990s and early 2000s, and have seen sharp decelerations recently. Even with the recent decelerations, however, the levels of house prices still appear to be very high relative to rents. Moreover, with the notable exception of Germany and Japan, the ratios of house prices to disposable income in many countries remain above levels that would have been predicted based on prior trends. Because prices of homes, like other asset prices, are inherently forward looking, it is quite difficult to conclude firmly whether they

[17] Here, I am referring to changes in the repeat-transaction price index (for purchase-transactions only) produced by the Office of Federal Housing Enterprise Oversight (OFHEO).

are above their fundamental values, and researchers have come to conflicting conclusions.[18] Nevertheless, an explosive rise in asset prices always generates concern that a bubble may be developing and that its bursting might lead to broad and deep economic distress.

Looking across countries, there appears to be some correlation historically between house-price declines and financial instability—but, I would argue, the relationship is usually not causal. I think the case of the Nordic countries in the early 1990s provides a helpful lesson. House prices indeed dropped shortly before the banking crises in Sweden, Norway, and Finland, but the collapse in commercial real estate prices, which occurred at the same time, was far more severe.[19] Indeed, the consensus in the literature on the Nordic banking crises is that commercial lending collateralized by commercial real estate that had greatly declined in value was the primary cause of the crises.[20]

The United States also experienced a degree of financial instability in the banking sector in the early 1990s, leading to what Greenspan (2004) referred to as "headwinds" in the economy that slowed the economic recovery from the 1990-91 recession. However, as in the Nordic countries, the problems in the banking sector were primarily the result of bad commercial loans, particularly in commercial real estate, and to a lesser extent were due to decreasing house prices or rising defaults on residential mortgages.

In the United Kingdom during the same period, residential mortgage lending did present some challenges to depository institutions. Mortgage repossessions rose over the period from 1991 to 1993, to nearly ten times their typical level in the 1970s.[21] However, the major banks and building societies withstood the test fairly well. Even at their peak, foreclosure rates remained below 1 percent per year, and, with substantial recoveries from reselling repossessed properties, actual credit losses incurred by the lenders were an even smaller percentage of their mortgage portfolios. U.K. mortgage lenders are likely to be even less vulnerable today because a significant proportion of U.K. mortgage

[18] For example, see Shiller (2005); McCarthy and Peach (2004); and Himmelberg, Mayer, and Sinai (2005).
[19] Illustrated in Borio and Lowe (2002), graph 2.
[20] For example, Drees and Pazarbaşioğlu (1998); and Herring and Wachter (1999).
[21] The Council of Mortgage Lenders provides statistics on repossessions (www.cml.org.uk/cml/statistics).

borrowers since 1998 have purchased private mortgage insurance (Ahearne and others, 2005).

Ordinarily, one might expect that falling house prices would not be a major, direct source of financial instability. First, the prices of houses tend to be much less volatile than those of other assets—particularly corporate equity and typically even commercial real estate—so house-price corrections would usually be expected to translate into smaller nominal wealth shocks than would stock market corrections. Second, in the past, residential mortgage lending has generally been less complex and less risky than commercial lending, particularly unsecured business loans. When residential mortgages are made for much less than the full value of the collateral, default rates are usually low and losses from defaults are frequently rather small. Indeed, the relatively benign experience with residential mortgage risk has led the Basel Supervision Committee to lower capital requirements for residential mortgages that do not have high loan-to-value ratios.

The above discussion is not meant to imply that financial institutions making housing loans can never get into trouble—that they can is well-illustrated by the savings and loan crisis in the United States in the 1980s and the current experience for subprime mortgages. Rather, in many prior cases, declines in house prices were not the primary source of crisis; in my view, excessive risk-taking in nonhousing lending and exposure to maturity mismatches (Kane, 1989; and Mishkin, 2007) were the more important factors leading to financial instability in the past, even in cases where weakening house prices also played a role.

Although I generally do not place the housing and mortgage markets close to the epicenter of previous cases of financial instability, I would note that the current situation in the U.S. could prove to be different. As I emphasized in my 1997 Jackson Hole paper, periods of rapid financial change—sometimes associated with deregulation, liberalization, or financial innovation—often lead to lending booms because of both increased opportunities for bank lending and financial deepening in which more funds flow into the financial system (Mishkin, 1997). I believe that these sources of financial deepening are vital developments for the economy in the long run. However, lending

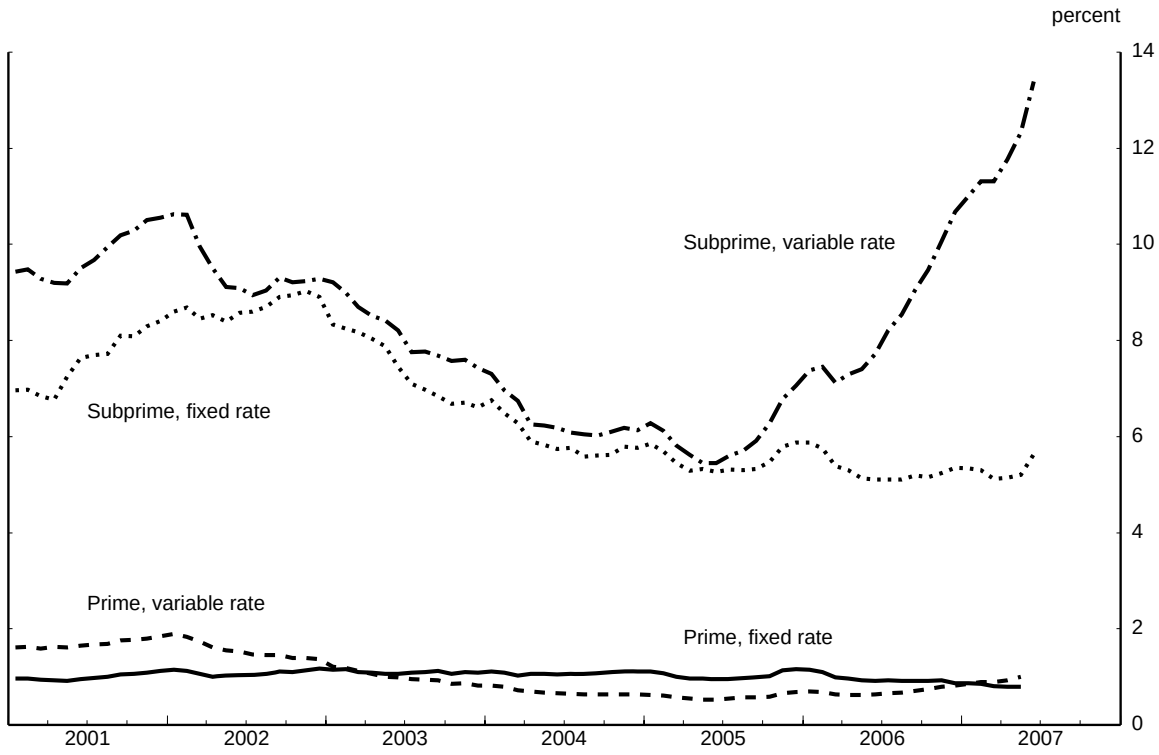
booms can sometimes outstrip the available information resources in the financial system, raising the odds of costly, unstable conditions in financial markets in the short run.

The past few years' activity in the U.S. subprime mortgage market now looks to have shared some of the characteristics of the previous lending booms I alluded to in my earlier Jackson Hole paper. Subprime loans are made to borrowers who are perceived to have high credit risk. This sector of the U.S. mortgage market had been a small portion of the overall market through the mid-1990s, but it expanded appreciably thereafter and really picked up steam from 2004 through the end of last year.[22] As home prices were accelerating rather steadily in the first half of this decade, subprime mortgages performed quite well, with delinquency rates trending down to historically low levels by the middle of 2005 (figure 3). In light of the rapid home-price appreciation and overall housing market activity (in terms of both home sales and residential construction) and the strong performance of sumbprime mortgages through this phase, borrowers appeared to be more willing to take on more mortgage debt and investors appeared to be more willing to fund new mortgage originations. Consequently, underwriting standards for subprime mortgages were loosened quite a bit and some borrowers stretched pretty far. Data show that by 2006, many subprime variable-rate mortgages were being extended to borrowers with less complete documentation regarding their incomes compared with originations in earlier years, and, most importantly, with significantly higher loan-to-value ratios (LTVs) at origination. Indeed, the share of subprime variable rate mortgages extended to borrowers with second liens, or so-called piggyback loans, at origination appears to have jumped late in 2005 and in 2006.

Over the past two years, the performance of subprime variable-rate mortgages has deteriorated substantially—the delinquency rate climbed to 13½ percent in June 2007 from about half that rate in mid-2005 (figure 3). Although we certainly do not have a complete understanding of all of the factors that contributed to the surge in delinquencies for subprime variable-rate mortgages, it now seems very likely that at least some borrowers and lenders had come to expect a continuation of rapid home-price

[22] A more in depth discussion of developments in the subprime mortgage sector can be found in "The Rise in U.S. Household Indebtedness: Causes and Consequences," by Karen D. Dynan and Donald L. Kohn, August 8, 2007. The paper was prepared for last month's conference hosted by the Reserve Bank of Australia.

Figure 3
Mortgage Delinquency Rates



Source. First American LoanPerformance

appreciation. As I already mentioned, house prices slowed appreciably in 2006, undoubtedly leaving some subprime borrowers who had taken out very high LTV mortgages with little or no equity to draw on should they have run into trouble with their mortgage payments. The lack of home equity probably made it quite difficult for many subprime borrowers to refinance their variable-rate mortgages toward the end of their interest-rate lock period, which they may have been counting on doing. The very high LTVs at origination also left some borrowers with an incentive to walk away from properties that had declined in value, particularly owner-investors, whose main attachment to these homes comes from purely financial considerations.

This spring, as you know, investors abruptly pulled back from funding subprime mortgages, and in the past couple of months a number of large financial institutions announced substantial changes to their subprime variable-rate mortgage programs. These developments have resulted in this form of lending being sharply curtailed. In addition,

recent indications suggest that investors also seem to have become less willing to buy securities backed by so-called Alt-A mortgage pools—pools of loans to borrowers who typically have higher credit scores than subprime borrowers but whose applications may contain other risky aspects. As a result of the deterioration in investor sentiment for these types of loans, it has reportedly become much more difficult for some borrowers to qualify for them or at least much more expensive for them to obtain.

The loosening of mortgage underwriting practices along with the unrealistic expectations for house prices probably boosted housing demand in 2005 and 2006 and the evident sharp reduction in nontraditional mortgage lending this year is, no doubt, contributing importantly to the extent and persistence of the weakness in the housing market. Moreover, as investors pulled back this summer from funding nontraditional mortgages, spreads on corporate bonds and credit derivatives widened and measures of implied volatility increased significantly, which signaled market participants' greater uncertainty about prospects. Corporate bond issuance has slowed appreciably from the spring's rapid pace and, in recent weeks, liquidity in the asset-backed commercial paper market has deteriorated. These developments led the Federal Open Market Committee to announce in mid-August that in its view the downside risks to economic growth had increased appreciably.

As these events illustrate, under certain conditions the housing sector can be a source of financial instability. But this leads to the second question I posed at the start of this section: Does financial instability necessarily alter the functioning of the monetary transmission mechanism in a marked way? One can conceive of cases in which financial instability could seriously limit the normal functioning of the monetary transmission mechanism, but in my view these should be rare. Barring cases in which the zero bound on nominal policy rates is a constraint, as it was in Japan, the modern era contains few, if any, clear examples of a breakdown in the monetary transmission mechanism.

III.
Policy Issues

The discussion of the role of housing in the monetary transmission mechanism raises two key policy issues: (1) How can monetary policy makers deal with the uncertainty with regard to housing-related monetary transmission mechanisms? (2) How can monetary policy best respond to fluctuations in asset prices, especially house prices, and to possible asset-price bubbles?

Uncertainty Around Housing-Related Monetary Transmission Mechanisms

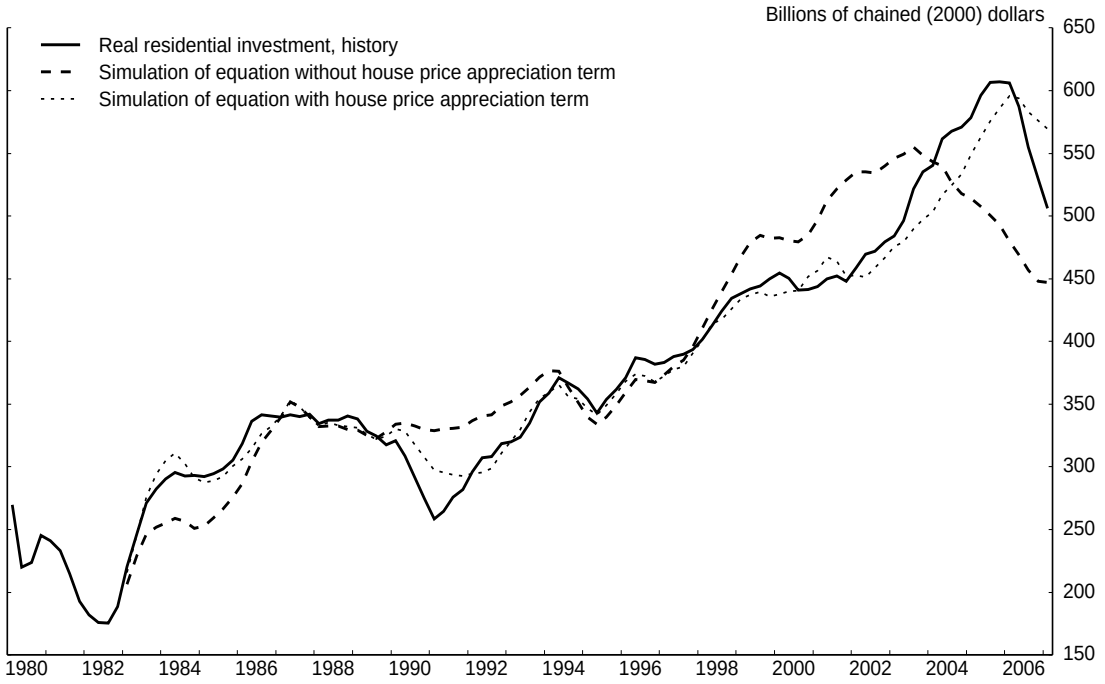
In recent years, we have learned a lot about housing-related monetary transmission mechanisms. However, as our tour of these mechanisms indicates, the importance of particular transmission mechanisms is still highly uncertain. First, we do not have a full understanding of the dynamics of residential construction. Econometric models of residential construction activity still leave a great deal to be desired. In the current cycle, the various models used by the Federal Reserve Board's staff to analyze housing market developments generally cannot account for the full extent of the boom and bust in residential construction.[23]

Figure 4 documents this limited ability to explain recent developments. The top panel shows results from dynamic simulations of two reduced-form error-correction models monitored by the Board's staff. The first of these equations (shown as the dashed line) relates the long-run desired level of real investment spending to fundamentals such as income and the cost of capital for housing; the latter variable does not factor in any effects of expected increases in real home prices. The second model (shown as the dotted line) allows for an estimated contribution to current construction activity from the recent lagged trend in real home-price appreciation. In both cases, the two simulations are conditioned on the actual paths of real income, interest rates, and other factors as they evolved after 1983. As can be seen, the standard model does a poor job of tracking the

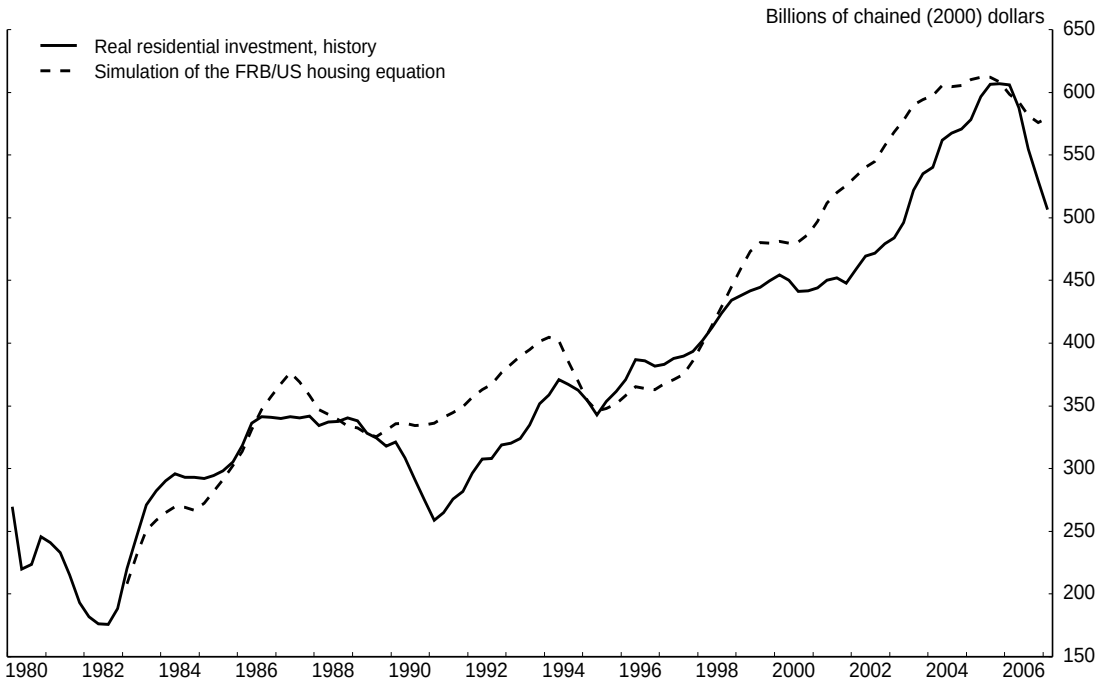
[23] General descriptions of the FRB/US model can be found in Brayton and Tinsley (1996); Brayton, Levin, and others (1997); Brayton, Mauskopf, and others (1997): and Reifschneider, Tetlow, and Williams (1999).

Figure 4
Dynamic Simulations of Residential Investment Models

Reduced-form error-correction housing models



Structural housing models



Note: FRB staff estimates of the effects of the 2005 hurricanes are excluded from the model simulations.

recent boom-and-bust cycle; the expected-capital-gains model does only somewhat better. As shown in the bottom panel of figure 4, dynamic simulations of the structural housing equation in the FRB/US model show a similar limited ability to track the movements in residential construction since the mid-1990s.

Also, as discussed earlier, we are not at all sure what role expected house-price appreciation should play in the user cost of capital. Does expected house-price appreciation that includes the appreciation of land values belong in the user-cost measure, or should appreciation in land values be stripped out? The issue is being explored at the Board.

Second, as the previous discussion of the housing-wealth transmission mechanism made clear, the size of the effect of housing wealth on consumer spending is subject to a very wide range of estimates. This uncertainty is likely to grow in the future because financial innovation is producing major institutional changes in mortgage markets throughout the world, innovations that are likely to affect the sensitivity of consumer spending to housing wealth.

Third, we do not have a firm understanding of what determines house prices and how they respond to changes in interest rates. Furthermore, we are not even sure if observed house prices are consistent with underlying fundamentals.[24] Indeed, as noted at the outset of this section, the question of whether house prices are currently overvalued is the subject of active debate. For example, Shiller (2005) argues that the recent run-up in house prices is unprecedented in the United States and represents an asset-price bubble. The opposite view is taken by McCarthy and Peach (2004) and Himmelberg, Mayer, and Sinai (2005), who argue that home valuations are mostly in line with fundamentals and

[24] Finding a strong empirical link between house price fluctuations and fundamentals often proves to be difficult. Gallin (2003), for example, does not find empirical support for the hypothesis that income and house prices are cointegrated, while Campbell and others (2006) show that rent-price ratios exhibit considerable fluctuations unrelated to expected future interest rates and rents. Some research also finds that house prices are often influenced by irrational impulses. Genesove and Mayer (2001) show that sellers exhibit loss aversion, while Brunnermeier and Julliard (forthcoming) find evidence that house prices are influenced by the type of money illusion originally described by Modigliani and Cohn (1979). Other research, however, is more supportive of the view that housing-price behavior can be rationalized through traditional supply-demand channels. Glaeser, Gyourko, and Saks (2005a,b) show that house prices have risen more rapidly in communities with tight land-use restrictions, while Gallin (2004) finds that house prices and rents do respond to the level of the rent-price ratio.

are well explained by a combination of low long-term interest rates and strong income growth.

Uncertainty about housing-related monetary transmission argues for humility on the part of monetary policy makers regarding our understanding of the monetary transmission mechanism generally and the appropriate settings of monetary policy instruments. The uncertainty also suggests that policymakers keep an open mind about specific transmission mechanisms because future research may change their views.

The bottom line is that blindly following the prescriptions in macroeconometric models that embed specific monetary transmission mechanisms is a dangerous strategy for monetary policy makers—judgment is still a necessary element of our decisions. The uncertainty around housing-related monetary transmission mechanisms provides one further reason why monetary policy will continue to be an art, albeit one that makes use of science.

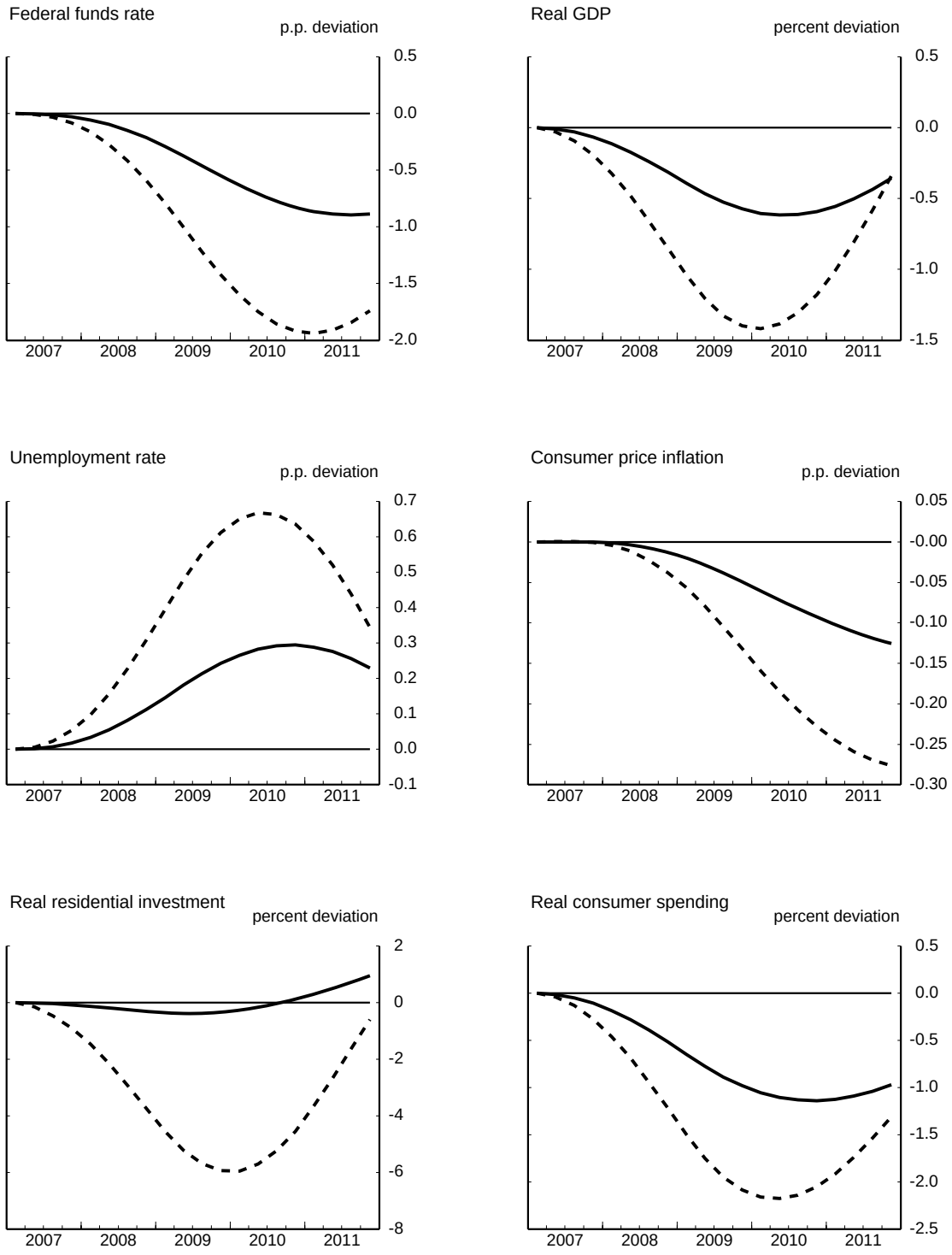
Monetary Policy Response to House Prices

The concern that recent run-ups in house prices may not reflect fundamentals has led to an active debate among monetary policy makers around the world on the appropriate reaction to fluctuations in house prices. Should central banks raise interest rates to slow down house-price appreciation? How should central banks prepare themselves to react if house prices decline?

We have already outlined several monetary transmission mechanisms that indicate that house prices have important effects on aggregate demand. Because central banks are in the business of managing the level of aggregate demand in the economy to produce desirable outcomes for both inflation and employment, it makes sense for them to respond to home prices to the extent that these prices are affecting aggregate demand and resource utilization.

To illustrate what might be an appropriate response to a house-price decline, we can again turn to simulations with the Federal Reserve Board's FRB/US model. Figure 5 shows the effect of a 20 percent decline in house prices spread evenly over the two-year period from 2007 to 2008. A 20 percent decline would be very large by U.S. standards;

Figure 5
Effects of a 20 percent Decline in Real House Prices Under the Estimated Taylor Rule in the Benchmark Version and the Magnified-Channels Version of the FRB/US



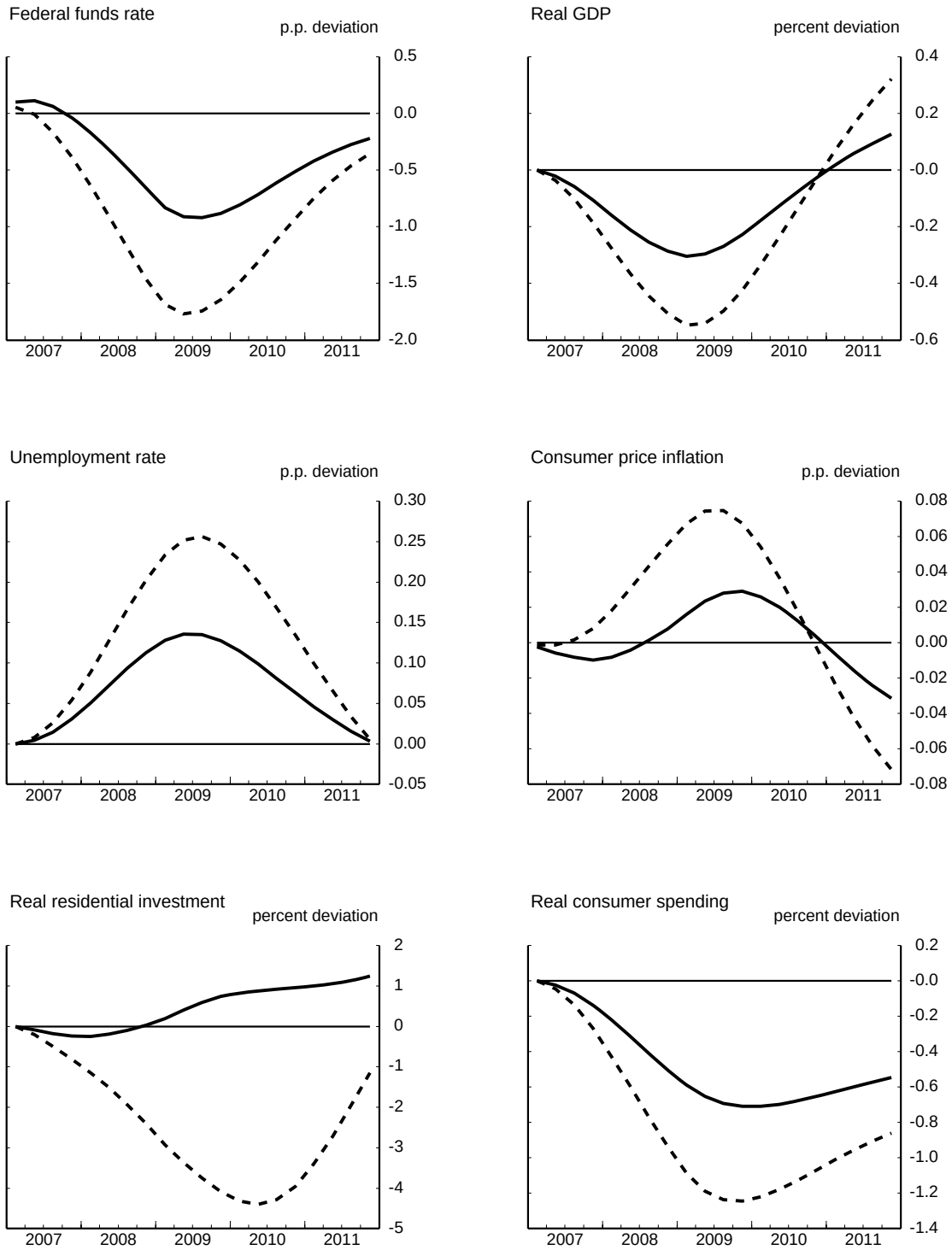
Solid: benchmark version of the FRB/US model
Dashed: version of the FRB/US model with magnified transmission channels

for instance, the real price of houses fell only 16 percent over the four years from late 1979 through late 1982, a disinflation marked by a significant slump in the housing market. As in the previous simulations, the monetary policy reaction function is specified by a Taylor rule estimated over the 1987 to 2005 period. The solid line shows the response in the benchmark model, and the dashed line shows the response when the transmission channels are magnified along the lines that were described for the simulations in figure 2: The long-run effect of housing wealth on consumer spending is doubled and takes place one and a half times faster, while the user cost of capital responds to past appreciation of house prices. The benchmark model displays a strong effect on real GDP, with real output falling ½ percent relative to baseline after three years; and the response in the model with magnified transmission mechanisms is more than twice as large as in the benchmark model, with a slightly earlier peak decline of real GDP of 1½ percent. An important feature of these simulation results is that it takes a long time for the full effect of the house-price decline to be felt, even when the speed of the reaction to housing wealth is speeded up. The slow response of aggregate economic activity to the house-price decline results from the long lags between wealth effects and consumer-spending effects in these models.

How monetary policy makers might respond to the house-price decline is outlined in figure 6. These simulations show what happens when monetary policy responds optimally, under the assumption that policymakers do not anticipate the house-price decline but set policy optimally when the price decline is realized.[25] The solid line shows the optimal response and outcomes for the benchmark version of the FRB/US model, while the dashed line shows the optimal response in the model with magnified transmission mechanisms. The first thing to notice by comparing the top panel in figure 6 with the top panel in figure 5 is that the federal funds rate is lowered more aggressively and substantially faster than with the Taylor-rule reaction function. This difference is

[25] To be precise, the monetary authority sets the expected path of the federal funds rate to minimize a loss function equal to the sum of the current and discounted expected future values of three terms—squared log deviations of output from potential, squared deviations of inflation from a fixed target, and squared quarter-to-quarter changes in the federal funds rate. In solving this optimization problem, the monetary authority uses a discount rate of 2 percent per quarter and assumes that the economy will behave as predicted by the FRB/US model. In the simulations, the monetary authority reoptimizes each period on the basis of new information, such as any additional movement in house prices.

Figure 6
Effects of a 20 percent Decline in Real House Prices Under Optimal Monetary Policy in the Benchmark Version and the Magnified-Channels Version of the FRB/US



Solid: benchmark version of the FRB/US model
Dashed: version of the FRB/US model with magnified transmission channels

exactly what we would expect because the monetary authorities would not wait to react until output had already fallen, as in the Taylor rule, but instead would react immediately to the house-price decline when they see it. As can be seen in the other panels of figure 6, optimal policy can be extremely successful at counteracting the real effects of this very large housing slump. In the benchmark model, the level of real GDP falls only ¼ percent relative to baseline, and the unemployment rate rises only 1/10 percentage point above its baseline level. In the model with magnified transmission mechanisms, the peak decline in real GDP is about ½ percent, with the unemployment rate rising 2/10 percentage point. One of the reasons that monetary policy is so successful at counteracting the effects of the house-price decline is that the long lags from changes in housing wealth to changes in consumer spending allow the monetary authorities plenty of time to respond to the house-price decline.[26]

Of course, conducting monetary policy in the face of a house-price decline is not as easy as is made out in the figure. As emphasized above, substantial uncertainty surrounds the housing-related transmission mechanisms, so the optimal policy response may differ from that shown in figure 6. Monetary policy makers will have to use judgment, keep track of how well their policy is working, and possibly modify policy accordingly. Also, the FRB/US model does not incorporate all the possible transmission mechanisms outlined earlier. The point that should be taken from this figure is not that getting the right response to a house-price slump is easy but, rather, that the monetary authorities have the tools to limit the negative effects on the economy from a house-price decline.

Finally, I should stress that the preceding analysis applies equally well to a house-price increase, as there is no inherent asymmetry in either the economic consequences of, or the appropriate policy response to, movements in real estate values. For example, the FRB/US model predicts that a gradual 20 percent *rise* in house prices would boost real activity and inflation to the same degree as shown in figure 5 but with signs reversed. Correspondingly, rising house prices would justify an "optimal" policy tightening similar in magnitude to the policy easing illustrated in figure 6. In part, this symmetry reflects

[26] Despite higher unemployment, inflation rises a bit under optimal policy because that policy eases more aggressively than monetary policy has historically, on average. As a result, private agents revise up slightly their perceptions of the policymakers' long-run inflation objective, thereby boosting inflation.

the approximately linear nature of the FRB/US model. But it also reflects the balanced nature of monetary policy in the simulations: Whether monetary policy follows the Taylor rule (figure 5) or is set optimally (figure 6), it responds to positive and negative deviations of output from potential and inflation from target by the same magnitude, and so implies a symmetric response to asset price movements.[27]

Monetary Policy Response to Possible Bubbles

Because fluctuations in house prices affect the economy, we have seen that managing the economy well requires that the monetary policy authorities respond to changes in house prices. The issue of how central banks might respond to house price movements is therefore not whether they respond at all but whether they respond over and above the response called for in terms of objectives to stabilize inflation and employment. The issue here is the same as the one that applies to potential bubbles in asset prices in general: Should monetary policy try to pop, or slow the growth of, developing house-price bubbles to minimize damage to the economy when these bubbles burst?

I will outline some conventional arguments for and against reacting to asset price movements with a response that would be over and above that determined by their direct and foreseeable effects on inflation and employment. I will also discuss why the case for responding to house prices is even weaker than it is for other asset prices. Although I come down squarely on the side of those who oppose a special role for house prices in the conduct of monetary policy, I outline steps that central banks can take to limit the potential for sharp movements in house prices to have negative consequences for the economy.

As Dupor (2005) has emphasized, the departure of asset prices from fundamentals can lead to inappropriate investments that decrease the efficiency of the economy. For

[27] In one sense, there could be an asymmetry in the way monetary policy responds to asset prices if the returns on the asset are negatively skewed, so that large negative returns are more likely than large positive returns. This is indeed found to be the case for stock market returns (Campbell, Lo and MacKinlay, 1997). In this case, asset price declines occur faster than asset price increases, so that a symmetric response to asset prices will then mean a more rapid response of monetary policy when they are falling than when they are rising.

example, if house prices rise above what the fundamentals would justify, too many houses will be built; when prices move back toward the fundamentals, the resulting overhang of housing units will cause housing construction to fall. Indeed, the United States now seems to be going through a period in which housing starts are declining because a large inventory of housing has to be worked off.

Despite the clear dangers of house-price bubbles, the question remains as to whether central banks should do anything about them. Some economists—such as Cecchetti and others (2000), Borio and Lowe (2002), Borio, English, and Filardo (2003), and White (2004)—argue that central banks should at times "lean against the wind" by raising interest rates to stop bubbles from getting out of hand. They argue that if a bubble has been identified, then raising interest rates will produce better outcomes. Bernanke, Gertler, and Gilchrist (1999) and Bernanke and Gertler (2001) counter these arguments by showing that monetary policy that optimally stabilizes inflation is likely to produce better outcomes.

Although central banks have generally not argued that interest rates should be raised aggressively to burst asset-price bubbles, some statements from central bankers suggest that leaning against the wind might be warranted. For example, over several meetings in 2004, a minority of members of the Monetary Policy Committee (MPC) of the Bank of England argued for raising interest rates more than could be justified in terms of the Bank of England's objectives for inflation over its normal policy horizon.[28] According to the minutes of those meetings, the advocates believed that such a move would reduce the risks that high house-price appreciation and the rapid accumulation of household debt would lead to an abrupt adjustment process, with serious negative consequences for the economy.[29] Mervyn King, the Governor of the Bank of England, did not advocate leaning against the wind but did suggest that, to prevent a buildup of financial imbalances, a central bank might extend the horizon over which inflation is brought back to target (King, 2004a,b). Statements from officials at the European Central Bank and other central banks also have suggested that the possibility of an asset boom or bust might require a longer period than the usual one to two years in assessing whether

[28] Bank of England (2004), MPC Minutes, January, p. 8; March, p. 9; April, p. 9; and August, p. 9.
[29] Bank of England (2004), MPC Minutes, March, p. 8.

the price stability goal was being met (Issing, 2003a,b; Gjedrem, 2003; Stevens, 2004; Selody and Wilkins, 2004; Bank of Canada, 2006; and Rosenberg, 2006).

The recent case of the Sveriges Riksbank, the Swedish central bank, is particularly interesting. Giavazzi and Mishkin (2006) found that Riksbank communications suggested to market participants that the Riksbank was adjusting monetary policy to lean against the wind of rapid increases in house prices. On February 23, 2006, the Executive Board of the Riksbank voted to raise the repurchase (repo) rate 25 basis points (0.25 percentage point). The action was accompanied by a statement acknowledging that the inflation forecast was revised downward. In fact, the Riksbank's *Inflation Report* published on the same day also showed that inflation forecasts had been revised downward and were below the 2 percent target at every horizon. The Executive Board's statement pointed out that "there is also reason to observe that household indebtedness and house prices are continuing to rise rapidly" (Sveriges Riksbank, 2006). It then said, "Given this, the Executive Board decided to raise the repo rate by 0.25 percentage points at yesterday's meeting." Not surprisingly, market participants took this statement to mean that the Riksbank was setting the policy instrument not only to control inflation but also to restrain house prices. A similar reference to house prices in explaining the decision to raise rates was made in the press release of January 20, 2006.

The above statements suggest that some central bankers believe that asset prices—in particular, house prices—should have a special role in the conduct of monetary policy over and above that implied by their foreseeable effect on inflation and employment. There are several objections to this view.

A special role for asset prices in the conduct of monetary policy requires three key assumptions. First, one must assume that a central bank can identify a bubble in progress. That assumption is highly dubious because it is hard to believe that the central bank has such an informational advantage over private markets, a point made by Greenspan (2002). Indeed, the view that government officials know more than the market does has been proved wrong over and over again. If the central bank has no informational advantage, and if it knows that a bubble has developed, the market will know this too, and the bubble will burst. Thus, any bubble that could be identified with certainty by the central bank would be unlikely ever to develop much further.

A second assumption needed to justify a special role for asset prices is that monetary policy cannot appropriately deal with the consequences of a burst bubble, and so preemptive actions against a bubble are needed. Many cite the disastrous experience of Japan after the bursting of the stock market bubble to illustrate the need for preemptive actions; as Posen (2003) points out, however, this interpretation is a misreading of the Japanese experience. The problem in Japan was not so much the bursting of the bubble as it was the subsequent policies. The imbalances in Japan's banking sector were not resolved, so they continued to get worse well after the bubble had burst. In addition, as pointed out in Ahearne and others (2002), the Bank of Japan did not ease monetary policy sufficiently or rapidly enough in the aftermath of the crisis.

The lesson that should be drawn from Japan's experience is that the task for a central bank confronting a bubble is not to stop it but rather to respond quickly after it has burst. As long as the monetary authorities watch carefully for harmful effects stemming from the bursting bubble and respond to them in a timely fashion, then the harmful effects can probably be kept to a manageable level.

Asset-price crashes can sometimes lead to severe episodes of financial instability, with Japan's being the most recent notable example among industrial countries. In principal, in the event of such a crash, monetary policy might become less effective in restoring the economy's health. Yet, for several reasons, this concern might be overstated for house prices.

As pointed out earlier, there are reasons why we would not normally expect a house-price correction to lead to financial instability, and, in fact, past declines in residential house prices generally have not done so. The financial instability experienced in the 1990s in many countries, including Japan, was caused primarily by bad commercial and industrial loans that were collateralized by commercial real estate that had declined in value. Although in some cases banks' woes were augmented by bad mortgages resulting from declines in house prices, housing loans were not a major source of bank distress. And current subprime mortgage problems in the United States appear to have stemmed more from a deterioration in underwriting standards than from weakening house prices per se.

One concern is that although banking institutions may not be significantly harmed by falling housing-market prices, households might well be. Indeed, the story of what transpired recently in the U.S. subprime mortgage market suggests that the softening of house prices in the United States may have squeezed subprime borrowers out of the housing market. Another way of thinking about this is with the financial-accelerator framework (Bernanke and Gertler, 1995; and Bernanke, Gertler, and Gilchrist, 1999). The softening of house prices weakened many subprime borrowers and so raised their finance premium and, therefore, the effective interest rate they faced. Monetary policy, however, has the ability to offset the adverse macroeconomic effects of this rise in the finance premium by lowering interest rates generally for all borrowers. The monetary authorities do have the tools to keep the economy on an even keel when households experience credit-constraint effects.

A third assumption needed to justify a special focus on asset prices in the conduct of monetary policy is that a central bank knows the monetary policy needed to deflate a bubble. The effect of interest rates on asset-price bubbles is highly uncertain. Although some theoretical models suggest that raising interest rates can diminish the acceleration of asset prices, others suggest that raising interest rates may cause a bubble to burst more severely, thus doing even more damage to the economy (Bernanke, Gertler, and Gilchrist, 1999; Greenspan, 2002; Gruen, Plumb, and Stone, 2005; and Kohn, 2006). By definition, bubbles are departures from the behavior that is normally incorporated within models; it is heroic to expect the tools of monetary policy to work normally in abnormal conditions.

Given the uncertainty about the effect of interest rates on bubbles, raising rates to deflate a bubble may do more harm than good. Furthermore, altering the trajectory of interest rates from the path previously predicted to be optimal for desirable inflation and employment outcomes over the foreseeable period carries the obvious risk of producing deviations from these desirable outcomes. In short, the serious doubts about each of the three assumptions needed to justify a special monetary policy focus on house prices constitute a strong argument for monetary policy makers to instead maintain their efforts to stabilize inflation and employment without such a special focus.

There are other important reasons for central banks to avoid focusing intently on house prices. A central bank with such a preoccupation looks as if it is trying to control

too many elements of the economy. Part of the recent successes of central banks throughout the world has been that they have narrowed their task and have more actively communicated what they can and cannot do. Specifically, central banks have argued that they are less capable of controlling real economic trends in the long run and should therefore focus more on price stability and damping short-term economic fluctuations.

Too much attention to house prices by the central bank might also lead to public confusion about its objectives. As reported in Giavazzi and Mishkin (2006), interviews with participants from different sectors of Swedish society suggested that statements on house prices by the Riksbank confused the public and led to a general weakening of confidence in the Swedish central bank.

My discussion so far argues against a special emphasis on house prices in the conduct of monetary policy. This argument does not extend to a recommendation that central banks stand by idly when house prices climb steeply. To the contrary, central banks can take steps to reduce the negative consequences for aggregate economic activity of sharp movements in house prices. But rather than try to preemptively deal with the bubble—which I have argued is almost impossible to do—a prudent central bank would be better advised to deal with adverse macroeconomic consequences as they emerge in the wake of any substantial decline in asset prices. One way a central bank can prepare itself to react quickly is to explore various scenarios as a normal part of its business to assess how it might respond to a variety of shocks, including a drop in house prices, to achieve maximum sustainable employment and price stability.

Indeed, the exploration of different scenarios by the central bank can be thought of as stress testing similar to that regularly conducted by commercial financial institutions and banking supervisors. They see how financial institutions will be affected by particular scenarios and then propose plans to ensure that the banks can withstand the negative effects. By conducting similar exercises, in this case for monetary policy, a central bank can mitigate the effects of a drop in house prices without having to judge that a bubble may be in progress or predict when a bubble might burst.

One objection to an easing of monetary policy following the collapse of an asset bubble is that it might lead market participants to believe that the central bank will always act to prop up asset prices, a belief that can make a bubble more likely. The

central bank can mitigate such an interpretation, however, if it publicly emphasizes that its monetary policy is not directed at stabilizing any particular asset price but is rather focused on achieving price stability and maximum sustainable employment. Making sure that a house-price collapse does not do serious harm to the aggregate economy in no way eliminates sharp declines in house prices and so does not provide insurance against such declines. The same reasoning holds true for stock prices. Indeed, we have seen substantial declines in housing and other asset prices in many countries even when monetary policy has been eased substantially.

Central banks with supervisory authority can also make bubbles less likely through prudential supervision of the financial system. If elevated house prices are leading to excessive risk-taking on the part of financial institutions, the central bank, along with other supervisory agencies, can encourage financial institutions to have appropriate risk-management practices in place. Besides helping make financial institutions better able to cope with possible house-price declines, working through supervisory channels could also have the indirect effect of moderating house prices should they be stimulated by excessive bank financing. Also, reminding institutions to maintain risk-management practices appropriate to the economic and financial environment could potentially help lessen a buildup of excessive house prices in the first place.

Even if the central bank is not involved directly in prudential supervision, it can still play a role through public communication, particularly if it has a vehicle like the financial-stability reports that some central banks publish. In these reports, central banks can evaluate whether increases in asset prices might be leading to excessive risk-taking on the part of financial institutions or whether distortions from inappropriate tax or regulatory policies may be stimulating excessive valuations of assets. If such distortions appear to be happening, the central bank's discussion might encourage policy adjustment to remove the distortions or encourage prudential regulators and supervisors to more closely monitor the financial institutions they supervise.

Large run-ups in asset prices present serious challenges to central bankers. The analysis of the role of housing in the monetary transmission mechanism argues against a special role for house prices in the conduct of monetary policy and in favor of a policy

response to them only to the extent that they have foreseeable effects on inflation and employment. Nevertheless, central banks can take measures to prepare for possible sharp reversals in the prices of homes or other assets to ensure that they will not do serious harm to the economy.

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