Housing, Monetary Policy, and the Recovery

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EXECUTIVE SUMMARY

While the economy shows signs of strength, the recovery remains tepid relative to economic upswings following deep recessions of the past. This weakness has occurred despite an aggressive monetary response by the Federal Reserve which has adopted even unconventional tools to reduce long term interest rates. A variety of factors have been blamed for the tepid recovery, including the financial crisis of 2008, uncertainty over policy, and high levels of indebtedness.

In this report, we focus on weakness in housing. Our analysis makes two broad points. First, weakness in housing and residential investment is a main impediment to a robust recovery. Second, problems related to housing have affected the transmission of monetary policy. More specifically, the unprecedented decline in house prices and residential investment has introduced headwinds that may require a more aggressive monetary response than in normal downturns. Further, problems related to housing markets may reduce the sensitivity of real economic activity to the interest rates that monetary policy can affect. Or in the parlance of textbook intermediate macroeconomics, housing problems have likely shifted the IS curve leftwards and steepened the slope of the curve by introducing a gap between policy rates and effective rates. For both of these reasons, problems related to housing introduce significant challenges to monetary policy-making.

There are six steps in our analysis:

1. We begin by placing housing in the context of the broader economic recovery. The overall recovery in GDP has been one of the weakest in the postwar period even though the recession was the largest in the postwar period. Residential investment has been a particularly dismal performer. Further, the other weakest components of GDP—consumption of services and state and local government expenditures—can also be closely linked to weakness in housing markets. Focusing just on the direct impact of housing—home construction and housing service consumption—the sector accounts for about a third of the shortfall of growth relative to a typical recovery. Obviously the full impact of the housing crisis is bigger if we include indirect impacts on local governments and consumption of housing-related durables. We also show evidence from other countries that a collapse in housing is associated with subsequently weak recoveries.

2. We then take a closer look at housing in particular. Weakness in housing construction is driven by continued weakness in the construction and sales of single-family homes. There is some evidence of a silver lining in construction of multi-family buildings and existing home renovation activity. However, there remain severe problems related to the physical overhang of existing vacant properties, foreclosures, tightened credit conditions, and weakness in household balance sheets. While there is some recent optimism related to residential investment numbers in the last quarter, residential investment levels remain very low and house prices continued to decline even into the end of 2011.

3. What is the role of monetary policy in addressing weakness in housing? Monetary policy would normally lower the user cost of housing by increasing consumer and house price expectations and lowering mortgage rates. This would induce more demand for housing, alleviate collateral constraints on household borrowing, and increase the flow of income to homeowners through refinancing into lower interest rates.

4. But the collapse in housing markets may hinder the ability of monetary policy to operate through these channels. In particular, the physical overhang of existing properties introduces a serious headwind that may require very large and unrealistic reductions in the user cost of housing to generate a recovery in residential investment. Foreclosures and depressed house price expectations only add to this problem. Further, the collapse in house prices and tight credit conditions may limit the ability of borrowers to access low interest rates. Or in other words, problems related to housing introduce a large wedge between rates that the Federal Reserve can affect and the rates at which households can realistically borrow.

5. To quantify the effect of physical overhang, we present a simple model of the desired versus actual housing stock and estimate the model using aggregate data. Desired housing is a function of non-housing consumption and the user cost of housing. The estimation of the model reveals the severity of the physical overhang problem: the housing stock as of 2010q4 remains about 9% above its desired level. In the baseline estimation, mortgage interest rates would need to be negative to bring down the user cost to a level that would equate desired housing with actual housing. The analysis suggests physical overhang presents a significant headwind to monetary policy—even if long term mortgage rates were reduced substantially from their already historical lows, the desired housing stock would likely still be lower than the existing housing stock. Our analysis paints a pessimistic picture for residential investment going forward even if mortgage rates decline further.

6. We also quantify the magnitude of housing-related problems by using cross-sectional data across states. There is a significant amount of such variation: states such as Arizona, California, Florida, and Nevada experienced severe declines in house prices whereas states such as the Dakotas, Iowa, and Texas largely avoided the housing bust. Problems related to housing are much more severe in large house price decline states: vacancy rates are significantly higher, households are unable to refinance into lower rates, and delinquencies and foreclosures are at extremely high levels. These housing-related problems appear to be impacting the real economy: new residential investment, renovations, and spending on durable goods are all significantly lower in these areas, even through the end of 2011. We can use our cross-sectional estimates to quantify the degree to which housing problems have weakened the transmission of monetary policy by assuming monetary policy is fully effective in states without severe housing problems. Relative to the observed mean values for all states, renovations, new residential investment, and auto sales purchases are 19, 5, and 10 percentage points higher relative to their 2006 levels in states in which monetary policy is fully effective. This suggests impediments to monetary policy transmission in states with large house price declines are important to understanding weakness in residential investment and durable consumption during the recovery.

We conclude by discussing what our results imply for policy. Both the aggregate and cross-sectional analysis suggests that weakness in housing presents challenges to the transmission of monetary policy to the real economy. The sensitivity of real economic activity to changes in rates that the Federal Reserve can affect may be substantially lower given the housing situation. In light of these challenges, we are in support of programs that directly tackle issues in housing, such as programs that facilitate refinancing for underwater mortgages and help transition foreclosure inventory into rentals. In this sense, we are in agreement with recent policy advice emerging from members of the Federal Reserve (e.g., Federal Reserve Board Staff (2012) and Dudley (2012)). However, we also believe that policies must recognize the possibility that a dramatic overinvestment in housing driven by unsustainable house price growth during the boom will not be magically cured. In this sense, policies should identify specific market frictions and target those frictions, rather than attempt to boost house prices artificially.

1. INTRODUCTION

The 2008-09 recession was the deepest in the post-war period and yet it has been followed by one of the slowest recoveries in the post-war period. Clearly, problems in the housing market have played a key role in this record weak bounce back. In every previous post war business cycle, home construction has had a V-shaped collapse and recovery; by contrast, the current cycle looks L-shaped. In past economic recoveries, real home prices have slowed during the recession and then rebounded; in this cycle, real home prices collapsed and continue to slide lower.

In this paper we discuss the direct and indirect role of the housing market in the recovery. We summarize the distress in the housing market. We observe that in an accounting sense the shock to housing services has paid an underappreciated role in slowing the recovery. We document glimmers of light from multi-family and renovation construction, along with continued gloom from single family sales, construction, and prices, as well as from measures of credit conditions and household collateral.

We summarize the literature on neoclassical and non-neoclassical channels through which housing affects the economy. In a neoclassical framework, housing is just another relatively interest-sensitive sector. In life cycle consumption models, or models with borrowing constraints, housing also matters as a store of wealth. And in a broader new Keynesian framework, housing matters due to a variety of information asymmetries: it is a source of collateral and it impacts bank balance sheets and capital.

We also explore the role of housing in the monetary transmission mechanism. We observe that housing problems have both offset the stimulative impact of easy monetary policy and have impaired the link between policy and the economy. In the parlance of intermediate macro, we distinguish between a housing-induced shift in of the IS curve (offsetting) and a steepening of the curve (impairing). The housing-induced shift is part of what many observers describe as an ongoing deficiency of aggregate demand. The steepening, which can also be cast as a widened wedge between policy rates and effective private borrowing rates, is not as widely discussed. But we believe it is important.

While the two types of problems are easy to delineate conceptually, quantitative estimation is difficult when the "new regime" is just a few years old. We do not attempt to estimate the intercept or slope of an IS or aggregate demand curve, let alone a complete macro model. Instead, by necessity we put together a range of circumstantial evidence of a change in behavior. Our organizing framework is the new Keynesian model with credit frictions. We review evidence that indicates that during the boom, growth in housing collateral led to increased non-housing consumption, which we call a shift out of the IS curve; relaxation of lending standards during the boom led to what we call a flattening of the IS curve. We speculate that recent collapse of collateral and tightening of standards therefore has led to a shift in and a steepening.

Our formal econometric analysis has two parts. First, using a simple macro model, we estimate that part of the inward IS shift is a large physical overhang in housing: the actual housing stock exceeds a desired stock by perhaps 10 percent. Second, we exploit cross-sectional variation across states to shed indirect light on the possible effectiveness of monetary policy that works via an interest rate that is the same across the 50 states. We find that cross-state variation in housing price growth is statistically and economically important determinant of remodeling permit growth, new residential permit growth and auto sales growth. We use our cross-sectional estimates to quantify the degree to which housing problems have weakened the transmission of monetary policy by assuming monetary policy is fully effective in states without severe housing problems. Relative to the observed mean values for all states, renovations, new residential

investment, and auto sales purchases are 19, 5, and 10 percentage points higher relative to their 2006 levels in states in which monetary policy is fully effective. This suggests impediments to monetary policy transmission in states with large house price declines are important to understanding weakness in residential investment and durable consumption during the recovery. We also use data on credit scores by zip code to find that housing troubles have relatively mild effects on spending in areas with a relatively low share of low credit scores but unusually strong effects in areas with a high share of low credit scores. This evidence is consistent with both a shift in and a steepening of the IS curve.

The rest of this report proceeds as follows. Section 2 of the paper summarizes the role of housing in the context of the overall macroeconomic recovery. Section 3 paper zeroes in on the current state of the housing market. Section 4 describes the modeling framework that we have in mind in our analysis of the role of housing in the transmission of monetary policy. Section 5 considers how the unusually severe downturn in housing weakens the usual transmission mechanism, by making the IS curve steeper. Section 6 presents macro econometric evidence that supports the view that the IS curve has shifted left. Section 7 presents state level econometric evidence that supports the view that the IS curve has shifted and steepened. Section 8 summarizes and considers policy options.

2. THE BACK DROP: BOUNCING LIKE A SLINKY

Before we look at the housing picture in detail, it is useful to look at housing in the context of the overall economic recovery. Specifically, we have put together a set of "spider charts" that summarize how this economic recovery compares to past recoveries. For each component of real GDP we index the data to equal 100 at the NBER business cycle trough and plot the level of activity from 8 quarters before to 12 quarters after the trough. We compare the current recovery to the two weakest recoveries—1991 and 2001—and the average of the last 8 recoveries.

The charts highlight how unusual this economic recovery has been:

- The overall recovery in GDP has been one of the smallest in the postwar period even though the recession was the largest in the postwar period (Chart 1). With the exception of the 1949 recovery, this breaks the normal pattern where big recoveries follow big recessions.

- Some sectors have had relatively normal recoveries. Exports have had a stronger than average recovery, presumably reflecting solid growth in emerging markets and improved competitiveness (Chart 1). Business fixed investment has had a relatively normal recovery, although the level of investment remains modest relative to depreciation (Chart 1). Federal government spending has been within the normal range for recoveries (Chart 1).

- The results for consumption are mixed (Chart 2). Both durable and nondurable spending have had relatively "normal" recoveries, but this follows unusually deep recessions for both sectors. Hence the relatively low level of spending on items such as motor vehicles. What stands out even more is the weakness in services. Normally the service sector motors through a recession. Both the recession and recovery in services is the weakest in modern history.

- Finally, three sectors stand out in terms of the subpar growth. State and Local governments have cut rather than increased spending (Chart 3). This is partly because a sharp drop in home prices has undercut local property tax revenue. More important to this paper, are the weakness in both housing investment and housing consumption. For the first time in the post-war period there has been essentially no recovery in residential investment (Chart 3). And among the components of services, the weakest is housing and utilities (Chart 3).

Chart 1: Spider Charts for GDP and other NIPA Components

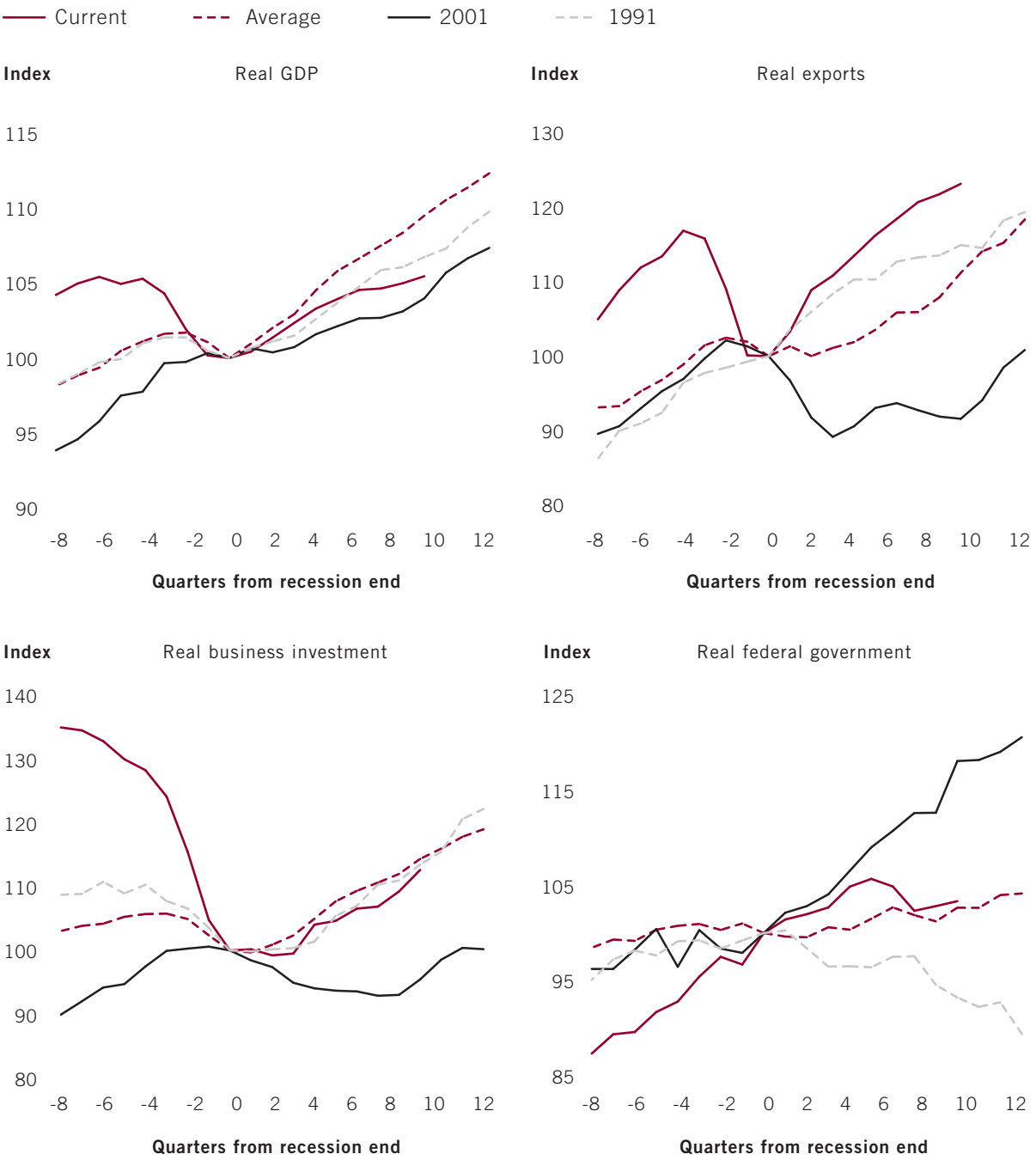
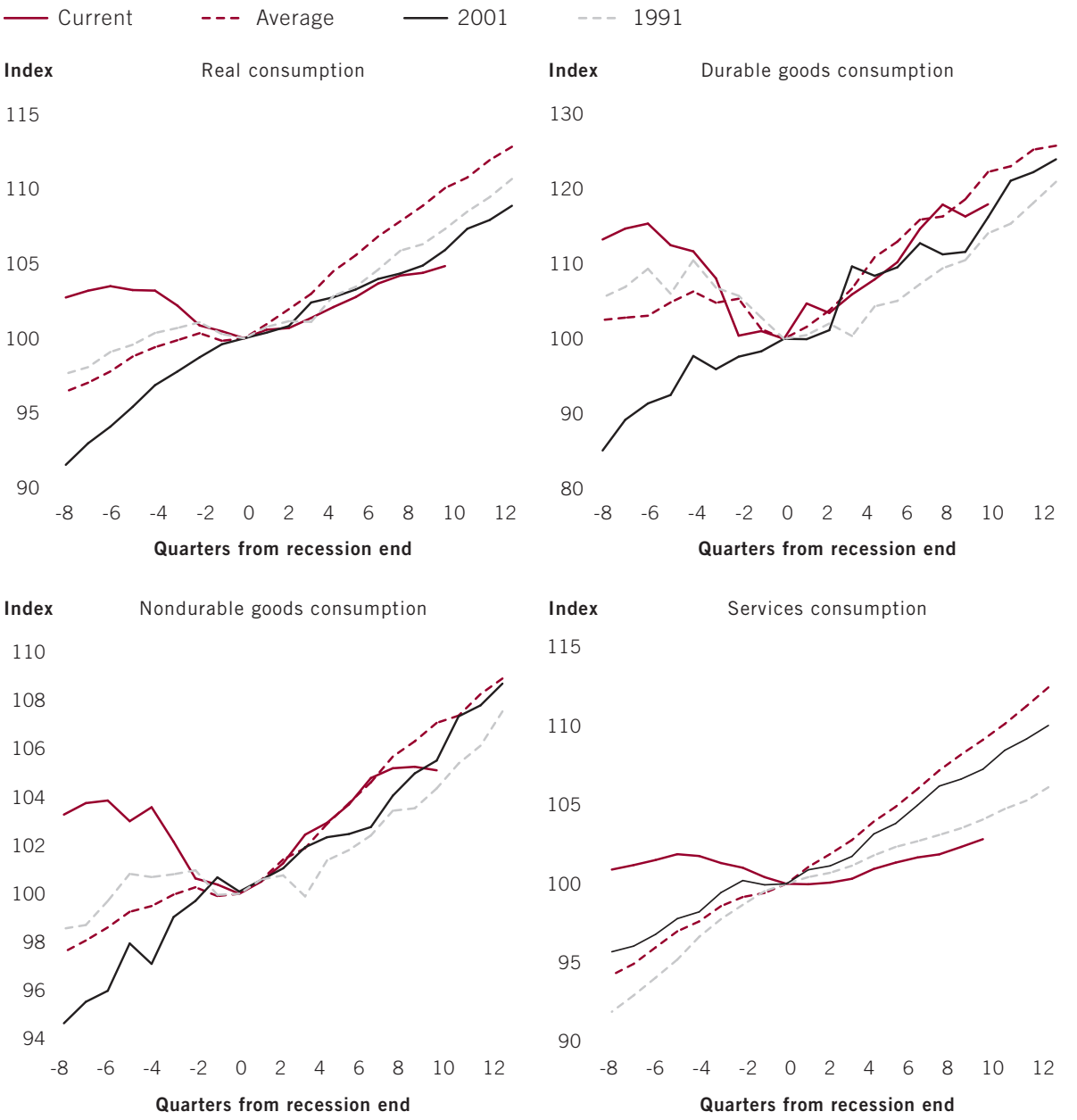
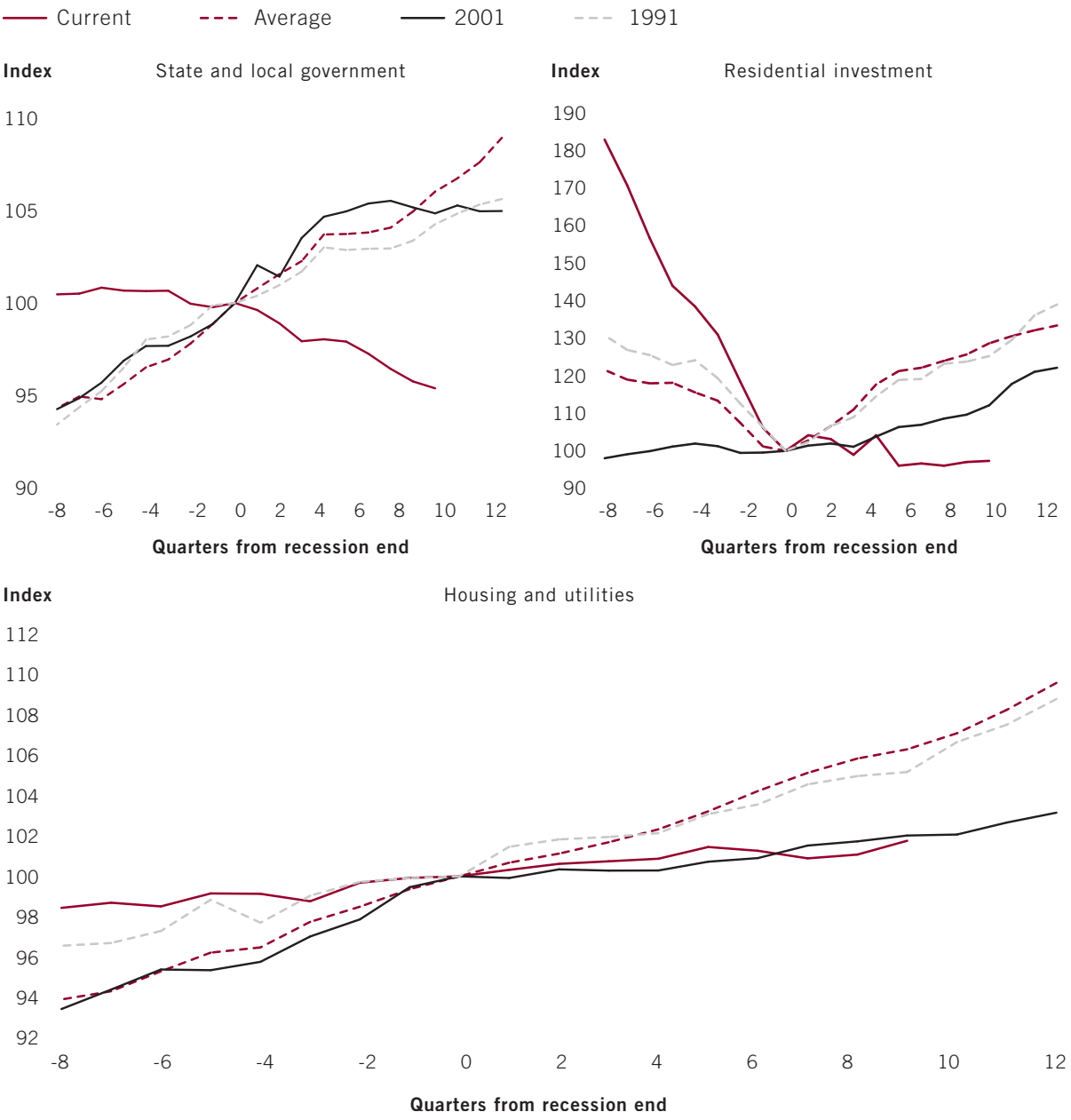


Chart 2: Spider Charts for Consumption



While most of this story is well known to business economists, in our view two aspects of the housing crisis have been underappreciated. First, housing plays a critical role in the state and local government funding crisis. As Chart 4 shows, state tax revenues have started to recover, growing a bit above 4% over the past year as income and sales taxes pick up. By contrast, at the local level taxes are now starting to fall. Local governments get about 80% of their tax revenues from property taxes. Property tax revenues are already lagging well behind the last two economic recoveries. Looking ahead, as assessed property values fall, in the usual lagged fashion, local government will have to either override popular resistance and raise property tax rates or face the impact of the 30% (and worsening) drop in home prices.

Chart 3: Spider Charts for Housing-Related Sectors



Weakness in housing services is another relatively ignored part of the housing story. Housing services account for about 13% of nominal GDP or roughly three times the normal GDP share of residential investment. Real housing services are determined by the amount of occupied space. About three-fourths of this service flow is imputed from owner occupied houses. During the boom, household formation was high and "McMansions" proliferated, driving very high growth in real housing service. During the bust, high vacancy rates and a doubling up of households have sharply curtailed the growth in the number of households and hence the growth in housing services (Chart 5). As Chart 3 shows, housing services are running about 5 pp below a normal recovery.

Chart 4: State and Local Government Receipts

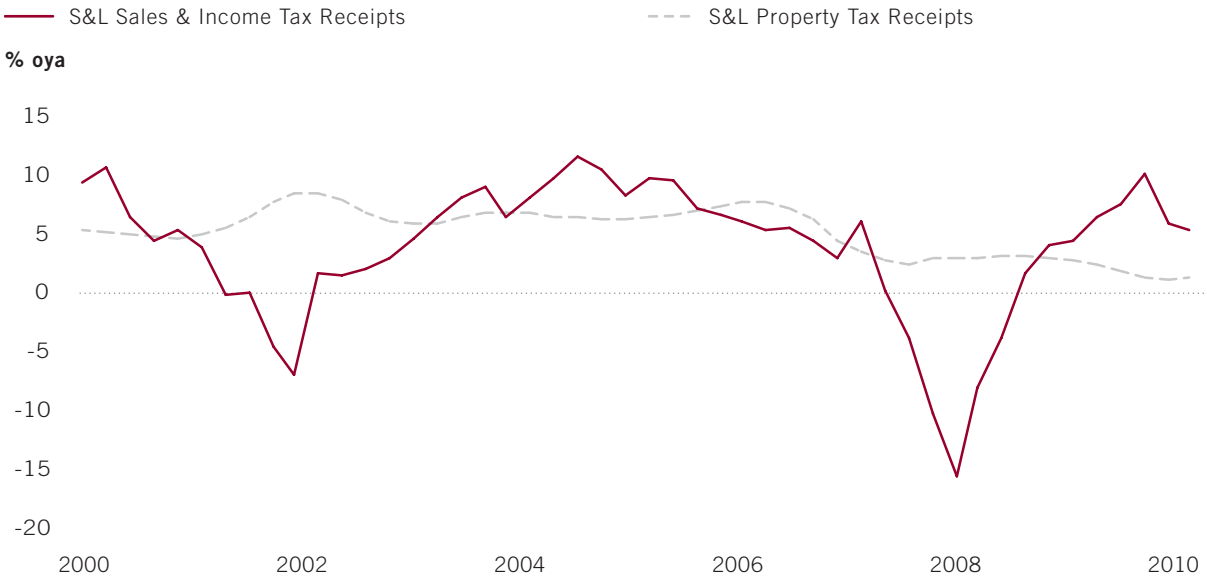
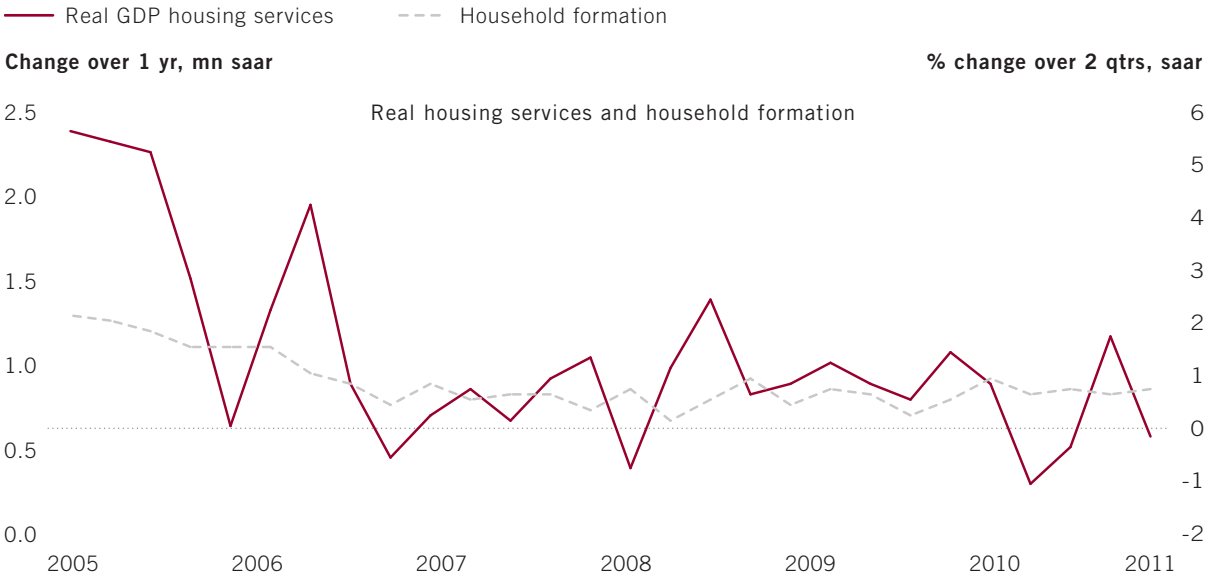


Chart 5: Real Housing Services and Household Formation



Taking this data one step further, we can compute—in an accounting sense—how important housing investment and services have been in the under performance of the recovery. At the peak of the boom in 2005, the 5% or so surge in housing services added about 0.8 pp to GDP growth (=.13 * 5%). At the peak of the boom in housing investment in 2004, construction growth of about 12% added about 0.7pp to GDP growth (= .06 * 12%). In Table 1 we compare the recovery in this cycle to both (1) the "average of eight recoveries" and (2) for the recoveries following the "major recessions" of 1975 and 1982. Since strong recoveries usually follow big recession, the latter is perhaps a better gauge of underperformance.

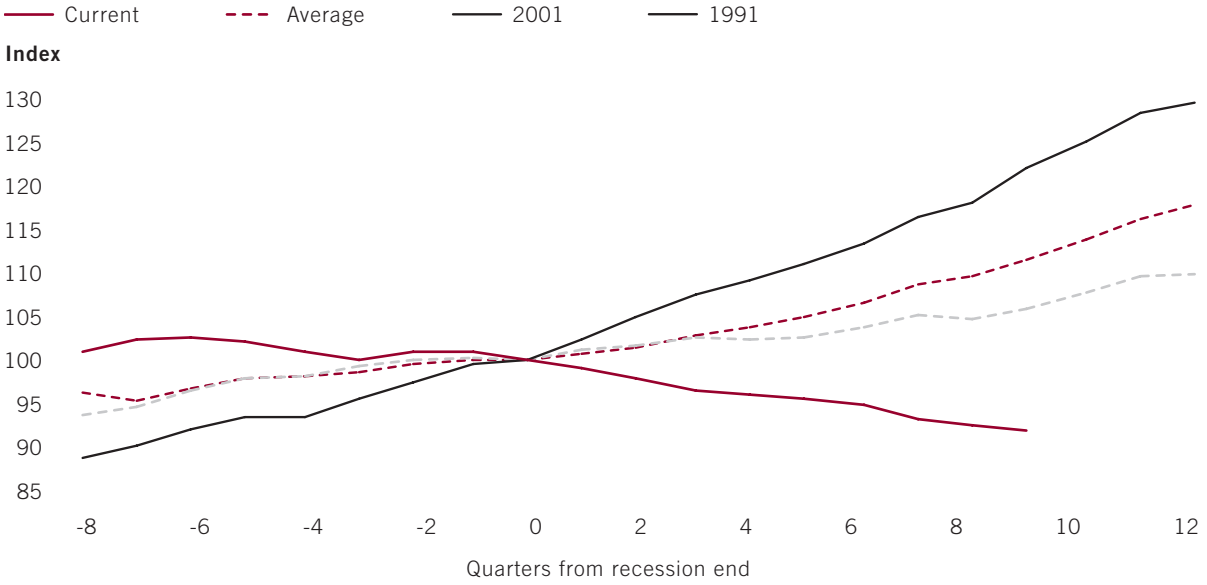
Table 1: Accounting for the GDP shortfall						
Sizing up the shortfall	Contribution to shortfall					
	10 Quarter Recovery			Relative to…		
Sector	Average	Major	Latest	Average	Major	Share
Real GDP	11.5	13.4	6.2	5.3	7.2	1
Consumption	11.3	12.9	5.4	3.9	4.9	0.65
BFI	18.3	25.4	13.5	0.7	1.8	0.15
Residential Inv	34.6	62.6	-0.1	1.6	3.0	0.05
Government	3.4	5.7	-2.7	1.2	1.7	0.20
Exports	17.2	5.3	24.6	-0.6	-1.5	0.08
Memo: Housing sensitive sectors						
Residential investment	34.6	62.6	-0.1	1.6	3.0	0.047
Housing services	8.0	6.8	1.0	0.7	0.5	0.095
Local government	7.6	3.9	-5.3	1.4	1.0	0.107
Consumer durables	25.0	31.4	22.1	0.3	0.8	0.088

Note: The table shows the growth in each component of GDP 10 quarters from the trough and then calculates how much each sector contributed to the overall underperformance Average is for 8 business cycle recoveries and "Major" is the average of 1975 and 1982

The table shows the short fall relative to each of these recovery metrics Residential investment was essentially flat in the first 10 quarters of this recovery compared to 34.6% growth in an average recovery and 62.6% growth following a major recession. Similarly, in past cycles housing service spending was usually up 6 to 8 % compared to a feeble 1.0% recovery in this cycle. We also calculate each sector's contribution to the GDP shortfall using nominal GDP weights. In this cycle, the recovery in GDP has been 5.3 pp weaker than the average recovery and 7.2% weaker than the recoveries from major recessions. As the bottom of the table shows, more than half of the underperformance in this recovery is associated with housing-related sectors.

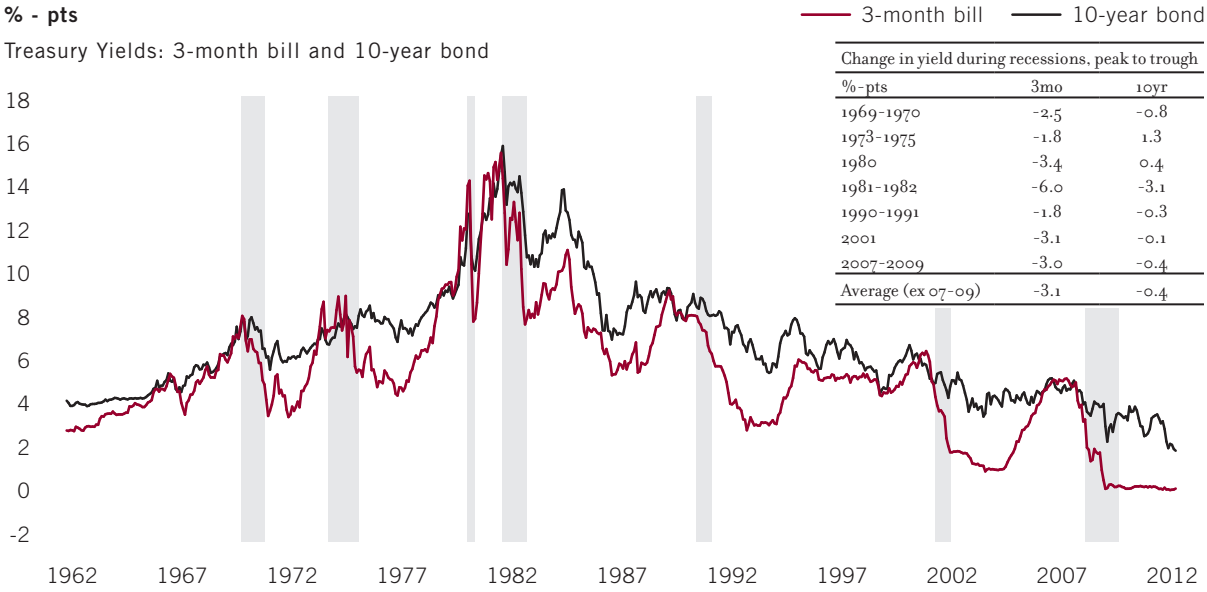
Of course housing does not operate in a vacuum and several other business cycle indicators can give a broader sense of how unusual this cycle has been. First, the household sector has been de-levering (Chart 6). This is the first business cycle recovery where real household debt has fallen rather than risen.

Chart 6: Real Household Debt



Second, housing is often viewed as one of the most interest-sensitive sectors of the economy. The dramatic underperformance of housing has occurred despite a relatively normal drop in interest rates (Chart 7). From the peak in the summer of 2007 to November 2011, 3-month treasury bill rates have fallen 3.0 pp and 30-year mortgage rates are down 2.7 pp. These drops are within the normal range of past cycles and it is highly unusual to have rates this low 10 quarters into a recovery.

Chart 7: Interest Rates

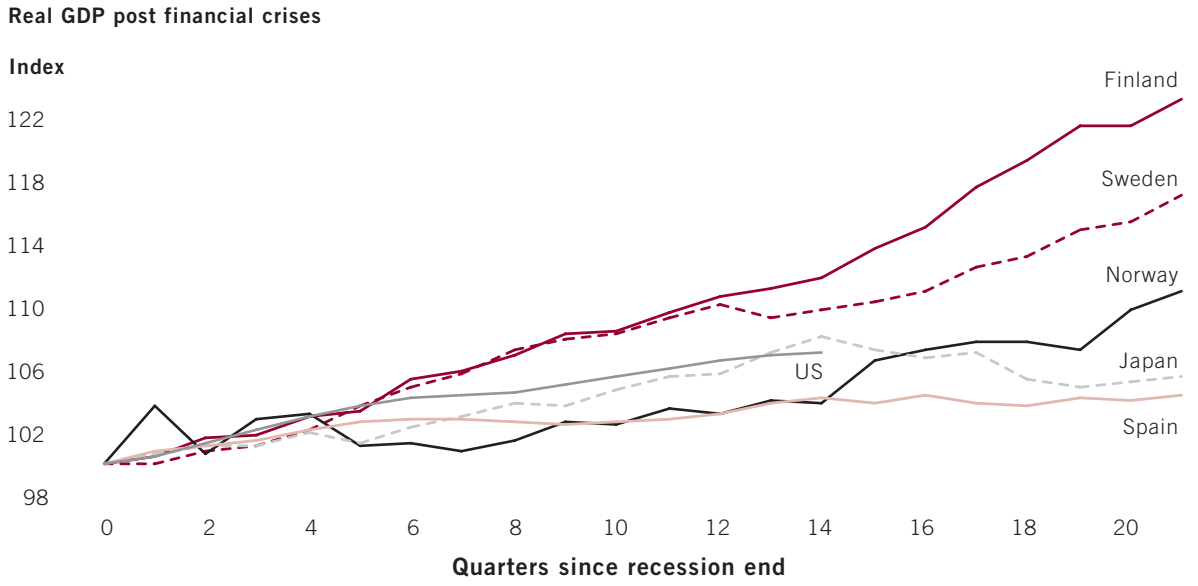


Change in yield during recessions, peak to trough

%-pts	3mo	10yr
1969-1970	-2.5	-0.8
1973-1975	-1.8	1.3
1980	-3.4	0.4
1981-1982	-6.0	-3.1
1990-1991	-1.8	-0.3
2001	-3.1	-0.1
2007-2009	-3.0	-0.4
Average (ex 07-09)	-3.1	-0.4

Third, the weak recovery in the US is consistent with the experience of other developed markets economies that have experienced major real estate and banking crises. Economic historians tend to focus on five episodes: Spain in 1977, Norway in 1987, Finland and Sweden in 1991 and Japan in 1992 (See, for example, Reinhart and Rogoff (2009). Chart 8 is a spider chart of real GDP indexed to the business cycle trough for of each of these episodes. In each case the recovery is long and painful. Typically these countries grew at about a 2 ½% rate following very deep recessions. However, in two cases, the economy did languish indefinitely. Thus far, the US experience is not unusual by this standard.

Chart 8: Financial and Real Estate Crisis Recoveries



The weak recovery has consistently surprised both Fed and consensus forecasts. Table 2 shows both Fed and consensus forecasts as of April and November each year. (We choose these dates to match the release of official FOMC forecasts) For example, the FOMC "central tendency" forecast in April 2010 predicted growth of about 4% in both 2011 and 2012. Moving down the table, that forecast was steadily trimmed, reaching just 1.6% for 2011 and 2.3% for 2012. Consensus forecasts have been less optimistic, but also have tended to overestimate the speed of recovery. Some of the underperformance reflects unforeseen shocks such as the Arab Spring oil shock, but presumably some is because post-crisis headwinds have been worse than expected.

Table 2: GDP growth surprises				
Below consensus and below central tendency (Q4/Q4 %ch)				
Time of forecast		Year forecasted		
		2010	2011	2012
Nov-09	FOMC	3.0	4.0	4.2
	Consensus	2.9	—	—
Apr-10	FOMC	3.4	4.0	4.0
	Consensus	2.9	3.2	
Nov-10	FOMC	2.4	3.3	4.0
	Consensus	2.4	2.9	—
Apr-11	FOMC		3.2	3.8
	Consensus		3.2	3.2
Nov-11	FOMC		1.6	2.7
	Consensus		1.6	2.3
Actual		3.0	1.7	2.2*

Note: The "Consensus" is from the Blue Chip survey "FOMC" is the rounded average of the central tendency range
*"Actual" for 2012 is the January Blue Chip survey

3. THE GOOD, THE BAD AND THE UGLY: THE CURRENT STATE OF THE HOUSING MARKET

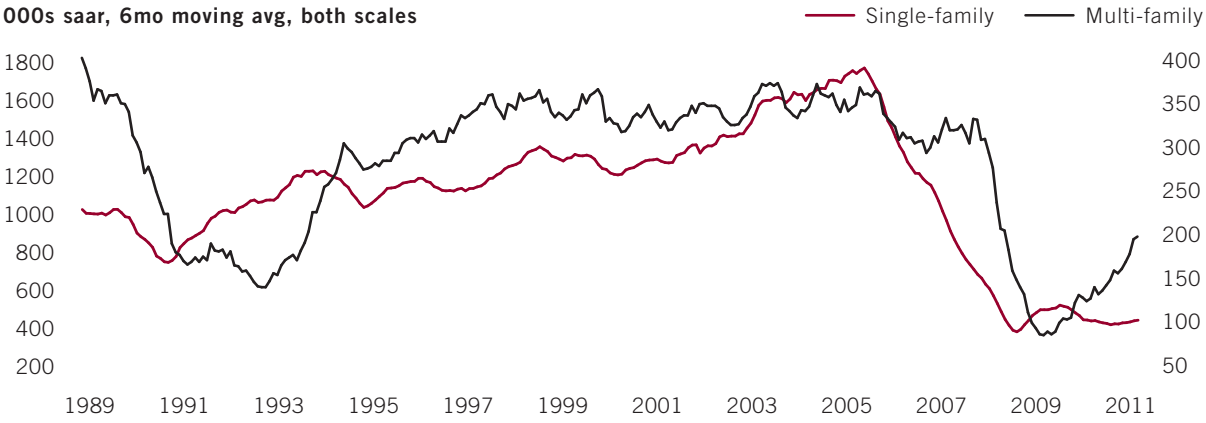
Before exploring the linkages from the housing market to the broader economy, it is useful to get a sense of the scale of the distress in the housing market. The period of free fall in the housing market ended two years ago, but the housing market is best described as being in slow-bleed equilibrium. We note that we make no presumption that it would be socially optimal to have a booming housing market. For example, if we invested too much in housing during the boom we expect, and from a social point of view probably want, relatively low investment post-boom. Our purpose in this section is to document patterns, not make a normative statement.

Here is the good, the bad and the ugly of housing in early 2012.

3A. GOOD: MULTI-FAMILY AND RENOVATION CONSTRUCTION

Two parts of the housing market are in recovery. Over the 12 months ending in December 2011, multi-family construction was up 19% (with starts up 50%) and renovations were up 4% (Chart 9). Indeed renovations are now a bigger share of residential construction than are new homes.

Chart 9: Housing Starts



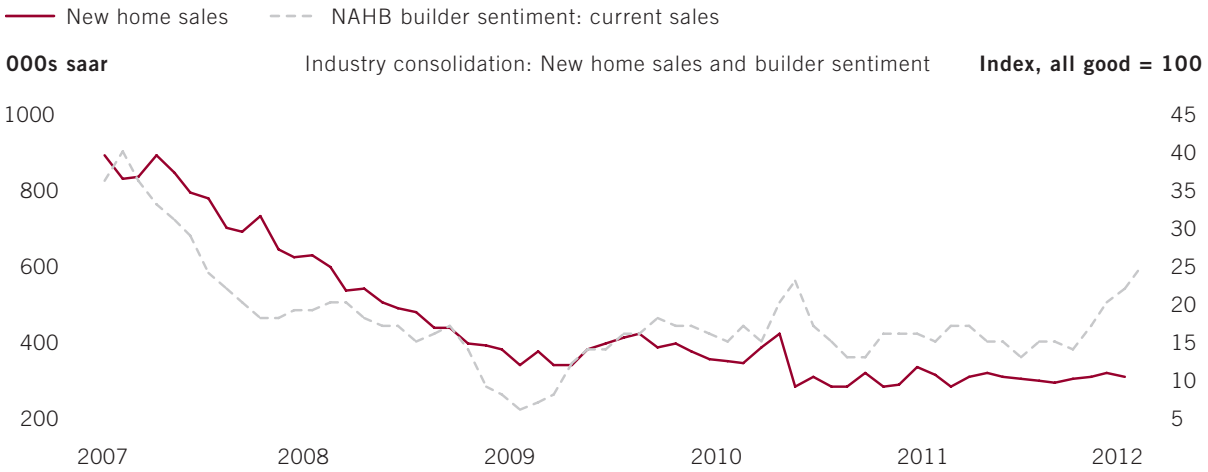
This recovery is likely to continue. The foreclosure process is an important factor in boosting these sectors. When a house is foreclosed, the owner becomes a renter or doubles up with someone else (See Molloy and Shan (2011). This means strong demand for apartment rentals, boosting multi-family construction. The slow messy foreclosure process also boosts renovation spending as many of these homes are in poor shape by the time they hit the market. According to the Campbell survey of real estate agents about a third of distressed sales are damaged and require renovation before moving in.

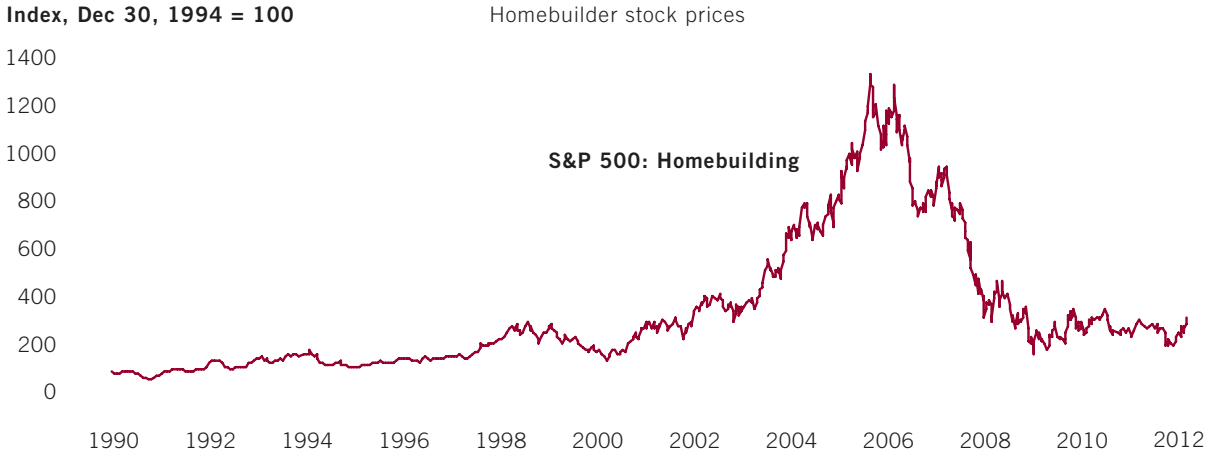
There are two reasons to expect this imbalance in the housing market to get worse before it gets better. First, normally single family rentals make up a small part of the market and the process of conversion from owner to rentals is very slow. Second, according to Flanagan and Meyer (2011) the foreclosure process is likely to reaccelerate in the next two years. Logistical and legal challenges to banks have dramatically slowed the foreclosure process in many states. As those challenges are put to rest, the pipeline should unclog. More on this in the "ugly" subsection below.

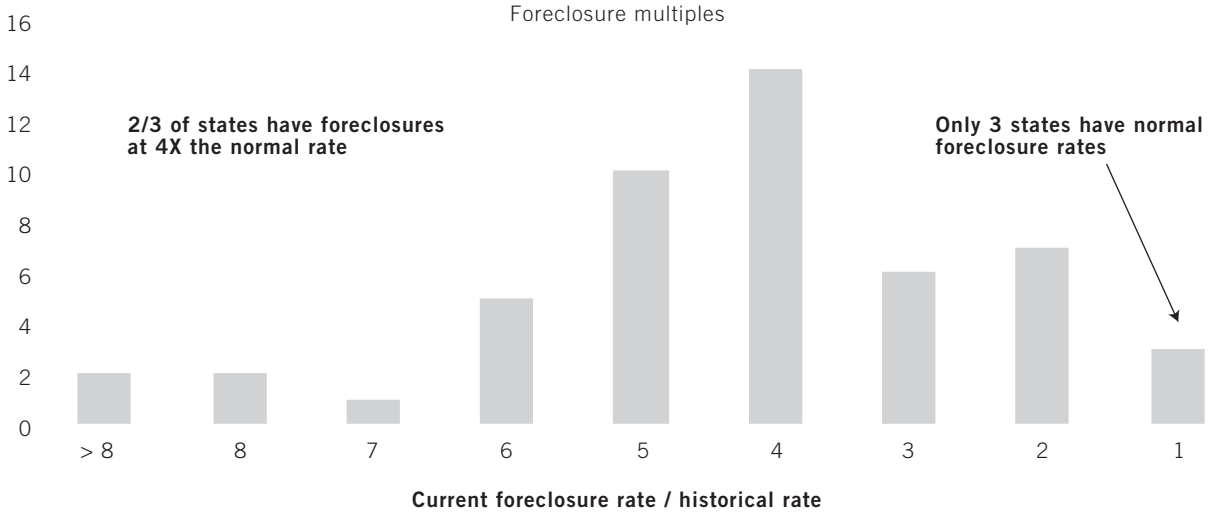
3B. BAD: SINGLE FAMILY SALES AND CONSTRUCTION

While the first time home buyer credit caused a brief surge in sales in 2010, both single family sales and construction have been essentially flat in the past three years. Recently, home builders have reported a pick up in near term sales and home builder stocks have more than doubled since the low of last fall. Before we break out the champagne, however, the improvement in home builder expectations probably reflects the rationalization of the industry. Many builders have dropped out of the business or have merged, leaving the market to bigger builders that have the financial where withal to withstand the recession. This explains why the home builder views of sales have improved, but actual aggregate sales have not (top panel of Chart 10). The recovery in home builder stocks reflects this rationalization of the industry and it should be kept in perspective. Stock prices are bouncing along a very depressed bottom (middle panel of Chart 10). Competition from foreclosures will remains very high. While the experience varies across states, most housing markets still face unusually high foreclosures. The bottom panel of Chart 10 compares the current foreclosure rate (the share of mortgages in foreclosure) versus the historic average from 1980 to 2000. Only three states have normal foreclosure rates (North Dakota, Wyoming and Alaska) and at the other extreme two states (Florida and Maine) have rates more than 8 times normal. But the real story is the breadth of the distress: both the mode and median of the distribution is four times normal. What started as a localized bubble and bust has transformed into a national problem.

Chart 10: Single Family Sales, Homebuilder Stock Prices, and Foreclosures







Finally, our own estimate of physical overhang in housing—which considers the combined stock of single and multifamily dwellings, and computes physical overhang as the gap between actual and desired housing stocks—finds a substantial overhang of about 9% (section 6 below). Thus the good or not so bad news summarized in this and the preceding subsection do not in the aggregate suggest an imminent recovery in housing.

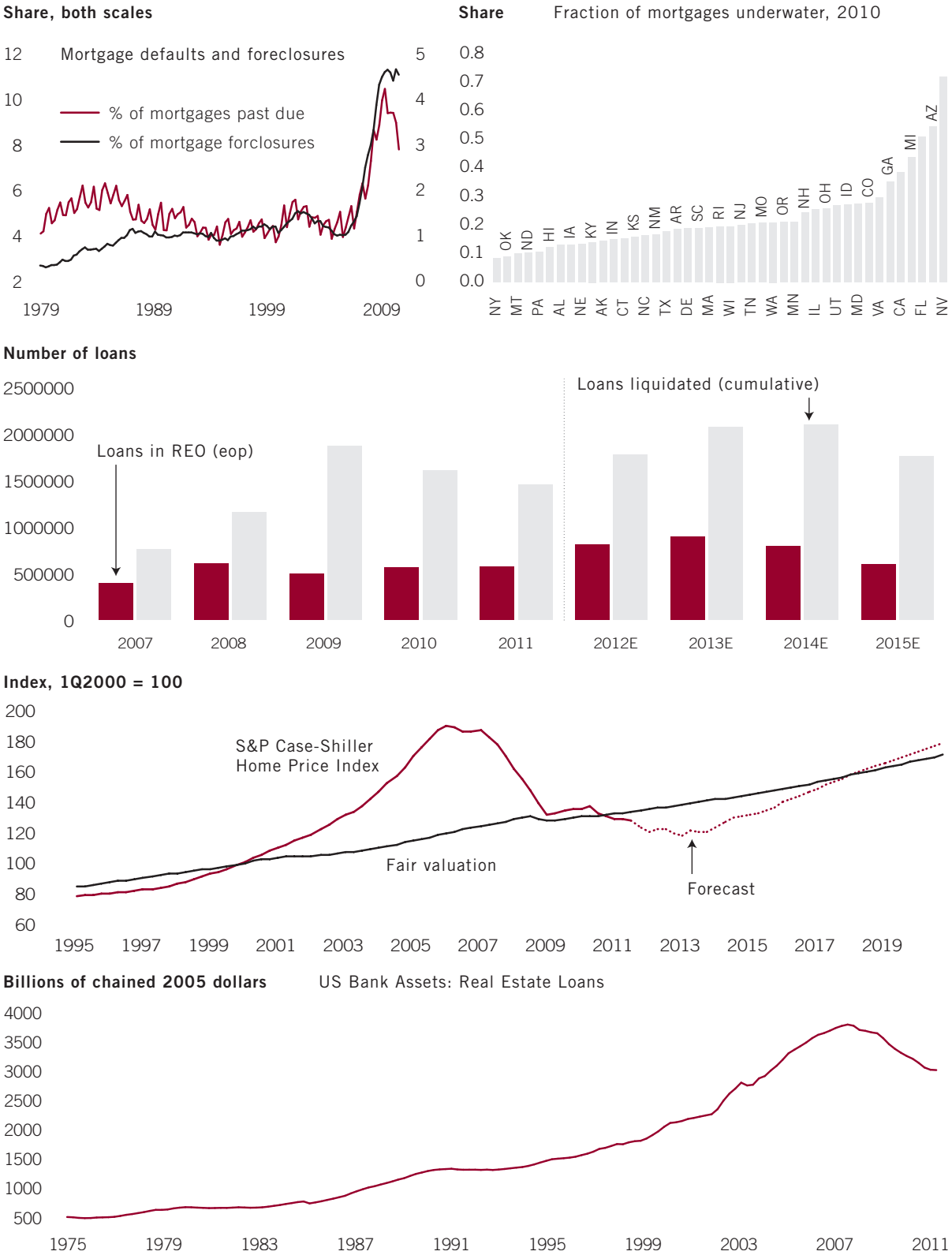
3C. UGLY: HOME PRICES, COLLATERAL AND CREDIT AVAILABILITY

The center piece of the housing crisis is the massive wave of foreclosures. As the top panel of Chart 11 shows, foreclosures and mortgage delinquencies are at historically unprecedented levels and a large fraction of homeowners are underwater. Flanagan and Meyer (2011) estimate that with a moderate economic recovery, there will still be another 7 1/2 million in distressed sales (foreclosure or short sale) over the next four years, on top of the 6 million that have already happened (middle panel of Chart 11). In addition, they argue that the foreclosure pipeline has been clogged by a variety of legal and logistical challenges for servicing companies.

Home prices have already fallen dramatically. Thus as of Q3 2011 the Case Shiller national composite is down 33% from its 2006 peak. Under their baseline scenario, Flanagan and Meyer (2011) argue that home prices as measured by the Case Shiller national index, will drop another 7% from Q2 2011 to Q2 2013, then level off before rising in 2014 (third panel of Chart 11). According to the December MacroMarkets home price survey of economists and strategists, the consensus forecast is for prices to fall another 2 to 3% before bottoming in early 2013. With such a dramatic collapse, even homes that originally had normal downpayments are now "under water"—the value of the home is less than the mortgage. Chart 11 shows the share of mortgages that were underwater in each state for 2010. Nevada leads the pack with almost three-fourths of mortgages underwater, but even in the in the least distressed states about 10% of mortgages are underwater. With a number of these homeowners defaulting, this share could drop; on the other hand, with the ongoing fall in prices additional mortgages could go underwater.

Finally, there is evidence that commercial banks are reducing their exposure to real estate lending, which reflects the broader pullback from mortgage lending and the significant tightening of credit standards. The bottom panel of Chart 11 shows total real estate loans by US commercial banks.

Chart 11: Foreclosures, House Prices, and Negative Equity



The housing crisis has blown a big hole in household balance sheets. The top panel of Chart 12 shows the ratio of total net worth and home equity to disposable income. The simultaneous boom in home and equity prices in the past decade helped improve household balance sheets. With the baby boom generation approaching its retirement years a surge in net worth helped reduce the share of households with inadequate savings. The collapse in the housing and stock markets has turned the clock back by some years.

We discuss in section 4C below alternative views on whether movements in housing prices generate a wealth effect for households. Whatever one's views on that subject, it is unambiguously true that housing is a large share of net worth for households. According to the 2007 Survey of Consumer Finances, home equity makes up 85% of net worth for homeowners in the bottom 20% of the income distribution. And it also makes up 62% of net worth for households in the 60th to 90th percentile of the income distribution. On average, this extremely important part of household net worth has fallen an average of 31%. As prices continue to fall and with a very high inventory in the market, homes have become a negative return, extremely illiquid asset.

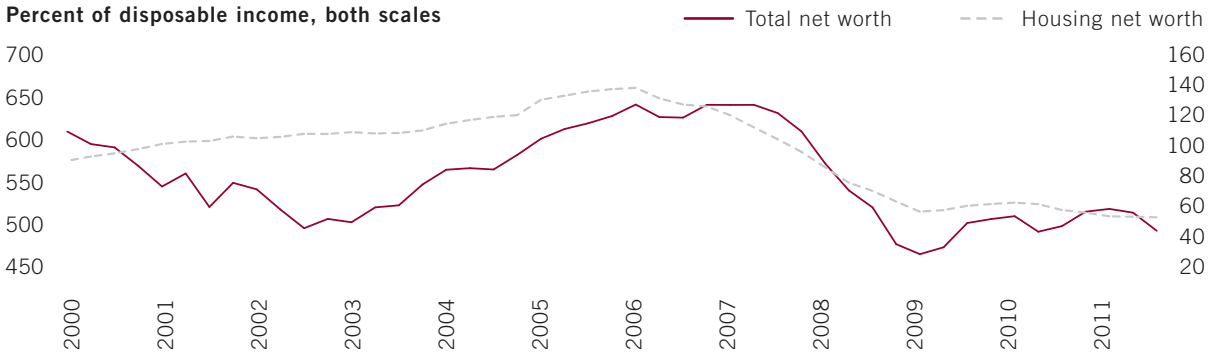
The combination of falling prices and falling interest rates has created a huge gap between two indicators of the desirability of owning a home. On the one hand, when households are asked about homes as an investment—is this a good time to buy because either prices are going higher or it is a good investment—the combined response is at a record low and has shown no sign of recovery (second panel of Chart 12). On the other hand, housing affordability—the median servicing costs of a new loan relative to median income—is at a record high (third panel of Chart 12).

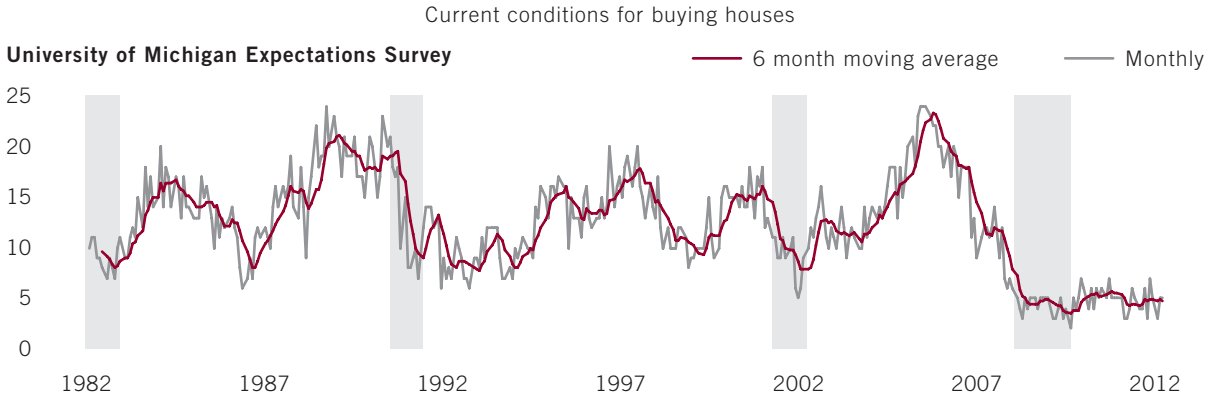
During the housing boom mortgage lending standards weakened dramatically. With regulatory authority split between state governments and several federal regulators, there was a sharp deterioration in underwriting standards. As San Francisco Fed President Williams notes that "it is the nature of a financial crisis that the pendulum swings from loose credit, when it's easy to borrow, to tight credit, when loans are hard to get. This time, that swing has been breathtaking." (Williams, 2012).

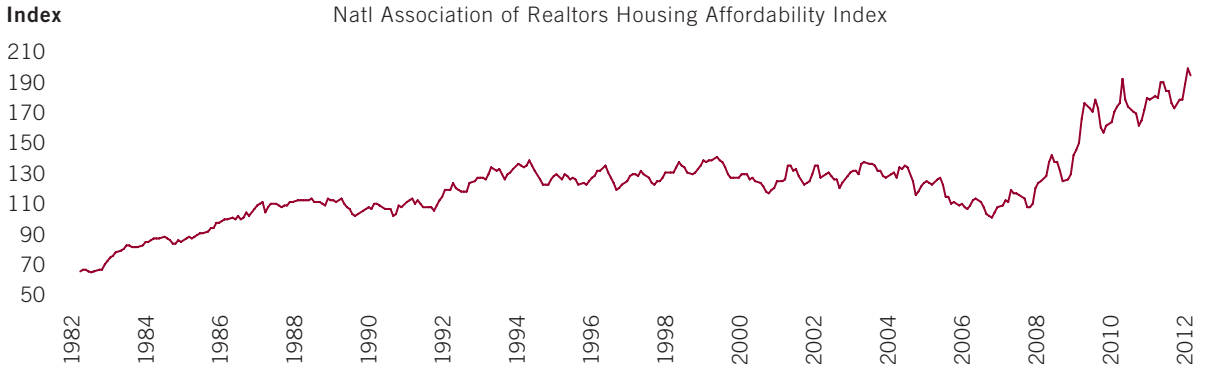
We can get a rough idea of this swing by looking at the Fed's Loan Officer Survey. Among a variety of questions, the Fed asks whether banks are tightening lending standards for residential real estate loans. The question has changed a bit over time and more recently the Fed is asking separate questions about prime and subprime. However, Haver Analytics has spliced the old and new data together using weights on the share of each type of loan. The bars in bottom panel of Chart 12 show the net percent of banks reporting tighter standards. It suggests most banks steadily raised standards from 2007 to 2009, with a much higher proportion of banks tightening standards than in the last credit crunch of 1989-92.

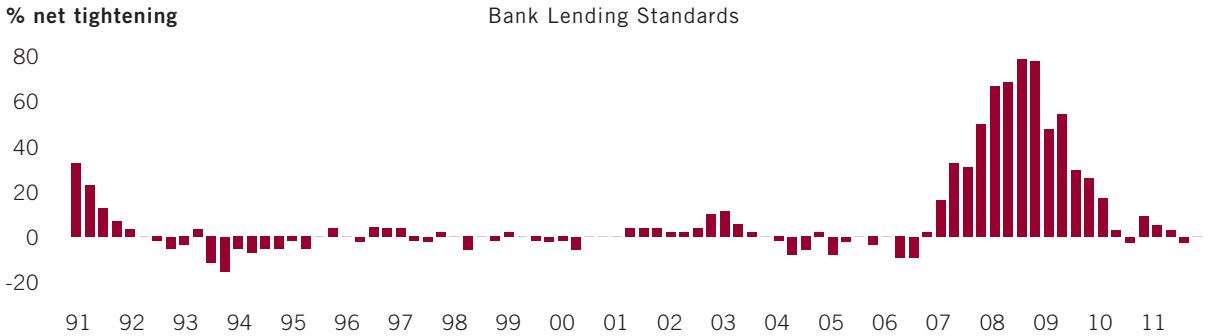
The upper line on the bottom panel in Chart 12 shows the results when we cumulate the responses. If there is a close correlation between the share of banks tightening credit and the degree of overall tightening, this is a rather alarming picture. We would not take this cumulative index literally, however. It is likely that some respondents misreport that credit is "getting more tight relative to the last survey" when they really mean "credit remains tighter than normal." That kind of misreporting is likely to increase in periods such as this, particularly if bankers think "we are tightening" is what regulators want to hear. Nonetheless, even assuming a 50% misreporting rate—lowering the line by about 50%—credit standards are easily the tightest ever. Moreover, it is noteworthy that in the last two years, even with pressure on banks to increase lending, reported standards have gotten a bit tighter.

Chart 12: Household Balance Sheets, Affordability, and Credit Standards









In section 7 we will present econometric evidence consistent with the view that household balance sheets and credit availability are associated with consumer spending in the period of the bust.

4. HOUSING AND THE MONETARY TRANSMISSION MECHANISM

How does the transmission of monetary policy interact with the housing market? Given the evidence above on weakness in housing, this is a crucial question for understanding how monetary policy is likely to affect the current economy.

4A. THE TRANSMISSION MECHANISM IN NEW KEYNESIAN MODELS

This subsection describes the macro framework that we have in mind when we interpret data such as that presented in the previous two sections, or work through, at a reduced form level, the linkages between the housing market, the economy and monetary policy.

We take the point of view of new Keynesian models, in which monetary policy has real effects because the monetary authority can change real interest rates, which in turn affect private spending. This principle applies even in the presence of a zero bound on short term nominal rates. If the monetary authority can affect short or long rates by shifting expected inflation, or can affect long rates that are above zero via quantitative easing, then the monetary authority can affect private spending. In our discussion we take as given the potential to move rates relevant to private spending, and hence will not make further reference to the zero bound on nominal rates.

The particular strand of new Keynesian research that we believe is most pertinent to our study is the one that includes borrowing constraints. Such constraints arise because of informational frictions and agency costs that fundamentally change private markets for borrowing and lending relative to a full information benchmark. The relevant models presume "asymmetric information:" specifically, lenders cannot freely detect the intention or ability of borrowers to repay. Instead, it is costly for them to monitor the borrowers. Loan collateral helps private markets function in the presence of such frictions. These frictions lead to a wedge or spread between the effective rate paid by households and private firms on the one hand and the rate on riskless securities on the other. The spread may be larger when collateral is lower. See, e.g., Carlstrom and Fuerst (1997), Bernanke et al. (1999), and Curdia and Woodford (2010). When such models explicitly include a housing sector, a strong or expanding housing market raises household collateral, which allows growth in lending, which boosts the overall economy and not just housing activity (Iacoviello (2005), Iacoviello and Neri (2010)). Conversely, a weak or shrinking housing market affects overall economic activity negatively. This is sometimes called the financial accelerator: a stimulative push from monetary policy or from a private shock gets multiplied via relaxation of lending constraints. The converse applies for contractionary shocks. Such models seem to fit basic facts about housing and the economy better than frictionless models such as Davis and Heathcote (2005).

We view the problems with the housing market as impeding the expansionary impact of stimulative monetary policy. The usual chain in new Keynesian models is:

stimulative monetary policy →
lower private borrowing rates, increased collateral and relaxation of borrowing constraints →
expansionary effect on the economy.

The first step in this chain is no longer working with its usual vigor. We presented circumstantial evidence to this effect above (e.g. banks report tighter lending standards). We will present additional circumstantial evidence in section 5 and econometric evidence in section 7 below. This is the steepening of the IS curve, or the widening of the wedge between risk-free and effective private borrowing rates, that we referenced in the introduction. The steepened slope or widened wedge is relative not only to the go-go years of the housing boom, but to the 1990s as well.

Our reading of the literature on the role of housing in monetary transmission is consistent with the view that the state of the housing market affects the transmission of monetary policy. For the sake of brevity, we cite but one piece of supporting evidence. The IMF(2008, p2), uses a "Mortgage Market Index" to compare 18 OECD countries. The Index measures the degree of development in the mortgage market on a scale by combining variables such as loan-to-value ratios, the ease of home equity withdrawal and the development of secondary markets for loans. Cross-section comparisons indicate that economies with higher Mortgage Market Indexes tend to show greater sensitivity of residential investment, real house prices and output to interest rates.

Our circumstantial evidence indicates that an updated measure of the Mortgage Market Index would find the US less developed than it was during the housing boom. The implication of the estimates in IMF (2008) is that the U.S. economy is now less sensitive to interest rate movements than previously. We do not offer an exact figure for how much less sensitive. We do note that Rosengren (2011a) suggests that the response of GDP to interest movements has fallen by 20 percent.

(To be clear, while our thinking is shaped by New Keynesian models with credit frictions, we do not rigidly predicate our argument on such models. For example, our thinking is compatible as well with models with credit rationing (e.g., Stiglitz and Weiss (1981)), and with a perception that the housing boom seemed to involve excessive rather than the socially suboptimal credit that results in baseline New Keynesian models. Our central presumption is that stimulative monetary policy is not yielding expansion to the extent it once did, not that a given New Keynesian model rationalizes this presumption in every detail.)

In sorting through the housing channels it is useful to first focus narrowly on the housing sector abstracting for clarity from the borrowing constraints that we have just emphasized (section 4B). We then consider how developments in that housing sector spill over to consumption, along the way reintroducing borrowing constraints (section 4C).

4B. THE TRANSMISSION MECHANISM: HOUSING DEMAND AND SUPPLY

In the standard frictionless neoclassical framework, monetary policy impacts housing via the "user cost of capital." Demand for owner occupied housing increases if there is an incipient rise in the annual flow of services from owning a home relative to the annual cost of ownership. The annual cost of ownership is the user cost of housing, which depends on the relative price of housing and a tax-and transactions-cost adjusted real mortgage rate. In section 6 below, we write out the user cost in detail. For our purpose at present, it suffices to write the user cost as

(4.1)

$\{P_h/P\}$ x {tax and transactions cost adjusted real mortgage rate}.

In (4.1), P_h is the house price whereas P is the overall consumer price level. The conversion from nominal to real mortgage rate in the second term in brackets {} in (4.1) comes from expected inflation in house prices P_h (i.e., nominal capital gain for owners of housing) as opposed to expected inflation in the overall price level.

The estimated elasticity of home demand with respect to the user cost is very wide. Below, we estimate a long run elasticity of between -0.1 and -0.2; McCarthy and Peach (2002) report a smaller value, of less than -.01; Mishkin (2007, p 365) reports that some estimates run as high as -1.0 and that the Federal Reserve Board's FRB/US model has an elasticity of -0.3.

Expansionary monetary policy impacts the user cost of capital via three channels. The first and most obvious channel is that monetary easing puts downward pressure on the real after-tax mortgage rates. Second, monetary easing can cause the general price level P to rise disproportionately to any rise in P_h, though this in general is a second order effect. Finally, as housing demand picks up, price P_h rises, which may put upward pressure on home price expectations. Robert Shiller refers to this feedback loop between prices and price expectations as an "amplification mechanism."

This effect on expectations depends critically on how home price expectations are formed. We find in our work in section 6 below that different treatments of home price expectations can lead to very different views of the state of the housing market.

4C. THE TRANSMISSION MECHANISM: THE SPILLOVER INTO CONSUMPTION

In this subsection, we discuss the reasons that housing market conditions can affect non-housing consumption. In the most standard model, households should not view changes in housing values as a change in net wealth. The reason is simple: changes in housing values reflect changes in the cost of housing services which need to be purchased going forward. For households that plan to downsize their consumption of housing services, an increase in their current home price represents a positive net wealth shock. However, households that plan to upsize their consumption of housing services are clearly made worse off by increases in house prices.

One reason the standard model may not apply is that there are distributional effects. A second reason that house values may affect consumption behavior is via the tightening or relaxation of collateral constraints, similar to the intuition of the New Keynesian financial accelerator models discussed in Section 4A. Indeed, there is substantial evidence that a significant fraction of the U.S. population face borrowing constraints (e.g., Gross and Souleles (2002), Mian and Sufi (2011), Kaplan and Violante (2011)). Housing represents a crucial collateralizable asset for these households. In particular, Mian and Sufi (2011) show that households with low credit scores and high credit card utilization rates aggressively borrowed against home equity during the 2002 to 2006 housing boom. Their estimates suggest effects on the order of $0.65 for every $1 of house value increase among this population. Greenspan and Kennedy (2005) also provide evidence of aggressive equity withdrawal relative to the benchmark model.

The importance of housing as an asset for secured lending is consistent with evidence that housing tends to affect consumption behavior more than changes in stock market wealth. For example, Carroll et al. (2011) find both short- and long-run spending elasticities are about twice as large for increases in housing versus financial wealth, with the exact values depending on the specification.

5. THE IMPACT OF THE HOUSING BOOM AND BUST ON THE TRANSMISSION MECHANISM

So much for the theory, what about the practice? The next two sections present our formal econometric attempts to measure the impact of the housing crisis, using macro (section 6) and cross-state data (section 7). Here, we indirectly gauge the impact. We consider the boom (section 5A) in order to contrast it with the bust (section 5B). If the boom enhanced the transmission channel, then presumably the bust has undercut the channel. In both boom and bust, shifts in lending standards and the dramatic cycle in home prices over the last decade could have had a number of macroeconomic effects.

5A. THE BOOM

One of the first calculations many buyers make is to determine how big a mortgage they are eligible for. The old rule of thumb, before the loosening of lending standards in the last decade, was that a buyer should put 20% down and monthly mortgage payments should comprise no more than a third of income. This is the basis of the "affordability index" (recall Chart 12), a popular tool business economists use to gauge the housing outlook. Note that the limit on borrowing was determined by current income and current interest rates. Hence "affordability" was a binding constraint for many buyers who either expected their income to rise over time or expected mortgage rates to drop over time.

In our view, the easing of such lending standards combined with the surge in home prices probably had a major impact on the housing market during the boom. For affordability-constrained borrowers, the easing of down payment and income verification standards and the use of exotic mortgages weakened the link between mortgage rates and borrowing. If income or downpayment funds were too low by normal standards, borrowers had the option of making a smaller down payment and either going to a variable rate mortgage or not revealing actual income. This relaxation of the affordability constraint contributed to a surge in home demand, boosting prices. Higher prices may well have boosted expected home price inflation, lowered the user cost of capital for buyers who are not income constrained and encouraged buyers to buy before prices go up even further (see e.g. Mian and Sufi (2009) and Favilukis et al. (2011)).

Lending markets also moved in the direction of lowering the cost and effort of refinancing. Presumably this had a relatively small impact on consumers who are not liquidity constrained and a bigger impact on constrained consumers (e.g., Mian and Sufi (2011)). If refinancing is easy, all consumers can increase their cash flow by refinancing when interest rates drop. For liquidity constrained consumers, lower refinancing costs made it easier to extract equity: every time home prices rose enough to cover closing costs, the constrained consumer could increase spending power by refinancing. Moreover, for these borrowers there may have been an interaction effect: as mortgage rates fell, home owners could both lower their monthly payment and increase cash flow by taking out a modestly bigger mortgage and paying a lower interest rate. Anecdotal evidence suggests that many borrowers saw this as a "fiscally responsible" way to take cash out of the home.

Hatzius (2005) and others cited in Mishkin (2007) argue for a strong cash-out effect. In the estimated DSGE model of Iacoviello and Neri (2010), in which 21 percent of households are estimated to be borrowing constrained, such borrowing constraints are found to increase by 2.5% the elasticity of consumption with respect to housing wealth. By contrast Feroli and Kasman (2006) and Macroeconomic Advisors (2006) argue that with the correct specification and if wealth is included in the model the cash effect is statistically insignificant. Mishkin (2007) argues on theoretical grounds against the notion that home equity withdrawal is a mechanism for implementing the wealth effect: Nonetheless, Mishkin

concedes that more efficient mortgage markets can make it easier for households to overcome credit constraints.

Congruent evidence on effects of lending standards may be found in Calza et al. (2007). They use an index of mortgage market development, created by the IMF and covering 18 countries. As noted earlier, the index combined three kinds of variables: (1) loan-to-value ratios, (2) the ease of home equity withdrawal and (3) the development of a secondary market for loans. According to this index, the US had by far the most developed mortgage market in the mid-2000s. Calza et al (2007) show that consumption growth is more correlated with house prices in economies with more advanced mortgage finance systems. If this is true on a cross country basis, one must wonder if it is also true across time. During the housing boom, the US mortgage system was becoming increasingly "advanced" in the sense that the speed and cost of processing steadily declined (along with mortgage underwriting standards). That in turn made it easier for borrowers to refinance and extract equity. If the marginal cost of equity extraction—in terms of time and money—is lower, then this could imply a stronger effect of housing on consumption.

5B. THE BUST

Presumably this also works in reverse. In section 3C we showed the dramatic damage to household balance sheets and the severe tightening of lending standards. In many respects the US mortgage system has moved backwards. Processing times have gotten a lot longer as banks have become very careful in assessing risk; banks resources have been drawn into the foreclosure process and this may have come at the expense of underwriting new mortgages; legal challenges to mortgages and mortgage backed securities and problems assessing real estate values have undercut faith in housing as reliable piece of collateral. See Duke (2011) and Rosengren (2011b) for discussions of specific impediments such as loan level pricing adjustments that stand between consumers and our current low level of mortgage rates. Moreover, these problems will not be resolved soon. By most accounts the foreclosure process is only about half over. As noted in section 3C, Flanagan and Meyer (2011) forecast another 7 1/2 million mortgages to be liquidated over the next 4 years. The IMF (2008, p4) notes that "in countries where lenders face high administrative costs and long periods of time in order to realize the value of their collateral in the event of default, they are less likely to make larger loans relative to the value of the property and to lend to higher-risk borrowers."

In the terminology introduced in section 4, this has led to clogging of the financial accelerator channel; in the terminology of our introduction, it has led to a steepening of the IS curve as the effective rates that borrowers can obtain may be significantly higher than the rates the Federal Reserve can affect. Additional anecdotal evidence may be found on the construction side. Financing conditions impact the supply of housing as well as demand. Many builders are relatively small businesses that depend on banks for credit, using real estate as collateral. A survey from the National Association of Home Builders found that credit in the homebuilding industry was still tightening in Q3 2011 ("Persistent Tight Lending Conditions for Home Builders Threaten Economic Recovery" NAHB December 6, 2011). Compared to the prior quarter, 8% said the availability of financing for single-family projects was getting better, 61% said it was unchanged and 31% said it had worsened. Of those seeing tighter credit, the NAHB reports:

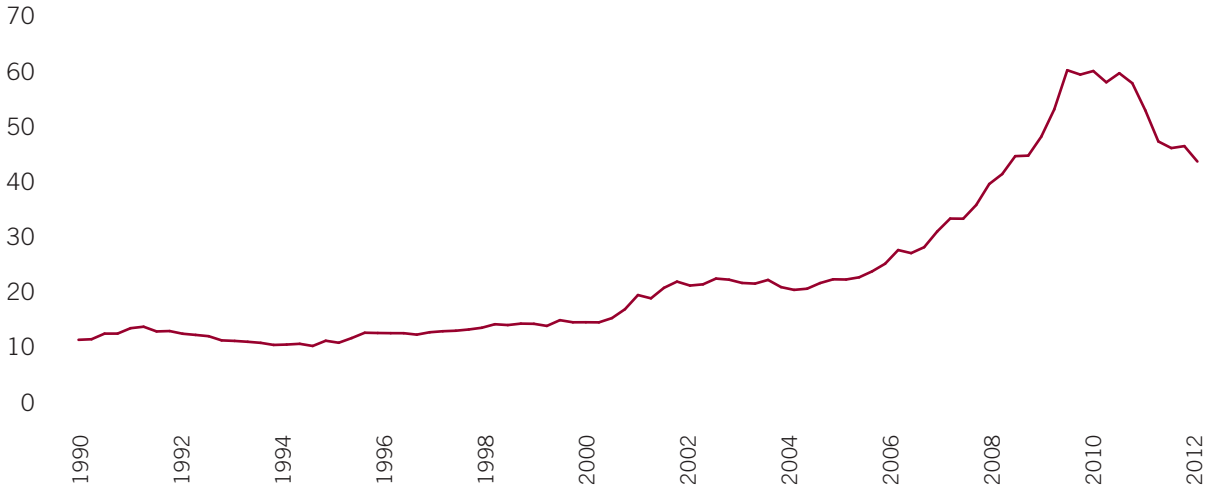
- "77 percent said lenders were reducing the amount they were willing to lend.
- 75 percent reported seeing the allowable loan-to-value ratio being lowered.

- 66 percent found lenders who were not making any new real estate loans.
- 63 percent said they encountered lenders who were requiring personal guarantees or collateral not related to the project."

One offsetting effect should be noted. While the fall in house prices has no doubt hurt consumption, there is an offsetting effect from a less recognized income flow variable, "squatter's rent." These are the funds that homeowners retain if they are delinquent on their mortgages. By not paying their mortgage (or rent) funds become available for other purposes such as consumer spending. This is not captured in official income data, but for the households whose spending is income-constrained it could have a large impact on spending. As Chart 13 shows, estimates from Feroli (2011) show squatter's rent peaking at more than a $60 billion annual rate early in 2010, then easing back as home foreclosures were delayed by legal and logistical problems. Of course, these unpaid bills are an income transfer from lenders to borrowers and the net stimulus depends on their relative propensity to consume.

Chart 13: Cash Squatter's Rent

$ bn saved by household sector due to delinquencies, ar



6. MACRO EVIDENCE ON PHYSICAL OVERHANG IN HOUSING

6A. OVERVIEW

In this section, we use a simple regression to get a rough idea of the magnitude of the physical overhang in housing. Our approach is to use a standard model, in which the housing stock h adjusts towards a desired level h^*. We do not model or estimate the adjustment, but instead focus on the determination of h^*. The desired level h^* is driven by two variables, namely, consumption and the user cost of housing. Using cointegration techniques, we ask: at the 2010q4 end of our sample, how far is actual h above desired h^*? Our baseline set of estimates indicates that h is about 9% above h^*, i.e., physical overhang is about 9% in real dollar terms ("real dollar" as opposed to number of units). The 9% figure is so large that even a hypothetical 2010q4 user cost with a hypothetical mortgage rate of zero yields desired housing h^* that is below actual housing h.

Estimates such as this one are sensitive to treatment of house price expectations and transactions/ liquidity costs of home ownership. We provide two other sets of estimates that have different treatment of house price expectations and transactions/ liquidity costs. One set implies a larger overhang, of about 22%, the other a smaller overhang of about 2%. In these cases, a hypothetical mortgage 2010q4 mortgage rate below zero and one of 3.3% equate hypothetical desired h^* to actual h.

These hypotheticals are neither descriptions of equilibrium effects nor indicators of recommended policy. Rather, they are offered for two reasons. The first is to help make concrete the depth of the physical overhang in housing. The second is to underline the uncertainty about the effects of mortgage rates on long run housing demand.

Throughout the analysis in this section, we abstract from the very credit conditions that we have been emphasizing in previous sections. Our working assumption is that movements in such conditions, while prolonged, are transitory, and hence do not effect the long run equilibrium that we study. Of course such conditions very much affect the transition towards the stochastic steady state, as we note at the close of this section below. We also abstract from the distinction between rental and owner occupied housing. Here we follow a long tradition in the housing literature, though we saw in our review of the housing market in section 3 that there are at present distinctions between the behavior of the two segments of the private housing market that are important from the point of view of transitory dynamics. We will return to the rental – owner occupied distinction in our discussion of policy options in section 8.

6B. MODEL AND DATA

We let the desired level be determined by a measure of household consumption c and the user cost of housing u (described below):

(6b.1) $h_t^* = \text{constant} + \theta_1 c_t + \theta_2 u_t$.

In calibrated DSGE models, preferences are often assumed to be Cobb-Douglas, in which case (6b.1) applies with $\theta_1 = 1$ and $\theta_2 = -1$. However, as noted below, while our data indeed are consistent with $\theta_1 \approx 1$, those data also seem inconsistent with $\theta_2 \approx -1$. This is also the finding of research that proceeds in a vein similar to ours, such as McCarthy and Peach (2002, 2004). Hence we decided to estimate rather than impose values for θ_1 and θ_2, constructing $\hat{h}_t^* = \text{const.} + \hat{\theta}_1 c_t + \hat{\theta}_2 u_t$.

Our data are quarterly from 1975q1 to 2010q4, with data from 1970q1 to 1974q4 used to construct our first observation on expected inflation as described below. For convenience in interpretation we do not convert to per capita terms. The real residential housing stock h is taken from BEA's estimate of the net stock of total fixed assets. The BEA data are annual and we use a cubic interpolation to get quarterly data. Real non-housing consumption is from the NIPAs. For consumption c in (6b.1) we avoid the modeling choices in calculating the service flow of consumer durables and look only at non-housing services and non-durables. We construct the real, chain-weighted data using nominal shares and real growth rates.

We compute three series for the user cost of housing u_t via a standard formula (e.g., Himmelberg et al. (2005), Mishkin (2007), Duca et al. (2011)), with the series differing in, first, their measure of expectations of house price inflation, and, second, in an assumed value of a transactions cost. Let P_{ht} be the housing price level, P_t the aggregate price level. Thus, P_{ht}/P_t is the relative price of housing. Also, let τ_t be the income tax rate, i_t the mortgage rate, τ_{pt} the property tax rate, π^e_{th} expected inflation in the price of

housing, γ_t transactions or liquidity costs that drive a wedge between costs of owner occupied housing and costs of renting, and δ_t the housing depreciation rate where "depreciation" includes maintenance and property taxes. Then the log of the user cost is

$$(6b.2) \quad u_t = \ln \{ (P_{ht}/P_t)[(1 - \tau_t)(i_t + \tau_{pt}) - \pi^e_{th} + \gamma_t + \delta_t] \}.$$

To construct (6b.2), we use data as follows:

- P_{ht}: FHLMC conventional mortgage purchase-only home price index, US (renormalized so that 2005=100);
- P_t: PCE, chain price index (2005=100);
- τ_t: average effective marginal tax rate on wages & salaries (%), from Macroeconomic Advisers' model;
- i_t: the FHFA's series on contract interest rates for existing single-family homes;
- τ_{pt}: inferred from BEA's estimate of state and local property taxes (BEA Table 3.3) as a share of the nominal value of real estate in the Fed's Flow of Funds balance sheet tables;

π^e_{th}, γ_t: see below;

- δ_t: ratio of annual data on nominal depreciation to the nominal stock of residential fixed assets. Annual depreciation rate converted to a quarterly rate by straight line averaging of the yearly figures.

We use the FHLMC series because it is available for a long time period (in contrast to the Case-Shiller data used in section 3). We use the long time series in part to construct house price expectations. Modeling house price expectations is both difficult and important. In our baseline user cost series, we began with an annualized average of the previous five years of house price inflation. Proxying expected house price inflation with three to five year backward averages of house price inflation has a long tradition in the housing literature (e.g., DiPasquale and Wheaton (1994),McCarthy and Peach (2002, 2004), Duca et al. (2011)). There is, however, a Michigan survey of house price expectations that is available beginning in 2007q2. We conjecture that this survey, however imperfect, is probably a better proxy than the traditional backward average. We therefore smoothly averaged the five year backward average and the mean of five year ahead Michigan survey forecast beginning in 2007q2, with the weight on the Michigan series increasing to 1 by 2008q4.

In our baseline user cost we set the transactions/liquidity cost γ_t to a constant value of 3%. Some studies set this to zero, while Duca et al. (2011) set it to a constant value of 8% and McCarthy and Peach (2002) choose an unspecified constant value. Clearly this figure can vary over time, and papers such as Verbrugge (2008) implicitly assume a time varying value by adopting an algorithm that adjusts the user cost upwards to a constant positive value when it would otherwise be negative. Presumably the transactions/liquidity cost is high now, since the usual transactions costs seem to be inflated by unusual sluggishness in effecting turnover in the housing market. We do note that in 6b.2 γ_t and $-\pi^e_{th}$ enter symmetrically, so what matters econometrically is the value $\gamma_t - \pi^e_{th}$. We also note that in our data, a value of at least 2% for γ_t is required to generate a positive value for the user cost series in all quarters: backward averages of rapid

house price inflation in the 2000s led to values of expected inflation π^e_{th} in the 2000's that exceeded after tax interest plus depreciation.

We also construct two other user cost series that differ from the first only in their measure of house price expectations and assumption about transactions costs. The second relies solely on house price inflation to measure expected inflation: it is identical to the first except that Michigan survey expectations are *not* substituted for a backwards average of house price inflation at the end of the sample. The third series proxies inflation expectations with a five year backward average of PCE inflation. At the end of our sample, this series happened to correlate well with the Michigan survey, so we used it even at the end of the sample. In this third series, we set the transactions/liquidity cost γ_t to zero.

We thus use three measures of user cost which differ only in their treatment of transactions costs γ_t and expected house price inflation π^e_{th}. We let u_{bt} denote the baseline series, which relies on house prices/ Michigan survey to proxy π^e_{th}; we let u_{ht} denote the series that relies sole on house prices to proxy π^e_{th}; we let u_{pt} denote the series that relies on PCE inflation:

(6b.3) u_{bt}: γ_t=3%, π^e_{th} = the average of the previous 5 years of house price inflation through 2007, then transiting smoothly to the Michigan survey of five year house price expectation;

(6b.4) u_{ht}: γ_t=3%, π^e_{th},= the average of the previous 5 years of house price inflation;

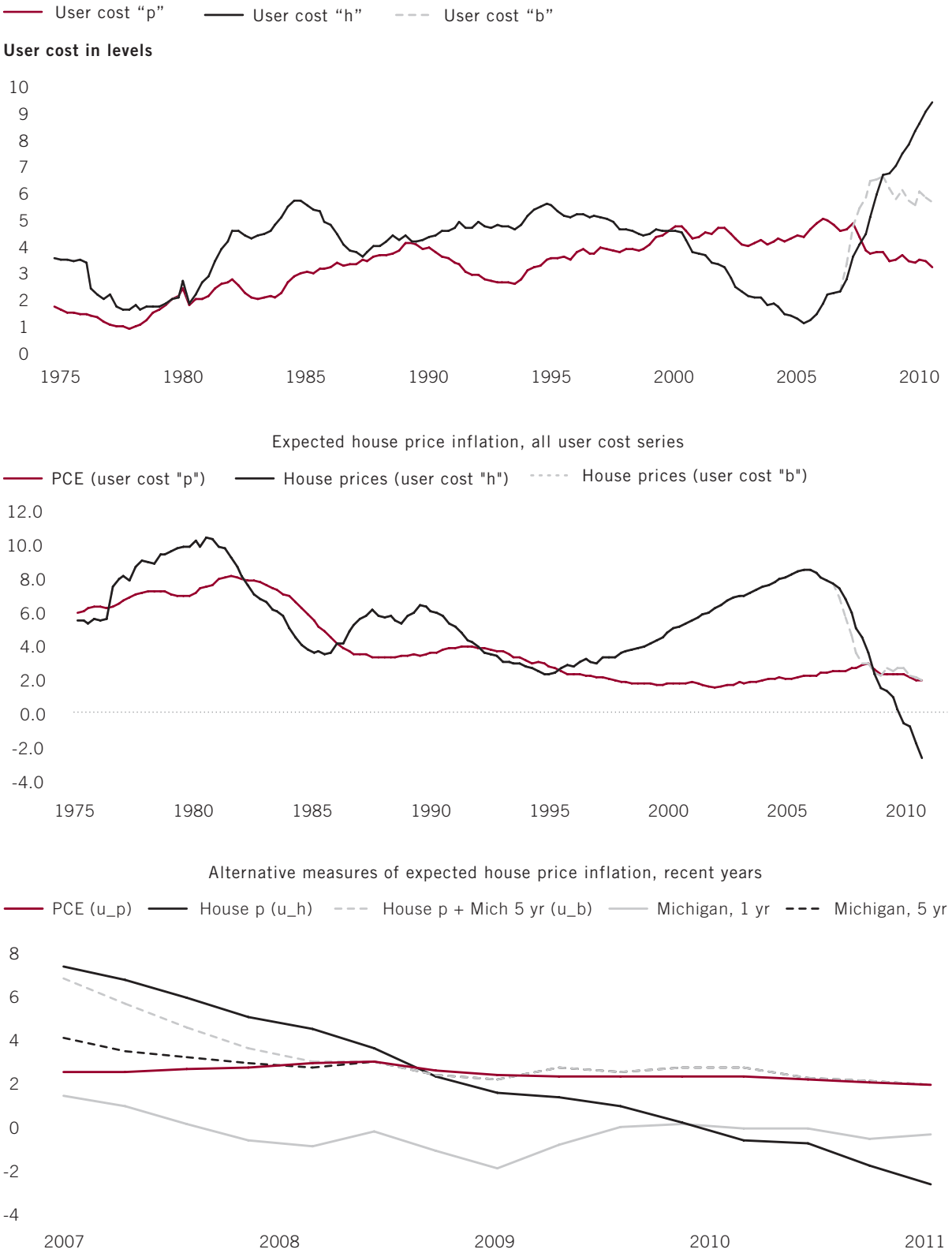
(6b.5) u_{pt}: γ_t=0, π^e_{th},= the average of the previous 5 years of PCE inflation.

To prevent confusion, we note that the baseline series u_{bt} and the series u_{ht} differ only in the last years of the sample, when the baseline series begins using Michigan survey data for expected inflation.

This can be seen in the top panel of Chart 14, which plots the levels of user costs, i.e., exp(u_{bt}), exp(u_{pt}) and exp(u_{ht}). The units on the vertical axis are to a certain extent arbitrary, since the term (P_{ht}/P_t) (normalized by us to 1 in 2005) is dimensionless. What seems to be a plot of only two series becomes a plot of three series in 2007 when our baseline series u_{bt} begins to use survey data. The middle panel of Chart 14 plots the expected inflation series embedded in each of the three user cost series. Upon comparison of the two figures, we see that the high volatility in u_{bt} and u_{ht} reflect house prices. For example, in the 2000's the rise in house price inflation 2000-2005 and fall 2006-2010 accounts for u_{bt}/u_{ht} falling from 2000-2005 and rising from 2006-2008. Because of the continued and prolonged fall in house prices, expected inflation for u_{ht} falls below zero by the end of our sample. The leveling off of expected inflation and user costs in the last couple of years for the baseline series u_{bt} results from our switch to Michigan survey expectations in those years. The bottom panel blows up the final four years of inflation, adding in both the 1 year and 5 year survey expectations. (The 1 year survey, which is not used in our empirical work, is included for comparison.) Expected inflation in user cost *h* segues into the 5 year survey by construction. Use of PCE in user cost *p* of course means somewhat unintuitively that expected house price inflation was low and stable during the house price run up in the 2000's. But, as well, this series does not show the dramatic and perhaps implausible movements in expected house price inflation that result when previous expectations are modeled via past house price inflation.

As we shall see, our series lead to somewhat different scenarios for the state of physical overhang in the housing market in 2010q4. Series u_{pt} will turn out to be an optimistic series; it will to lead to a relatively low estimate of the extent of physical housing overhang at the end of our 2010q4 sample. The more

Chart 14: User Cost Estimations



conventional series u_{bt} will turn out to imply a larger and thus more pessimistic estimate of the extent of physical overhang. The major reason for the differing outcomes for u_{pt} vs. u_{bt} is the differing treatment of transactions/liquidity cost (3% vs. 0%), not the differing house price expectations series. Finally, series u_{ht}, which is probably our most conventionally constructed series, delivers the most pessimistic estimate of the extent of physical overhang. It is more pessimistic than is the baseline series u_{bt} because use of backward averages of past house price inflation lead to very low (in fact, as we see in Chart 14, negative) expected house price inflation at the end of the sample.

6C. DESIRED HOUSING STOCK h_t^*

Following McCarthy and Peach (2002), for the trivariate time series (h, c, u), we estimate the leading cointegrating vector using Johansen's maximum likelihood technique. We renormalize the estimate so that the coefficient on h_t is unity. Let $\hat{\theta}_1$ and $\hat{\theta}_2$ be the resulting weights on c and u. Our measure of the desired housing stock h_t^* is

(6.c1) $\hat{h}_t^* = \text{const.} + \hat{\theta}_1 c_t + \hat{\theta}_2 u_t$

where the constant is chosen so that the 1975-2010 mean of $h_t - \hat{h}_t^*$ is zero.

The estimates are similar to those of earlier research such as McCarthy and Peach (2002): each of the estimated coefficients on consumption $\hat{\theta}_1$ is near one, each of the estimated coefficients on the user cost $\hat{\theta}_2$ is negative and much smaller in absolute value. (We noted in section 4 that estimates of the user cost elasticity range as high as -1. The studies that find estimates that high in absolute value take a different approach than do we.) For our baseline user cost series u_{bt} in (6b.3), we obtain

(6c.2) $\hat{h}_t^* = 2.43 + 0.84c_t - 0.11u_{bt}$.

The resulting series for $h_t - \hat{h}_t^*$ turned from negative to positive in early 2007. That is, a housing overhang (or a positive gap between the actual housing stock h_t and the desired housing stock h_t^*) appeared at that date. By the end of the sample, 2010q4, the actual stock of a little under $17 trillion 2010 dollars exceeded the desired stock by about 9.4 percent or about 1.5 trillion 2010 dollars.

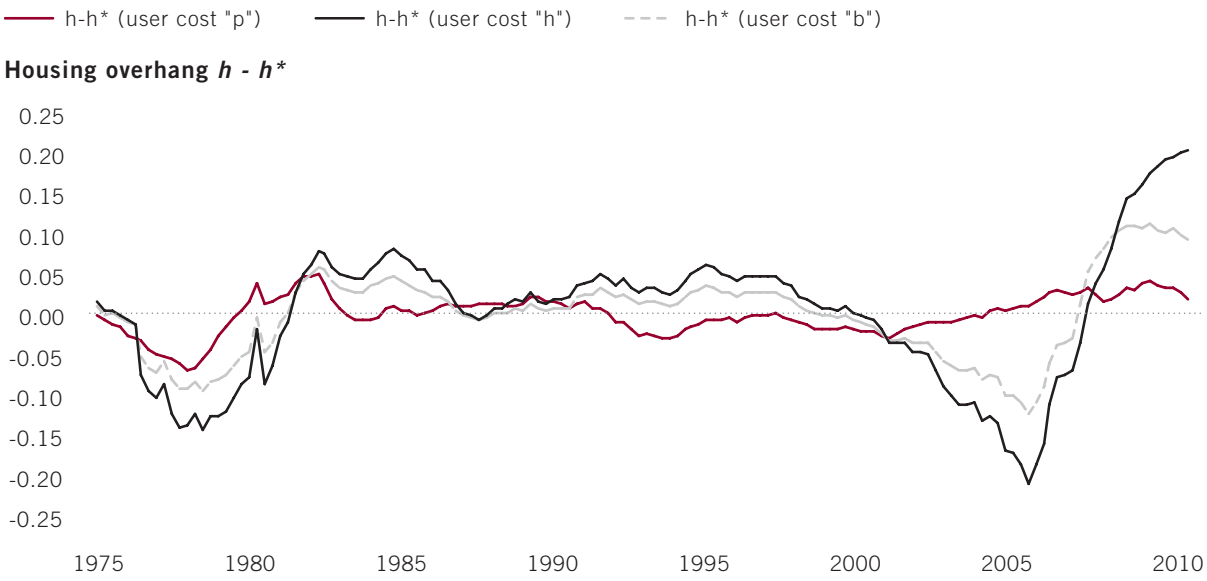
For our alternative user cost series u_{ht} and u_{pt} in (6b.4) and (6b.5),, the regression implies a desired housing stock of

(6c.4) $\hat{h}_t^* = 2.38 + 0.86c_t - 0.18u_{ht}$,

(6c.5) $\hat{h}_t^* = 1.80 + 0.91c_t - 0.08u_{pt}$.

For these two measures of housing costs, overhang began to develop in 2007 (u_{ht}) or 2004 (u_{pt}). By the end of the sample, 2010q4, the actual stock of a little under $17 trillion 2010 dollars exceeded the desired by: about 23% or about $3.1 trillion 2010 dollars (u_{ht}), or 2.0% or by about $330 billion 2010 dollars (u_{pt}). Chart 15 plots housing overhang for $h_t - \hat{h}_t^*$.

Chart 15: Housing Overhang



6D. DISCUSSION

According to the Census's Housing Vacancy Survey, the vacancy rate in 2010q4 was 14.1%, or about 3% above its 1987-2002 mean of about 11%. (This Survey's data are imperfect but seem to be the best available.) Of course this is in unit (as opposed to dollar) terms. If empty residences are less or more expensive, on average, than occupied units, the implied physical overhang will be below or above 3%. Separately, since house sizes increased during the boom years, it may be the case that at current user costs a disproportionate share of households are holding "too much" housing. In any event, our estimates of 9%, 22% and 2% of dollar overhang bracket the vacancy figure of 3% unit overhang.

In a mechanical accounting sense, what sort of changes in user cost would be required to eliminate physical overhang in 2010q4? We consider in sequence: changes in mortgage rates, changes in house prices and changes in expected house price inflation. We change just one of these at a time, holding constant consumption and all other components of user costs. For example, when we consider a change in house prices, we hold fixed at their actual 2010q4 values consumption, mortgage rates and expected house price inflation along with all other components of user cost. Thus, this is clearly not a calculation about feasible policy, let alone a calculation that incorporates general equilibrium effects.

The results are summarized in Table 3. The first five columns present actual 2010q4 data. Mortgage rates i_t and relative house prices P_{ht}/P_t are the same for all measures of user costs, while expected inflation π^e_{th} the level of user costs $\exp(u_t)$ and housing overhang $h_t - \hat{h}^*_t$ of course differ for the different measures of user cost. Column (6) presents what we call $\exp(u_t\sim)$, which is the level of user costs that would eliminate physical overhang in housing in 2010q4, i.e., equate h_t and $\hat{h}^*_t$ in 2010q4. In columns (7) through (9) we adjust either interest rates or housing prices or expected inflation so that housing overhang is eliminated.

Table 3: Counterfactual Changes in User Costs that Eliminate Housing Overhang in 2010Q4

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	2010q4 data								
	i_t	P_{ht}/P_t	$\pi_{ht}(e)$	$\exp(u_t)$	h_t-h_t^*	$\exp(u_t\sim)$	$i_t\sim$	$\%\Delta P_{ht}$	$\pi_{ht}(e)\sim$
(1)u_{bt}	4.50	0.81	1.93	6.96	9.4%	2.44	-0.80	-57.1	5.92
(2)u_{ht}	4.50	0.81	-2.63	9.40	22.6%	2.97	-6.00	-68.4	5.27
(3)u_{pt}	4.50	0.81	1.94	3.25	2.0%	2.53	3.32	-22.2	2.82

Notes: 1. Columns (1)-(5) present data or estimates: i_t is the mortgage rate, P_{ht}/P_t the relative price of housing, $\pi_{ht}(e)$ expected inflation in housing, $\exp(u_t)$ the level of the user cost, h_t-h_t^* the estimated level of housing overhang.
2. Columns (6)-(9) present values that, in an accounting sense, would eliminate the housing overhang presented in column (5). For example, for the baseline user cost series u_{bt}, column (9) in row (1) indicates that if expected inflation in 2010q4 were 5.92% rather than 1.93% but all else is unchanged, desired housing h_t^* would equal actual housing h_t.

We begin by looking at our baseline user cost series u_{bt}. Column (7) in row (1) of Table 3 indicates that in a mechanical accounting sense, the 2010q4 housing overhang would be eliminated only if mortgage rates i_t were around -0.8%! After returning mortgage rates to their actual 2010q4 value of 4.5%, we compute that a 57% fall in housing prices would in our accounting sense eliminate housing overhang when user costs is our baseline series (row (1), column (8)). Alternatively, a rise in expected inflation from 1.93 to 5.92 would also cause computed h_t^* to equal h_t ((row (1), column (9)).

Our second user cost series u_{ht} states that the housing overhang would be eliminated if mortgage rates i_t were -6%, housing prices lower by 68% or expected inflation at 5.3% (row (2), columns (7)-(9)).

The negative values for i_t in column (7), rows (1) and (2) warrant a word. Even if we grant the Fed the ability to adjust mortgage rates, and even if we arbitrarily and foolishly require that the Fed focus single mindedly on eliminating physical overhang, we may have a sector specific liquidity trap in which interest rate movements alone cannot eliminate the housing overhang. It is important to note that these results are in principle applicable with a normally-functioning mortgage market. The limitation on the Fed's effectiveness in this case is not inherent to housing, but rather is the same one identified by Keynes (1936) and modeled by Krugman (1998). What makes housing different is the fact that the large swings in house prices, such as are embodied in user cost series u_{ht}, are more likely to engender large swings in house price expectations—and increase the risk that housing falls into a sector-specific liquidity trap.

To return to Table 3: our third user cost series u_{pt} states that the housing overhang would be eliminated if mortgage rates i_t were about 3.3%, housing prices fell by 22% or expected inflation rose to 2.8%.

Why do the user cost series—each of which has something to recommend relative to the other—lead to such different measures of physical overhang in 2010q4? Series u_{ht} has a disproportionately low figure for expected inflation, at -2.6%. So the dramatic figures associated with that series are easy to understand: expectations of falling house prices make user costs high. For our baseline u_{bt} vs. PCE based u_{pt} the explanation is a little subtler. The use of different 2010q4 measures of house price expectations is not part of the explanation, since the two measures are the same at about 1.9% in 2010q4. Instead there are two factors that account for the difference. The first is the estimates of the weights on c and u in construction of h^*. If we were to construct our baseline h_t^* using user cost u_{bt} but with the coefficient estimates obtained for u_{pt} (i.e., (i.e., $\hat{\theta}_1$ = 0.91, $\hat{\theta}_2$ = -0.08), the physical overhang would fall from 9.4% to

6.4%; if we were to construct h^*_t with our PCE based user cost measure u_{pt} but use the coefficient estimates reported for the baseline user cost measure, physical overhang rises from 2.0% to 3.2%.

The remainder of the discrepancy in terms of these two estimates of physical overhang is accounted for by the transactions/liquidity cost γ_t, fixed at 3% in u_{bt} and at 0% in u_{pt}. Had we followed research such as one of the models of Verbrugge (2008) and assumed that the transactions/liquidity cost is zero except when required to make user costs positive, we would have set γ_t to zero in 2010q4 and the two measures of user cost would deliver substantially the same estimates for physical overhang. A nonzero value seems to us warranted, both on intuitive grounds, and because such a value helps reconcile divergences between user costs for housing and rental rates (Duca et al.(2011)). But clearly reasonable people could disagree on this.

Chart 15 indicates that transitions towards steady state historically are slow. One can see in the Chart that once housing overhang ($h - h^* > 0$) or housing shortfall ($h^* - h < 0$) begins, it typically takes 5+ years until the $h - h^* = 0$ line is crossed again. The calculations in Table 3 are consistent with this pattern: one cannot reasonably think of house prices falling the indicated amounts over any but a long period of time. Moreover, movements in the variables considered in Table 3 are not the only ones that will ultimately lessen overhang. Our estimates of the parameter that we called θ_1 indicate that each percentage increase in non-housing consumption relative to the housing stock lessens overhang by about .8 to .9 percent. But even taking consumption growth into account, we doubt that physical overhang in housing will be eliminated anytime soon. That message is also found in studies such as Hedberg and Krainer (2011), who describe a "soft landing" scenario for housing starts in which return to average takes six years. We note that the credit conditions that we have abstracted from probably make for an unusually slow transition towards the steady state values estimated above. Thus physical overhang will not be easily or quickly cleared by lowering interest rates.

7. QUANTIFYING THE EFFECT OF HOUSING USING STATE-LEVEL DATA

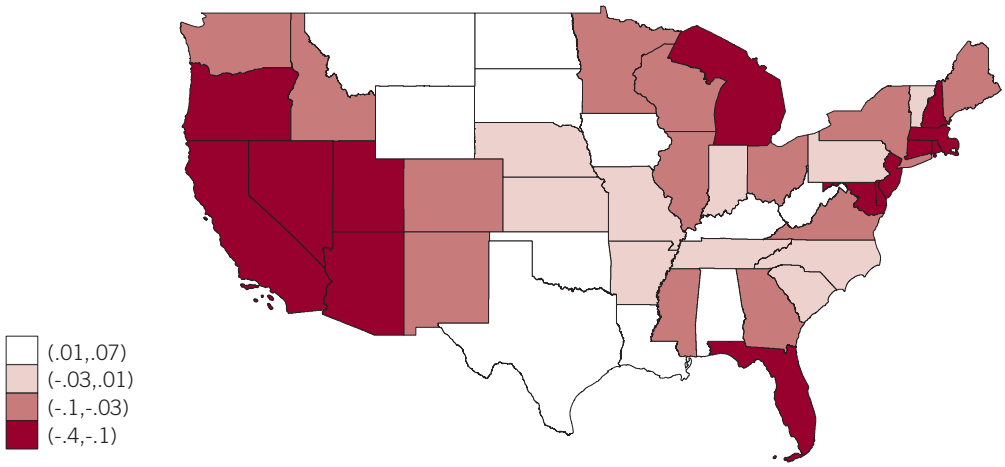
7A. METHODOLOGY

Few doubt that housing weakens the effectiveness of monetary policy and represents a drag on economic growth going forward. The difficulty lies in quantifying how large these effects are. While we believe that the previous section's analysis using aggregate data is informative, it is difficult to quantify effects using aggregate data alone. For example, it might be that problems in housing reflect other problems in the economy, such as high unemployment. It is not obvious from the aggregate data whether housing is the crucial factor in understanding economic weakness, or simply one of many ancillary conditions.

The key challenge in quantifying the effect of housing on the economy and monetary policy is to construct a reasonable counter-factual for how the economy would perform in the absence of the housing downturn. Our methodology for constructing such a counter-factual is based on the observation that weakness in housing markets has been very different across the United States. In fact, some states have avoided a downturn altogether.

Chart 16 shows house price declines from 2006 to 2009 using the FHFA house price indices across states. Arizona, California, Florida, and Nevada were hardest hit by the housing collapse. Several states completely avoided the housing downturn including Texas, Oklahoma, and the Dakotas. Our empirical methodology will use the distribution across states of house price declines from 2006 to 2009 to estimate the effect of housing on monetary policy and the recovery. We will use states that avoided the housing downturn as a counter-factual for what the recovery would have been if house prices did not collapse.

Chart 16: House Price Growth, 2006 to 2009, Across States



The use of the cross-section of states is useful because the conduct of monetary policy is identical across all states (given the currency union), but the effects of monetary policy may be very different depending on the local conditions. This allows for a test of the mechanisms we outline in the previous section. For example, if collateral value is key to the effectiveness of monetary policy, we expect to see far less refinancing activity in states that have had larger house price declines. Or put another way, states that have not experienced a housing downturn are states where monetary policy is likely to be most effective.

We choose to focus on variation across states in house price declines from 2006 to 2009 because that is the period over which the national house price index declined most sharply. We also sorted states by the house price decline from 2006 to 2008 with similar results.

There are important caveats to this approach. First and foremost, there are interactions among states with and without severe housing downturns. For example, a decline in durable consumption in California will affect employment in the auto manufacturing sector in Michigan. Second, relative to states that avoided the housing downturn, the states where house prices have declined sharply may face problems that are completely unrelated to the housing market. A related point is that housing problems may have triggered the initial problems in these areas (such as unemployment), but these problems may have become so large that even a recovery in housing would not fix them.

These are valid concerns. In the appendix, we address some of these concerns by showing robustness tests for the results that follow. Further, it is important to emphasize that any econometric modeling implicitly assumes some counter-factual scenario for how the economy would perform in the absence of some problem. We have chosen to be explicit here by choosing a counter-factual based on states that did not experience a housing downturn. Despite some drawbacks, we believe this methodology can inform us on basic patterns related to the effects of housing on monetary policy and economic growth.

As a final note, most of the data are described in detail in Mian, Rao, and Sufi (2011). The only exception is the state-level data on renovation permits, which were generally provided to us by Joe Masters Emison (joe@buildfax.com) of Buildfax.

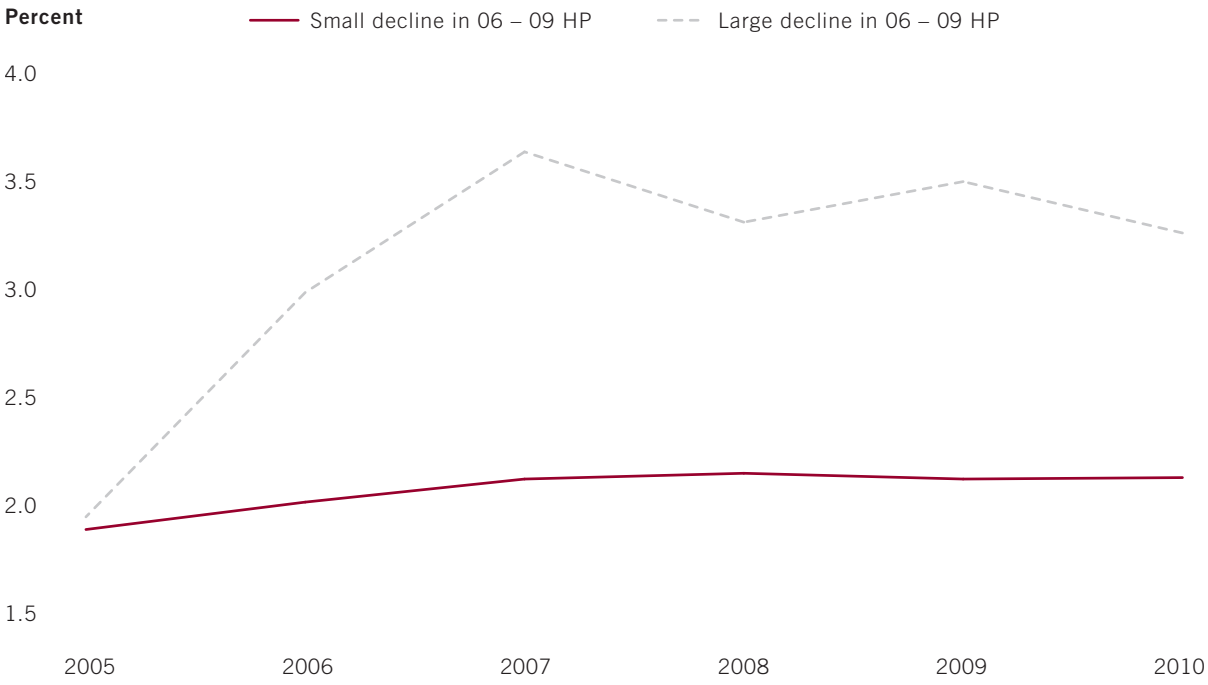
7B. HOUSING-RELATED FRICTIONS ACROSS STATES

In Section 4, we outlined issues related to housing markets that can both offset and make the economy less responsive to stimulative monetary policy. Or in other words, housing problems both shift the IS curve leftwards and steepen the slope of the curve. In this section, we show evidence that these effects are occurring disproportionately in states where house prices declined the most from 2006 to 2009.

One such problem is the aggregate physical overhang problems outlined in Section 6. Here, we show that the physical overhang problems are operating disproportionately in states that have experienced large house price declines.

More specifically, in Chart 17, we examine the homeowner vacancy rate for the top and bottom quartile states based on the house price decline from 2006 to 2009. The two quartiles are formed weighting by total population so that both the top and bottom quartile of the house price growth distribution contain the same number of households.[1] As Chart 17 shows, the homeowner vacancy rate was similar in both groups as of 2005. However, from 2005 to 2007, vacancies increased dramatically in large house price decline states. Further, the difference has persisted through 2010. Physical overhang problems are much more pronounced in large house price decline states.

Chart 17: Homeowner Vacancy Rates for Large and Small House Price Decline States

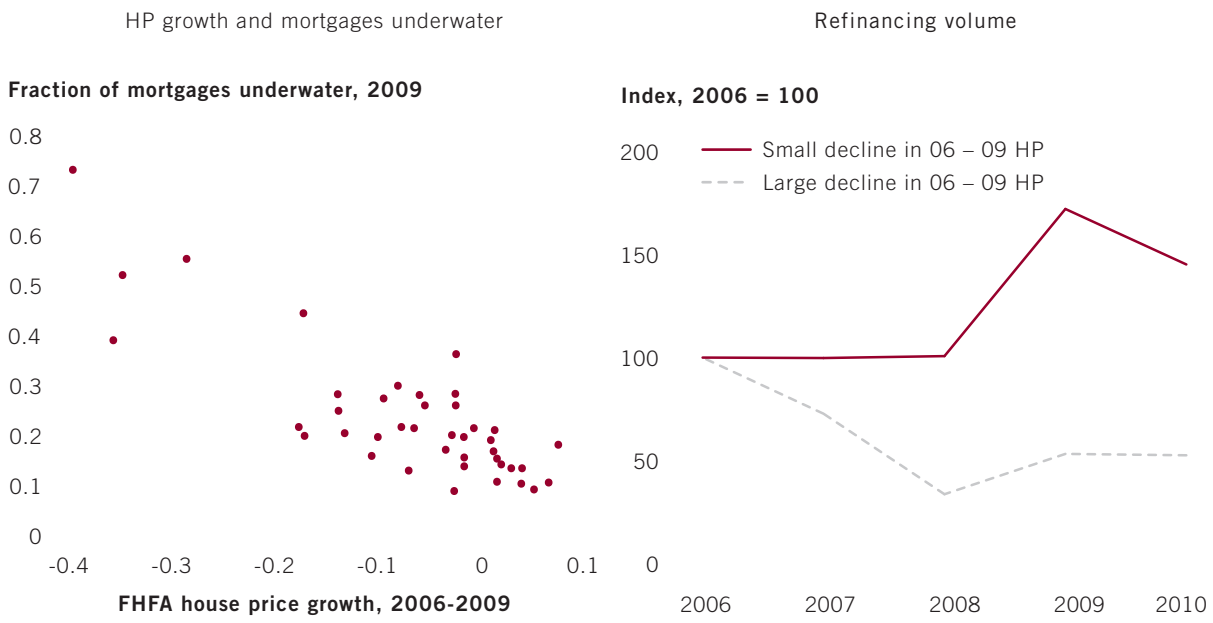


1 Footnote: The large house price decline states include Arizona, California, Florida, Maryland, Michigan, Nevada, Oregon, and Rhode Island. The small house price decline states include Alabama, Alaska, Iowa, Kansas, Kentucky, Louisiana, Montana, North Carolina, North Dakota, Oklahoma, Pennsylvania, South Dakota, Texas, West Virginia, and Wyoming.

Chart 18 shows problems related to low collateral value in large house price decline states. The left panel shows the very strong negative cross-sectional correlation across states between house price growth from 2006 to 2009 and the fraction of mortgages underwater as of 2009. While the correlation is not surprising, it is important to note that house price declines in several states pushed a very large fraction of mortgages underwater. Households with mortgages underwater will be unable to draw on home equity for consumption or residential investment, and will be much less likely to refinance at lower interest rates.

The right panel of Chart 18 shows the latter effect. It displays the volume of refinancing relative to the 2006 level for large and small house price decline states. In line with an effect of monetary policy, states with small house price declines from 2006 to 2009 experienced a boom in mortgage refinancing activity in 2009 which continued into 2010. Refinancing volume was up between 50 and 70% relative to 2006 in these areas. In contrast, states with large house price declines have seen a sharp decline in refinancing volume relative to 2006. In fact, refinancing volume was 50% lower in 2008, 2009, and 2010. The evidence suggests that a large fraction of homeowners in large house price decline states are unable to take advantage of lower mortgage interest rates. Or in the language of the previous section, the slope of the IS curve has significantly steepened making monetary policy less effective at affecting refinancing activity.

Chart 18: Ability to Refinance for Large and Small House Price Decline States



The cross-state evidence is consistent with evidence in policy proposals arguing for streamlining the refinancing process. For example, Boyce, Hubbard, and Mayer (2011) provide strong support to the argument that house price declines and tight credit conditions have made it very difficult for homeowners to access low interest rates. For example, they show that over 75% of homeowners have interest rates above 5% despite market rates being well below 5% for an extended period. Further, only 18% of outstanding GSE mortgages were originated from January 2010 to July 2011, despite exceptionally low interest rates. They argue that an economy without frictions related to the refinancing process would have seen three times the amount of refinancing activity.

Chart 19: Delinquencies and Foreclosures for Large and Small House Price Decline States

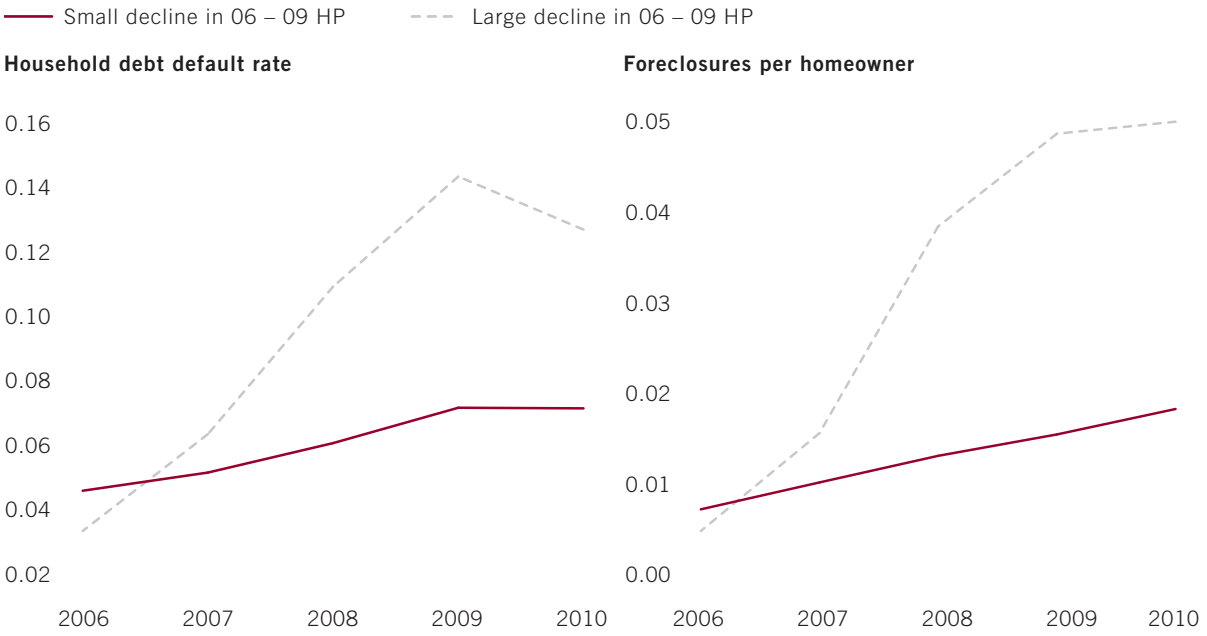


Chart 19 shows that delinquencies and foreclosures are much higher in large house price decline states. The difference is staggering. The household default rate in large house price decline states increased from less than 4% to 14% from 2006 to 2009. The rate remains very high even as of 2010. Foreclosures have increased to 5% per homeowner in these areas. In contrast, the increase in delinquencies and foreclosures has been much more modest in small house price decline states. The brunt of the delinquency and foreclosure crisis has been borne in states with significant declines in house prices.

Charts 17 through 19 show evidence that frictions related to declining house prices have been elevated in states where house prices have declined substantially. Vacancy rates are much higher in these areas, and homeowners are unable to refinancing into lower interest rates. Further, delinquencies and foreclosures have skyrocketed in states with large house price declines, whereas they have been modest in states with low house price declines.

7C. RESIDENTIAL INVESTMENT AND DURABLE CONSUMPTION

What has been the effect of these housing market frictions on residential investment and durable consumption? Chart 20 presents evidence on residential investment. The left panel plots permits for remodeling purposes, and the right panel plots permits for new residential construction.

Remodeling in states with small house price declines has been fairly robust through the recession. In contrast, remodeling permits have collapsed in areas of the country with large house price declines. The right panel shows that new residential permits have been significantly lower in all states, including those that have not experienced sharp house price declines. However, the decline is much larger in states with large house price declines.

One potential reason that the difference in residential investment is not as large between large and small house price decline states is housing supply elasticity. US states with more inelastic housing supply are precisely the states that saw the largest boom and bust in house prices. Of course, areas with inelastic housing supply also have less volatile construction episodes. So we should expect new residential permits to be less sensitive to shocks in areas with large house price declines. Even so, the decline is larger in states with large house price declines.

Chart 20: Residential Investment for Large and Small House Price Decline States

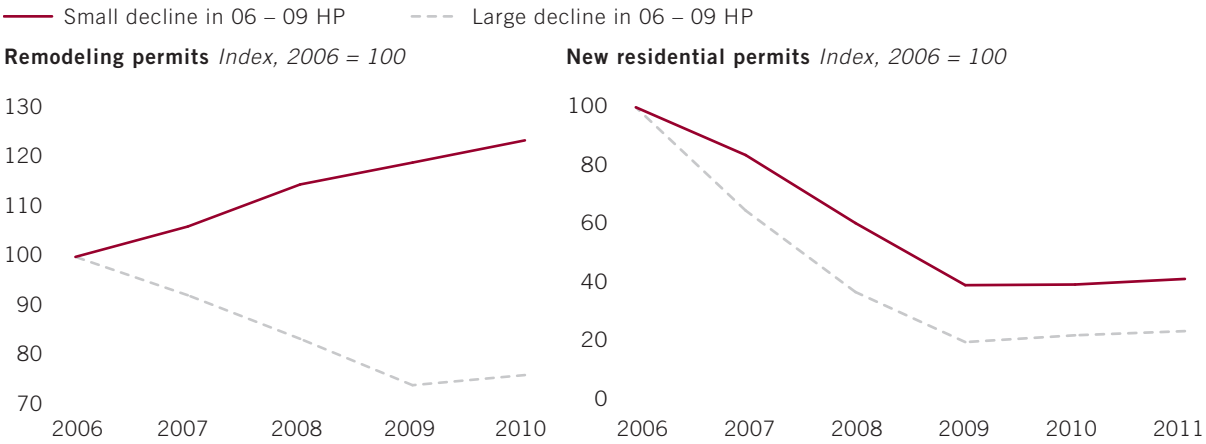
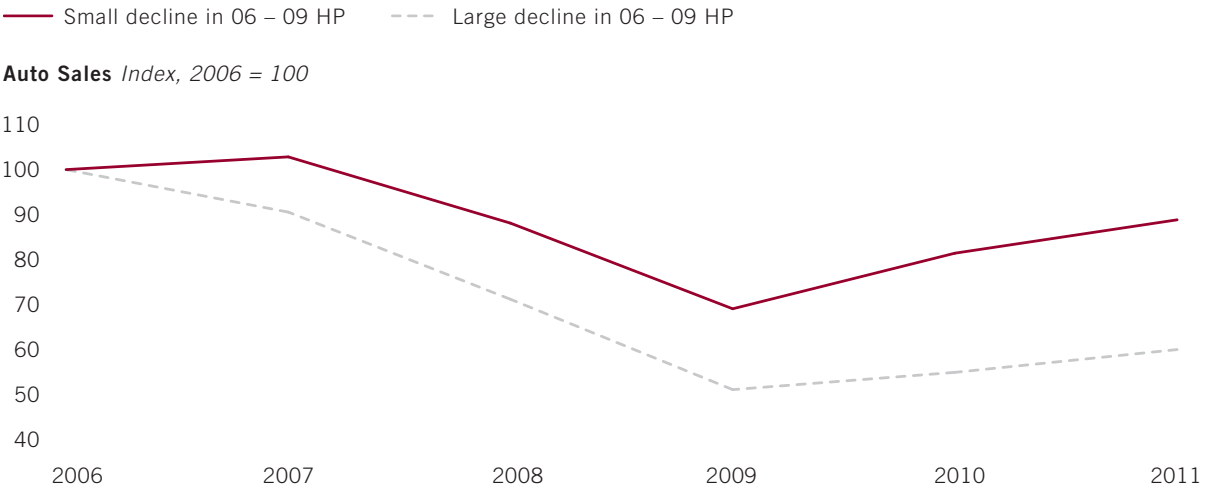


Chart 21 shows evidence on durable consumption using auto sales as a proxy. The pattern is striking. First, the decline in auto sales was significantly larger in states with large house price declines from 2006 to 2009. Second, despite the fact that the decline in auto sales was larger during the recession, large house price decline states have seen a weaker rebound in auto sales in 2010 and 2011.

Chart 21: Auto Sales for Large and Small House Price Decline States



It is important to emphasize that market interest rates facing households have been at historical lows from 2008 through 2011. Despite these very low market interest rates, states facing a depressed housing market have seen little or no rebound in residential investment and durable consumption. In contrast, the recovery has been significantly stronger in areas without a depressed housing market. The evidence is consistent with the argument that problems in housing markets are impeding monetary policy from boosting residential investment and durable consumption.

7D. QUANTIFICATION

In this section, we use a simple linear regression analysis to quantify the extent to which the recovery in durable consumption and residential investment has been weaker in states with large house price declines. The predicted regression line will allow us to consider plausible counter-factuals on how the recovery would look in the absence of the housing market disaster facing much of the country. The basic idea is to use the distribution of house price growth across states to assess how much of the aggregate residential investment and durable consumption weakness can be explained by the housing market.

Table 4 presents coefficients from state-level OLS regressions of the percentage change for each real outcome from 2006 to the end of the sample on house price declines from 2006 to 2009. The goal is to see how far the recovery has come relative to 2006 levels depending on how severe the housing market decline was in a given state.

Table 4: Real Outcomes and House Price Declines

	(1)	(2)	(3)
	Remodeling permit growth, 2006-2010	New residential permit growth, 2006-2011	Auto sales growth, 2006-2011
House price growth, 2006-2009	0.870** (0.238)	0.631** (0.177)	0.891** (0.222)
Constant	0.066 (0.049)	-0.592** (0.023)	-0.279** (0.036)
N	43	50	50
R2	0.12	0.20	0.24

There is a statistically significant and very large positive correlation with house price growth from 2006 to 2009 for all three variables. The estimates are elasticities, so they are easily interpretable. For example, a state with an additional 10% decline in house price from 2006 to 2009 would have 8.91% lower auto sales growth from 2006 to 2011.

We can now use this linear projection to assess the effect of housing on residential investment and durable consumption. In Table 5, we report in the first row the mean percentage change in all three variables from 2006 to 2011 across states. Consistent with the severity of the recession and weakness of the recovery, all three outcomes are down relative to their 2006 level. Remodeling permits are down 8.4%, new permits are down 61%, and auto sales are down 27%.

In the second and third row of Table 5, we do our counter-factual estimation. Using the predicted linear relationship between house price declines and the real outcomes estimated in Table 4, we predict each real variable growth for the 5th and 95th percentile of the house price growth distribution. At the 5th

percentile, house price growth from 2006 to 2009 was -35% according to the FHFA house price indices. At the 95th percentile, house price growth was 5%.

As the second row shows, in the 95th percentile of the house price growth distribution, the recovery has been significantly stronger. Remodeling permits are actually up 11% relative to their 2006 level. New residential permits and auto sales are lower than the 2006 level, but significantly less lower than the average. In contrast, the linear projection shows a much sharper decline in these variables for the lowest part of the house price growth distribution—the housing "disaster" states.

Table 5: Predicted Values of Real Outcomes Based on House Price Declines

	(1)	(2)	(3)
	Remodeling permit growth, 2006-2010	New residential permit growth, 2006-2011	Auto sales growth, 2006-2011
Mean across states	-0.084	-0.606	-0.271
95th percentile house price growth	0.113	-0.559	-0.162
5th percentile house price growth	-0.239	-0.814	-0.550

The three rows allow for a very simple quantification of the housing downturn on the real economy. Under the counter-factual scenario where house price declines were minor, the second row tells us how steep the decline in these variables would have been from 2006 to 2011. It is interesting to note that the decline in auto sales and new residential permits is substantial even in areas of the country that avoided the housing downturn. Nonetheless, as the third row shows, the recession would have been much more severe if the entire country experienced severe housing market declines.

Taken together, the evidence in this section suggests that the housing market represents a quantitatively significant headwind facing the economic recovery. States where house prices declined the most from 2006 to 2009 have seen the worst performance for residential investment and durable purchases. Further, these states are more likely to face frictions that make monetary policy less effective. Our counter-factual estimation suggests that residential investment and durable consumption would be substantially higher in the absence of housing market problems, which suggests that monetary policy has a stronger effect in areas that avoided the housing market collapse.

7E. MORE ON THE SPREAD BETWEEN POLICY AND EFFECTIVE INTEREST RATES

In our review of new Keynesian models in section 4A, we observed that a collapse of housing collateral leads to an increased spread between the policy rate and the effective rate paid by private borrowers. In this section, we use zip code level auto sales data to provide more direct evidence of this effect.

As in the last section, the idea is to use the cross-section of states that have experienced small and large house price declines. However, within each of these two types of states, we can split zip codes by the credit quality of the households living in the zip code. More specifically, we split zip codes into quartiles based on the fraction of borrowers with a credit score under 660 as of 2006. Zip codes in the lowest quartile are considered high credit quality, and zip codes in the highest quartile are considered low credit quality. The working assumption is that lower credit quality households will face a disproportionately large gap between the effective interest rate and the policy rate controlled by the Federal Reserve.

Chart 22 presents the results for the four groups. Auto sales have been lowest in low credit quality zip codes within large house price decline states. This is precisely the group that we expect to be most adversely affected by tightened credit standards, delinquencies, and reduced collateral value. The magnitudes are striking: auto sales declined 60% between 2006 and 2009 in these areas, and they have only barely recovered through 2011. The best performance has been in high credit quality zip codes within small house price decline states. These are the households that are least likely to be affected to the frictions we describe in Section 4. As Chart 22 shows, the decline was less severe in these zip codes and the recovery is in full swing.

Interestingly, the two interim groups—high credit quality zip codes in large house price decline states and low credit quality zip codes in small house price decline states—have had similar auto sales patterns through the downturn and the recovery. This suggests that both problems specific to housing and problems specific to credit quality are operating in consumer markets.

Chart 22: Auto Sales for High and Low Credit Quality Within Large and Small House Price Decline States

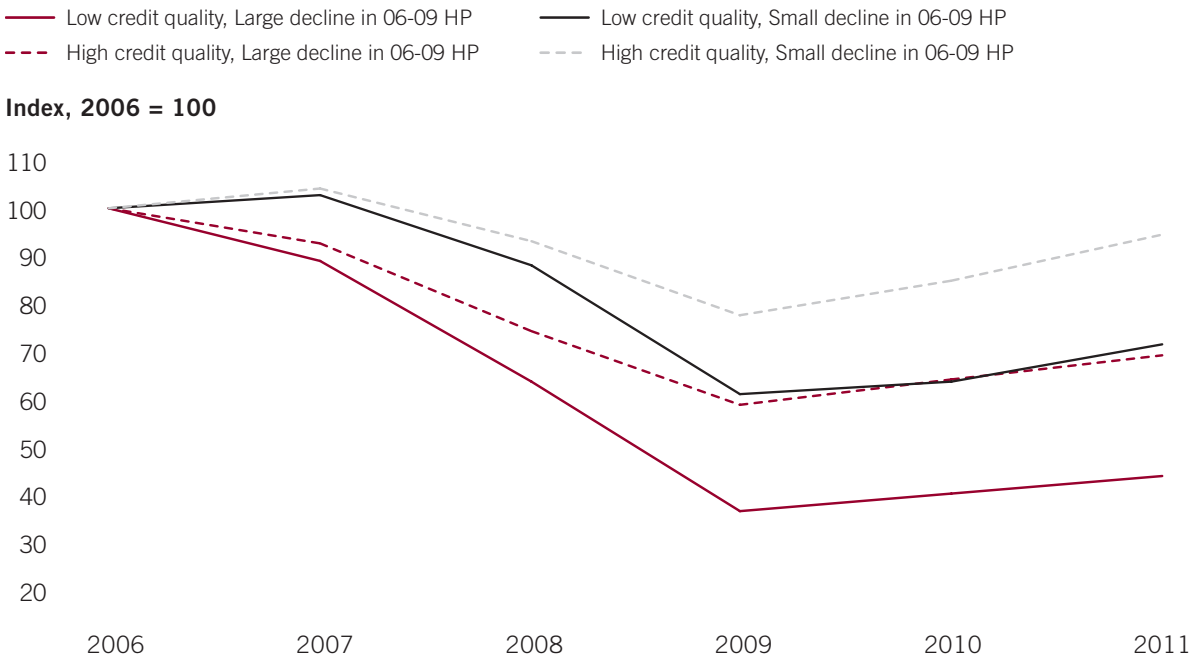


Chart 22 introduces an interesting policy question: Can further attempts by the Federal Reserve to lower long-term interest rates facing consumers help spur auto purchases? One can make the argument that the actual borrowing terms available to low credit quality households that have experienced a sharp decline in housing value are much worse than the rates the Federal Reserve can influence. Under this argument, it is unlikely that further reductions in interest rates that the Federal Reserve can directly influence would affect the auto purchases of these highly constrained households.

8. SUMMARY AND POLICY OPTIONS

8A. SUMMARY

The evidence we have outlined above suggests problems in the housing market have weakened the monetary transmission mechanism. The challenges can be split into two categories. First, even with an aggressive attempt to lower long-term interest rates on mortgages, the large physical overhang of existing residential properties may still be above the desired stock. Our calculations suggest that long-term interest rates would need to be negative to equate the desired and actual stock of homes.

Second, our analysis suggests that frictions related to lending markets mean that the economy may be less sensitive to Fed policy. Let us expand on this point. We outlined above the new Keynesian framework that we have in mind. We noted that the usual two-step chain in new Keynesian models with credit frictions is:

stimulative monetary policy→
lower private borrowing rates, increased collateral and relaxation of borrowing constraints→
expansionary effect on the economy.

The first step in this is no longer working with its usual vigor. We have presented circumstantial evidence consistent with diminished transmission: banks report tighter lending standards; builders report increased difficulty of borrowing; since many homeowners are significantly underwater, they cannot refinance into lower rates. Clearly households will display diminished sensitivity to changes in market interest rates if they simply cannot obtain loans at those rates. Further, in our analysis of cross-state data we presented strong evidence that states with particularly moribund housing markets have performed particularly poorly. Households in these states have not been able to refinance into lower interest rates. This, too, is consistent with the notion that in such states monetary policy has had diminished effect.

Nonetheless, members of the Federal Reserve have expressed a desire to stimulate this critical sector of the economy. For example, in addition to the remarks by Dudley (2012) and the Federal Reserve Board Staff (2012)—henceforth, the "white paper"—Yellen (2011) sees "a strong case for additional policies to foster more-rapid recovery in the housing sector."

While we also support such policies, it is important to recognize that there was likely over-investment in housing during the boom, and that consumption was likely partially driven by unrealistic expectations about house prices going forward. This sentiment has been expressed by Bullard (2011), who notes that the weakness in the recovery "looks like a collapse real estate bubble," and that "it is not reasonable to think that these particular areas of investment should robustly expand in the aftermath of a collapse real estate bubble." Given this sentiment, it is crucial that policy-makers think carefully about the market frictions that justify a policy response. A mistake would be to adopt policies that seek to artificially boost house prices and residential investment going forward.

We do believe that there are real frictions that justify policy interventions. First, there are frictions preventing borrowers from refinancing into lower rates, including the reduced value of collateral and historically tight credit conditions. Second, foreclosures impose externalities through their effects on physical overhang and house prices (e.g., Mian, Sufi, and Trebbi (2011)), and there may be a role of the government in helping to convert foreclosed properties into rentals. We take on both of these ideas in the next two subsections. Our sense is that among the proposals in the Fed's white paper, attempts to help convert foreclosed properties into rentals show the most promise.

8B. FACILITATING REFINANCING

One set of approaches seeks to unclog lending markets to facilitate refinancing activity. We have emphasized that policies to push down rates have had limited effects because of obstacles standing between monetary policy easing on the one hand and private borrowers on the other. It is not new or controversial to recommend removal of such obstacles to the extent possible. The recent Boyce et al. (2012) proposal is motivated in large part by the fact that many mortgages have rates well above current market rates. Williams (2011) endorses a policy "to make it easier for underwater homeowners to take advantage of very low rates and refinance their mortgages." Dudley (2012) states that "steps should be taken to improve households' access to credit."

In our view, however, an effective program to aid underwater homeowners will require large budgetary resources that are unlikely to prove politically palatable. There have already been a number of attempts to unclog the market, with limited success. The government announced a streamlined refinancing program in February 2009 called the Home Affordable Refinancing Program (HARP), which at the time was supposed to help 3 to 4 million homeowners easily refinance into lower mortgage rates. Unfortunately, less than a million mortgages have been refinanced through HARP thus far. The Administration attempted to address a number of technical problems in October with an expanded HARP program, dubbed "HARP 2.0." which could allow another one million borrowers to refinance.

As this paper was being written (February 2012), President Obama unveiled another plan to stimulate refinancing, this time focused on the private market. The Administration would like to extend a streamlined refinancing program, similar to HARP, to borrowers with mortgages that are not owned or guaranteed by the GSEs. Without getting into the details, there are two significant obstacles to this program. First, it would require funding, which would either come from a tax on financial institutions (as President Obama has requested) or from the general federal budget. Either way, this would require Congressional approval. Second, it would involve the Federal Housing Administration (FHA). The bottom line is that someone – either the public or private sector – has to bear the cost of a large scale refinancing program.

8C. REO SPEEDWAGON

As we noted in Section 3, one of the biggest challenges in the housing market is the seismic population shift from ownership into renting. Ongoing foreclosures could push as many as another 7.5 million families out of their home, which could create another 5 of 6 million additional renters, (assuming some "doubling up" of households and some of the homes are owned as vacation properties or by investors). The housing stock is not prepared for this flow of renters, suggesting potentially severe rental shortage. Currently there are 43.7 million rental units and 9.4% or 4.1 million are vacant. Multifamily construction is running at about 200,000 apartment completions per year, and cannot possibly meet this shift in demand at current prices. The vacancy rate has never fallen below about 7% in the last 20 years. If 7% is the "NAIRU" equivalent for rental housing, there is only 2.4pp or about a million units of spare capacity.

The vacancy data for the housing market are not particularly reliable, but they suggest that pressure on the rental market is growing. Both the rent and owners equivalent rent measures in the CPI are steadily accelerating, while home prices are still falling. As a result, housing is not only inhibiting the economic recovery, it is increasingly becoming the main source of core inflation. In December 2011, rent inflation reached 2.5% year-over-year while owners' equivalent rent reached 1.8%. Both are still accelerating.

Together these housing components make up 40% of the core CPI and they have accounted for 1.0 pp of the 1.8pp annualized rise the core in the past three months. Looking ahead, rising rents and falling home prices should encourage a transition of owner occupied housing into rentals.

There is considerable focus on assisting such a transition by converting distressed inventory from the ownership to rental market. Of the options outlined in the 2012 Fed white paper the one that we think most likely to be adopted is the one in which government REOs (Real Estate Owned) could be sold to investors who would rent them out. This would be done through bulk sales, which means pooling REOs together, presumably by region, to sell to investors at once. This approach would likely include government financing to investors for bulk purchases, and in particular would relax current rules restricting the number of units that can be financed by Fannie or Freddie when properties are sold in bulk. We agree with the 2012 white paper that predicting the effects of such a program is difficult. But in our view, such a program moves the housing market in the right direction and should be undertaken. Here is why.

Is it big? It has the potential to affect a significant portion of the market. BofA Merrill Lynch mortgage research estimates that there are nearly 250,000 REOs held by Fannie, Freddie and the FHA and about 3.0 million additional government mortgages will be liquidated over the next four years. This is about 40% of the total foreclosure pipeline. The challenge will be focusing the program on regional housing markets where it would be the most beneficial. There are two requirements: (1) a large percentage of government REOs so investors can achieve economies of scale in managing the properties and (2) increasing rental demand so that the rental return is strong. This means targeting big metro areas, such as Atlanta, Chicago and Miami, will be more impactful than smaller cities. About half of the government REOs are in just 20 metro areas, so it is possible to target certain housing markets.

Will investors be interested? As estimated in the 2012 white paper, about two-thirds of Fannie's REO inventory could have a capitalization rate of about 8%. This measures the rate of return from cash flows from renting the property relative to the price at which the property could be sold. Investors are already interested – despite the current impediments, a significant amount of conversion are already taking place. According to the Campbell's HousingPulse Survey of real estate agents and brokers, last year about 20% of homes were bought by investors and of those about 60% were turned into rentals. This implies a rough rule of thumb of about 600,000 conversions per year. Allowing Fannie and Freddie to finance bulk purchases would make it possible for the private market to increase the conversion rate.

Can it really affect rental supply? Over the last two years the number of renter households increased by about 0.9 million per year. If the Campbell's HousingPulse data is right, then about two-thirds of these renters found shelter in properties converted from the owner market. The remaining would be net new construction. This suggests that if they can increase the rate of conversion of owner occupied units into rentals to about 0.9 million per year they can stop the pressure on rental markets. Of course this assumes everything else moves along a steady track, including the net supply of new apartments per year, the number of displaced homeowners per year and the number of new households entering the renter market.

Obstacles: There are many challenges to this program, but we believe the biggest is to remove the credit constraint for investor demand. According to Campbell survey most investor buyers are currently paying cash and very few have government sponsored funding. Of course removing the credit constraint might reveal other constraints. For example, investors may have already converted the easiest real estate and there may be a steep marginal cost curve for managing additional properties. After all, presumably investors are snapping up the higher return and more cost effective (geographically concentrated) properties first.

Nonetheless, given the importance of getting the housing market back on its feet, it seems clear to us that it is worth trying. A successful own-to-rent policy could speed the efficient reallocation of resource, ease pressure on home prices and speed the turn in the housing market. An added benefit to the Fed, is that by taking pressure off of rent and owners equivalent rent, it would help contain inflation.

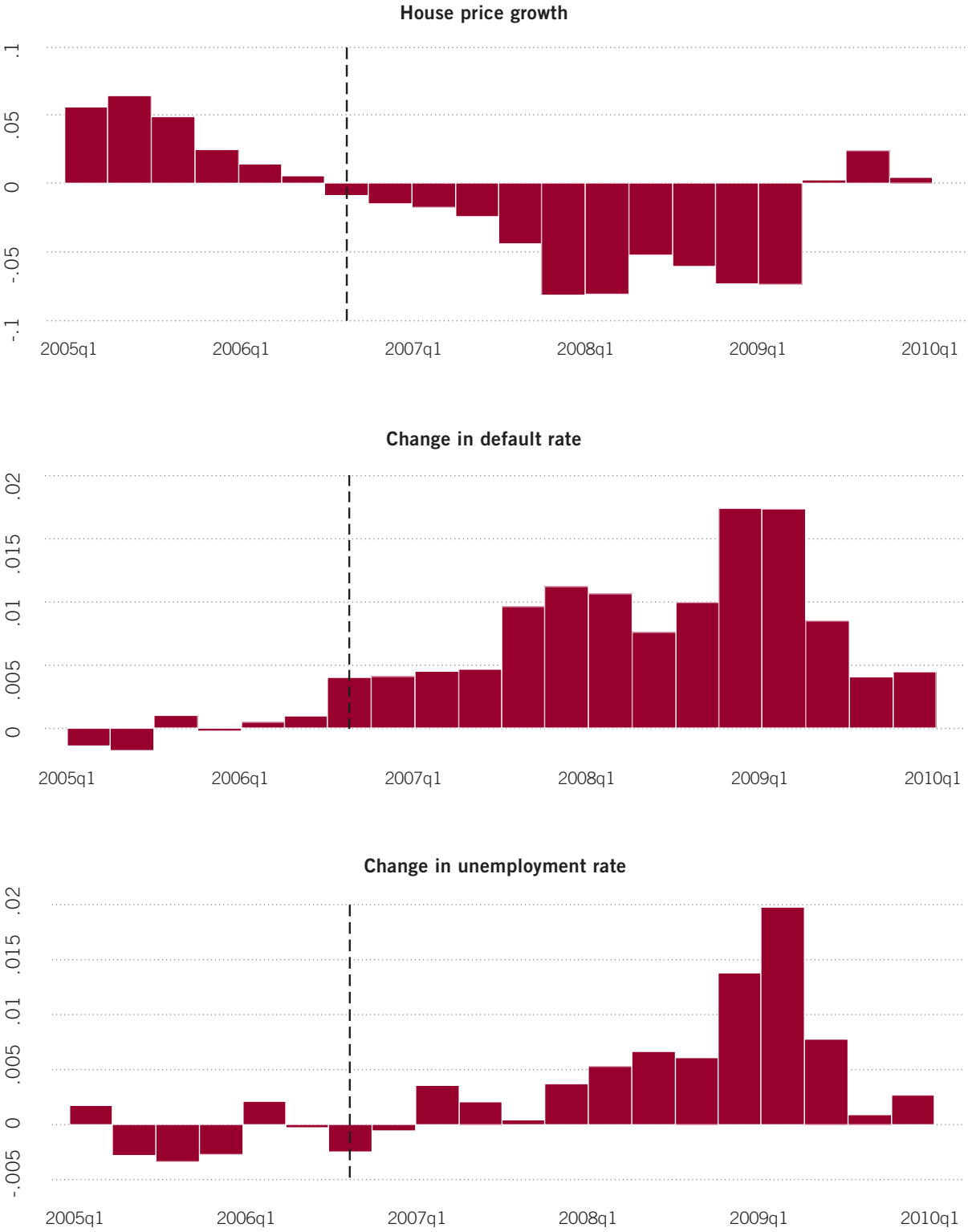
Appendix: Robustness for State-Level Analysis

One concern with the state level analysis is reverse-causality. Perhaps the deteriorating economy in large house price decline states caused the decline in house prices, not vice versa. There are several ways in which we can mitigate this concern. First, in terms of timing, it is clear that house price declines occurred in these areas before the local economies began to deteriorate. Appendix Chart 1 isolates the sample to the large house price decline states discussed in Section 7. It shows that mortgage default rates increased and house price declined before the large increases in unemployment in these areas. More specifically, house prices first experienced negative growth in these states in the second quarter of 2006. Mortgage default rates jumped in the same quarter. But in terms of unemployment, there was not a steady increase in the unemployment rate until the fourth quarter of 2007, a full six quarters later.

An alternative approach to this concern is to exploit variation across states that is fixed as of 2006. That is, instead of relying on house price declines from 2006 to 2009, we can sort states based on some ex ante variable. This is similar to an instrumental variables approach in which one regresses house price declines from 2006 to 2009 on some instrument that is presumably more exogenous to economic conditions during the recession and recovery.

One such variable is straightforward—we could just as easily sort states by house price growth from 2002 to 2006. The reason is that there is a very strong negative correlation between house price growth from 2002 to 2006 and house price growth from 2006 to 2009. The R2 of the a regression of these two variables is 0.5 across states.

Appendix Chart 1: House Prices, Default Rates, and Unemployment in Large House Price Decline States



As Appendix Table 1 shows, the real outcomes during and after the recession are strongly negatively correlated with house price growth from 2002 to 2006. This supports the idea that the weakness in the economies of these states is a function of the housing market, not vice versa.

Appendix Table 1: Real Outcomes and House Price Growth, 2002 to 2006			
	(1)	(2)	(3)
	Remodeling permit growth, 2006-2010	New residential permit growth, 2006-2011	Auto sales growth, 2006-2011
House price growth, 2002-2006	-0.512** (0.146)	-0.164 (0.089)	-0.396** (0.113)
Constant	0.203* (0.078)	-0.542** (0.040)	-0.127 (0.067)
N	43	50	50
R2	0.15	0.06	0.14

In Appendix Table 2, we conduct an instrumental variables specification where we instrument house price declines from 2006 to 2009 using the housing supply elasticity of the state as an instrument (as measured by Saiz (2010)). Mian and Sufi (2011) have gone to great lengths to show that this instrument isolates variation in house price volatility that is likely independent of economic outcomes during the recession through any other channel. The instrumental variables estimates are actually larger than the OLS estimates in Table 4 of the report. The standard errors are larger, which is to be expected from a two-stage least squares estimation. Nonetheless, all coefficients remain statistically distinct from zero at the 10% confidence level.

Appendix Table 2: Real Outcomes and House Price Growth, 2006 -2009 Instrumental Variables Estimates			
	(1)	(2)	(3)
	Remodeling permit growth, 2006-2010	New residential permit growth, 2006-2011	Auto sales growth, 2006-2011
House price growth, 2006-2009	1.324 (0.737)	1.43* (0.622)	1.479** (0.478)
Constant	0.101 (0.069)	-0.514** (0.052)	-0.178** (0.050)
N	41	47	47
R2	0.87	0.06	0.168

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