[B]eing the managers rather of other people’s money than of their own, it cannot well be expected, that they should watch over it with the same anxious vigilance with which . . . (they) frequently watch over their own.

– Adam Smith (Wealth of Nations, Book V, Chap. 1, Part III)

In the 1950s, I went to work for a mortgage brokerage firm in LA. When my father learned about my new job, he expressed concern. “You’re not going to bundle them, are you? That’s what brought on the Depression.”

– Personal correspondence from William A. Fraser, Jr., April 7, 2009

Real estate bubbles occurred frequently during the past thirty years in both developing and advanced economies. Reinhart and Rogoff (2008) evaluated five major developed-country financial crises: Spain in 1977, Norway in 1987, Finland and Sweden in 1991, and Japan in 1992. They found that, averaged across the five crises, residential real estate prices peaked a year before the onset of the financial crisis; house prices had fallen by 22 percent four years after they had peaked. Rogoff and Reinhart (2009) extended their earlier analysis to twenty-two financial crises in both developed and developing countries and found that real estate prices fell in all of them, with a median decline of 35.5 percent. House prices declined more than 10 percent in twenty of the twenty-two crises. They also found that a typical financial crisis is associated with a substantial increase in unemployment and a decline in GDP that lasts for several years, followed by a large increase in government debt. Although their analyses indicated that house-price declines, unemployment, and equity market declines are all associated with financial crises, they did not indicate which factor or factors might have triggered the downturns and which are effects.

Data from the United States in the past several decades provide an opportunity to evaluate the sequence of events in the current economic cycle and compare it to past cycles. This comparison provides a clearer picture of the
chronology of a real estate bubble and collapse, the transmission of losses from the housing collapse to the financial sector, and the impact of the collapse on the broader economy. We consider interactions among a variety of factors – including house prices, mortgage lending, current account deficits, income growth, and mortgage delinquency – during a long, relatively stable period prior to the bubble, during its formation, and during the collapse of the bubble and the financial system. Our approach complements the cross-sectional approach of Reinhart and Rogoff (2008), and our conclusions broadly agree with theirs.

Comparison between the sequence of events in the real estate bubble and in asset market experiments illustrates the role of self-fulfilling expectations during the expansion and during the collapse of a bubble when growth expectations reverse.1 By examining the sequence of events, we can form a clearer idea of how a financial crisis develops. In Chapter 4, we consider the Great Depression; in Chapter 5, we examine the ten post-war U.S. recessions that preceded the Great Recession. We find that – with the single exception of the 2001 recession – these events were preceded by substantial downturns in residential construction.

3.1 Expansion of the Real Estate Bubble and Onset of the Recession

Whereas the origins of the U.S. crisis lie in both institutional factors that encouraged risky mortgage lending and international capital flows that expanded the scale of risky lending – factors that developed before the period with the most rapid home price appreciation – the data show that the period of serious and sustained aggregate excess mortgage lending began in 2001 after home prices had reached their previous inflation-adjusted peak, which occurred in 1989. This phase of the economic cycle was primarily attributable to a large stimulus to mortgage finance that encouraged rapid accumulation of mortgage debt. Debt financing pushed up house prices;

1 Some researchers fancifully suggest that expectations shift for no fundamental economic reason: A “sunspot” equilibrium is affected by an extrinsic random variable (i.e., a “sunspot”) that has no impact on economic fundamentals but does affect agents’ beliefs. We argue that during a bubble, it is myopically rational to believe that prices will rise further but that at some point, prices become implausibly disconnected from fundamentals. At that critical point, expectations of buyers shift: the momentum buying and momentum-motivated lending that generated asset price increases are reversed. Lewis (2010) described the shift in beliefs among a number of participants in the market for credit default swaps (CDS) on mortgage-backed securities (MBS). Participants such as Kyle Bass, Michael Burry, Steve Eisman, Greg Lippmann, and John Paulson were adamant in their belief that the market was poised for disaster. We examine the CDS market in more detail in Chapter 7.
then, higher house prices stimulated residential construction and home price appreciation justified further mortgage lending. This dynamic can readily persist as long as mortgage lenders believe that their investments are secure and a pool of new home buyers can be attracted by the prospect of capital gains. Other market participants gladly played along: mortgage originators, mortgage securitizers, rating agencies, and home builders could lock in their gains while the bubble inflated and hope to get out before the collapse. The bubble could persist even as credit was extended to many borrowers who were incapable of meeting their mortgage obligations in the long term because new mortgage credit was flowing into the market to buy them out or refinance their loans if they ran into trouble.

The precarious condition of the housing market, however, became apparent when by late 2006, many borrowers were unable to meet their obligations even in the very short term: Liu and Li (2006, Figure 4a) showed that for 2006-vintage, interest-only adjustable rate mortgages (ARM-IO), 3 percent of borrowers were sixty days delinquent within eight months of their closing date. In Q2 2006, after three quarters of sharp declines in sales of both new and existing homes, the flow of mortgage credit abruptly began to subside. Soon afterward, in December 2006 and January 2007, the cost of insuring the lower tranches (e.g., the BBB-rated tranches) of mortgage-backed securities (MBS) with credit default swaps (CDS) began to increase rapidly. When the cost of insuring the AAA rated tranches of new MBS increased dramatically in July 2007, the flow of funds into the mortgage market through privately issued mortgage securities soon collapsed: new private-label mortgage securities fell 52.0 percent in Q3 2007 and another 57.7 percent in Q4 2007. This reinforced the decline in new mortgage credit, and the collapse of the housing market was underway.

The collapse of the bubble damaged household balance sheets, transmitted large losses to lenders, suppressed aggregate demand, and caused widespread unemployment. This chapter begins with a brief overview of the bubble formation, collapse, and its lingering repercussions. The remainder of the chapter examines the expansion and collapse in more detail.

3.1.1 Momentum Characteristics of the Developing Bubble
The “Great Recession” was preceded by an unusual stimulus to housing finance and housing construction. The largest housing price bubble in the United States in at least seventy-five years began in 1997 and expanded in

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two phases. The first phase, 1997–2001, carried inflation-adjusted national housing prices to their previous peak, reached in 1989. The second phase, from 2001 into early 2006, was financed by a bulge in the net flow of mortgage credit to households, accompanied by an equally rapid increase in the inflow of foreign investment. Foreign investment surged from $157.2 billion in 1997 (1.60 percent of GDP) to $773.0 billion in 2006 (5.96 percent of GDP). During that period, the net flow of mortgage funds increased from $284.8 billion in 1997 to $1,040.4 billion in 2006. The unusual level of mortgage credit pushed up prices; however, by the end of 2005, the pool of potential buyers was depleted after so much credit had been extended to weak borrowers.

Figure 3.1 shows the size and unusual characteristics of the recent bubble in comparison with two bubbles that peaked in 1979 and 1989. By 2001, the recent bubble already had exceeded the previous 1989 peak and was only beginning its ascent to levels that would dwarf the previous bubble. We also observe that the two previous bubbles followed price time paths that were convex; that is, prices rose to their peak at a decreasing rate per unit of time—prices decelerated as they rose to their top. However, the recent bubble exhibits a clear concave time path of accelerating price increases from 1997 to 2005. Year-over-year growth rates increased until the beginning of 2005 and remained near the peak growth rate until the quarter before the peak. This feature is consistent with the momentum trading model described in Chapter 2. In that model, the momentum component of demand increased in proportion to the rate of change in price: rapid price increases attract momentum buyers due to the prospect of capital appreciation, and their arrival in the market generates price appreciation.

The Case-Shiller U.S. Home Price Index (1987 to 2012) underestimates the scope of the problems: Its broad geographical coverage obscures the fact that so many of the losses occurred in markets such as Los Angeles, San Francisco, Phoenix, Las Vegas, Miami, and Tampa, where the bubbles and

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3 Current account data come from the Federal Reserve Flow of Funds historical data, Table F.107. Net flow of mortgage funds data come from Table F.218 in the same document. The net flow of mortgage funds to households is the increase in their total mortgage loans outstanding. It is approximately equal to new loan originations minus principal payments and prepayments (e.g., when a homeowner sells the home and a portion of the proceeds from the sale is used to retire the existing mortgage). These data are available at www.federalreserve.gov/releases/z1/Current/data.htm in the file atabs.zip. These values of the seasonally adjusted current account deficit and the net flow of mortgage funds are both inflation-adjusted to 2005 dollars using the series CPIAUCNS, which is available from Federal Reserve Economic Data (FRED) at http://research.stlouisfed.org/fred2/.
collapses were the largest. Section 3.3.5 examines these six markets in more detail. As an example of the extreme price movements in one market – that is, the lower-valued third of the Los Angeles market – the index increased 108 percent from the beginning of 2003 to the beginning of 2006. Then, from the middle of 2006 to the middle of 2009, the index fell by 56 percent.

3.1.2 The Course of the Recession

The crisis that ensued was characterized by a clearly ordered process of decline that provides a particularly useful guideline to rethinking the

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Data for 1935 through 1970 are FHA annual prices reported in an appendix to Davis and Heathcote (2007). Quarterly data from Q1 1970 through Q4 1986 are from the Freddie Mac Conforming Mortgage House Price Index (CMHPI), available at www.freddiemac.com/finance/cmhipi. Quarterly data from Q1 1987 through Q4 2012 are Standard & Poor's Case-Shiller National U.S. Home Price Index, available from Standard & Poor at www.standardandpoors.com/home/en/us. Each of these series is inflation-adjusted by the Consumer Price Index (CPI) series CPIAUCNS. (See Footnote 3 for the CPI data source.) The inflation-adjusted series are then spliced together so that they have the same value or average in the first year of each overlap (i.e., 1970 and 1987). The index value is set to 100 in Q1 1997, the first quarter following the long decline in real house prices from Q3 1989 to Q4 1996.
Depression (see Chapter 4) and to reexamining the Finnish depression (1990–3), the economic collapse in Thailand, and other serious economic downturns (see Chapter 10). Events in the unraveling of the bubble were sharply delineated, starting with a precipitous decline in new home unit sales beginning in Q4 2005. The sales decline was followed by (1) sharp declines in expenditures on construction of new single-family and multifamily housing units and in the net flow of mortgage funds starting in Q2 2006; (2) a rapid house price decline beginning early in 2007; (3) a credit market seizure in August 2007 that accelerated the collapse of mortgage lending and house prices (and brought Federal Reserve action to supply liquidity to the banking system); (4) a rapid collapse in the prices of financial firms’ stocks that gathered momentum after the August 2007 credit market seizure; (5) continued deterioration of the financial system in 2008; (6) an aggressive and unprecedented Federal Reserve intervention (see Chapter 8) starting in September 2008 and continuing into 2014; and (7) sharp declines in output and employment in Q4 2008 and Q1 2009. These events differ significantly from those in a typical recession because most recessions do not involve the serious stresses in the financial system in Steps (3) through (5) or the central bank response of Step (6). To better understand the Great Recession, we examined all of the economic downturns in the United States since the Depression, with the objective of determining why the Great Recession was so much more severe. To our surprise, our examination of the post-war recessions from 1948–9 through 1990–1 (reported in Chapter 5) revealed that all involved some measure of the problems in Steps (1), (2), and (7). We found strong evidence that economic cycles emanate from the household sector and then move into the business sector as aggregate demand falls.

In the aftermath of these events, many households suffered extreme balance sheet damage that has suppressed borrowing for new housing assets and durable goods consumption. Households’ decreased expenditures on new housing units and durable goods, in turn, led to a sharp decline in non-residential fixed investment. Large decreases in housing construction, durable goods expenditures, and non-residential fixed investment all contributed to decreased employment and output, which led to a rapid decline in tax revenues and an increase in government expenditures.5

5 In 2009, federal government receipts fell $419.0 billion from their level in 2008 and outlays increased $535.1 billion. Individual and corporate income taxes together account for 94.6 percent of the decline in receipts: individual income taxes fell $230.4 billion (55.0 percent of the decline in receipts) and corporate taxes fell $166.1 billion (39.6 percent of the decline).
3.1.3 Lingering Repercussions of the Bubble and Recession

As of Q3 2013, almost six years after the start of the recession, all three major components of durable goods output – housing construction, consumer durables, and non-residential fixed investment – remained below their peak levels (in inflation-adjusted figures). Seven years after the peak level of residential construction, it remained at a historically low level.\(^6\) Our objectives in this chapter are to (1) demonstrate that important features of the residential real estate bubble are similar to those found in the laboratory asset market bubbles described in Chapter 2, and (2) outline how the housing bubble affected household balance sheets, the financial sector, and – ultimately – the broader economy. We describe the general course of the downturn and then argue that the effects of the recession have persisted because the problems generated by the massive real estate bubble – namely, damaged household balance sheets and a saturated housing market – will require years to resolve. In subsequent chapters, we use the insights from this recession to reevaluate the Depression (see Chapter 4) and postwar U.S. recessions (see Chapter 5). We show that a decline in residential construction is a good predictor of the onset and depth of a recession and that the recovery of residential construction is a good predictor of the strength of the general recovery. In Chapter 10, we examine downturns from other countries that were similar to the Great Recession in order to consider which policies have been associated with strong recoveries.

Increases in Medicare, health costs, and social security – which were largely independent of the bubble and crisis – amounted to $159.0 billion (29.7 percent of the increase in outlays). Income security outlays (primarily unemployment benefits) increased $101.9 billion (19.0 percent of the increase in outlays). The largest increases in outlays were due to homeowner and business credit, which increased by $257.8 billion. These two items together account for 48.2 percent of the increased government outlays: mortgage credit accounts for 18.6 percent of the increased outlays and commercial credit accounts for 29.5 percent of the increase. Of the $954.1 billion increase in the federal deficit in 2010, $756.2 billion can be attributed to problems that ensued from the real estate bubble, the financial crisis, and the unusually severe recession that followed. Government receipt and outlay data are from the Historical Tables of the 2011 Budget of the United States Government, available at www.gpoaccess.gov/usbudget/fy11/hist.html.

\(^6\) In the first sixty years of quarterly national accounts, from 1947 to 2006, construction of new single-family and multi-family residences averaged 3.03 percent of GDP. During that period, the figure fell below 2.0 percent of GDP in seven quarters: all four quarters of 1982 and the first three quarters of 1991. It has now been below 1.5 percent of GDP for twenty-one quarters beginning in Q3 2008 through the last data available in Q3 2013. The level in Q3 2013 was 1.20 percent of GDP. This is what we mean by a historically low level of residential construction.
3.2 Parallels in Behavior: Laboratory and Housing Market Asset Bubbles

Critical features of both the expansion of a bubble and its collapse were similar in the real estate market during the past decade and the asset market experiments described in Chapter 2. Asset bubbles are exacerbated by market liquidity: When buyers have more money, the bubble is more pronounced. In the housing bubble, liquidity was provided by mortgage finance, with most of the excess flow of mortgage funds coming – directly or indirectly – from foreign investment.

As a bubble expands, trade quantities increase as prices rise. Eventually, buyers become scarce as prices deviate too much from fundamentals and, at the prevailing high prices, the trade quantity collapses. When sellers realize that few buyers are willing to trade at the prevailing prices, they reduce their offer prices or accept lower bids to hasten sales, and the price collapse begins. These patterns from experimental asset market bubbles also appeared as the housing bubble expanded and collapsed.

3.2.1 Liquidity Influences the Magnitude of the Bubble and Its Subsequent Collapse

During the formation and expansion of the housing bubble, the flow of funds into mortgage finance increased dramatically, especially through foreign investment. During the expansion, the large increase in mortgage lending pushed up prices. Unit sales of both new and existing homes peaked in Q3 2005 (as shown in Figure 3.2); mortgage finance flows peaked two quarters later in Q1 2006 (as shown in Figure 3.3) – the same quarter that house prices peaked.

As house prices fell against fixed mortgage debt, homeowners’ housing equity collapsed and, for many homeowners, housing equity turned negative. This is the source of the damage to household balance sheets that plagued the economy for five years. Damage to household balance sheets was transmitted to bank balance sheets through delinquency and foreclosure. Delinquency reduced mortgage payments to banks and, in foreclosure, the assets that collateralized loans (i.e., the mortgaged houses) were often worth less than the loan amounts.

Figure 3.7 shows that household mortgage debt and residential real estate value moved up together until early 2006.
The rapid expansion of mortgage financing during the formation of the bubble also fueled the increased construction of new housing units. This is shown in Figure 3.2 by the run-up in sales of new home units from 1995 to 2005. These sales abruptly reversed in 2006 and, by the second half of 2010, they had fallen by 77 percent – to their lowest level since at least 1963. Moreover, the construction of new housing units would remain depressed and would not rise above their recession low until Q2 2012.

3.2.2 Trade Quantities Fall While Prices Continue to Rise or Flatten Out

When an experimental asset bubble peaks, prices usually remain at or near their peak value, whereas the trade quantity declines; even after prices reach a peak, sellers expect to receive a high price but willing buyers eventually become scarce. After a period of declining trade quantity, prices commonly begin to collapse and volume typically continues to fall as prices collapse. In the experiments, we observed all bids and asks and found that the turning point in a bubble is foreshadowed by a reduction of the number of bids
relative to asks. At the peak, both ask prices and the number of asks remain high, but fewer of them are accepted. These experimental price and trade-quantity patterns were present in the expansion and the collapse of the housing bubble.

This stickiness of asking prices is paralleled in the housing market by the slow decline in housing prices between Q3 2005 and Q4 2006, even as sales fell and the median number of months between construction and sale of new homes rose. During this period, the Case-Shiller Home Price Index fell only six tenths of 1 percent; however, sales of new homes fell 24.3 percent and sales of existing homes fell 11.7 percent. When seasonally adjusted sales

Figure 3.3. Mortgage funds and foreign investment flows into the United States (in billions of 2005 dollars per quarter).
of new homes peaked in July 2005, builders had 4.2 months of supply. By the end of Q1 2007, when prices first began to decline sharply, their months of supply had almost doubled to 7.9 months, even as construction had fallen sharply. By January 2009, builders’ months of supply reached 12.1 months.\footnote{See www.census.gov/const/fsalmon.pdf for data on builders’ months of supply of new houses.}

Declines in both new and existing home unit sales are apparent in Figure 3.2. The figure shows the percentage difference between sales (or prices) in each quarter and sales (or prices) when the recession began in Q4 2007. Sales of new residential units were the most volatile of the three series. Unit sales peaked in Q3 2005 at a level 95.7 percent higher than their level in Q4 2007, whereas existing home sales peaked in the same quarter at a level 78.6 percent higher than their level in Q4 2007. We notice, however, that home sales declined for two quarters (i.e., Q4 2005 and Q1 2006) as their prices continued to rise.\footnote{At least two factors might lead to a large quantity decline prior to a price decline. Sellers may be unaware of the lengthening time to sale because they may not have aggregate sales data and because market conditions are local. Moreover, Stein (1995, p. 382) described an aspect of the housing market that, in some cases, may accentuate the tendency for sellers to adhere to their asking prices. When house prices fall, a family with reduced equity will be unable to trade up and may even be unable to sell and make a comparable purchase in a new location. Such a family is motivated to hold to its asking price.}

### 3.2.3 Prices Turn and Collapse While Trade Quantity Continues to Decline

In a pattern also found in asset market experiments, prices turned down after the trade quantity fell. Following the Q1 2006 peak, home prices declined slowly from Q1 2006 to Q4 2006 (i.e., a cumulative decline of only 2.5 percent), whereas home sales continued to fall rapidly.\footnote{The real home price index shown in Figure 3.2 is the Case-Shiller U.S. National Home Price Index inflation-adjusted by the CPI series CPIAUCNS. Sales of new single-family housing units come from the U.S. Census Bureau, “Houses Sold by Region,” available at www.census.gov/const/soldreg.pdf. Data on sales of existing homes are from the National Association of Realtors, “Single-Family Existing-Home Sales and Prices,” available at www.realtor.org/research/research/ehsdata.} In the sharp collapse from Q4 2006 to Q1 2009, both sales and prices fell rapidly for nine quarters. By the end of 2010, sales of new homes had declined more than 55 percent below their level when the recession began in Q4 2007. From the new home sales peak in Q3 2005 through Q1 2011, new home sales declined in nineteen of twenty-one quarters to a level only 22.8 percent of their peak level. Even at the end of 2013, three years after the bottom, new
home sales had recovered only a small fraction of the declines. In 2013, they were slightly more than half of the average level between 1987 and 2007.

3.3 Mortgage Finance Supported the Bubble until It Was Withdrawn

During the housing bubble expansion, the flow of mortgage funds increased rapidly. As the amount of credit grew unusually large, mortgage finance was extended to increasingly less credit-worthy borrowers for purchases at prices that grew more rapidly than household income, which ultimately would be required to support the mortgage payments. The increased extension of mortgage credit was accompanied by lower down payments: In 2005, 45 percent of first-time home buyers made no down payment at all.\(^{11}\)

Deterioration of lending standards was particularly apparent in the rapid growth of Alt-A lending between 2000 and 2005.\(^{12}\) Standards for Alt-A loans were deteriorating along a number of dimensions during this period as loan originations soared, especially for interest-only and negative-amortization loans. According to Liu and Li (2006), total Alt-A originations increased by a factor of twenty-four, from $14.2 billion in 2000 to $341.5 billion in 2005. During this same period, interest-only and negative-amortization loans increased from 2.2 to 72.7 percent of the Alt-A pool; in the Alt-A pool, interest-only and negative amortization loan originations increased by a factor of 797, from $311 million (in 2000) to $248.2 billion (in 2005).\(^{13}\)

3.3.1 Self-Sustaining Expectations in the Housing, Mortgage, and Derivatives Markets

Declining lending standards led to an increase in mortgage delinquency, especially toward the end of 2006. Delinquency predictably frightened investors, which contributed to the rapid decline in the flow of mortgage funds that began in Q2 2006. As Figure 3.3 shows, the flow of mortgage funds peaked in Q1 2006 and then began a rapid decline that soon led to a

\(^{11}\) This figure comes from the National Association of Realtors (2006 Exhibit 5–3).

\(^{12}\) The Alt-A category is considered riskier than prime loans because the borrowers typically had one or more risk factors, such as less than full documentation of income or assets, high loan-to-value ratio, or a blemished credit history.

\(^{13}\) Bair (2011) reported that as Assistant Secretary for Financial Institutions at Treasury: “This is what we were seeing in 2001 and 2002 – negative amortization features, steep prepayment penalties, so that you’d force them [borrowers] into refinancing and then you’d charge them a really steep prepayment penalty to refinance out of these loans that had these steep presets.”
collapse of house prices. The sharp reduction in the flow of mortgage funds came two quarters in advance of the first sign of trouble in the market for the CDS that insured MBS. With the collapse in the price of CDS, the cost of insuring MBS soared. This increased the cost of issuing new MBS because the rating agencies (i.e., Standard & Poor’s, Moody’s, and Fitch) required that an MBS pool include CDS insurance to qualify for higher ratings. When the price of insurance on the AAA rated tranches of MBS increased rapidly in July 2007, problems developed for the investment banks that created and marketed the securities. To obtain high ratings, the banks needed to include CDS insurance in the bundle of assets in the pool. However, the cost of that insurance increased astronomically, beginning with the low-rated tranches between December 2006 and February 2007. For example, on November 30, 2006, the cost of buying insurance on $10 million of BBB- rated MBS issued in the second half of 2006 would have been $180,000 plus a $242,000 annual premium. By February 28, 2007, the cost for the same insurance had risen to $3,337,000, plus the $242,000 annual premium. In July 2007, a similar cost surge for insurance on the AAA rated tranches preceded the credit market seizure of August 9, 2007. On July 9, 2007, insurance on $10 million of AAA rated securities issued in the second half of 2006 could be purchased for $50,000 plus an $11,000 annual premium. On August 3, 2007, that same insurance would cost $936,000, plus the $11,000 annual premium.14

The rapid increase to the cost of insuring MBS led to a rapid decline in their issuance. In Q2 2007, new private-label MBS issues amounted to $258.5 billion. In Q3 2007, the figure fell 52.0 percent to $124.1 billion. The collapse continued in Q4 2007, when new issues fell another 57.7 percent to $52.5 billion. As securitization was collapsing, origination of alternative mortgage products was collapsing almost as quickly, from $247 billion in Q2 2007 to $77.5 billion in Q4 2007.15 These collapses figured significantly in the collapse of the net flow of mortgage funds, which fell $47.1 billion from Q2 2007 to Q4 2007, and new MBS issues fell $206.0 billion. The decline in the flow of mortgage funds, in turn, reinforced the collapse of house prices.

This is a clear example of the type of self-sustaining expectations fundamental to the behavior found in the asset market experiments discussed in

14 We first reported our analysis of the cost of insuring MBS with CDS in the *Wall Street Journal* in Gjerstad and Smith (2009a). We expanded on that analysis in Gjerstad and Smith (2009b).

Chapter 2. As prices were rising, those price increases justified the investments by both homeowners and mortgage financers. Moreover, capital gains from house price appreciation could be used to “paper over” developing problems with unsound underwriting practices because teetering borrowers could refinance into a larger mortgage, extracting equity to alleviate their immediate financial distress. Mortgage default rates and house price appreciation data strongly suggest that this was occurring. In Arizona, the serious delinquency rate in Q3 2006 was 0.63 percent, which was the second lowest figure in the fifty states, Puerto Rico, and Washington, DC. The rate in California was 0.74 percent, which was the fourth lowest figure. Three years later, in Q3 2009, the situation had changed dramatically. Arizona and California had serious delinquency rates of 12.21 and 11.70 percent, respectively, which were the third and fourth highest figures in the country.16

When prices fell even modestly, speculative (i.e., momentum) buyers withdrew from the market and mortgage financers restricted their loans to only the most financially stable buyers. The resulting decline in lending then led to a more precipitous decline in home prices and exposed the fundamental weakness of borrowers in the cities that had experienced the largest price gains. In these markets, as delinquency rates soared, prices collapsed.

3.3.2 Money Mattered: The Flow of Mortgage Funds Grew Dramatically During the Bubble

The massive flow of mortgage credit into the housing market is charted in the upper panel of Figure 3.3. The exponential trend of mortgage fund growth from 1952 to 1998 is shown as the solid line in the top panel. The lower panel of Figure 3.3 charts the difference between the flow of mortgage credit and its exponential trend. A positive value for this difference indicates an above-normal flow of funds into the residential mortgage market; the flow of funds into the market grew to an elevated level between 2003 and 2006. The figure also demonstrates that the excess flow of mortgage funds corresponds closely to foreign capital inflows, shown in the lower panel, especially between late 2001 and late 2006.17

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16 Figures on serious delinquency are from the Mortgage Bankers’ Association National Delinquency Survey in the Third Quarter 2006 and the Third Quarter 2009 issues.

17 Sources for the home mortgage and current account data in Figure 3.3 are provided in Footnote 3 in this chapter. Both series are inflation-adjusted to 2005 prices.
Asset Performance

The surge in housing prices to their peak in Q1 2006 – shown in Figures 3.1 and 3.2 – is clearly supported by a corresponding surge in the flow of mortgage credit into housing above its long-term trend, as shown in Figure 3.3. The net flow of mortgage credit was above its long-term trend for thirty-six consecutive quarters, from Q4 1998 through Q3 2007. The net flow of mortgage funds was positive from Q1 1952 through Q1 2008; it was negative for twenty-one consecutive quarters from Q2 2008 through Q2 2013 before turning positive again in Q3 2013. As Figure 3.1 shows, real house prices had cyclical peaks in 1979 and 1989. Figure 3.3 shows the close correspondence of these peaks with net flow of mortgage credit. Both of the previous price peaks followed long periods in which the net flow of mortgage credit was above trend. However, the deviation was not as long or as large in the two previous periods of house price appreciation as it was during the thirty-six quarters from Q4 1998 to Q3 2007.

House prices increased most rapidly between Q1 2003 and Q3 2005, when the Case-Shiller U.S. National Home Price Index increased 30.4 percent (i.e., an average annual increase of 11.2 percent per year for 2.5 years). As house prices escalated, the flow of mortgage funds increased commensurately from $208.9 billion in Q1 2003 to $304.3 billion in Q3 2005. The positive feedback loop between home prices and the net flow of mortgage funds is an inherently unstable dynamic system.18

The growth of both home prices and the net flow of mortgage funds should correspond more closely to income growth if their growth rates are to be sustainable. When home prices and mortgage funds cause the growth of one another in a positive feedback loop – fed by credit creation and an inflow of foreign investment – then both can grow much faster than income; eventually, however, they must return to growth rates in line with income. Figure 3.4 shows the sharp increase in the ratio of median house price to median family income between 2001 and 2005.

18 Economists prefer stories about self-correcting or stabilizing feedback loops. In a typical narrative about self-correcting dynamics, home builders would respond to higher house prices by increasing production. Increased supply would then lead to house price declines, restoring equilibrium. We know that this self-correcting feedback effect occurred because home construction surged during the bubble. However, for several years, the destabilizing feedback between house price appreciation and the increased mortgage lending was stronger than the self-correcting loop. Home price appreciation drew in new buyers and lenders, and the increased flow of mortgage funds contributed to home price increases. This positive feedback system is inherently unstable; when home price appreciation turned negative, so did the flow of mortgage funds. Wheat (2009) described system dynamics models that incorporate both stabilizing and destabilizing feedback loops by evaluating three models of the housing bubble.
The rapid influx of new mortgage credit increased total outstanding mortgage debt of U.S. households from $5.84 trillion at the end of Q4 2001 to $9.00 trillion at the end of Q1 2006, a 54.1 percent increase. This rapid growth of mortgage credit corresponded to an increase in the value of residential real estate, from $14.96 trillion at the end of Q4 2001 to $22.24 trillion at the end of Q1 2006 – an increase of 48.7 percent.19

On the surface, this looks like a bargain: Housing value increased by $7.28 trillion whereas mortgage debt increased by only $3.16 trillion. During this period, about 4.5 million new homes were sold, with a value of about $1.3 trillion; therefore, the value of the existing housing stock increased about $6 trillion. Assuming that the $1.3 trillion in new housing value was financed with 60 percent equity, the mortgage debt of the 73.2 million existing homeowners increased about $2.65 trillion. Therefore, their equity increased about $3.35 trillion in slightly more than four years – an average increase of almost $46,000 per household. However, when the bubble burst, most of the house price increase disappeared but the debt burden remained.

The large flow of mortgage financing to lower-income borrowers also pushed up house prices more in the lowest priced tier, as Figures 3.5 and 3.6 demonstrate. In the self-reinforcing loop from prices to credit in the bubble, rapid price increases in the low-price tier encouraged lending to borrowers in that market segment – many of whom had low income, few assets, and a weak credit history. In the next section, we examine the source of this mortgage credit. In the subsequent section, we show that this large flow of mortgage credit in support of increased homeownership disproportionately

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19 Mortgage debt and residential real estate values are from the Federal Reserve Flow of Funds historical data, Table L.218 in lbats.zip and Table B.100 in btabs.zip. These files are available at www.federalreserve.gov/releases/z1/Current/data.htm. Figures are inflation-adjusted to 2005 dollars with the series CPIAUCNS.
encouraged mortgage borrowing and refinancing among those buyers in the weakest financial condition.

3.3.3 Money from Abroad: Foreign Investment Inflated the Bubble

Trade imbalances and international capital flows contributed importantly to this debt-fueled asset price surge in the United States. The inflow of foreign
investment is charted in the lower panel of Figure 3.3. The pronounced surge in such inflows between 1997 and 2006 corresponded first to the run-up in equity prices during the technology sector boom and then, after 2001, to the run-up in housing prices evident in Figure 3.2. Between 2001 and 2006, accumulated U.S. current account deficits totaled $3.52 trillion, whereas net mortgage lending exceeded its 1952–98 trend by $2.43 trillion. During those six years, foreigners invested $786.8 billion in government-sponsored enterprise (GSE) (i.e., Fannie Mae, Freddie Mac, and Ginnie Mae) MBS; we estimate that foreigners also purchased $676 billion in private residential MBS.\(^{20}\) Slightly more than 60 percent of the excess flow of mortgage funds can be attributed directly to foreign investment.\(^{21}\) Foreign investment in mortgages was significant, but foreign investment in other financial instruments indirectly freed domestic funds for investment in mortgage lending.

During the past decade, a large fraction of the world’s current account surpluses have been invested in the United States. For example, in 2004, sixty-eight countries ran current account surpluses that totaled $930.4 billion. The United States absorbed $630.5 billion of that total, or 67.8 percent of all current account surpluses in the world.\(^{22}\) Why should two thirds of the world’s net international investments find their way to the world’s wealthiest nation, and why should their investments support consumption? We examine this issue in more detail in Chapter 10. However, the short answer is that in 1997, there was a sudden stop of the capital flows that had been going into the fast-growing economies of East Asia. Those economies quickly began

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\(^{20}\) Foreign investment in GSE securities is from Table F.107 in the Federal Reserve Flow of Funds document. For our estimate of foreign investors’ purchases of private-label MBS, we start from their purchases of corporate bonds, which totaled $1,729.6 billion in those six years (Flow of Funds, Table F.107). During this period, corporate bond issues amounted to $4,536.2 billion (Flow of Funds, Tables F.2 and F.3), of which $1,773.8 billion were private mortgage securities (Flow of Funds, Table F.126); therefore, 39.1 percent of corporate bonds issued were MBS. Assuming that foreigners made the same percentage of their corporate bond investments in MBS as domestic investors, their MBS purchases would have amounted to $676.3 billion.

\(^{21}\) The inflow of foreign investment equals the trade deficit minus net earnings on foreign investment. Elliot and Min (2004) provided a concise summary of the current account, the financial account, and their relationship to the international investment position. Higgins et al. (2005) showed that despite the fact that foreign investment in the United States exceeds U.S. investment in foreign assets, the United States has net earnings on its international investment position. Whitaker (2006) described the similar position in the United Kingdom by noting that “the United Kingdom can, surprisingly, generate net investment income from net debt.”

\(^{22}\) These figures are calculated from data in the World Economic Outlook Database from the International Monetary Fund. Data are available at www.imf.org/external/pubs/ft/weo/2010/02/weodata/weoselgr.aspx.
to repay prior debts and many other countries began to accumulate foreign currency reserves as a precaution against the type of sudden stop that Thailand, South Korea, Malaysia, and Indonesia had suffered from during and after the East Asian crisis. Much of this capital ended up flooding into the United States after 1997.

3.3.4 Housing Affordability Fell as Credit Pushed Up Prices

When developing countries switched course and became net suppliers of capital, most of that capital was invested in the United States. Much of this investment made its way into the U.S. mortgage market, especially after the investment boom in the technology sector subsided in 2000 and 2001. As the huge volume of foreign investment flowing into the U.S. mortgage market pushed up house prices, house prices became disconnected from fundamentals – such as the income that would be required to make mortgage payments during a period of several decades.

Until the late 1990s, the rough guideline for housing affordability in the United States had limited housing expenditures (i.e., principal, interest, taxes, and insurance) to about 30 percent of income. For example, before the mid-1990s, federal housing agencies would not purchase conventional mortgages unless those expenses were no larger than 28 percent of the borrower’s income (29 percent if the mortgage was insured by the Federal Housing Administration).23 These mortgage underwriting restrictions limited access to mortgage financing. Rajan (2010) argued that the widening income distribution in the United States created political pressure to make the “American dream” accessible to the growing number of households whose real incomes had remained stagnant or fallen in the past thirty years. Rajan argued that credit was the palliative offered to those whose incomes had stagnated. We present evidence later in this section that credit grew faster in lower-income segments of the population and that house prices grew fastest in the lowest priced tier of the market.

The massive infusion of credit led to a rapid increase in home prices that was unconnected to income growth. As shown in Figure 3.2, inflation-adjusted house prices increased by 85.0 percent from Q1 1997 to their peak in Q1 2006 – a 7.1 percent annual increase in excess of inflation. During that same period, median real household income grew 3.7 percent, from $45,022 in 1997 to $46,695 in 2006 – an increase of only 0.3 percent per

year.\textsuperscript{24} Hence, house prices grew 7.1 percent faster than the prices of all other goods and 6.8 percent faster than income during the nine-year period.\textsuperscript{25}

The ratio of median house price to median household income, shown in Figure 3.4, indicates a substantial decline in housing affordability during the bubble. The ratio averaged 3.29 between 1984 and 2000; during those seventeen years, the ratio never deviated by more than 4 percent from that average. However, between 2001 and 2005, the ratio shot up to a level 44.1 percent above its long-term average.\textsuperscript{26}

Teaser rates, ARM loans, and negative-amortization loans all drew borrowers into unsustainable financial positions. Their predicament is apparent if we consider what would be required if they had a conventional loan. A fully amortizing thirty-year fixed-rate mortgage with a 6 percent interest rate requires annual payments of $7,200 per $100,000 borrowed. The median household income in 2005 was $46,326 and the median house price was $240,900. If that house were financed 100 percent with a mortgage (as it was for 45 percent of first-time home buyers in 2005), the annual mortgage payments would be $17,345. With a household income of $46,326, the mortgage payments would need to be made from an after-tax income of about $40,000. With property taxes and insurance added to mortgage payments, housing costs would exceed 50 percent of median income for a household owning a median-priced house.

Only two thirds of American households own their home, so this benchmark might overstate the problem faced by the median household because

\textsuperscript{24} Median household income is reported annually by the U.S. Census Bureau, in income Table H-08, available at \url{www.census.gov/hhes/www/income/data/historical/household/index.html}. These figures are inflation-adjusted to 2005 prices using series CPIAUCN.

\textsuperscript{25} Throughout this book, we use the inflation-adjusted price of homes to identify housing bubbles over time. This implies that the fundamental value of homes is related to the price of other consumer goods, with price bubbles measured relative to this fundamental value. There are other useful measures of house price deviations from fundamental value – for example, the ratio of price to income as shown in Figure 3.4, or the ratio of home price to rental values. Figure 3.4 shows an increase in the price-to-income ratio starting in 1986 that subsequently peaked in 1989. The start of this house price bubble has been attributed to the Tax Reform Act of 1986 based on the reported upward shift in the (linear) relationship between median house price and median family income. The assertion is based on the fact that the 1986 Act created tax incentives for larger mortgages by eliminating the tax deductibility of non-housing related interest on consumer debt. (See “The U.S. Housing Bubble Is Back,” \textit{Seeking Alpha}, March 19, 2013, available at \url{http://seekingalpha.com/article/1285281-the-u-s-housing-bubble-is-back}.)

\textsuperscript{26} Median household income data and median house price data are available from the U.S. Census Bureau. The median sale price for sales of existing homes is from various issues of the \textit{Real Estate Outlook} by the National Association of Realtors. For the median household income data source, see Footnote 24.
those with income at the 67th percentile would own the median-valued home if income and home value were perfectly correlated. However, Lloyd (2007) and Lewis (2008) provided anecdotes that suggest that lower-income borrowers may have been purchasing more expensive homes. Lenders, and especially mortgage originators, frequently pushed loans on people with dubious employment and credit histories and few or no assets. Lloyd recounted the story of a couple in Watsonville, California, who earned about $300 each per week picking strawberries and who purchased a $720,000 house in Hollister. Lewis (2008, p. 98) told of a nanny who owned five townhouses in Queens and could not afford to make mortgage payments on any of them.

3.3.5 Low-Priced Homes had a Bigger Bubble

Statistical analysis by Mian and Sufi (2009) suggested that these anecdotes were not unusual. They examined relationships among credit quality, mortgage lending growth, and household income growth at the ZIP code level between 2002 and 2005. They found that income growth was slower in ZIP codes with lower credit quality; however, mortgage credit grew more quickly in those ZIP codes. Their evidence suggests that aggregate figures on home price appreciation might not fully reveal the extent of the problems that developed during the past decade: So much of the new lending went to households with low incomes and weak credit histories that were not in a position to weather a downturn in the housing market. The tiered Case-Shiller Home Price Index movements during the course of the bubble and collapse are consistent with the pattern of credit growth that Mian and Sufi found.

Across every city covered by the tiered price indices, during the bubble home prices grew and fell fastest in the low-price tier. Mian and Sufi (2009) showed that credit grew faster in the low-income tier, and the Case-Shiller tiered indices showed that prices grew fastest in that tier during the bubble and fell fastest in the low-priced tier during the collapse. More risk was concentrated in the low-price tier, wherein homeowners were least able to withstand a decline in asset values. There also was a significant geographical concentration of risk. Figures 3.5 and 3.6 show the tiered Case-Shiller U.S. Home Price Indices for four Western cities and two Florida cities, respectively.27

27 Tiered Case-Shiller U.S. Home Price Indices divide homes into three tiers. In December 2010, the Los Angeles low-price tier consisted of homes that sold for less than $309,109; the high-price tier consisted of homes that sold for more than $506,475.
By March 2011, nominal prices in the lowest tier had fallen from their peak by 52.0 percent in Los Angeles, 59.4 percent in San Francisco, 70.7 percent in Phoenix, 67.3 percent in Las Vegas, 55.1 percent in Minneapolis, 52.3 percent in Chicago, 56.2 percent in Atlanta, 65.1 percent in Miami, and 60.2 percent in Tampa. The middle-price tier had fallen 60.2 percent in Las Vegas, 58.9 percent in Phoenix, 54.5 percent in Miami, and 50.4 percent in Tampa. In Las Vegas, the high-price tier had fallen 54.6 percent. None of the other ten cities with tiered price indices had a decline of more than 50 percent in any tier. Although even the aggregate figures showed a serious decline in housing affordability during the course of the bubble, price increases were concentrated unevenly both geographically and by income. In several cities, house prices grew much faster than in the country as a whole, and prices grew faster yet in the low-price tier in those cities.

3.3.6 Mortgage Leverage was Extreme During the Bubble

The National Association of Realtors (2006, Exhibit 5-3) reported that in 2005, 45 percent of first-time home buyers made no down payment. On stocks, margin loan requirements are commonly 50 percent, and a loan can be called within 24 hours (see Chapter 8), whereas an “underwater” mortgage goes unrecognized on a financial firm’s balance sheet as long as the loan servicer receives mortgage payments. This hidden mortgage-lender risk accumulates if the collateral values continue to erode against fixed debt. If a homeowner stops making payments, the foreclosure process can be prolonged, and the value of the collateral may continue to decline during the process. In its October 2013 Mortgage Monitor report, Lender Processing Services (LPS) estimated that the average borrower in foreclosure had not made a payment for 900 days. It also estimated that among buyers whose payments are 90 days or more past due (but who are not yet in foreclosure), the average number of days since the last payment reached 512 in October 2013. Illiquidity in the housing market, combined with declines in asset values and high leverage, generated significant losses that threatened financial-system solvency.

29 In Chapter 8, we examine the development of margin rules for lending on equities and on real estate especially before and after the Depression. Many financial sector problems in the United States during the past thirty years developed when these rules were abandoned.
3.3.7 Mortgage Delinquency Reversed the Flow of Mortgage Funds

The rapid increase in serious delinquency in late 2006 and 2007 finally broke the myopically rational positive feedback loop in which mortgage credit drove house prices higher, and higher prices justified additional mortgage credit. Then, mortgage financing abruptly reversed: between Q1 2006 and Q1 2007, the net flow of mortgage funds fell by 36.2 percent. Five quarters later, the net flow of mortgage funds turned negative for the first time since 1944. MBS peaked earlier than the flow of mortgage funds, but their sharp decline came later than the decline in the net flow of mortgage funds. New private-label MBS issues peaked at $327.5 billion in Q3 2005, but new issues had fallen only to $258.5 billion in Q2 2007. In Q3 2007, just as the problems in the CDS market hit the AAA rated tranche of the securities, new MBS issues collapsed dramatically. (Chapter 8 describes how this event precipitated the abrupt change in Federal Reserve policy when the Fed embarked on an extended period of enhanced liquidity injections into the financial system.) New issues fell 52.0 percent in Q3 2007 to $124.1 billion. The collapse continued in Q4 2007, when new issues fell another 57.7 percent to $52.5 billion. By Q2 2013, nominal residential mortgage debt had fallen for twenty-one consecutive quarters; the decline finally ceased in Q3 2013. Real residential mortgage debt outstanding had fallen by $2.05 trillion below its peak level in Q4 2007. 30 The process of paying down this debt has been slow; only a small fraction of the debt accumulated since 2001 had been shed by Q2 2013.

3.3.8 Leverage Cuts Brutally on the Downside

As the flow of mortgage funds into the market leveled off in early 2006, house prices also leveled off, and many homeowners who relied on price increases to refinance their mortgage became financially distressed. Mortgage delinquencies began to rise rapidly toward the end of 2006 as house prices flattened out. Increases in serious delinquency were especially acute in states where house price appreciation had been the greatest. Among subprime ARM loans, serious mortgage delinquency increased fastest in three states that previously had seen the fastest home price appreciation. Between

30 The inflation-adjusted outstanding mortgage debt level peaked in Q4 2007 at $9,881 billion. In Q3 2013, it had fallen $2.05 trillion to $7,826 billion. These figures are inflation-adjusted to 2005 prices by series CPIAUCNS.
Q3 2006 and Q2 2007, serious mortgage delinquency increased by a factor of 3.02 in Arizona, 2.75 in California, and 2.68 in Nevada.\textsuperscript{31}

Figures 3.1 and 3.2 show that prices collapsed soon after the flow of mortgage funds began to subside in Q2 2006. Without credit flowing into the housing market, there was nothing to support house prices, and the decline gathered downside momentum – similar to what is described in the asset market experiments reported in Chapter 2.

In 2006, delinquency alerted investors to the problems in the mortgage market and led to a decline in the flow of mortgage funds that was soon followed by the collapse of house prices. However, as house prices collapsed, delinquency rose dramatically. During the bubble, rising prices concealed much of the risk in the mortgage market. As Buffett (2001) famously noted in his letter to Berkshire Hathaway investors, “[Y]ou only find out who is swimming naked when the tide goes out.”

The Mortgage Bankers’ Association estimated that serious delinquency fell after the 2001 recession to a minimum of 1.82 percent in Q3 2005. By Q3 2006, the figure had risen modestly to 2.00 percent and rose thereafter in every quarter until Q4 2009, when it reached 9.67 percent.\textsuperscript{32} Deterioration in the performance of some mortgage products was far worse. The percentage of seriously delinquent subprime ARM loans went from a minimum of 5.13 percent in Q2 2005 to 7.72 percent in Q3 2006. Even the minimum delinquency rate of 5.13 percent is extraordinarily high, but lenders in 2005— in case of borrower default— would either refinance the borrower into a larger loan or take possession of collateral that had appreciated in value. However, by Q4 2009, the subprime ARM serious delinquency rate had risen for eighteen consecutive quarters to 42.70 percent. By that time, in case of borrower default, lenders would take possession of collateral that had greatly eroded in value, and the market was far less liquid than it had been before the price collapse.

Because so many mortgages had been written with slender down payments, the other side of the house price collapse was its impact on banks, which suffered an impaired flow of mortgage payments from distressed homeowners, asset value losses on foreclosed homes, and further exposure to risk in the portfolio of housing loans and mortgage bonds still active on their books.

\textsuperscript{31} These figures are calculated from the Q3 2006 and Q2 2007 National Delinquency Survey from the Mortgage Bankers’ Association.

\textsuperscript{32} Seriously delinquent loans are those that are ninety days past due as well as loans in the foreclosure process.
3.4 Housing Equity, Negative Equity, and the Transmission of Borrowers’ Losses

During the bubble, large loans were issued to many existing homeowners who had experienced house price appreciation. Home equity loans thus allowed many existing homeowners to incur mortgage obligations that kept pace with the rising value of their home. When home prices fell, the net wealth of most homeowners fell at an even faster rate than prices. If a homeowner has 20 percent equity and prices fall by 10 percent, the homeowner’s equity falls by 50 percent. If prices fall by 50 percent, as they have in many cities in the Case-Shiller U.S. Home Price Index, the homeowner’s equity position turns to negative 60 percent. Although this example may seem extreme, in January 2011, Case-Shiller U.S. Home Price Indices had fallen below peak values by 57.7 percent in Las Vegas, 55.4 percent in Phoenix, 49.7 percent in Miami, and 46.0 percent in Tampa. As shown in Figures 3.5 and 3.6, the percentage declines in house prices were much greater in the low-price tier. Homeowners who were unable to make mortgage payments or who lost homes through foreclosure generated large losses for lenders and investors in mortgage securities.

3.4.1 Households’ Equity in the Housing Stock

By the close of Q4 2011, Americans owned housing assets worth $13.94 trillion, $3.21 trillion greater than at the end of 1997. However, on the liability side of the ledger, Americans had mortgage debt of $8.40 trillion, up from $4.54 trillion at the end of 1997. At the end of 2011, household inflation-adjusted housing equity was lower than at any time since the beginning of 1985. Between 1997 and 2011, the number of owner-occupied homes increased 11.7 percent, from 67.4 million to 75.3 million units. Most of the mortgage lending was used to bid up the prices of existing homes. Debt per household has increased dramatically, even after we take into account the increased number of households; debt-service costs have risen with debt. With the drop in housing value against fixed mortgage debt, equity collapsed disproportionately between 2006 and 2011. By Q2 2012,

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33 These figures are all inflation-adjusted to 2005 dollars by the CPIAUCNS series. The mortgage debt and housing value data sources are provided in Footnote 19.

34 At year end in 1997, there were 67.42 million owner-occupied homes in the United States. At year end in 2011, that number had increased to 75.32 million. See U.S. Census Bureau, Housing Vacancies and Homeownership, Historical Table 8, available at www.census.gov/housing/hvs/data/histtabs.html.
Figure 3.7. Mortgage debt pushed up housing values and housing equity rose with them from 1997 to 2006, but when values plummeted, debt remained high.

homeowner equity had finally recovered to its level in 1997 – although the total value of all homes had risen from $10.7 trillion to more than $14 trillion.

The effect of the debt build-up and of the price bubble and collapse is indicated in the chart in Figure 3.7, which shows the dollar value of households’ residential assets, their mortgage debt, and their housing equity (i.e., residential assets minus mortgage debt). Although real estate assets are only 30 percent of households’ total assets, unlike financial assets, they are widely distributed across households – and for many households, they are highly leveraged. Housing assets, mortgage debt, and housing equity grew in roughly similar proportions throughout the formation of the bubble from 1997 until Q1 2006. When house prices collapsed in 2007 and 2008, a large portion of the previous run-up in asset value was lost, but the debt remained. Equity declined from $13.25 trillion in Q1 2006 to $9.63 trillion at the start of the recession and declined further to only $5.54 trillion in Q1 2009, from which it finally recovered to its 1997 level in Q2 2012.35 The modest recovery in 2009 and early 2010 was driven by special home-buyer subsidy programs that arrested the decline in home asset values – but only temporarily because such programs tend to shift future demand into the present.

The aggregate nature of the chart in Figure 3.7 underestimates the loan-to-value ratio among mortgaged properties because one third of homeowners

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35 These housing equity figures are all inflation-adjusted to 2005 dollars by series CPIAUCNS.
have no mortgage. The First American Negative Equity Report for Q3 2010 estimated that mortgaged homes are worth $12.71 trillion and mortgage debt on those homes totals $8.85 trillion. Homeowners’ equity is the difference between the estimates, or approximately $3.86 trillion. Even this aggregate equity figure does not indicate the extent of mortgage distress being experienced by some households because of the wide distribution in the loan-to-value ratio from one mortgaged property to another.

3.4.2 Negative Equity Became Widespread After Prices Fell

In its first negative equity report in Q3 2008, First American Corporation estimated that there were more than 7.6 million negative equity mortgages. That number increased rapidly to more than 11 million, where it remained through 2011. Even at the end of 2012, CoreLogic estimated that 10.4 million mortgaged homes were in a negative equity position, which is 21.5 percent of the 48.5 million mortgaged properties in its database. Nevada had the highest negative equity percentage – 52.5 percent of homeowners – and total residential mortgage debt in Nevada exceeded the value of all mortgaged residential properties. California had the largest number of negative equity homeowners at 1.70 million, followed by Florida at 1.67 million and Illinois at 632,000.

Homeowners with negative equity of 25 percent or more default much more frequently than homeowners with positive equity or even small negative equity positions, and they generate larger losses for lenders. In Q4 2012, about 4.4 million homeowners (about 9.1 percent of homeowners) had a loan-to-value ratio of 1.25 or more. These losses are readily transmitted to the financial sector when homeowners are delinquent in their mortgage payments or when properties revert back to the lenders in foreclosure at a value below the outstanding mortgage. CoreLogic estimated that even in Q4 2012, four years after the financial crisis in September 2008, there was an aggregate of $628 billion in negative equity among homeowners. LPS estimated that as of December 2012, 5.29 million mortgages were

36 CoreLogic produces a quarterly estimate of negative equity by state. It also estimates the percentage of households in negative equity positions from 0 to 5 percent, 5 to 10 percent, 10 to 15 percent, 15 to 20 percent, 20 to 25 percent, and finally, above 25 percent. The report is available at www.corelogic.com/research/negative-equity/corelogic-q4-2012-negative-equity-report.pdf.

37 According to LPS, there were 50.65 million first-lien mortgages in the United States as of May 2012; therefore, the First American database includes about 95.8 percent of mortgaged residential properties.
noncurrent. Of those non-current mortgages, 1.72 million were in foreclosure and another 1.55 million were more than ninety days past due but not yet in foreclosure. The combination of the number of delinquent loans and the extent of negative equity on those loans suggested that even at the end of 2012, more than four years after the financial crisis, the banks had not yet experienced the full extent of their losses. Reilly (2011) noted that in the spring of 2010, proposed rules from the Financial Accounting Standards Board (FASB) would have forced banks to value the loans on their books at market price; however, banks were able to defeat the proposal and value their loans at “original cost less a reserve to reflect the possibility of loss.”

In March 2010, First American Corporation estimated, for ten cities, the length of time until the average borrower with negative equity would reach positive equity. It expects that the average borrower with negative equity in Q4 2009 will reach positive equity by 2015 or later in each of the ten cities that it examined. Its estimates were based on the assumption that home prices increase at 3 percent per year. The Case-Shiller U.S. National Home Price Index has appreciated at an average rate of 4.3 percent per year since Q4 2010. Even with home price appreciation that has exceeded the estimate, the number of negative equity homeowners has fallen only 42 percent from 11.1 million in Q4 2010 to 6.4 million in Q3 2013.

3.4.3 Borrowers’ Losses were Transmitted to the Financial Sector

Two risk factors in mortgage lending contributed to the large losses suffered by banks. Mortgage loans have become increasingly leveraged during the past twenty years. Even the extreme case of 100 percent leverage has become the norm for first-time buyers. This exposes lenders to extreme risk because the borrower has nothing at stake in case of default and has no equity to buffer losses in case of a decline in the asset value.

Illiquidity poses another risk for both homeowners and lenders. Sales of both new and existing units were falling sharply during the price collapse, and inventories of unsold homes were growing rapidly while house prices fell. Homeowners who needed to sell because their equity was eroding or

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38 Many mortgages have been securitized, and expected losses on those securities are reflected in the decline in their value. However, even these losses are not completely reflected on the banks’ balance sheets due to changes in mark-to-market accounting rules. Newman (2009) noted that “in the wake of the banking crisis, many changes have taken place – or are taking place – in mark-to-market accounting. The FASB in the United States has relaxed mark-to-market rules after political pressure from banking and financial services lobbies.”
because their mortgage payments strained their budget faced a challenging dilemma. They could lower the price to try to hasten a sale or hold to their asking price as home prices continued to fall. If they were already in a negative equity position, either alternative could lead to a larger loss to lenders.

Stock market prices of financial firms and mortgage lenders eventually reflected the accumulation of bad loans on their books. The Keefe, Bruyette, and Woods BKX Index of financial firms peaked in January 2007. By January 2008, the index had fallen 23.2 percent. The rapid declines in the share prices of financial firms came in 2008 and early 2009. By February 2009, the index value was only 19.5 percent of its peak value twenty-five months earlier. Although the index recovered substantially after its trough, as of November 2013, it stood at 49.9 percent of its peak value.

NIPA data indicate that financial-sector profits in 2010 were 79.6 percent of profits in 2006. Yet, even with these high profits, the value of the Keefe, Bruyette, and Woods BKX Index in January 2011 was only 35.1 percent of the Index level in January 2007. This pattern persisted into 2013. In the two years from Q4 2011 to Q3 2013, financial-sector profits have exceeded the peak per-crisis level from Q2 2006 in every quarter, yet the value of the BKX index is only 49.9 percent of its peak pre-crisis level. There are several possible explanations for the significant difference in asset prices given the small difference in financial sector profits. The market may have recognized that financial sector equity prices were too high in January 2007. It is also possible that equity markets were not convinced that financial institutions had set aside adequate reserves to account for the losses that they already experienced on their assets and will experience in the future.

3.5 Housing and Key Components of GDP in the Great Recession: The Two Types of Markets Again

In this chapter, we have examined the development of the housing bubble, drawing attention to the large influx of foreign investment. We have compared the broad patterns of price and trade-quantity movements during the bubble to their patterns in asset market experiments. We have also described how borrowers’ losses were transmitted to lenders, leading to the most serious financial crisis since the Great Depression. Next, we turn our

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39 These figures on financial sector profits come from NIPA, Table 6.16D, which is available from the Bureau of Economic Analysis at www.bea.gov/national/nipaweb/SelectTable.asp.
Figure 3.8. Percentage changes to GDP and its major components. Housing (H) represents the percentage difference between real expenditures on new housing units in the indicated quarter and its level at the start of the recession in the Q4 2007. For example, housing was 76.3 percent higher in Q4 2005 than it was in Q4 2007; it was 49.0 percent lower in Q4 2012 than it was in Q4 2007. Other series are interpreted similarly. For example, non-residential investment (I) was 25.5 percent lower in Q1 2003 and 25.7 percent lower in Q4 2009 than it was in Q4 2007. Series are inflation-adjusted with GDP deflators. See Footnote 40 for a discussion of GDP deflators.

attention to the changes in GDP and its major components prior to, during, and following the Great Recession.

Figure 3.8 provides a comparative empirical perspective on the housing sector and its relation to other components of GDP in the Great Recession. The expenditure chart in Chapter 4 on the Great Depression, as well as all of the expenditure charts in Chapter 5 on post-war recessions, follow the same measurement principles used in Figure 3.8. The charts follow a common design intended to convey the relative magnitude of changes to GDP and its major components before, during, and after the peak of an economic cycle. The purpose is to facilitate understanding of comparative movements of these components and to establish pattern regularities across different cycles. Thus, Figure 3.8 charts percentage changes in GDP, non-residential fixed investment (I), value of new residential construction (H),
and consumer durables (D). The change for each category is computed relative to its level at the beginning of the recession in Q4 2007. The graph also includes a series with changes in sales of new residential units (S), also relative to their level in Q4 2007.

The contrast between the two fundamental types of markets – perishable goods and services versus the class of durable goods – is quite striking: consumption of nondurable goods and services (C) had a maximum decline of 1.7 percent during the recession, whereas housing (H), which declined the most, fell 60.0 percent from the start of the recession to its end and fell 78.8 percent from its peak to its trough. The slower decline in non-residential fixed investment (I), after the recession started, likely reflects that industry did not recognize the strain that households were under and the extent that their distress would affect aggregate demand: Firms were blindsided along with the experts. The fall of I intensified even as consumer durable goods (D) stabilized for three quarters before the recession officially ended. As discussed in Chapter 5, D and I are more likely to be coincident than leading indicators of economic decline.

The impact of financial developments on the housing sector as described in this chapter is particularly apparent in Figure 3.8. Housing construction expenditures began to fall in Q2 2006; unit sales of new homes – also shown in Figure 3.8 – turned down six months earlier in Q4 2005. For an extended period, the slowdown in the housing industry did not spill over into the broader economy because banks continued to lend even though at a reduced rate – net mortgage lending would not turn negative until 2008.

It took seven more quarters after residential construction began to decline (in Q2 2006) before durables fell, ten quarters before the financial system collapsed at the end of Q3 2008, and another quarter before investment declined substantially in Q4 2008. Non-residential fixed investment – primarily firms’ investments in plants and equipment – did not fall substantially until long after the housing market decline was underway. The major investment decline began to set in three quarters after the recession began.

These four series all come from the NIPA data provided by the U.S. Department of Commerce. For brevity, we refer to personal consumption of services and nondurable goods expenditures (NIPA Table 1.1.5, line 4) as “consumption” (C); households’ durable goods expenditures (NIPA Table 1.1.5, line 5 and 6) as “durables” (D); expenditures on new single-family and multi-family housing units (NIPA Table 5.3.5, line 19) as “housing” (H); and non-residential fixed investment (NIPA Table 1.1.5, line 9) as “investment” (I). All series are converted from nominal to real figures by dividing by GDP deflators, which we calculate by dividing NIPA Table 1.1.5, line 1, by Table 1.1.6, line 1. The data are available at www.bea.gov/national/nipaweb/SelectTable.asp.
Chapters 4 and 5 demonstrate that the delayed decline in I is a feature common to all economic cycles in the United States since the Great Depression. The shaded area in Figure 3.8 shows the recession. Consumer durable goods expenditures recovered slowly after they bottomed out, along with GDP, in Q2 2009. Housing had a tepid, temporary recovery due to temporary tax incentives in 2009 but then resumed its decline in late 2010 and the first half of 2011. Investment bottomed out two quarters after consumer durables. Investment recovery also has been weak, and all three of these components of GDP (i.e., H, D, and I) remained below their peak levels nearly six years after the beginning of the recession. It seems likely that all three of these types of durable expenditures will continue to grow slowly at best, possibly for several more years. Household balance sheets are stressed from debt accumulation and asset value declines, the housing market is saturated from the building boom of the past decade as well as the rash of foreclosures and short sales, and business capacity is not strained enough to generate a significant increase in non-residential fixed investment.

Almost certainly, the eight-year period embracing 2006 through 2013 and perhaps beyond will be seen historically as the great episode of household and bank deleveraging from the excesses of 1997 to 2006. The decline in mortgage lending, combined with declines in other lending, played a crucial role in the onset of what is arguably our largest deleveraging cycle and our first deflationary episode since the Great Depression.41

3.6 Summary: The Great Recession Has Unusual Persistence

Reviewing the housing bubble, its collapse, the recession that followed, and the lingering effects of the collapse, we see a number of broad patterns. Many of these patterns occurred during other financial crises and during the stagnation that frequently follows a financial crisis. The large run-up in mortgage credit pushed house prices higher, especially in the Southwest and in Florida but also to a substantial extent in other cities, and even in the small urban areas of the central valley in California. The geographical concentration of price increases, the large price increases in the lowest 41 The CPI in February 2011 was only 0.6 percent above its level in July 2008. Because the CPI utilizes homeowners’ equivalent rent rather than home prices, the rapid decline in housing purchase costs is not fully reflected in the CPI. If housing costs were fully reflected in the CPI, it would probably have fallen by about 8 percent between July 2008 and February 2011, which constitutes significant deflation. Smith and Gjerstad (2010) examined the velocity of money between 1919 and 2009, with particular attention to the collapse of velocity in 1930 and in 2008.
price tier, and the high leverage in mortgage lending had the effect of concentrating a significant risk in a fairly small fraction of the housing market. Low down payments and lax underwriting standards contributed importantly to rapid house price increases: Under normal circumstances, the time required by newly formed households to acquire a down payment and build a credit and employment history effectively regulates the flow of potential home buyers into the market. When this natural regulatory mechanism was short-circuited and new home buyers entered the market faster than new homes could be built, house prices surged. The other effect of reduced down payment requirements and relaxed underwriting standards has received more attention: When risky loans soured and house prices turned down, many borrowers had an inadequate equity buffer, and losses were transmitted to lenders and investors in mortgage securities. When the equity cushions of homeowners disappear, banks are exposed to losses and their balance sheets also become stressed.

The illiquidity of houses as collateral added to lenders’ problems when house prices collapsed. As lenders worked through the arduous and slow foreclosure process, missed payments and eroding collateral added to lenders’ losses throughout the foreclosure process. In addition to their losses on mortgages held on their books, financial institutions suffered major losses from the collapse of the market for mortgage securities in the fall of 2008. This combination of factors precipitated the most serious financial crisis in the United States in the past seventy-five years.

The house price collapse produced balance sheet losses not only among financial firms but among households as well. The economy suffered from a long, sharp collapse of expenditures on new residential units but, in addition, households’ concerns about their declining housing assets and damaged balance sheets precipitated declines in consumer expenditures on durable goods. Finally, firms recognized the developing downturn and cut their investment in inventories and in non-residential fixed investments starting in Q1 2008. Employment peaked just as the downturn reached consumer durables and firms’ inventory investments and then accelerated with the rapid collapse in non-residential fixed investment that began in Q3 2008.

The extreme saturation of the housing market that resulted first from the rapid expansion of residential construction during the boom and then from the rash of foreclosures and short sales during the collapse contributed to the extreme and persistent suppression of residential construction. During the post-war period prior to the Great Recession, the fraction of GDP dedicated to construction of single-family and multi-family residential structures had
Rethinking Housing Bubbles

its low point in Q2 1982, at 1.66 percent of GDP. At the bottom of the Great Recession, the figure sank to 0.89 percent of GDP but by Q2 2011, it had fallen well below even that post-war low to 0.80 percent of GDP. Residential construction, which is typically an important contributor to post-war recoveries, remained sharply suppressed into 2013, and the number of homes in the foreclosure process and the number of mortgages that are seriously delinquent but not yet in foreclosure both suggest that the residential construction recovery will be slow. This situation sharply contrasts with a typical post-war recovery. Chapter 5 on the post-war recessions discusses the fact that residential construction – normally sensitive to interest rates – typically recovers more than any other sector in the first year after the end of a recession. The current recovery has had to proceed without one of the main contributors to previous post-war recoveries.

In addition to suppression of residential construction, the balance sheets of millions of households remained stressed for years after the housing bubble burst. As late as Q1 2013, about 9.6 million homeowners from the First American Corporation database were in a negative equity position. As of March 2013, LPS estimated that 3.2 million homeowners were either in the foreclosure process or at least ninety days past due on their mortgage but not in the foreclosure process. This left at least 6.4 million homeowners in a negative equity position who were current or nearly current on their mortgages. These homeowners were able to make their mortgage payments, but it is likely that their impaired asset position suppresses their demand for consumer durables and even for some nondurables and services. This situation likely will be rectified only after several years of balance sheet repairs. The effect of household balance sheet problems on mortgage and consumer credit has been substantial. The value of mortgage loans outstanding fell in every quarter from Q2 2008 until Q2 2013, after sixty-three years of uninterrupted expansion. Nominal consumer credit outstanding fell 7.0 percent during the two years beginning in July 2008. In the post-war era, nominal consumer credit outstanding has fallen only twice before: by 1.0 percent in the first half of 1975 and by 1.9 percent between November 1990 and November 1991. Clearly, this reflects a combination of unwillingness among households to take on new debt and a tightening of lending standards by banks.

Reduced household demand for durable goods and for new residential units has impacted the need for new investment in business capacity. Non-residential fixed investment has partially recovered since its trough in Q4 2009 but, as of Q3 2013, it remained at 4.2 percent below its peak level from Q4 2007. This suppressed level of investment also affected borrowing by
businesses. Commercial and industrial loans at commercial banks peaked in October 2008 and then fell 24.9 percent before bottoming out in October 2010.

All of these factors have contributed to an unusually persistent recession; a robust recovery with a return to real GDP growth in the historical range of 3 to 3.5 percent will require absorption of the excess housing stock and strengthening of both household and bank balance sheets. Unfortunately, there is no “silver bullet” that will fix these problems. Both require time, and household balance sheet repair also will require discipline. Personal savings as a percentage of disposable income rose after the recession began, from an average of 2.2 percent between 2005 and 2007 up to 4.6 percent between 2008 and March 2013.42 At the same time, households reduced their mortgage debt considerably. However, the process is far from complete, and the sizable government debts only shift the burden of indebtedness from households individually to households and firms collectively. Therefore, more fiscal discipline will be required to simultaneously strengthen household, financial institution, and government balance sheets.

References


42 Both of these period averages are much lower than historical savings rates. For example, between 1950 and 1992, the savings rate averaged 8.5 percent.
Rethinking Housing Bubbles


