

# Critical Review

A Journal of Politics and Society

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## MONETARY POLICY, CREDIT EXTENSION, AND HOUSING BUBBLES: 2008 AND 1929

**ABSTRACT:** *Asset-market bubbles occur dependably in laboratory experiments and almost as reliably throughout economic history—yet they do not usually bring the global economy to its knees. The Crash of 2008 was caused by the bursting of a housing bubble of unusual size that was fed by a massive expansion of mortgage credit—facilitated, in turn, by the longest sustained expansionary monetary policy of the past half century. Much of this mortgage credit was extended to people with little net wealth who made slender down payments, so that when the bubble burst and housing prices declined, their losses quickly exceeded their equity. These losses were transmitted to the financial system—including banks, investment banks, insurance companies, and the institutional and private investors who provided liquidity to the mortgage market through structured securities. It seems that many of these institutions became insolvent; it is certain that they became illiquid. Liquidity loss and solvency fears created a feedback cycle of diminished financing, reduced housing demand, falling housing prices, more borrower losses, and further damage to the financial system and eventually the stock market and the real economy. There are important parallels with the housing and financial-market booms that led up to the Crash of 1929 and the Great Depression.*

Asset price bubbles have been common for hundreds of years, from the Dutch tulip mania in 1636 to the South Sea bubble in 1720 and on through the years until the recent dot-com and housing bubbles. Indeed,

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*Critical Review* 21(2–3): 269–300  
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ISSN 0891-3811 print, 1933-8007 online  
DOI: 10.1080/08913810902934117

bubbles occur quite predictably in the laboratories of experimental economists under conditions that—when we first studied them in the 1980s—we thought were so transparent that bubbles would *not* be observed. We were wrong: Even when every trader in an asset market is provided with complete information on the fundamental value of holding an asset, and is provided with regular reminders of that value, large price deviations from that value in the form of bubbles occur routinely. A sufficient condition for a bubble to arise and be sustained is when some agents buy not on any discount from fundamental value, but on price trend or momentum. When the momentum-trading sentiment increases, the bubble becomes more pronounced. If momentum traders have more liquidity, either in the form of higher endowments of cash or access to margin buying, they can sustain a bubble longer.

Momentum trading and liquidity can fuel a bubble, but the factors that spark the formation of ebullient price expectations both inside and outside the laboratory—in a “crowd”—and those that trigger the sudden turnaround in those expectations, resulting in a crash, remain mysteries. We can model price bubbles, and we have learned much about the conditions that exacerbate or dampen them. But the sparks that ignite them, and the myopic, self-reinforcing behavioral mechanisms that sustain them, remain unpredictable.

Moreover, as common as they are, most bubbles do not bring down an entire economy when they pop. Something more than “irrational exuberance,” and something in addition to momentum trading, must have been responsible for the financial crisis and the great recession of 2008. Thus, beyond asking what triggered the recent bubble and what sustained it, we want to address another crucial question. Why does one large asset bubble—such as the dot-com bubble—do no damage to the financial system, while another bubble leads to its collapse?

Lest we be misunderstood, we hasten to add that the behavioral features of laboratory asset markets do not apply to the ordinary day-to-day markets—prominent in all modern economies—that sustain the flow of goods and services from producers to consumers and that represent efficient decentralized mechanisms for wealth creation through specialization and innovation. This important distinction is echoed in the current crisis and the events that led up to it: The housing asset-market bubble collapse was *transmitted* into mortgage, financial, and banking markets, and this disrupted an economy that had been performing quite well.

If we add key characteristics of housing markets to the standard bubble story, we can offer a fairly complete and simple hypothesis for why first the financial system, and then the wider economy, were pulled down when the bubble popped. Moreover, we will present some data on parallel developments in the 1920s suggesting that we have experienced similar circumstances before.

## I. THE HOUSING BUBBLE: IN OUTLINE AND IN THEORY

Housing markets go through long swings. In just the past forty years in the United States, there were two other nationwide housing bubbles, with peaks in 1979 and 1989.

We think that the upward turn in housing prices that began in 1997 was probably sparked by rising household income (beginning in 1992), combined with a very popular bipartisan political decision in 1997 to eliminate taxes on capital gains of up to a half million dollars for residences. A rising price path in any asset market is likely to draw the attention of investors, and the early stages of the housing bubble had this potential for nourishing a self-reinforcing continuation of rising prices.

The recession in 2001 might have brought the housing bubble to an early end, but the Federal Reserve—with its eye focused not on any one sector, but on the overall economy—decided to pursue an exceptionally expansionary monetary policy in order to counteract the recession.

Naturally, when the Fed opened its liquidity valve, the money flowed to the fastest expanding sector of the economy. House prices were already rising, and both the Clinton and Bush administrations pursued the goal of expanding homeownership; public policy and private incentives combined to erode mortgage-underwriting standards. Mortgage lenders, the government-sponsored enterprises (Fannie Mae and Freddie Mac), and investment banks that securitized mortgages, used rising home prices to justify loans to buyers with limited assets and income. Rating agencies also accepted the notion of ever-rising home values, so they gave large portions of each securitized package of mortgages an investment-grade rating, and investors gobbled them up. Everybody in the chain thought that risk was being reduced by the fact that the asset values underlying loans were growing.

The availability of housing finance and the relaxation of lending standards provided a flow of new buyers into the market that even rapid investment in new housing construction couldn't fully accommodate, so house prices rose dramatically. When even subprime lending couldn't keep new buyers arriving fast enough to sustain the price increases, the financial wizards turned to the interest-only adjustable rate mortgage (ARM). When that stopped working, they had one more magic potion: the negative-equity option ARM. These innovations were responses to the incentives that arise naturally in an environment of rising home-price expectations. But housing expenditures in the United States, and in most of the developed world, have historically accounted for about 30 percent of household income. If housing prices double in a seven-year period without a commensurate increase in income, eventually something has to give.

The price decline started in 2006, and with it all the policies designed to fulfill the American dream turned into unintended nightmares. Trillions of dollars of mortgages had been written to buyers with slender equity, and when delinquencies and defaults started, the borrowers' risk was limited to their small down payments. Hence, the lion's leveraged share of the risk was transmitted directly into the financial system. Uncertainty about which banks holding the securities would fail impaired the credit-intermediation capacity of the financial system, and its subsequent collapse abruptly ended the fine performance of the broader economy.

As straightforward as this story is, analyzing each step more closely yields parallels to the Roaring Twenties—and the Great Depression.

### *Consumption Markets vs. Asset Markets*

In an early experimental study modeled after consumer goods and services markets—in which items disappear after being bought and consumed—Smith 1962 showed that these markets are far *more* efficient, under conditions of strictly private information, than economists had expected. Since then, hundreds of other experimental studies have demonstrated the robustness of this competitive equilibrium discovery process in repetitive-flow markets for goods and services. Moreover, Williams et al. 2000 and Gjerstad 2007a showed experimentally that convergence to competitive equilibrium in single-commodity supply-and-demand markets also extends to more complex interdependent

commodity markets, where what people are willing to pay for good A depends on the price of good B, and vice versa. For the single-commodity markets first studied experimentally in Smith 1962, Gjerstad and Dickhaut 1998 developed a model of heuristic learning by buyers and sellers about the prices that are likely to be accepted by the other side of the market; and they showed, in artificial-intelligence simulations, that when traders follow strategies based on these beliefs, market prices converge to the competitive equilibrium. (Gjerstad 2007b also showed—by mixing algorithmic traders and human traders in the same market experiment—that these heuristic traders can perform as well as, and even better than, human buyers and sellers.)

Taken together, all of these results demonstrate just how well markets function when the items traded *are not re-traded later*, but instead are produced, purchased, consumed, and disappear, and when this process is repeated over and over.

But in asset markets where the item can be resold, value can depend on how a buyer thinks others will value it in the future. Vernon Smith, Gerry Suchanek, and Arlington Williams (1988) showed that human behavior in asset-trading markets leads to dramatically different convergence results from those in commodity-flow markets, even under conditions of high transparency. In their experiment, assets pay dividends over many periods. In early periods, prices rise and soon exceed the expected stream of dividend payments that the asset will yield. Halfway through an experiment session, asset prices are often 50 percent or even 100 percent higher than the expected dividend payments.

While under stationary conditions, a market consisting of people who have previously been through two complete experiment sessions—such that they've had the same experience twice before—finally converges to fundamental values (rational equilibrium) in the last session, it will tend to generate substantial bubbles in the earlier sessions. Although baffling at first, these results were replicated with widely different groups of traders—college students, small-business owners, corporate-business executives, and over-the-counter stock traders—and by skeptical new experimenters. (Initially, Smith, Suchanek, and Williams had been skeptical of their own findings.) But the phenomenon is at the heart of human behavior. Twenty years of experimental research on asset-market bubbles shows that under a wide variety of treatments, asset prices typically deviate substantially from those predicted by the rational-expectations market model (Postrel 2008).

Economists first had to overcome the shock that laboratory markets, like those of daily consumer life, proved the “wisdom of crowds” when people—informed only about their private individual values (as buyers) or of their private costs (as sellers)—sell, buy, and consume items in a process that is replicated over time. But the next shocker was that in asset markets, the wisdom of crowds failed decisively. The key difference in asset markets was the prospect of resale, with no immediate endpoint consumption.

Houses and securities can be re-traded, unlike hamburgers, plumbing repairs, haircuts, and all manner of consumer and producer services. People rely on their investments in asset markets, including the chief asset of many—their houses—to meet retirement and other significant life-cycle needs, and, naturally, they desire high yields on those investments. Firms rely on asset markets for the effective allocation of savings toward productive new investments and innovative technologies. When bubbles emerge, the effect is to distort prices and yields, interfering with both of these objectives.

Caginalp, Porter, and Smith 2000 modeled asset-market bubbles by assuming that they form out of the interaction of two kinds of investors: (1) *fundamental-value* traders, who buy in proportion to the percentage discount below, and sell in proportion to the premium above, underlying asset value; and (2) *momentum traders*, who buy (or sell) in proportion to the current percentage increase (or decrease) in price. Plainly stated, a momentum trader gets into the market when prices are rising because he believes that he’ll be able to sell later at a higher price. Fundamental traders have long-term rational-expectation-supported objectives, while momentum traders are driven by myopic expectations that cannot be indefinitely sustained.

The Caginalp–Porter–Smith model of bubbles also shows that momentum traders can sustain their buying longer as a bubble expands when there is more liquidity in the capital market. A larger credit market allows buyers to sustain their momentum trading longer, and at higher and higher prices, so the bubble diverges ever-farther from fundamental values.

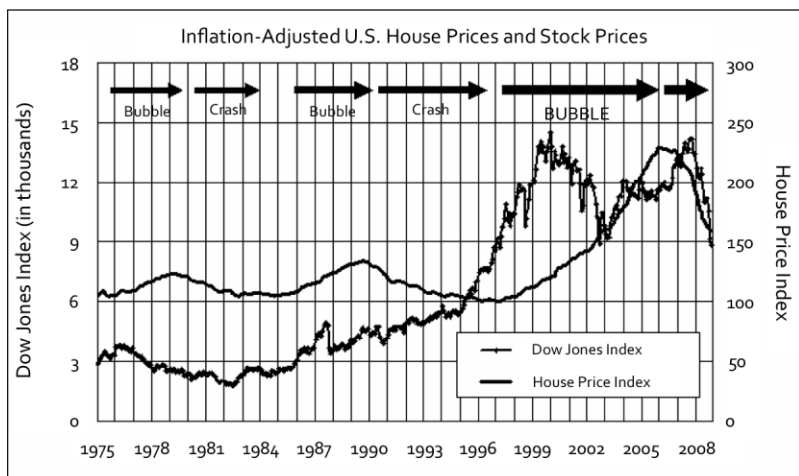
The sparks that initiate bubbles remain a mystery, but once one is underway, we have a basic understanding of their mechanics. The expectations that people have of future price changes, and the provision of liquidity to an asset market, are integral elements in understanding how bubbles grow and are sustained.

## II. PUBLIC POLICY AND THE HOUSING BUBBLE

Over the last four decades, the United States has passed through three national housing-price cycles, the last of which has been the largest housing bubble in U.S. history. During the same period, the stock market registered several bubbles and crashes comparable in percentage magnitude to those in the housing market, but the two market time paths appear to move independently, to a considerable extent. (See Figure 1.) Moreover, they seem to have distinct causes and effects. Six years of relatively tight money, from 1995 to 2000, failed to preclude a large rise in stock prices from 1995 through 1999. The same period saw the start of the current housing bubble (in 1997); but the surge in house prices continued well after the stock market decline of 2000–2002.

This divergent behavior may be explained, in part, by a new factor introduced in 1997: the Taxpayer Relief Act, which for the first time exempted housing assets (up to \$500,000) from the capital-gains tax. Housing and corporate securities each make up about one third of all U.S. wealth. Since historically, about 30 percent of household income is spent on housing, one would expect housing wealth to account for about

Figure 1. Three Housing Bubbles, 1975–2008



Sources: Dow Jones Industrial Average; Freddie Mac CMHPI, 1975–1987; Case-Shiller 10-city composite index, 1987–2008. See n3 for details on these indices. All three series are deflated by the Consumer Price Index (CPIAUCNS).

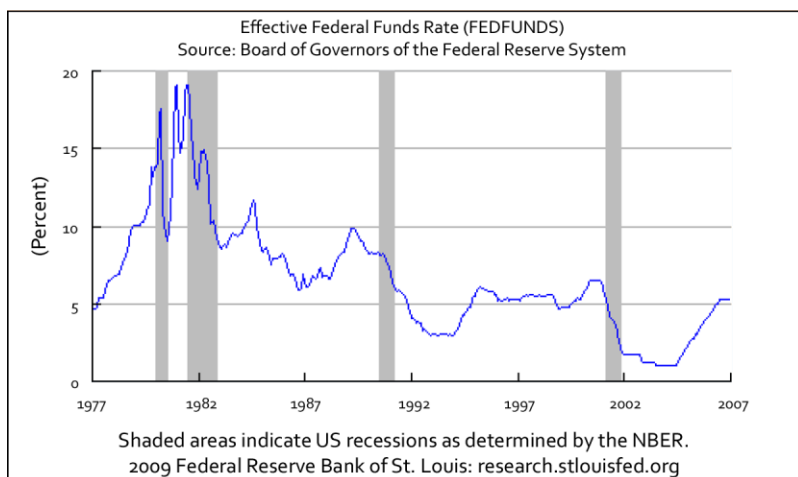


the same fraction of total wealth. An asymmetric reduction in taxes on homes implies that a larger fraction of wealth will eventually flow to home investment, away from other forms of capital investment. Insofar as overinvestment in housing diverted capital away from new-product and cost-reducing technologies, it reduced the growth of productivity per labor hour and, therefore, diminished future (i.e., at this writing, present) wealth-creation capacity. Smith 2007 argues that the 1997 tax law, which favored houses over all other investments, would have naturally led more capital to flow into the housing market, causing an increase in demand—and a takeoff in expectations of further increases in house prices. (See also Bajaj and Leonhardt 2008.)

If the Taxpayer Relief Act helped to trigger the runoff in housing prices, a significant and sustained change in monetary policy, beginning in 2001, appears to have dramatically strengthened it.

In January 2001, after four years of real house-price increases averaging 7.2 percent per year in the Case-Shiller 10-city composite index (about 6 percent above the inflation-adjusted trend for the previous eighty years), the Federal Reserve started to ratchet down the federal funds rate (see Figure 2). By December 2001, the federal funds rate had been reduced to its lowest level since 1962. The average federal funds rates in 2003 and 2004 were lower than in any of the years since the Fed began

Figure 2. Monetary Policy over the Period Including the Three Housing Bubbles



Source: Board of Governors of the Federal Reserve System.

reporting this rate in 1955; the average federal funds rate had been lower than the average rate of 2002 in only one year since 1955: the recession year of 1958. In other words, *the years 2001–2004 saw the longest sustained expansionary monetary policy of the past 54 years.*

The combined effect of the Taxpayer Relief Act and loose monetary policy as inflators of the housing bubble is revealed in the fact that the path of house prices from 1997 through 2005 is convex: House prices were increasing *at an increasing rate*. The effect of the sharp easing of monetary policy between 2001 and 2004 is evident in the continued acceleration of home-price increases between 2002 and 2005, shown in Figure 1.

We find equally persuasive the fact that, during the expansion phases of the two earlier bubbles (1976–79 and 1986–89), the Fed was *increasing* the federal-funds rate, and those two bubbles were much milder than the current one. In short, when the Federal Reserve was “leaning against the wind,” the bubbles were far smaller than when, at the beginning of this century, monetary policy pumped credit into the economy.

### *How the Bubble—and Inflation—May Have Escaped Official Notice*

Monetary policy, in conjunction with mortgage securitization and tax-free capital-gains status for housing, appear to have added up to an astonishing housing-market stimulus: Mortgage-loan originations increased from \$1.05 trillion in 2000 to \$3.95 trillion in 2003, or 56 percent annually. By the time the Federal Reserve slowly began to raise the federal funds rate in May 2004, housing prices had been increasing by 2.8 percent *per month* in Las Vegas for the previous year (39 percent over the 12-month period of June 2003 to May 2004); by 2.3 percent per month in Los Angeles (31 percent over the 12-month period); and by 1.5 percent per month in Washington, D.C. (20 percent over the 12-month period). The Case-Shiller 20-city composite housing-price index increased 15.4 percent during that 12-month period.

Yet the housing portion of the Consumer Price Index (CPI) for the same period rose only 2.4 percent. How could this be? The answer reveals the dramatic effect that loose monetary policy was having—despite effectively escaping official measurement.

Starting in 1983, the Bureau of Labor Statistics began to use the price of equivalent rentals in estimating the housing portion of the CPI for

homeowner-occupied units. Between 1983 and 1996, the ratio of house prices to rental equivalents increased from 19.0 to 20.2, so the change had little impact on measured inflation: The CPI underestimated inflation by about 0.1 percentage point per year during this 14-year period. Between 1999 and 2006, however, the ratio shot up from 20.8 to 32.3, creating a whole new structural relationship between house prices and their “rental equivalents.”<sup>1</sup> With home asset-price increases effectively excluded from the CPI, and the price-to-rent ratio rapidly increasing, an important source of inflation escaped inclusion in the CPI. In 2004 alone, the price-to-rent ratio increased 12.3 percent. Since homeowner-occupied housing accounts for about 23 percent of the CPI, inflation for that year was reported as being 2.9 percentage points lower than it would have been if homeownership costs were folded back into the CPI: The reported CPI increase was 3.3 percent instead of 6.2 percent.<sup>2</sup>

With nominal interest rates around 6 percent and actual inflation around 6 percent, the real interest rate approached zero. With continuing expectations of rising prices, people borrowed in response to this strong incentive. As measured by the Case-Shiller 10-city index, the accumulated surge in homeownership prices between January 1999 and the peak, in June 2006, was 151 percent—but the CPI measured an accumulated increase of a mere 25 percent.<sup>3</sup> As the Federal Reserve monitored the economy for signs of inflation during the early part of this decade, home-price increases were no longer so visible in the CPI. Consequently, the Fed saw no reason to curtail its lax monetary policy.

Even after the Fed began to raise the federal-funds rate in May 2004, the housing bubble grew for two more years, due, we would argue, to self-reinforcing expectations of rising resale prices and to overgenerous mortgage financing in the form of low down payments, interest-only loans, negative-equity loans, and adjustable-rate mortgages (ARMs), enabled by the Fed’s loose-money policy.<sup>4</sup> Surely such financing unintentionally encouraged momentum buying. But the liquidity that sustained subprime and ARM lending was about to evaporate.

### III. SUBPRIME MORTGAGES AND THE BURSTING OF THE HOUSING BUBBLE

The collapse of the housing market is in many ways the most fascinating—and certainly the most painful—part of the story.

In 2006, the median price of existing homes fell from \$230,000 in July to \$217,300 in November. By the beginning of 2007, the Case-Shiller Boston and San Diego price indices had been falling for over a year; the indices for San Francisco and Washington, D.C. had been falling for six months. In thirteen of the other sixteen cities in the Case-Shiller index, too, prices were falling. Only the housing markets in Miami, Seattle, and Portland had not turned down by December 2006.

Serious mortgage delinquencies spiked noticeably at about the same time, especially for subprime ARM loans. In the second quarter of 2006, 6.52 percent of these loans were seriously delinquent; by the third quarter, the figure was 7.72 percent; by the fourth quarter, it reached 9.16 percent.<sup>5</sup> The mortgage-market collapse had not yet begun, but the warning signs were there for any alert observers.

Kelly 2007 tells the story of how Goldman Sachs avoided the fate of many of the other investment banks. In January 2006, a small group in Goldman's mortgage department—the structured-products trading group—began trading Markit ABX credit-default swap indices. In December 2006, Goldman's CFO, David Viniar, pushed these traders to hedge the firm's long positions in mortgage-backed securities by using the same indices. They loaded up on an issue called ABX-HE-BBB-2006-2. This asset, which started trading in July 2006, is tied to the performance of subordinate (BBB-) tranches of an index of twenty mortgage-backed securities issued in the first half of 2006. When the price of an ABX index falls, the cost of insuring mortgage-backed securities rises. The price of an ABX index is approximately 100 minus the expected percentage of the losses on the twenty mortgage-backed securities in the index. If the index stands at 100, the aggregated market belief is that there will be no losses at all. If it falls to 90, the market believes that losses on the security will be 10 percent. But this is only an approximation, because a Markit ABX index also has a coupon, which is an annual premium. For the ABX-HE-BBB-2006-2 issue, the coupon was 242 basis points: Thus, insuring \$10 million of BBB- rated mortgage-backed securities cost \$242,000 per year when the index was first issued. Every price drop of one unit below the par value of 100 adds a fixed cost of \$100,000 to the cost of \$10 million of insurance.

Goldman anticipated large losses on these assets and began to purchase insurance (with Markit ABX credit-default-swap indices) when their prices reflected market-expected losses that were well below the losses that Goldman expected.<sup>6</sup> As the prices of ABX derivatives collapsed, the

cost of insuring new mortgage-backed securities skyrocketed. Goldman had invested heavily in these derivatives—that is, it had increased its insurance against declines in the underlying value of their mortgage-backed securities—between the beginning of December 2006 and late February 2007, as the price dropped from 97.70 on December 4 to under 64 by February 27. Normally, buying an asset with a falling price is not a good idea, but the ABX index pays off when mortgage-backed securities suffer losses: at a price of 97.70, it cost \$230,000 plus the annual premium of \$242,000 to insure \$10 million of BBB– tranches; at a price of 64, the same insurance cost \$3.6 million (plus the same annual premium).

By getting into this market early, Goldman Sachs had obtained the insurance at a much lower fixed cost. With insurance premia on new residential mortgage-backed securities (RMBSs) skyrocketing, mortgage financing from these securities rapidly declined. In 2006, \$483 billion in new subprime RMBSs were issued. By the fourth quarter of 2007, the figure had fallen to \$11.9 billion.<sup>7</sup> Other measures of new loan originations were falling at the same time.<sup>8</sup> As the liquidity that generated the housing market bubble evaporated, new buyers disappeared. And as housing prices then declined, subprime and ARM delinquencies rose.

Goldman, acting on the belief that the housing market was headed for trouble, now bought more insurance on mortgage-backed securities. This raised the price of insurance on these securities, which decreased the flow of capital to lenders and of mortgages to households, and hastened the trouble that Goldman anticipated.<sup>9</sup> Many firms had major exposures to subprime and ARM RMBSs, but failed to notice the weakness in the housing market—or noticed developing signs of weakness but failed to balance their exposure to it.<sup>10</sup> They were drawn into the undertow from the collapsing housing market. Bear Stearns, Lehman Brothers, Merrill Lynch, A.I.G., Citigroup, Washington Mutual, and Wachovia all collapsed, in one way or another, as a result of their exposure to the mortgage crisis.<sup>11</sup>

As of February 2007, the mortgage market was not yet in free-fall: insurance on the AAA tranches of RMBS remained inexpensive. At the end of February, the cost of \$10 million of insurance on the AAA-rated portion of an index of RMBSs issued in the first half of 2006 was only \$68,000 (plus a \$9,000 annual premium). It is true that significant concerns had emerged about the viability of the BBB– tranches, so that investment banks were reluctant to buy new subprime and ARM

mortgages issued by lenders with poor risk-management practices (such as Countrywide, Ameriquest, and Option One). Still, no large players were yet concerned about the AAA tranches, which would face losses only after all the subordinate tranches had been wiped out. That soon changed. By July 2007, prices of the cheapest homes in San Francisco were down almost 13 percent from their peak; in San Diego they were down by 10 percent. Serious delinquency on subprime ARM loans, which had reached 9.16 percent by the fourth quarter of 2006, increased to 12.40 percent by the second quarter of 2007.

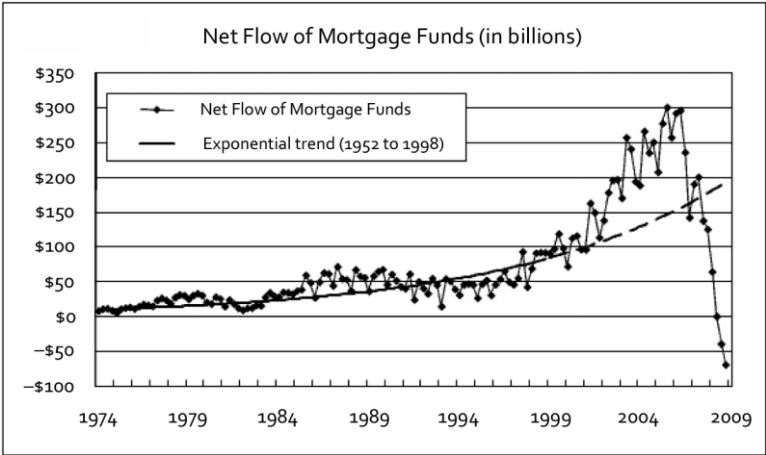
Between July 9 and August 3, 2007, the cost of insuring \$10 million of AAA tranches of mortgage-backed securities went from \$50,000 (plus a \$9,000 annual premium) to more than \$900,000 (plus the premium). Since the cost of insuring mortgage-backed securities provides a measure of the estimated losses on them, the rising insurance cost left many of the bad assets stranded in the hands of the subprime lenders. Worse, it also signaled to the market that assets that had already been acquired by banks and other financial institutions were at risk of substantial losses. By this time, expected losses at the bottom tier of the investment grade (e.g., BBB-) subprime RMBS tranches had reached 40 to 60 percent, depending on the issue date of the securities. Expected losses on the investment-grade (e.g., AAA) portions of the securities were in the 5-10 percent range. Since about two-thirds of each RMBS was rated AAA, the expected losses had surged between January and July 2007 from under 2 percent to over 20 percent. Meanwhile, the market for mortgages issued by subprime lenders was completely frozen by August 3, and Countrywide was considered a bankruptcy risk by August 10.

Figure 3 displays the quarterly net flow of mortgage funds through the fourth quarter of 2008.<sup>12</sup> The data show clearly that the final, and sudden, collapse of the market began in the third quarter of 2007, when fears about subprime mortgage delinquencies and defaults became acute.

In one local market after another, the housing bubble followed the same pattern. Prices of homes in the low-price tier appreciated the most and then fell the most; prices in the high-priced tier appreciated the least and fell the least; house-price appreciation in the middle-price tier came between that of the other two tiers (Fig. 4).

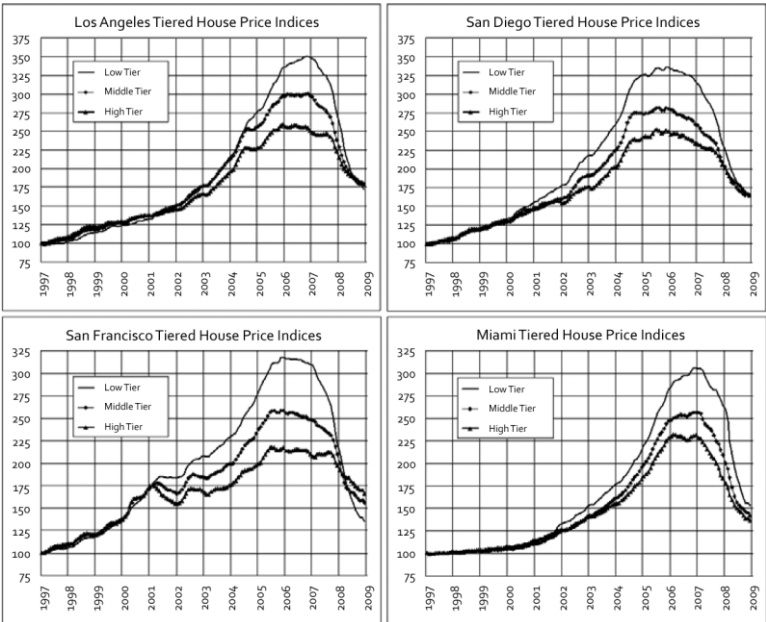
In Figure 4, the price-index graphs for Los Angeles, San Francisco, San Diego, and Miami show that in all of these cities, prices in the low-price tier have now fallen between 50 percent and 57 percent. When

Figure 3. The Mortgage-Finance Bubble Pops



Source: Federal Reserve Flow of Funds historical data table F.218. See n12 for details.

Figure 4. The Cheaper the House, the Bigger the Bubble



Source: Case-Shiller tiered price indices. See n3 for details.

the bubble burst it wiped out the slender equity of those households who were least able to sustain a decline in the value of their asset, and the financial system suffered a self-inflicted blow arising from the high-risk leverage game it had played. By the end of 2008, 1.9 million mortgages in California—29.5 percent of that state's outstanding mortgages—had negative equity; it was even worse in Arizona (31.8 percent), Florida (30.3 percent), Michigan (40 percent), and Nevada (55.1 percent).<sup>13</sup> When housing prices turned down, many borrowers with low income and few assets other than their home—which was often purchased with an adjustable-rate mortgage and no down payment—lost their occupancy rights. These were the households that public policies encouraging subprime lending had been intended most specifically to help (see Wallison 2009).

### *The Subprime Crisis Becomes a Financial Crisis*

When housing prices began to plummet, many homeowners with low income and few assets became delinquent on their mortgage payments or defaulted entirely.<sup>14</sup> This sparked fear among banks as to the credit-worthiness of their peer institutions, which were very often heavily invested in structured securities containing subprime mortgages. Consequently, banks became unwilling to lend to each other, as reflected in an unprecedented jump in the spread between short-term U.S. Treasury debt (which is considered secure) and the London Interbank Offered Rate (LIBOR)—from 0.44 percent to 2.40 percent between August 8 and August 20, 2007.

Banks, unable to get loans from other banks—and, by the same token, banks holding their own fearsome subprime RMBSs—began hoarding cash to protect themselves from further exposure to declining asset values. Lending quickly contracted. Figure 3 shows the rapid decline in net mortgage flow, from \$291.5 billion in the first quarter of 2006 to \$63.5 billion two years later.

As credit became more difficult to obtain, durable-goods sectors unrelated to housing began to suffer collateral damage. Lending for automobile purchases, for instance, contracted sharply: Auto sales fell 36 percent between December 2007 and December 2008. Ultimately, the broader economy and the labor market became victims of the collapse of the subprime mortgage market.



For comparison purposes, during the dot-com crash between December 1999 and September 2002, approximately \$10 trillion of equity was erased,<sup>15</sup> but a measure of financial-system performance, the Keefe, Bruyette, & Woods BKX index of financial firms, fell less than 6 percent in real terms during that period.<sup>16</sup> In the recent downturn, the value of residential real estate had fallen approximately \$3 trillion by the third quarter of 2008,<sup>17</sup> while the BKX index had fallen 45 percent between its peak in January 2007 and September 2008, as the financial crisis gathered force. The financial sector has been devastated in this crisis, whereas it was almost completely unaffected by the downturn in the equities market early in this decade. This raises the question of how a crash that wipes out \$10 trillion in assets can cause no damage to the financial system, while another that causes \$3 trillion in losses undermines the financial system worldwide.

In the earlier market downturn, equities with declining prices were held by institutional and individual investors, pension funds, and retirement funds that either owned the assets outright or held only a small fraction on margin. The losses on these assets were immediately absorbed by their owners, and did not cascade into the foundation of the financial system. But in the recent crisis, declining housing assets in many cases were, in effect, purchased by households between 90 percent and 100 percent on margin. In some of the cities hit hardest, borrowers who purchased in the low-price tier at the peak of the bubble have seen their home value decline 50 percent or more. Borrowers without equity who are unable to make payments on their loan can be forced out (through foreclosure) or may choose to move from the homes they occupy. As housing prices have fallen, more and more homes became worth less than the loans on them, and more and more losses have been transmitted to lending institutions, investment banks, investors in mortgage-backed securities, sellers of credit-default swaps, and the insurers of last resort, the U.S. Treasury and the Federal Reserve system.

Subprime and adjustable-rate mortgage originators, such as Ameriquest, Indymac, and Countrywide, were caught with inadequately secured assets in inventory when the market for their loans froze in mid-summer 2007. Similarly, investment banks got caught with many mortgages in the pipeline extending from the time that they acquired them (from mortgage originators) until they had been securitized, rated, registered with the S.E.C., and marketed to investors. In addition, commercial banks and other financial institutions that held

the securities as investments also faced large losses. Credit-default swaps on RMBSs were the primary form of insurance on these securities, so they were essential to maintain the flow of funds to the subprime and ARM lenders. The market for these swaps evaporated in the summer of 2007.

### *The Role of Derivatives in the Collapse*

We have argued that derivatives—specifically, credit-default swaps—were the linchpin of the housing-finance market. The collapse in the ABX index for AAA-rated securities in July 2007 led soon afterward to the collapse in the market for the loans written by many subprime lenders, and also to a collapse in the market for the structured securities into which these loans were gathered by investment banks. The vast regulation-exempt and publicly unregistered market for these derivatives was at the core of the mortgage-market expansion and its collapse.

The credit-default-swap (CDS) market grew from \$631.5 billion in notional value in the first half of 2001 to over \$62.1 trillion in notional value in the second half of 2007.<sup>18</sup> How did such a large market, with so much risk accumulated in it, remain so opaque? If these securities had been registered and summary exposures had been disclosed, the Fed and investors might have been able to better assess the risks from the mortgage-market bubble. Summary disclosures of the exposures that A.I.G., Ambac, and MBIA had accumulated on RMBS credit default swaps would have alerted informed investors to the risks that these firms had undertaken.

Ten years before the crisis reached a critical stage, the Treasury, the Federal Reserve, and the S.E.C. had gone to great lengths to make sure that neither they nor the one federal agency that considered revisiting the exempt unregistered status of the CDS market—the Commodity Futures Trading Commission (C.F.T.C.)—would have the information that they needed to assess the risks of derivatives. On May 7, 1998, the C.F.T.C. issued a Concept Release to solicit input regarding potential prospective regulatory oversight of the derivatives markets, including markets for credit-default swaps. In its press release accompanying the Concept Release, the C.F.T.C. explained its rationale for a regulatory review.<sup>19</sup>

The goal of this reexamination is to assist [C.F.T.C.] in determining how best to maintain adequate regulatory safeguards without impairing the ability of the OTC derivatives market to grow and the ability of U.S. entities to remain competitive in the global financial marketplace.

In that context, the Commission is open both to evidence in support of broadening its existing exemptions and to evidence of the need for additional safeguards. Thus, the concept release identifies a broad range of issues in order to stimulate public discussion and elicit informed analysis. The Commission seeks to draw on the knowledge and expertise of a broad spectrum of interested parties, including OTC derivatives dealers, end-users of derivatives, other industry participants, other regulatory authorities, and academicians.

The concept release seeks comment on a number of areas where potential changes to current CFTC exemptions might be possible, including eligible transactions, eligible participants, clearing, transaction execution facilities, registration, capital, internal controls, sales practices, recordkeeping and reporting. The release also asks for the views of commenters as to whether issues described in the release might be addressed through industry bodies or self-regulatory organizations.

It is hard not to be impressed by the benign and unthreatening tone of this release; here was an agency seeking knowledge with an open mind and a willingness to reduce as well as increase regulation. Remarkably, Treasury Secretary Robert Rubin, S.E.C. Chairman Arthur Levitt, and Federal Reserve Board Chairman Alan Greenspan issued a terse statement on the same day questioning the authority of the C.F.T.C. to review the markets, and stating that the Fed, the S.E.C., and the Treasury had "grave concerns about this [C.F.T.C.] action and its possible consequences."<sup>20</sup>

In his July 30, 1998 congressional testimony on the C.F.T.C. concept release, then-Deputy Secretary of the Treasury Lawrence Summers argued that "the parties to these kinds of contract are largely sophisticated financial institutions that would appear to be eminently capable of protecting themselves from fraud and counterparty insolvencies." Summers, like others who opposed the concept release, offered no proof for the soundness of his position. Instead, he suggested that "to date there has been no clear evidence of a need for additional regulation of the institutional OTC derivatives market, and we would submit that proponents of such regulation must bear the burden of demonstrating that need."

Many of the issues raised in the concept release ultimately proved to be at the heart of the problems with the derivatives market, which

contributed to the spread of the riskiest subprime and ARM lending practices. A.I.G. and many other insurers of mortgage-backed securities had inadequate capital to meet the obligations they had undertaken with credit-default swaps; regulators had an inadequate understanding of these risks due to the lack of registration of the securities; and investors (in A.I.G., Ambac, MBIA, etc.) had an inadequate understanding of the risks they faced due to the lack of disclosure.<sup>21</sup> The derivatives they used differed in substance from other derivatives in that they were not exchange traded under standard private-exchange transparency rules; and in that the lack of standardization, registration, rating, disclosure, and capital-reserve requirements made them more complex and—as we have now learned—inherently more unstable than futures and options markets for commodities and equities.

#### IV. REASSESSING THE GREAT DEPRESSION

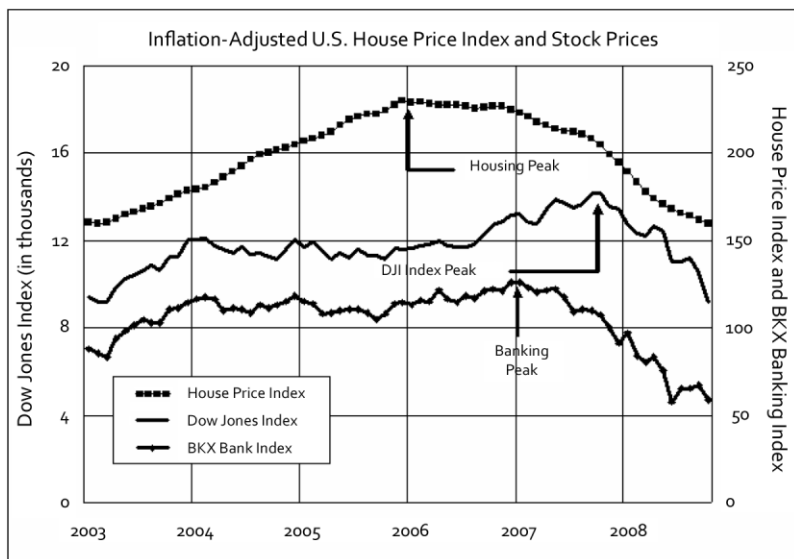
In an important scholarly paper, Ben Bernanke (1983) argued that during the Great Depression, severe damage to the financial system impeded its ability to lend to households for durable goods consumption and to firms for production and trade. The same process played out after the collapse of the financial system in 2008. The housing market peaked at the end of 2006; losses from the mortgage market subsequently began to infect the financial system; asset prices in that sector began to decline early in 2007, and then lending declined and affected the broader economy, as reflected in equities markets—which had been performing quite well into 2007. The sequential footprints of these three turning points are clearly visible in Figure 5.

Bernanke takes a weakened financial system in the Great Depression—not its antecedents—as his starting point. But there are parallels between the fundamental causes of that crisis and our own.

The standard explanation of the precipitating factor in the crash of 1929 has been excessive speculation on Wall Street. Speculation does appear to have been a factor, but then, as now, we believe that mortgage and consumer finance growth were also at the core of the problem.

Many aspects of the Crash of '29 suggest that it was not the primary cause of the subsequent deterioration of the financial system. John Kenneth Galbraith (1972, 37) notes that “margins were not low in 1929; a residue of caution had caused most brokers to require customers to put

Figure 5. The Housing, Financial, and Equities Markets Decline



Sources: Dow Jones Index; Housing: Case-Shiller 10-city composite; Banking: KBW BKX index.

up 45 to 50 per cent of the value of the stocks they were buying in cash.” Barrie Wigmore (1985, 161) notes that banks’ “earnings per share declined only 25–30 percent in 1930, and four of the top ten paid higher dividends in 1930” than in 1929. He also points out that brokerages survived the crash intact (*ibid.*, 31–32). In many ways, the stock-market crash of 1929 caused only slightly more damage than the downturn in the stock market between 2000 and 2002, which raises the question: What was the source of the storm that overtook the financial system between the late fall of 1930 and the spring of 1933, dragging the country into the Great Depression?

More than half a century ago, Ernest M. Fisher (1950, 307–9) pointed to the growth of the housing sector and of mortgage finance from 1920 until the early postwar era:

The general economic expansion of that period found no more dramatic expression in any area than in that of mortgage lending. The expansion of mortgage lending was, in turn, a manifestation of a rapid expansion of our urban real estate inventory.

During the decade 1920 to 1929, according to the best evidence available, new construction accounted for about 5.7 million dwelling units, reflected in an increase in inventory from an estimated 17.6 million dwelling units in 1920 to nearly 23.3 million in 1930, an increase of over 32 per cent.

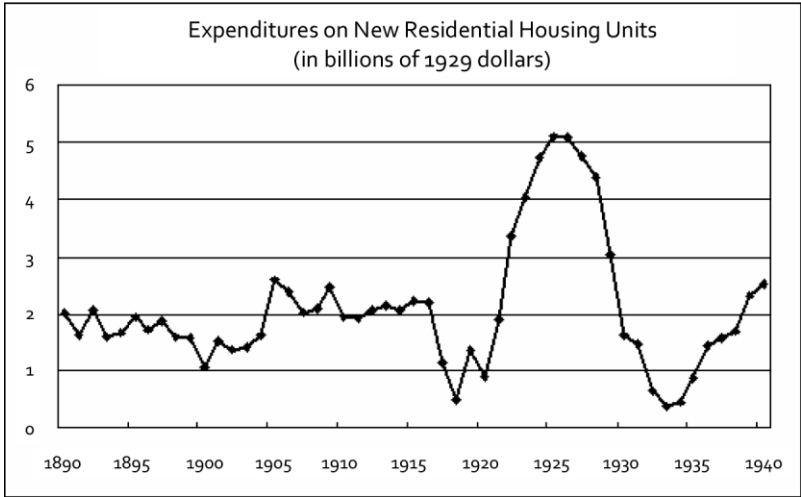
There was also a rapid increase in home ownership during the decade. The number of owner-occupants increased by about 50 per cent, from a little over 7 million to about 10.5 million. The expansion of real estate facilities occurred largely on the basis of extension of credit secured by mortgage liens. All [residential and commercial] real estate mortgage indebtedness is estimated to have increased from \$12.1 billion to \$33.1 billion, or 174 per cent.

Included in this total is the large volume of mortgage bond issues, estimates of the amount of which vary between \$5 billion and \$10 billion in 1935, rising to this sum from an estimated \$300 million outstanding around 1920.

Similarly, Charles E. Persons (1930, 104) estimated total residential real-estate mortgages outstanding of \$11.1 billion as of 1920—and \$27.1 billion as of 1929. In the same paper, Persons (*ibid.*, 126) provides monthly figures on residential construction contracts for 1927 through 1929. On a year-over-year basis, construction contracts increased in every month from January 1928 until September 1928 and then declined (also on a year-over-year basis) in every month from September 1928 until December 1929.<sup>22</sup> By September 1929, one month before the crash, construction contracts were 40 percent lower than they had been in September 1928. Problems were appearing in the automobile industry as well, but with a lag, as in the current crisis. Automobile production was increasing on a year-over-year basis from January 1928 until August 1929, but the increases were dropping off rapidly.<sup>23</sup> Seventy-six percent more cars were produced in January 1929 than in January 1928; 24 percent more were produced in July 1929 than in July 1928; 2 percent fewer were produced in September 1929, the month before the crash, than in September 1928.<sup>24</sup> The crash of October 1929 resulted from a sudden recognition that the credit system had been stretched to its limit: New houses and consumer durables could be produced, but creditworthy borrowers were scarce.

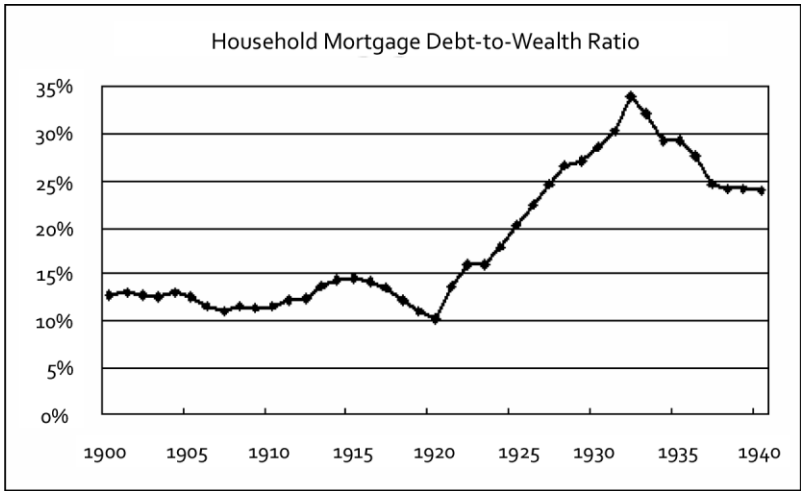
The data provided by Fisher, by Persons, and especially by Leo Grebler, David M. Blank, and Louis Winnick (1956) indicate a rapid rate of residential expansion and a commensurate buildup of debt. Figures 6 and 7 provide graphical representations of how precisely commensurate

Figure 6. New Housing Expenditures During the Roaring Twenties



Source: Grebler, Blank, and Winnick 1956, table B-3.

Figure 7. Household Mortgage Debt-to-Wealth Ratio During the Roaring Twenties



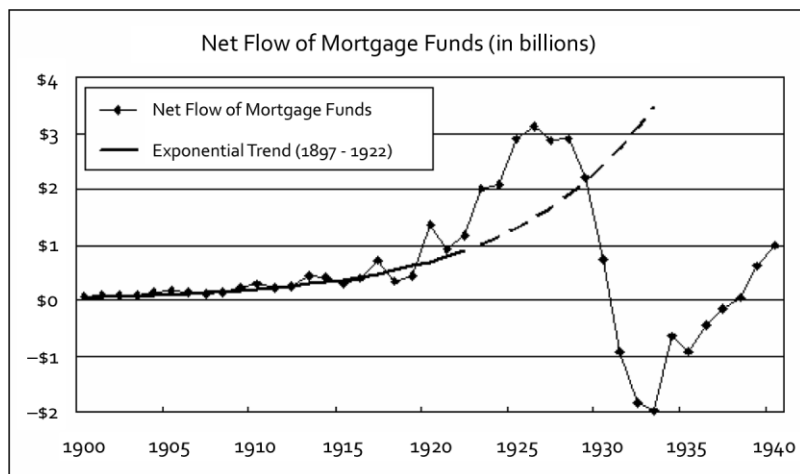
Source: Grebler, Blank, and Winnick 1956, table L-6.

they were. Between 1922 and 1928, average real residential construction expenditures exceeded the average annual figure from 1889 to 1916 by 138 percent. Between 1921 and 1929, household debt as a percentage of household wealth increased from 10.2 percent to 27.2 percent. A huge boom in residential housing construction was financed by an equally rapid increase in household indebtedness.

When the collapse came, between 1929 and 1932, the net flow of funds into mortgages fell dramatically. Net mortgage originations fell from \$2.202 billion in 1929 to \$736 million in 1930, and turned sharply negative from 1931 to 1933. Note the similarity between the pattern of net residential mortgage lending between 1900 and 1931, shown in Figure 8, and the pattern observed for 1974–2008, shown in Figure 3 (p. 282 above). The prolonged increase above the trend in mortgage growth from the second quarter of 2001 through the second quarter of 2006 has a striking parallel in the escalation in mortgage lending from 1923 through 1928. The sudden reduction in the net flow of mortgage funds from \$2.88 billion in 1928 to \$736 million in 1930 is remarkably similar to the rapid decline from \$201 billion in the second quarter of 2007 to \$5 billion a year later.

The two precipitous declines that began in 1930 and in 2007 are also notable for standing out from the historical experience of the past 120

Figure 8. The Housing Finance Collapse in the Great Depression



Source: Authors' calculations based on Grebler, Blank, and Winnick 1956, table L-3.



years. Net mortgage issuance remained negative from 1931 to 1937; but thereafter, with the exception of 1942–1944 (when financing and production were diverted to military requirements), the net flow of mortgage funds has been positive every year—until it turned negative in the third quarter of 2008.

The problem in modern economies is not what can be produced. The technology and resources available for production in the 1930s were the same as, or better than, they had been in the 1920s. The real problem is how markets allocate output so that those who acquire it have the capacity to pay for it. Since so much production, trade, and durable-goods consumption depends on credit, the real issue is market effectiveness in the assessment of credit risk.

The Milton Friedman–Anna Schwartz argument, which is also standard now, concerned the monetary policies that turned the crash into a depression—after the crash had been precipitated. Schwartz (1981, 7) summarized the view that she and Friedman developed:

Our main theme was that the effect of whatever economic forces produced the contraction was magnified by the unprecedented decline in the quantity of money resulting from the banking crisis. Our ancillary judgment was that the Federal Reserve could have prevented the monetary consequences of the banking crisis but failed to do so.

In the same paper (*ibid.*, 42), Schwartz states that she and Friedman “continue to believe that had [Benjamin] Strong [the president of the Federal Reserve Bank of New York] lived or had he been succeeded by someone of similar views and equal personal force, the same monetary growth policies followed in 1924 and 1927 would have been followed in 1930, hence the decline in high-powered money either would not have occurred or would have been promptly reversed, and the economy would have been spared its prolonged ordeal.”

It is true that, as Friedman and Schwartz argued, the Fed should have expanded the money supply in 1929 and 1930—once the crash had occurred. This is a lesson that Bernanke, a specialist in the field, learned all too well. As a result, the Fed aggressively expanded the money supply beginning in August 2007—even before the financial crash was fully underway—but to little effect. The monetarist view, including Bernanke’s version of it, begs the question of what causes collapses of the financial system in the first place, and how this should affect public policy.

Aggressive monetary policy designed to increase liquidity did not resolve the crisis. It also seems likely that it would not have resolved the crisis that overtook the financial system between late 1930 and the spring of 1933. Both crises appear to have originated in widespread household insolvencies that then infected the financial system. Liquidity alone could not make the banks and households whole again.

Consider again that the massive loss of shareholder equity between 2000 and 2002 caused almost no damage to the financial system. Similarly, when the Dow Jones Industrial Average declined from 362 in September 1929 to 225 in September 1930, the banking system had not yet suffered any serious damage. Surely another factor must have been present in that case, and in the present one. Arguably, this factor was, in both cases, excessive debt among borrowers with especially limited assets and income—hence with an especially constrained ability to repay. The mortgages made to these borrowers turned on poor credit assessment.

## V. BLINDSIDED EXPERTS

As the current crisis reached one critical stage after another, the Federal Open Market Committee (F.O.M.C.) reacted with evident surprise to the developments in the financial markets.<sup>25</sup> Until August 7, 2007, the F.O.M.C. maintained the federal-funds rate at 5.25 percent. In statements on March 21, May 9, June 28, and August 7, the F.O.M.C. reiterated verbatim that “the Committee’s predominant policy concern remains the risk that inflation will fail to moderate.” The August 7 release also recognized an ongoing housing correction, but as we have seen in Figures 3 and 5, the net flow of mortgage funds had by then declined dramatically from its peak in the second quarter of 2006, and housing prices had been picking up much downward momentum in 2007.

On August 10, 2007 the F.O.M.C. announced that

the Federal Reserve will provide reserves as necessary through open market operations to promote trading in the federal funds market at rates close to the Federal Open Market Committee’s target rate of 5-1/4 percent. In current circumstances, depository institutions may experience unusual funding needs because of dislocations in money and credit markets. As always, the discount window is available as a source of funding.

The Fed appears to have been misled by its monetarist (pro-liquidity) preconceptions. Depository institutions were encountering much stress because banks were reluctant to lend to each other (or to signal distress by borrowing from the Fed).<sup>26</sup> LIBOR was spiking, and Countrywide was going down the drain. This was not the familiar world in which the financial system merely needed a shot of short-term liquidity—as the Fed treated it. It was a crisis of confidence in the banks' own assets (Taylor 2009; Taylor and Williams 2009), based on the realization that subprime borrowers might not be able to pay back their loans.

Seven days later, the F.O.M.C. announced that “financial market conditions have deteriorated.” A month after that, the F.O.M.C. reacted to the deterioration by lowering the target funds rate to 4.75 percent—even as it cautioned that “some inflation risks remain.” The rate continued to be lowered into 2008, and numerous open-market operations in 2008 continued to facilitate short-term liquidity. These actions were explained on August 5, 2008: “Over time, the substantial easing of monetary policy, combined with ongoing measures to foster market liquidity, should help to promote moderate economic growth.” In the view of the Fed, liquidity, not solvency, was the problem, and the standard tools were being used. Moreover, the inflation—which on August 5 was still named as a “concern”—had occurred years earlier. The massive bubble in housing prices (driven by self-reinforcing price expectations) and the supporting expansion of credit, undisciplined by traditional equity requirements, as well as the tiered internal structure of the housing market, had all depended on further unsustainable housing-price growth, premised on unfathomably easy mortgage credit—fueled by easy money. Once that momentum turned negative, buyers of homes, mortgages, and bank obligations reined in their activity, the stock market plummeted, and monetary policy was impotent to stem the collapse. Monetary policy was “pushing on a string” that only absent buyers could have pulled.

## VI. THE SECOND CRISIS OF THE FOURTH CAPITALIST ERA

N.S.B. Gras (1938) identified three stages in the history of capitalism: The petty capitalism of itinerant merchants in the period before the commercial revolution of the thirteenth century; the mercantile capitalism characteristic of international trade from about 1300 until shortly after the

financial revolution of the seventeenth century; and industrial capitalism. Transitions between stages created new economic opportunities but also produced new financial stresses. New institutional responses were essential for the effective management of the new conditions, and these responses typically developed only after many decades of false starts and iterative steps toward a solution. For example, mercantile capitalism required deployment of capital at the time scale of international trade in raw materials and finished goods (i.e., many months). Industrial capitalism required capital deployment at a much longer time scale, and the risks were of an entirely new sort. The profitability of a railroad would depend on population growth, demand for the products from a developing region, and general market conditions over a period of a decade or more. It is unsurprising that nineteenth-century economic history was punctuated by numerous financial crises given changes in the scale, the duration, and the novelty of many industrial enterprises—relative to the business requirements of the mercantile era.

The past century has grafted a new form of capitalism onto the mercantile capitalism of large-scale trade and the industrial capitalism of large-scale production. Consumer capitalism uses capital markets to support widespread purchases of consumer durable goods. It seems that we are now witnessing the second major crisis of consumer capitalism (the first having begun 80 years ago). Just as industrial capitalism involved greater risks than mercantile capitalism due to the longer time span of credit and debt, consumer capitalism poses new problems in credit-risk assessment and in structural characteristics of consumer-durables markets.

One of the most important messages of this debacle, however, is that even the best-informed scholars did not recognize the historical changes in the function of credit and debt, and accordingly were unable to guide public policy well—in large part, because we have so little experience with consumer-debt crises.

During Alan Greenspan's tenure at the Fed, many scholars knew that we were in a housing bubble. But this did not translate into corrective policies that would have commanded agreement. Ben Bernanke had as thorough an understanding of the Great Depression as anyone. But that expertise was retrospective—as has been our own attempt to analogize the crashes of 1929 and 2008. In contrast, when one encounters a new situation in the present moment, one cannot know which historical analogies apply. We are reminded of the distinction that F. A. Hayek (1967, 43-44) borrowed from Michael Polanyi: the distinction between “knowing

how” to do something—knowledge that may be gained through the long experience of a craftsman; and “knowing that” something is true (or so one believes)—knowledge that may be gained through long years of study. Perhaps fortunately—because of their infrequency of occurrence—none of our policy makers has a craftsman’s experience with Great Depression-like events.

It may be that new precautionary institutional controls are required at this advanced stage in the development of consumer capitalism, to effectively manage its risks and harness its opportunities—just as our predecessors developed institutions to manage the risks of industrial capitalism. But it is important first to recognize that we are experiencing a crisis that differs in many ways from the crises that have punctuated the development of industrial capitalism over the past two centuries.

## NOTES

1. Price/rent ratios are calculated from data compiled and analyzed in Davis, Lehnert, and Martin 2008.
2. These data are taken from 2003 and 2004 monthly CPI news releases archived at [https://www.bls.gov/schedule/archives/cpi\\_nr.htm](https://www.bls.gov/schedule/archives/cpi_nr.htm)
3. We use the Case-Shiller twenty-city index when possible because of its broader coverage than the ten-city index. Karl Case and Robert Shiller initiated their twenty-city index in January 2000, so we use their ten-city index for earlier periods. The twenty-city index covers metropolitan areas that are home to over 90 million Americans, and includes many cities that had a severe bubble, as well as many that had a moderate one. Since the mortgage defaults that cascaded into the financial system originated in cities with severe bubbles, it is useful to examine price paths there, rather than broader national indices such as the Median Sales Price of Existing Homes (from the National Association of Realtors) or the Conventional Mortgage Home Price Index (from Freddie Mac: <http://www.freddiemac.com/finance/cmhpi/>). Case-Shiller data are available at [http://www2.standardandpoors.com/spf/pdf/index/CSHomePrice\\_History\\_022445.xls](http://www2.standardandpoors.com/spf/pdf/index/CSHomePrice_History_022445.xls). Case-Shiller tiered price indices are at [http://www2.standardandpoors.com/spf/pdf/index/cs\\_tieredprices\\_022445.xls](http://www2.standardandpoors.com/spf/pdf/index/cs_tieredprices_022445.xls)
4. Even in 2005, the average federal-funds rate was lower than in every year between 1964 and 2001, with the single exception of 1993. The rate was increased so slowly starting in May 2004 that monetary policy remained lax (until late 2005) by the standards of the past half century.
5. These figures on serious delinquency (defined as mortgage payments over 90 days past due plus foreclosures in process) are taken from the third-quarter 2006 and fourth-quarter 2006 National Delinquency Survey, published by the National Association of Realtors.

6. Goldman was not the only firm that made extensive bets against the subprime market. Pittman 2007 recounts the steps taken by J. Kyle Bass of Hayman Capital Partners to trace down the source of some of the worst subprime loans and bet against them with synthetic Collateralized Debt Obligations. Lewis 2008 tells a similar story for FrontPoint Partners. Weiss 2009 describes the bets made by John Paulson against both subprime mortgages and the firms that wrote them.
7. These figures are taken from Inside Mortgage Finance Publications 2008, vol. II: 149–50.
8. By 2006, the characteristics and performance of many of these securities were extremely poor. For example, on 17 August 2006, Goldman Sachs issued a security, GSAMP Trust 2006-S5, which consisted of 5,321 second-lien mortgages totaling \$330,816,621. The loan-to-value ratio in the pool was 98.7 percent, the average FICO score of the borrowers was 666, and the average loan term remaining on these second-lien mortgages at the time the security was issued was 25.25 years. The two top tranches of the bond, A1 and A2, were rated AAA by Moody's and S & P. These tranches amounted to \$231,571,000. Thirty-nine days later, in the 25 September 2006 Distribution Report filed with the S.E.C., \$26,129,089 of the loan pool was delinquent. By the end of 2006, over \$40 million was delinquent. On 12 September 2008, Standard and Poor's "Revised Projected Losses for 2005–2007 Vintage U.S. Closed-End Second Lien RMBS Transactions" estimated that total losses on GSAMP Trust 2006-S5 would reach 68 percent.
9. By betting against the market, Goldman Sachs, Hayman Capital Partners, FrontPoint Partners, and Paulson & Co. made tens of billions of dollars, but their bets drove the cost of insurance on new mortgage-backed securities up to a level that deterred the flow of capital into these securities. These firms have been criticized for making money from the economic collapse, but their actions arguably stanching the hemorrhaging of capital into this destructive housing-market bubble.
10. A.I.G. Financial Products stopped writing credit-default swaps on RMBSs "in late 2005 based on fundamental analysis and based on concerns that the model was not going to be able to handle declining underwriting standards," according to A.I.G.F.P. risk management consultant Gary Gorton (quoted in O'Harrow et al. 2008). Curiously, A.I.G. saw the problems more than a year before Goldman Sachs, but did nothing during an eighteen-month period when they could have taken steps to reduce their exposure.
11. Lehman went into bankruptcy. Bear Stearns, Merrill, and Wachovia were all taken over by other firms in the face of imminent collapse. Washington Mutual was seized by the Office of Thrift Supervision and placed into receivership with the F.D.I.C. in late September, filed for bankruptcy, and had major assets taken over by J. P. Morgan Chase. Citigroup and A.I.G. became wards of the state.
12. The data in Figure 3 come from the Federal Reserve Flow of Funds historical data table F.218 (Home Mortgages). The data are available at <http://www.federalreserve.gov/releases/z1/Current/data.htm> in the file `utabs.zip`. Table F.218 is in the file `utab218d.prn`. The net flow of mortgage funds is in the third column.
13. Negative equity figures are taken from the First American CoreLogic Negative Equity Report for the fourth quarter of 2008: [http://www.loanperformance.com/loanperformance\\_hpi.aspx#NegEqReport](http://www.loanperformance.com/loanperformance_hpi.aspx#NegEqReport)

14. We follow the convention of calling even the weakest borrowers “homeowners,” even though “high-margin speculators” more accurately describes their activities.
15. The equity value figure for the first quarter of 2000 is taken from Table L.213, line 1 in the fourth-quarter 2000 Federal Reserve Flow of Funds document; the equity figure for the third quarter of 2002 is taken from Table L.213 in the fourth-quarter 2003 Flow of Funds document.
16. In nominal terms, the BKX index rose slightly during a period when the stock market lost 49 percent of its value.
17. Residential real-estate values are taken from Table B.100, line 4 in the third-quarter 2008 Flow of Funds document.
18. The International Swaps and Derivatives Association publishes summary data on outstanding derivatives contracts at <http://www.isda.org/statistics/pdf/ISDA-Market-Survey-historical-data.pdf>
19. The Concept Release press statement is available at <http://www.cftc.gov/opa/press98/opa4142-98.htm>; the release itself is available at <http://www.cftc.gov/foia/fedreg98/foi980512a.htm>
20. See <http://www.treas.gov/press/releases/rr2426.htm> for the joint statement from Treasury Secretary Rubin, Federal Reserve Board Chairman Greenspan, and S.E.C. Chairman Levitt.
21. Summers—who spearheaded opposition to the regulatory review of the derivatives markets that was proposed by the C.F.T.C., and who was the apparent architect of derivatives-market deregulation—nonetheless said, in an interview with George Stephanopoulos on 15 March 2009, that “there are a lot of terrible things that have happened in the last eighteen months, but what’s happened at A.I.G. . . . the way it was not regulated, the way no one was watching . . . is outrageous.”
22. The decline after 1929 was severe, but occurred after Persons’s paper was published in 1930. Grebler, Blank, and Winnick (1956, Table B-3) shows that residential construction expenditures in 1930 were 53 percent of their 1929 level, and by 1932 they were 12.5 percent of their 1929 level and a mere 7.5 percent of their 1925 level.
23. Automobile production figures are from NBER Macrohistory production data, series mo1107a, available at <http://www.nber.org/databases/macrophistory/rect-data/01/mo1107a.dat>
24. According to the Motor Vehicle Manufacturers Association, by 1932 auto sales were only 25 percent of 1929 sales. See MMVA, Facts and Figures, various years.
25. See <http://www.federalreserve.gov/newsevents/press/monetary/20070817b.htm>
26. Cecchetti 2009, 55 discusses reasons that banks may be reluctant to borrow at the discount window.

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