

The Origins of the Financial Crisis

Martin Neil Baily, Robert E. Litan, and Matthew S. Johnson

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SUMMARY

The financial crisis that has been wreaking havoc in markets in the U.S. and across the world since August 2007 had its origins in an asset price bubble that interacted with new kinds of financial innovations that masked risk; with companies that failed to follow their own risk management procedures; and with regulators and supervisors that failed to restrain excessive risk taking.

A bubble formed in the housing markets as home prices across the country increased each year from the mid 1990s to 2006, moving out of line with fundamentals like household income. Like traditional asset price bubbles, expectations of future price increases developed and were a significant factor in inflating house prices. As individuals witnessed rising prices in their neighborhood and across the country, they began to expect those prices to continue to rise, even in the late years of the bubble when it had nearly peaked.

The rapid rise of lending to subprime borrowers helped inflate the housing price bubble. Before 2000, subprime lending was virtually non-existent, but thereafter it took off exponentially. The sustained rise in house prices, along with new financial innovations, suddenly made subprime borrowers — previously shut out of the mortgage markets — attractive customers for mortgage lenders. Lenders devised innovative Adjustable Rate Mortgages (ARMs) — with low “teaser rates,” no down-payments, and some even allowing the borrower to postpone some of the interest due each month and add it to the principal of the loan — which were predicated on the expectation that home prices would continue to rise.

But innovation in mortgage design alone would not have enabled so many subprime borrowers to access credit without other innovations in the so-called process of “securitizing” mortgages — or the pooling of mortgages into packages and then sell-

ing securities backed by those packages to investors who receive pro rata payments of principal and interest by the borrowers. The two main government-sponsored enterprises devoted to mortgage lending, Fannie Mae and Freddie Mac, developed this financing technique in the 1970s, adding their guarantees to these “mortgage-backed securities” (MBS) to ensure their marketability. For roughly three decades, Fannie and Freddie confined their guarantees to “prime” borrowers who took out “conforming” loans, or loans with a principal below a certain dollar threshold and to borrowers with a credit score above a certain limit. Along the way, the private sector developed MBS backed by non-conforming loans that had other means of “credit enhancement,” but this market stayed relatively small until the late 1990s. In this fashion, Wall Street investors effectively financed homebuyers on Main Street. Banks, thrifts, and a new industry of mortgage brokers originated the loans but did not keep them, which was the “old” way of financing home ownership.

Over the past decade, private sector commercial and investment banks developed new ways of securitizing subprime mortgages: by packaging them into “Collateralized Debt Obligations” (sometimes with other asset-backed securities), and then dividing the cash flows into different “tranches” to appeal to different classes of investors with different tolerances for risk. By ordering the rights to the cash flows, the developers of CDOs (and subsequently other securities built on this model), were able to convince the credit rating agencies to assign their highest ratings to the securities in the highest tranche, or risk class. In some cases, so-called “monoline” bond insurers (which had previously concentrated on insuring municipal bonds) sold protection insurance to CDO investors that would pay off in the event that loans went into default. In other cases, especially more recently, insurance companies, investment banks and other parties did

the near equivalent by selling “credit default swaps” (CDS), which were similar to monoline insurance in principle but different in risk, as CDS sellers put up very little capital to back their transactions.

These new innovations enabled Wall Street to do for subprime mortgages what it had already done for conforming mortgages, and they facilitated the boom in subprime lending that occurred after 2000. By channeling funds of institutional investors to support the origination of subprime mortgages, many households previously unable to qualify for mortgage credit became eligible for loans. This new group of eligible borrowers increased housing demand and helped inflate home prices.

These new financial innovations thrived in an environment of easy monetary policy by the Federal Reserve and poor regulatory oversight. With interest rates so low and with regulators turning a blind eye, financial institutions borrowed more and more money (i.e. increased their leverage) to finance their purchases of mortgage-related securities. Banks created off-balance sheet affiliated entities such as Structured Investment Vehicles (SIVs) to purchase mortgage-related assets that were not subject to regulatory capital requirements. Financial institutions also turned to short-term “collateralized borrowing” like repurchase agreements, so much so that by 2006 investment banks were on

average rolling over a quarter of their balance sheet every night. During the years of rising asset prices, this short-term debt could be rolled over like clockwork. This tenuous situation shut down once panic hit in 2007, however, as sudden uncertainty over asset prices caused lenders to abruptly refuse to roll over their debts, and over-leveraged banks found themselves exposed to falling asset prices with very little capital.

While *ex post* we can certainly say that the system-wide increase in borrowed money was irresponsible and bound for catastrophe, it is not shocking that consumers, would-be homeowners, and profit-maximizing banks will borrow more money when asset prices are rising; indeed, it is quite intuitive. What is especially shocking, though, is how institutions along each link of the securitization chain failed so grossly to perform adequate risk assessment on the mortgage-related assets they held and traded. From the mortgage originator, to the loan servicer, to the mortgage-backed security issuer, to the CDO issuer, to the CDS protection seller, to the credit rating agencies, and to the holders of all those securities, at no point did any institution stop the party or question the little-understood computer risk models, or the blatantly unsustainable deterioration of the loan terms of the underlying mortgages.

A key point in understanding this system-wide failure of risk assessment is that each link of the securitization chain is plagued by asymmetric information – that is, one party has better information than the other. In such cases, one side is usually careful in doing business with the other and makes every effort to accurately assess the risk of the other side with the information it is given. However, this sort of due diligence that is to be expected from markets with asymmetric information was essentially absent in recent years of mortgage securitization. Computer models took the place of human judgment, as originators did not adequately assess the risk of borrowers, mortgage services did not adequately assess the risk of the terms of mortgage loans they serviced, MBS issuers did not adequately assess the risk of the securities they sold, and so on.

The lack of due diligence on all fronts was partly due to the incentives in the securitization model itself. With the ability to immediately pass off the risk of an asset to someone else, institutions had little financial incentive to worry about the actual risk of the assets in question. But what about the MBS, CDO, and CDS holders who did ultimately hold the risk? The buyers of these instruments had every incentive to understand the risk of the underlying assets. What explains their failure to do so?

One part of the reason is that these investors — like everyone else — were caught up in a bubble mentality that enveloped the entire system. Others saw the large profits from subprime-mortgage related assets and wanted to get in on the action. In addition, the sheer complexity and opacity of the securitized financial system meant that many people simply did not have the information or capacity to make their own judgment on the securities they held, instead relying on rating agencies and complex but flawed computer models. In other words, poor incentives, the bubble in home prices, and lack of transparency erased the frictions inherent in markets with asymmetric information (and since the crisis hit in 2007, the extreme opposite has been the case, with asymmetric information problems having effectively frozen credit markets). In the pages that follow, we tell this story more fully.

INTRODUCTION

The financial crisis that is wreaking havoc in financial markets in the U.S. and across the world has its origins in an asset price bubble that interacted both with new kinds of financial innovations that masked risk, with companies that failed to follow their own risk management procedures, and with regulators and supervisors that failed to restrain excessive taking. In this paper, we attempt to shed light on these factors.¹

The paper is organized as follows: the first section addresses the bubble that formed in home prices over the decade or so up to 2007 and the factors that affected housing demand during those years. The following sections address: the shifting composi-

tion of mortgage lending and the erosion of lending standards; economic incentives in the housing and mortgage origination markets; securitization and the funding of the housing boom; the innovations in the securitization model and the role of leveraged financial institutions; credit insurance and growth in credit default swaps; the credit rating agencies; federal reserve policy and other macroeconomic factors; regulation and supervision; the failure of company risk management practices; and the impact of mark to market accounting. The paper concludes with a preview of subsequent work in the Fixing Finance series by describing some lessons learned from studying the origins of the crisis.

1. There exists much literature that also seeks to explain the events leading up to the crisis. Also see Ashcraft and Schuermann (2008), Calomiris (2008), Gerardi, Lenhart, Sherlund, and Willen (2008). Gorton (2008), Demyanyk and Hemert (2008), among many others.

Housing Demand and the Perception of Low Risk in Housing Investment

The driving force behind the mortgage and financial market excesses that led to the current credit crisis was the sustained rise in house prices and the perception that they could go nowhere but up. Indeed, over the period 1975 through the third quarter of 2006 the Office of Federal Housing Enterprise Oversight (OFHEO) index of house prices hardly ever dropped. Only in 1981-82 did this index fall to any significant extent—5.4 percent—and that was the period of the worst recession in postwar history. From 1991 through the third quarter of 2007, the OFHEO house price index for the U.S. showed increases in every single quarter, when compared to the same quarter in the prior year. Rates of price increase moved above 6 percent in 1999, accelerating to 8 and then 9 percent before starting to slow at the end of 2005. Karl Case and Robert Shiller (2003) report that the overwhelming majority of persons surveyed in 2003 agreed with or strongly agreed with the statement that real estate is the best investment for long-term holders. Respondents expected prices to increase in the future at 6 to 15 percent a year, depending on location.

The continuous advance of nominal house prices has not always translated into real price increases, after taking into account general inflation.

Figure 1 shows that, between 1975 and 1995, real home prices went through two cyclical waves: rising after 1975, falling in the early 1980s, and then rising again before falling in the early 1990s. From 1975 until 1995, housing did increase faster than inflation, but not that much faster. After the mid 1990s, however, real house prices went on a sustained surge through 2005, making residential real

estate not only a great investment, but it was also widely perceived as being a very safe investment.²

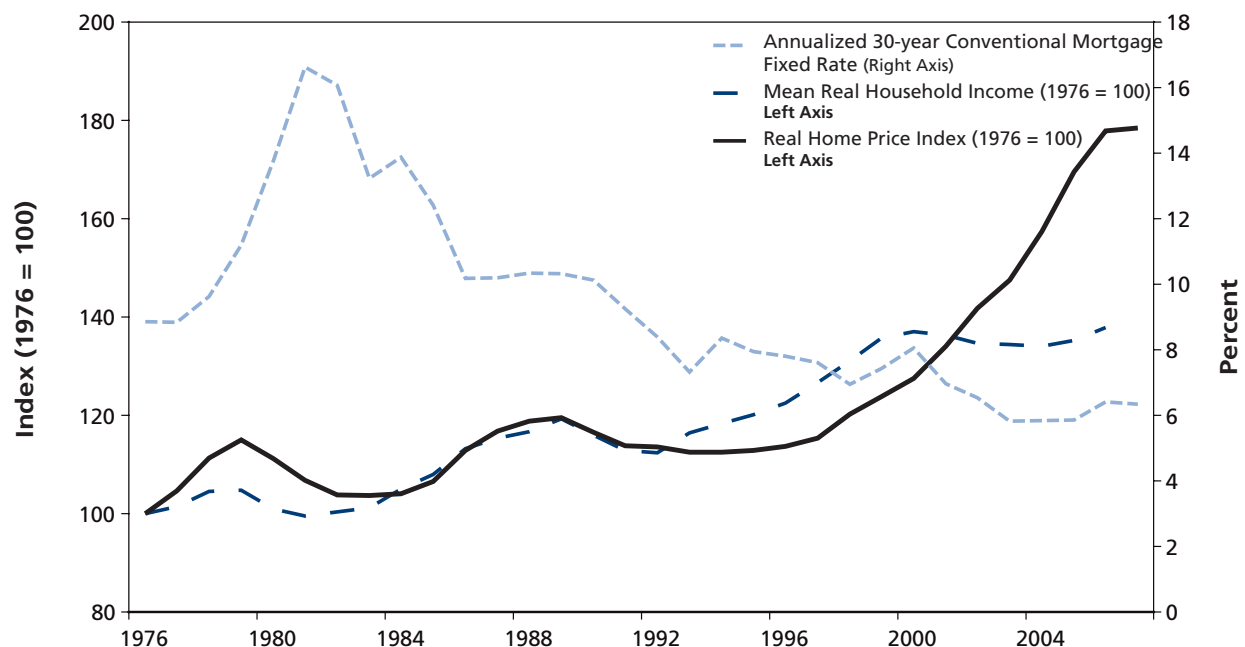
A variety of factors determine the demand for residential housing, but three stand out as important in driving price increases. The first factor was just described. When prices rise, that can increase the pace of expected future price increases, making the effective cost of owning a house decline. The expected capital gain on the house is a subtraction from the cost of ownership. As people witness price increases year after year — and witness those around them investing in homes — a “contagion” of expectations of future price increases can (and did) form and perpetuate price increases. The second is that when household income rises, this increase allows people to afford larger mortgages and increases the demand for housing. Over the period 1995-2000, household income per capita rose substantially, contributing to the increased demand. However, Figure 1 shows that the increase in house prices outpaced the growth of household income starting around 2000. One sign that house prices had moved too high is that they moved ahead much faster than real household income. People were stretching to buy houses.³

The third factor is interest rates. After soaring to double digits and beyond in the inflationary surge of the 1970s and early 1980s, nominal rates started to come down thereafter, and continued to trend down until very recently. Real interest rates (adjusted for inflation) did not fall as much, but they fell also. From the perspective of the mortgage market, nominal interest rates may be more relevant than real rates, since mortgage approval typi-

2. The Case-Shiller Index is also widely used to measure housing prices. It has a broadly similar pattern to the one shown here, but does not go back as far historically.

3. The relation between household income and housing demand is not exact. See, for example, Gallin (2004). For a more in-depth and disaggregated look at the ratio of home prices to income over the past decades, see Case et al (2008). Shiller (2008) shows that for over 100 years (from as far back as 1880 to the early 1990s), house prices moved proportionally to fundamentals like building costs and population. The subsequent boom was out of line with each of these fundamentals.

FIGURE 1:

Real Home Prices and Real Household Income (1976=100); 30-year Conventional Mortgage Rate

Source: OHFEO; Federal Reserve; Bureau of the Census. Home Prices and Income are deflated by CPI less Shelter.

cally depends upon whether the borrower will be able to make the monthly payment, which consists mostly of the nominal interest charge. Regardless, with both real and nominal interest rates lower than they had been for many years, the demand for mortgage-financed housing increased.

Asset price bubbles are characterized by a self-reinforcing cycle in which price increases trigger more price increases, but as the level of asset prices moves increasingly out of line with economic fundamentals, the bubble gets thinner and thinner and finally bursts. At that point the cycle can work in reverse as people hurry to get rid of the asset before prices fall further (see Box 1). This was the pattern of the dot com bubble of the late 1990s, when investors were enthralled by the promise of new technologies and bid up the prices of technology stocks beyond any reasonable prospect of earnings growth. There were some crashes of particular stocks and finally

prices of most technology stocks plunged. In the case of the housing bubble, prices in some markets moved so high that demand was being choked off. Eventually, suspicions increased that price rises would slow down, which they did in 2005, and that prices would ultimately fall, which happened in 2007 according to both the Case-Shiller and the OFHEO indexes.⁴

The rise in housing prices did not occur uniformly across the country, a fact that must be reconciled with our story of the origins of the bubble. If there were national or international drivers of the price boom, why did these not apply to the whole market? In some parts of the country there is ample land available for building, so that as mortgage interest rates fell and house prices started to rise, this prompted a construction boom and an increase in the supply of housing. Residential housing starts increased from 1.35 million per year in 1995 to 2.07

million in 2005, with 1.52 of the two million built in the south and west. Demand growth outstripped supply, however, in very fast growing areas like Las Vegas and in California and East Coast cities where zoning restrictions limited the supply of land. In the Midwest, there was only a modest run up in house prices because the older cities that were dependent on manufacturing were losing jobs and population. So the answer to the puzzle is that while the factors encouraging price increases applied broadly (especially the low interest rates), the impact on prices and the extent to which a bubble developed also depended largely on local conditions.⁵

An additional note on this issue comes from looking at other countries. The decline of interest rates was a global phenomenon and most of the advanced countries saw corresponding rises in housing prices.⁶ For example, home prices in the UK rose nearly 70 percent from 1998 to 2007. In some of these countries, there have been subsequent price declines, suggesting a price bubble like that in the U.S. In general, the experience of other countries supports the view that the decline in mortgage interest rates was a key factor in triggering the run up of housing prices (see Green and Wachter (2007)).

4. The Case-Shiller index started to decline a little earlier than OFHEO and has fallen by substantially more. That is to be expected since the Case-Shiller 10-city index follows the markets that have seen big price declines.

5. As an illustration, Case et al (2008) show that the behavior of the ratio of home prices to per capita income varied substantially across cities, rising substantially in metropolitan areas like Miami and Chicago but staying relatively flat in cities like Charlotte and Pittsburgh.

6. Germany is the exception, where there was a huge building boom following reunification, resulting in an oversupply of housing.

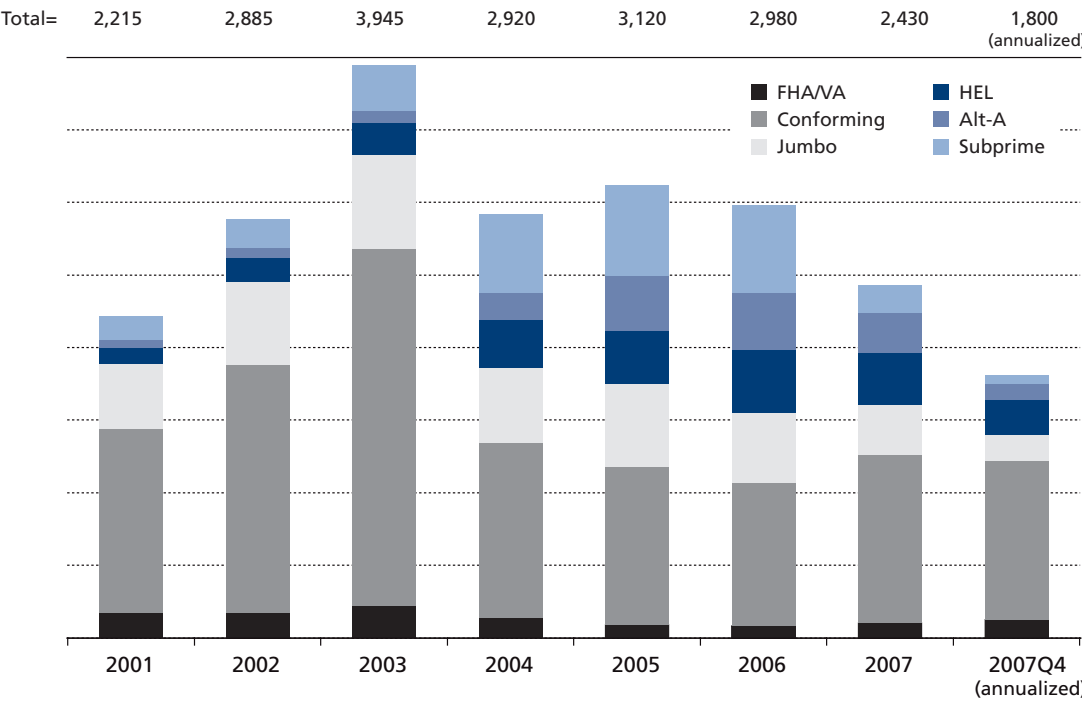
The Shifting Composition of Mortgage Lending and the Erosion of Lending Standards

As the economy recovered from the 2001 recession, the expansion of mortgage lending was in conformable and other prime mortgages, but as the boom proceeded, a larger fraction of the lending was for so-called “non-prime” lending that consists of subprime, Alt-A and home equity lending. The definition of what constitutes a “subprime” borrower is not precise, but it generally refers to a borrower with a poor credit history (i.e. a FICO score below 620 or so) that pays a higher rate of interest on the loan. Alt-A borrowers, deemed a bit less risky but not quite prime, had better credit scores but little or no documentation of income. Figure 2 illustrates the recent shift into “non-prime” lending. In 2001 there were \$2.2 trillion worth of mortgage originations, with 65 percent of these in the form of conventional conforming loans and Federal Housing Administration (FHA) and Department of Veterans Affairs (VA) loans. An additional 20 percent were prime jumbo mortgages,

issued to those with good credit buying houses that were too expensive to be conforming, meaning that 85 percent of originated loans in 2001 were prime quality. There was a huge expansion of mortgage lending over the next couple of years, and in 2003 nearly \$4 trillion worth of loans were issued, but the share of prime mortgages remained steady at 85 percent as the volume of conformable mortgages soared.

The total volume of mortgage lending dropped after 2003, to around \$3 trillion a year in 2004–06 but the share of subprime and home equity lending expanded greatly. Prime mortgages dropped to 64 percent of the total in 2004, 56 percent in 2005 and 52 percent in 2006, meaning that nearly half of mortgage originations in 2006 were subprime, Alt-A or home equity. It is clear that there was a significant change in lending patterns apparent in the composition of loans going back to 2004.

FIGURE 2:
Total Mortgage Originations by Type: with share of each product; billions, percent



Source: Inside Mortgage Finance. HEL is Home Equity Loan.

BOX 1: The Mortgage Boom in the Context of Theories of Bubbles

The events leading up to the current crisis were very much in line with some common theories on how bubbles form. For example, Bikhchandani, Hirshleifer and Welch (1992) developed a theory on why rational people exhibit herding behavior that can lead to a bubble. Bikhchandani et al constructed a game theory model where individuals base their decisions both on their own judgment and on the actions of others. If an individual observes everyone around her choosing one way, she may conclude they are all correct, even if she herself may believe the opposite is true. The authors refer to this phenomenon – where by observing the actions of others, an individual discards her own judgment – as an “information cascade.” In a marketplace where individuals observe the actions of others, herding behavior may trump the judgment of rational individuals. This kind of “social contagion” can go a long way in describing how homeowners, mortgage originators, holders of mortgage-backed securities, regulators, ratings agencies – indeed everyone – could get swept up in a bubble that *ex post* was clearly bound to burst.

Another bubble theory that had received attention in the press was developed by the economist Hyman Minsky, who argued that financial markets are inherently unstable, and he developed a theory of a bubble cycle that aptly describes the recent bubble in housing markets. Minsky theorized that a bubble had five steps. Step 1 was displacement: investors start to get excited about something – whether it be dot-com companies, tulip bulbs in 17th century Holland, or subprime mortgages. Step 2 is a boom: speculators begin to reap high returns and seeing their returns, more investors enter the market. Step 3 is euphoria: as more and more people crowd into the market, lenders and banks begin to extend credit to more dubious borrowers and lower lending standards (i.e. lend to borrowers with no documentation of income, or offer loans with high loan to value ratios), financial engineers create new instruments through which they can increase their exposure to the market (i.e. CDOs, CDS), and there is a general desperate surge by new participants to get “a piece of the action.” Indeed, Step 3 could be largely framed in terms of the “information cascades” and the herding behavior it entails.

Step 4 is profit-taking: the bubble reaches its peak, and smart investors cash out of the market. This profit-taking unleashes the final step, which is Panic. Once the bubble begins to contract, pessimism immediately replaces exuberance, and investors try to get rid of their now ill-fated assets as quickly as possible. In the context of the current crisis, banks see their asset values plummet and see their lenders refuse to rollover debt, forcing them to de-leverage even further to make good on their liabilities. A so-called “Minsky moment” occurs when banks and lenders are forced to fire-sell even their safe assets in order to pay off their outstanding liabilities.

Minsky went even further in a 1992 piece where he outlined his “financial instability hypothesis” and argued market economies will inevitably produce bubbles. When times are good, banks will increase the riskiness of their assets to capture high returns, and they will borrow more and more to finance and increase the profitability of these assets. Minsky’s view is that financial markets are inherently unstable.

There is, of course, an alternative, efficient markets view, which says that individuals are independent-minded investors, and that asset prices reflect information that is known to everyone. It follows that the aggregate market is wiser than any one individual. In that view, excessive risk taking is not an inherent outcome of markets, but rather is a moral hazard problem that is the responsibility of government policies that insure deposits and bail out banks that get into trouble. While failures of government policy contributed to what happened, we judge that failures by private market participants were at the heart of this crisis, a viewpoint expressed by Alan Greenspan in Congressional testimony on October 23, 2008.

Robert J. Shiller has studied speculative bubbles, analyzing stock market and other asset price cycles, based upon “irrational exuberance” in markets. He wrote about the risks of a real estate bubble well before the crisis hit and offers an analysis of the current crisis in Shiller (2008).

The period of 2001-07 was one of rather modest growth in household income, but household consumption continued to grow as the personal saving rate, already low, continued to decline. Americans were tapping into the rising wealth they had in their homes in order to finance consumption. Greenspan and Kennedy (2007) estimate that homeowners extracted \$743.7 billion in net equity from their homes at the peak of the housing boom in 2005 — up from \$229.6 in 2000 and \$74.2 in 1991. The increase in house prices allowed a borrowing spree. The spree was largely financed by a boom in Home Equity Loans (illustrated in Figure 2) that allowed homeowners to borrow against the rising value of their home.⁷ In addition, there was an expansion of loans to lower-income, higher-credit risk families, including from the Government Sponsored Enterprises, Fannie and Freddie, as they sought to expand home ownership for the benefits it brings in terms of sustaining neighborhoods.

There was a deterioration in lending standards generally dated to 2004 or 2005. Families that lacked the income and down payment to buy a house under the terms of a conforming mortgage were encouraged to take out a mortgage that had a very high loan to value ratio, perhaps as high as 100 percent (often using second or even third mortgages), meaning that they started with no initial equity — and thus no true financial stake — in the house. Such borrowing typically requires a rather high interest rate and high monthly payment, one that likely violates the usual rules on the proportion of household income needed to service the debt. Originators got around this problem by offering Adjustable Rate Mortgages (ARMs), which had low initial payments that would last for two or three years, before resetting to a higher monthly amount. These so-called “teaser” interest rates were often not that low, but

low enough to allow the mortgage to go through.⁸ Borrowers were told that in two or three years the price of their house would have increased enough to allow them to re-finance the loan. Home prices were rising at 10 to 20 percent a year in many locations, so that as long as this continued, a loan to value ratio of 100 percent would decline to 80 percent or so after a short time, and the household could re-finance with a conformable or prime jumbo mortgage on more favorable terms.

There is a lively industry in the United States that offers guides for people who want to make money by buying residential real estate and then re-selling it at a profit. The Miami condominium market was a favorite place for real estate speculation as investors bought condos at pre-construction prices and then sold them after a short time at a profit. Speculative demand—buying for the purpose of making a short-term profit—added to overall housing demand.⁹

By their nature fraudulent practices are hard to assess in terms of the volume of outright fraud, but based on press reports and interviews, it seems clear that shading the truth and outright fraud became important in the real estate boom (and in the subsequent bust). According to the Financial Crimes Enforcement Network, the number of reported cases of mortgage fraud increased every year since the late 1990s, reaching nearly 53,000 in 2007, compared with roughly 3,500 in 2000.¹⁰ Some borrowers lied about their income, whether or not they were going to live in the house they were buying, and the extent of their debts. Credit scores can be manipulated, for example, by people who become signatories on the credit accounts of friends or relatives with good credit ratings. Without having to make regular payments on a loan themselves, they

7. Indeed, Home Equity Loans have boomed since the 1980s, when banks first began to advertise them to homeowners as a way to “extract wealth” from their homes. See Louise Story, “Home Equity Frenzy was a Bank Ad Come True,” *The New York Times*; August 15, 2008.

8. As mortgage rates are typically linked to the Federal Funds rate, the loose monetary policy during 2001-2004 helped keep these ARM rates down at an “unnaturally” low level.

9. Since pretty much anyone who buys a house factors in the expected capital gain on the house, everyone is subject to speculative demand. The reference here refers to people or companies that bought houses they did not intend to live in or use as vacation homes.

10. Taken from Barth and Yago (2008)

can acquire the high credit rating of the other person. Another fraudulent practice occurred with speculators. Mortgage lenders want to know if a household will actually occupy a house or unit being purchased; or if it will be rented out or re-sold. This knowledge affects the probabilities of default or of early repayment, both of which can impose costs on the lender. We do not know how many delinquent mortgages are on properties that are not owner-occupied, but we have heard figures in the 40 to 50 percent range.

Misrepresentation by borrowers and deceptive practices by lenders were often linked together. A mortgage broker being paid on commission might lead the borrower through an application process, suggesting places the borrower might change the answer or where to leave out damaging information. Sometimes the line will be fuzzy between a situation where broker helps a family navigate the application process so they can buy a house they really can afford, and a situation where the broker and the applicant are deliberately lying.

Looking at the data, the deterioration in lending standards over the course of the boom is remarkable. The share of subprime loans originated as ARMs jumped from 51 to 81 percent from 1999 to 2006; for Alt-A loans, the share jumped from 6 to 70 percent during the same time period. A similar deterioration happened in combined loan to value ratios (the CLTV combines all liens against a property): the average CLTV ratio for originated subprime loans jumped from 79 to 86 percent. Furthermore, the share of full-doc subprime originations fell from 69 to 58 percent; for Alt-A loans it dropped from 38 to 16 percent.¹¹

Figure 3 provides further illustration of the shift into riskier lending as the boom progressed. It shows the proportion of mortgage originations for home purchase that were made based on interest only or negative amortization loan provisions (“re-

fis” are excluded from this data). Someone borrowing with an interest-only loan pays a slightly lower monthly payment because there is no repayment of principal. Since the principal repayment in the first few years of a mortgage are usually very small, this is not a big issue in the short run, although the impact mounts up over the years. A negative amortization loan goes even further, and borrowers do not even pay the full amount of the interest accruing each month, so the outstanding balance rises over time. Such a mortgage might make sense for families whose incomes are rising over time and where home prices are rising, but it adds a significant amount of risk for both borrower and lender.

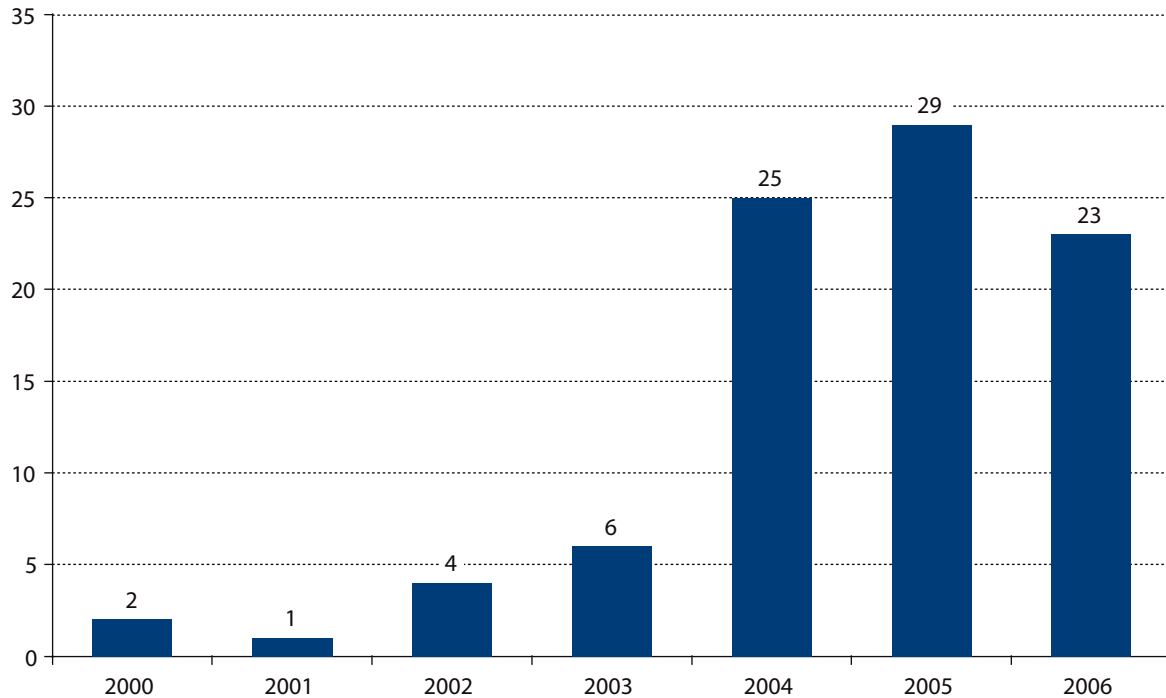
In summary, the boom in mortgage borrowing was sustained by low interest rates and easier lending practices. As households cashed in the wealth in their property for consumption, less credit-worthy families were able to buy houses, and speculators purchased property in hopes of making money by reselling them. The increasingly lax lending standards are characteristic of classic behavior during bubbles. Fraud, lack of due diligence, and deceptive practices occurred on both sides of the mortgage transactions, but as long as house prices continued to rise at a good pace, the whole structure could continue, and even the fraud and deception were buried as people were able to refinance and were unlikely to default on their mortgages and lose the equity (if they had any) that they had built up.

With the benefit of hindsight we can look back and see that some of the innovative mortgage products have contributed to the default mess we have now. However, we would like to note that this analysis is not meant to be construed as a call to restrict financial innovations. There were substantial benefits to those who used the products properly. Young families often face a tough situation in trying to buy a home. They are at an early stage in their careers, earning moderate incomes while they have the expenses of young children. Owning a home

11. Data taken from Ashcraft and Schuerman (2008). The drop in the share of full-doc loans for Alt-A loans is relatively unsurprising, as Alt-A loans were by definition made to borrowers with little or no documentation of income.

FIGURE 3:

Interest-Only and Negative Amortization Loans, Share of Total Mortgage Originations Used to Purchase a Home (excludes refis): 2000-2006; percent



Source: Credit Suisse (2007), LoanPerformance

in a good neighborhood with good schools is a very desirable and natural wish, but many families lack the down payment necessary and the monthly mortgage payment may be out of reach, especially in high-cost regions such as California or the East Coast. Based on their expected lifetime family income, they can afford a house, but at this early stage of their life-cycle, they are liquidity constrained. Some such families rely on older family members

for help, but not all can do this. Mortgages with low payments for the first few years and low down payments provide a way to deal with this problem. Lending standards need to be restored to sanity in the wake of the mortgage crisis, but that should not mean, for example, the abolition of adjustable rate mortgages or low down payments for borrowers with the right credit.

Economic Incentives in the Housing and Mortgage Origination Markets

The legal and institutional arrangements that prevail in the U.S. housing market produced a pattern of incentives that contributed to what happened. First, there are important protections given to households. These vary by state, but in many states it is possible to repay a mortgage early without penalty. This option meant that households were encouraged to take out mortgages with terms that looked good in the short run, but were unfavorable in future years. They expected to refinance later on better terms, and without incurring a pre-payment penalty.

In some states the mortgage contract is “without recourse to the borrower,” meaning that if a household stops paying on a mortgage and goes into default, the lender can seize the house (the collateral on the loan) but cannot bring suit to recover losses that are incurred if the sale of the property does not yield enough to pay off the mortgage and cover the selling and legal costs. In principle, this encourages households to walk away when they are unable or unwilling to cover a mortgage payment. This can be an important protection for families facing unemployment or unexpected medical expenses, but it can lead to abuse by borrowers and encourage over-borrowing. In a significant percentage of defaults in the current crisis, borrowers are simply mailing in the keys to the house and are not even contacting the lender to try and work out a settlement that would avoid default. There is debate about the importance of this issue. On the one hand, there are reports that the states that have had the most problem with mortgage defaults are the ones that are non-recourse to the borrower. On the other hand, lenders rarely find it profitable to pursue defaulting borrowers—big bank suing poor family in trouble is not a situation most banks want to take to a court.

The most perverse incentive in the mortgage origination market though, is the ability of originators to immediately sell a completed loan off their books to another financial institution. Currently, most mortgage loans are originated by specialists and brokers who do not provide the funding directly. One institution provides the initial funding of the mortgage but then quickly sells it off to another financial institution, where either it is held on a balance sheet or packaged with other mortgages to be securitized (see below).¹² The key issue here is that the institution that originates the loan has little or no financial incentive to make sure the loan is a good one. Most brokers and specialists are paid based on the volume of loans they process. They have an incentive to keep the pace of borrowing rolling along, even if that meant making riskier and riskier loans.

Mian and Sufi (2008) provide evidence that many of largest increases in house prices 2001–2005 (and subsequently large crashes in prices and foreclosures 2005–07) happened in areas that experienced a sharp increase in the share of mortgages sold off by the originator shortly after origination, a process they refer to as “disintermediation” (but is synonymous to the first stage of securitization, which we discuss shortly). These areas were also characterized by high “latent demand” in the 1990s, meaning that a high share of risky borrowers had previously been denied mortgage applications. The “disintermediation” process, by allowing originators to pass off the risk of their loans, increased the supply of credit and encouraged them to lend to risky borrowers who previously were ineligible for loans (the authors also find that these areas experienced relatively high delinquency rates once house prices began to fall after 2004). Thus, by increasing the availability of credit to riskier borrowers, disintermediation increased housing demand and house prices during the boom

12. Mortgage sales contracts often allowed the buyer to “put” back the mortgage to the seller for a limited period, a year or two. But in an era of rising housing prices and thus low delinquencies, originators did not view these “puts” as a serious risk.

years. The authors find that some of these areas that experienced high house price appreciation did so despite experiencing negative relative income and employment growth over the period. Mian and Sufi (2008) thus show empirically that the ability to securitize subprime mortgages was key factor in inflating the housing bubble.

The adverse incentives in the originate-to-distribute model for mortgages occur in other markets where there is asymmetric information—when one party to the transaction knows more than the other. For example, most drivers know little about mechanical issues, so when they have a problem with their car they take it to an auto mechanic. That mechanic will know much more about the cause of the difficulty than the owner, so he or she can tell the owner that there are expensive problems that must be fixed, even if that is not the case. The mechanic has an economic incentive to exaggerate problems in order to make a profit on the repair. This does not necessarily tell you that there is a market failure, however, because there are market responses to information asymmetries—people in business for a long time want to develop a reputation for honesty and reliability. Publications like Consumer Reports or services like Angie's List can be used to find quality products and services. In the mortgage origination market, there were similar market responses to the asymmetric information. There were provisions intended to provide information to and protect the interests of the ultimate holders of the default risk.

For example, anyone selling a mortgage loan had to provide information on the credit score of the borrower, the loan to value ratio, and other information that the buyer of the mortgage could use to assess its value. Many of the originating financial institutions had been providing mortgages for many years and had built up reputations for sound practices.

Unfortunately, the market responses to asymmetric information in the mortgage market did not solve the problem. It is somewhat puzzling why this was the case in the secondary market where mortgages were re-sold. One would have expected that the institutions that ultimately ended up with the default risk knew about the incentive problems in the origination process and would have taken the necessary steps to counteract them. It is hard to get a full answer as to why they did not, but the key issue is the one given earlier. **The long upward movement of house prices convinced nearly all stakeholders that these prices had nowhere to go but up, so the level of monitoring and the standards of lending in mortgage origination eroded.** Default rates had remained low for many years and so there did not seem to be much risk involved. Another issue, as we will discuss below, is that the securitization process created an enormous gap between the origination of the loan and the investors who ultimately held the underlying risk, making sound risk analysis extremely difficult.

Securitization and the Funding of the Housing Boom

In the old model, mortgage loans were made by Savings & Loans institutions (S&Ls) and the funds for them came from the savings deposits of retail customers. The S&Ls themselves vetted the mortgages and took on the three risks involved: the risk of default; the risk of pre-payment (which reduces returns); and the risk of changes in interest rates. By keeping a stake in the health of their loans, originators had a financial incentive to monitor their quality and investigate whether or not the borrower could feasibly repay the mortgage. However, it was also quite expensive for these institutions to keep loans on their books, and it limited the volume of loans they could originate.

This system broke down in the S&L crisis of the mid-1980s for complex reasons that link to the era when financial institutions and interest rates were much more heavily regulated.¹³ To oversimplify, the crisis stemmed from both interest rate risk and default risk. As market interest rates rose, the S&Ls had to pay higher rates on their deposits but could not raise the rates on their stock of mortgages by enough to compensate. They tried to avoid insolvency by investing in much riskier assets, including commercial real estate that promised higher returns but then suffered serious default losses. Because of regulations limiting interstate banking, the mortgage portfolios of the S&Ls were geographically concentrated, which made them riskier—the residential mortgage markets in Texas and California suffered high default rates in the 1980s. There were also some fraudulent practices at that time; for example in the Lincoln Savings collapse, the CEO Charles H. Keating was convicted and served time in jail. In response to the losses in the S&Ls, the federal government created

the Resolution Trust Corporation to take the assets off the banks' books, and then sold them off. In the process, there were large losses that were covered by taxpayers — roughly \$150 billion.

Securitization was seen as a solution to the problems with the S&L model, as it freed mortgage lenders from the liquidity constraint of their balance sheets. Under the old system, lenders could only make a limited number of loans based on the size of their balance sheet. The new system allowed lenders to sell off loans to a third-party, take it off their books, and use that money to make even more loans. The Government Sponsored Enterprises (GSEs), notably Fannie Mae and Freddie Mac, were created by the federal government in 1938 and 1970, respectively, to perform precisely this function: the GSEs bought mortgage loans that met certain conditions (called “conforming loans”) from banks in order to facilitate mortgage lending and (theoretically) lower mortgage interest rates.¹⁴

The GSEs initially funded their mortgage purchases by issuing bonds, but they were pioneers in securitization — or where a pool of geographically dispersed mortgages is re-packaged and sold as mortgage-backed securities (MBS) to investors (see box 2 below). Freddie Mac issued the first ever modern mortgage backed security in June 1983. The returns of an MBS reflect the returns on the underlying mortgage pool. Those who held the GSE-issued MBS took on some of the risks, notably the interest rate risk. Importantly, however, the GSEs retained the default risk of the mortgages that underlined the MBS they sold. They guaranteed investors against default losses and pre-payment losses (by including a guarantee fee

13. One of these was the result of regulation (Regulation Q) that limited the interest rate that S&Ls could pay on their deposits and led depositors to withdraw funds when market rates rose. That regulation, in an era of double digit market interest rates, exposed the thrifts to a massive potential outflow of funds in the 1979-1981 period, which was avoided when Congress lifted Regulation Q. But even after this occurred, the loss in asset value on the S&Ls balance sheets meant that most had little or no capital at risk.

14. There are different estimates of the extent to which the GSEs provided lower interest rates for borrowers. Most suggest the impact on mortgage rates is fairly small. See Passmore, Shurland and Burgess (2006), for example. Presumably without the GSEs, other financial institutions would have had a bigger role.

in the price of the MBS), or at least losses above an expected amount built into the rate of return of the MBS when it was issued. Investors in GSE-issued MBS were thus shielded from the default risk of the underlying loans.

The GSEs could then either sell the MBS on the open market, or they could issue their own bonds, use the revenue to buy the MBS and hold them on their own books. They could also buy MBS issued by private institutions to further increase the size of their books. They earned a profit because they earned a higher interest return on the mortgage assets than they would pay on the bonds that they have issued. This has some similarity to the S&L model, except that Fannie and Freddie can hold much larger pools of mortgages that are geographically dispersed. In addition, the GSEs were seen as implicitly guaranteed by the federal government (a guarantee that has since become explicit) so they paid only a few basis points above Treasury yields on their bond issuance. This implicit government backing lowered their cost of borrowing and allowed them to inflate their balance sheets enormously. Over the years, this line of business was very profitable for the GSEs, and the size of their internally-held mortgage portfolios ballooned until they faced regulatory restrictions pushed by Alan Greenspan, then Federal Reserve Chairman, and others.

The GSEs have been major participants in the mortgage market and by 2008, Fannie and Freddie held or guaranteed \$5.4 trillion in mortgage debt. The Treasury was forced to nationalize them in September 2008 and guarantee their liabilities because they would otherwise have been driven into bankruptcy. Fannie and Freddie combined had nearly \$5.5 billion in losses in the first two quarters of 2008, according to their statements. How did they get into trouble? Mostly because they behaved like so many other people and believed that default rates were stable and predictable and that, at most, there would be only regional price declines and not national price declines. When the price bubble burst, they faced much higher default

rates than expected and they did not have enough capital to cover their losses. Their unstable “government sponsored” status allowed them to skirt around capital requirements, and they became overleveraged – indeed their leverage ratio in 2007 was estimated to be over twice that of commercial banks.¹⁵

In part, their problems also came from their efforts to meet the affordable housing goals set by Congress. Congress pushed them to provide more loans to low-income borrowers to justify the capital advantage they had because of the implicit federal guarantee. The rules under which they operated required that they not buy subprime whole loans directly. But they faced no limits on the amount of subprime MBS they could buy from private issuers that they then kept on their books. Indeed, the two of them bought between \$340 and \$660 billion in private-label subprime and Alt-A MBS from 2002-2007.¹⁶ The losses they now face on their mortgage portfolio include both prime mortgages and the lower quality mortgages on their books. House prices have fallen so much that even many prime mortgages are defaulting.

Many have pointed to the GSEs as one of the main, culprits in the financial crisis because the implicit government guarantee allowed them to inflate their balance sheets by borrowing at below-market rates. Is this perception correct? Starting in 2004, they did begin to buy riskier loans in the face of pressure from Congress, but this was late in the game, after private subprime lending had already taken off. Further, while the GSEs purchased private-label subprime MBS to hold on their books, they by no means “led the charge.” For example, in 2002 Fannie Mae purchased just over 2 percent of private-label subprime and Alt-A MBS. In 2004, once the market was already booming, it bought 10 percent of the total, and in 2007 it bought 4.5 percent.¹⁷ Fannie and Freddie did not catalyze the market for subprime MBS; rather, they started to hold such mortgages in the pools they purchased, perhaps because of shareholder pressure or to regain market share.

15. Greenlaw et al (2008), page 35.

16. OFHEO (2008). The wide range is because data for Freddie Mac’s purchases of subprime and Alt-A MBS only goes back to 2006, so its purchases are estimated 2002-2005.

17. The data for Freddie Mac’s purchases of subprime MBS does not go back as far, but it is probable that Freddie played a bigger role than Fannie in the market. In 2006 and 2007, for example, Freddie bought 12 percent of all subprime MBS issued in those years.

BOX 2: The Anatomy of an MBS

Figure 4 illustrates the way that MBS repackaged mortgage loans in order to increase the funds available to the mortgage market, as well as to generate fees for the re-packagers. While some of the underlying mortgages would inevitably default, they are selected from geographically diverse areas which, it was once believed, would protect the health of the overall pool from any local default shocks; prior to the current turmoil in housing markets, there had never been a housing downturn on a national scale. Still, an asset based on a simple pool of subprime mortgages would carry a credit rating below or well below AAA.

Rather than sell one asset based on the entire pool, though, an MBS issuer could issue securities with varying risk and return by tranching the securities into different groups based on exposure to the underlying risk of the pool. After buying the receivables of thousands of mortgage loans, an issuer then transfers them to what is called a Special Purpose Vehicle (SPV), an off-balance sheet legal entity, which “holds” the receivables in a pool and issues the securities. The securities are typically separated into senior, mezzanine (junior), and non-investment grade (equity) tranches. A senior tranche has preferred claim on the stream of returns generated by the mortgages; once all the senior tranche securities are paid, the mezzanine holders are paid next, and the equity tranche receive whatever is left. A portion of the mortgages can go into delinquency, but various forms of protection should mean there is still enough income coming into the pool to keep paying the holders of at least the senior tranche. Thus, the holders of the senior tranche have an asset that is less risky than the underlying pool of mortgages, and they were deemed so safe that credit rating agencies were willing to give them AAA ratings.

The safety of a senior tranche, or any tranche, mainly depends on two concepts (other than the health of the mortgage loans themselves): the degree of *subordination* under it and the level of *credit enhancement* in the MBS.¹⁸ Subordination of a tranche refers to the total size of the tranches junior to it. The higher the subordination, the safer the tranche. If, for example 75 percent of a set of MBS is senior, then the senior tranche benefits from 25 percent of subordination, plus any over-collateralization.¹⁹ Over-collateralization, or when the face value of the mortgage assets in the pool is higher than the face value of the re-packaged securities, is a form of credit enhancement used to reduce the exposure of the debt investors to the underlying risk of the pool. The over-collateralized part of the MBS is the “equity” tranche, as its holders are the first to lose money in case of default and receive whatever money is “left over” if there are below-than-expected defaults. If, for example, 1.5 percent of an MBS is equity, then 1.5 percent of mortgage payments can default before the most junior debt tranche incurs any losses.

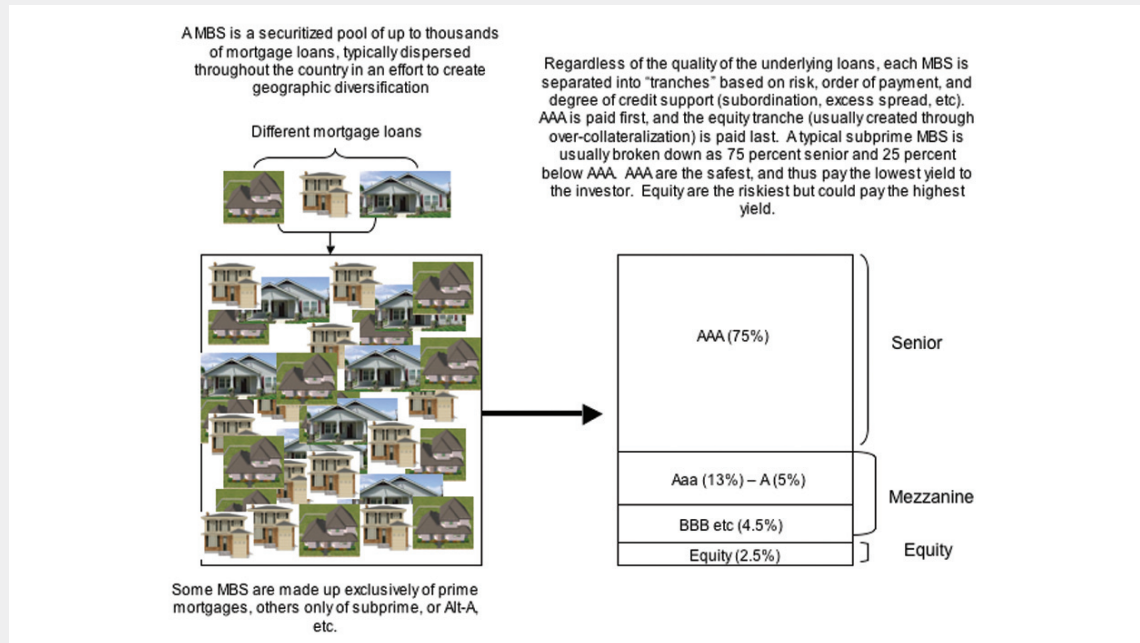
Another important form of credit enhancement is “excess spread,” whereby the total incoming interest received from the mortgage payments exceeds the payment made to senior and junior debt holders, fees to the issuer, and any other expenses. This is the first line of defense in terms of protection, as no tranche incurs losses unless total credit defaults become high enough to turn the excess spread negative. (If this does not happen, the equity tranche gets whatever excess spread is left over).

The repackaging of MBS into tranches does nothing to reduce the overall risk of the mortgage pool, rather it rearranges it. The senior tranches are less risky and eligible for high investment grade credit ratings, as

18. There exists much literature explaining MBS structure; for a more in-depth and very elucidating description see Ashcraft and Schuermann (2008) or Gorton (2008).

19. Senior tranches of subprime MBS were typically more subordinated and those in Alt-A or prime MBS to compensate for the higher risk of the underlying pools.

FIGURE 4: Anatomy of a MBS



they are (theoretically) quite insulated from the default risk. On the other hand, the lower tranches are much more risky and can face losses very quickly; **the equity tranche has the potential for huge returns when defaults are low** but are also the first to be wiped out when the default rate hits even a small amount above what is expected. Tranching redistributes the risk according to risk appetite of investors: senior tranches pay a lower yield but are safer bets, and the junior tranches pay a higher yield and are riskier.

However, effective tranching of risk rests on the assumption that proper risk analysis is performed on the underlying assets. Since 2007, many previously AAA-rated securities have been downgraded, reflecting the fact that all stakeholders underestimated the true risk in these securities. As a result, many MBS holders that were previously considered relatively insulated are now getting wiped out.

The idea of taking risky assets and turning them into AAA-rated securities has been received with scorn by many as the mortgage market has slumped. And with good reason, in the sense that the riskiness of these se-

curities was in fact much higher than their ratings suggested, because the overall market slump resulted in a correlated wave of defaults. But this financial alchemy is not as strange as it seems; in fact it has been around for a long time in other markets. **A public company is an asset with an uncertain stream of returns.** Typically, the claims on that income are assigned to two broad groups, **the bond holders and the stock or equity holders.** The company's bonds may well be of low risk and eligible for a high credit score. The bond holders get first dibs on the returns of the company and the equity holders get what is left over. Most large companies effectively tranche their liabilities into bonds with different seniorities in terms of claims on the company's income, and they may have different classes of equities, too. In short, the idea of different tranches of assets with differing risk levels is not at all new and there is nothing inherently wrong with it. The goal is to provide investors with different risk and return options and to let investors with an appetite for risk absorb that risk. The repackaging did not stop there, however. **There were second and third rounds of securitization, and the trouble that emerged there was worse.**

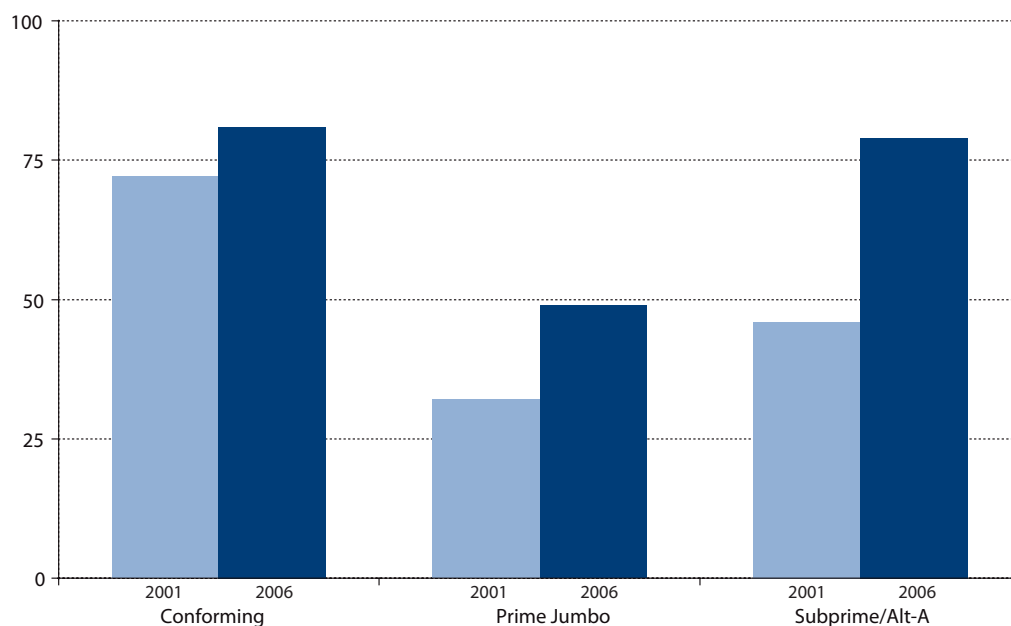
Other financial institutions also issued MBS, but because of the capital advantage of the GSEs, these institutions operated in the “jumbo” market for loans that were for larger amounts than the GSEs were allowed to buy, and more recently especially in the subprime and Alt-A market. In the recent boom years since 2000, securitization through private financial institutions exploded, and the GSEs increasingly lost market share to “non-agency,” or private, MBS issuers. To illustrate: in 2000 MBS issued by the GSEs made up 78 percent of total MBS issued in that year. By 2006 their share of MBS issuance had dropped to 44 percent.²⁰ The list of the top subprime and Alt-A MBS issuers in 2006 includes such ill-fated names as Lehman Brothers, Bear Stearns, Countrywide, Washington Mutual, and Merrill Lynch (whose fates, among others, we will return to in a future report). As securitization became more widespread, and as the subprime

mortgage market boomed, private banks, broker dealers, and other institutions increasingly dominated the MBS market.

Figure 5 illustrates the growing importance of securitization, showing the rates in 2006 for conforming, prime jumbo and subprime / Alt-A loans, for which securitization rates reached 81, 46 and 81 percent, respectively. Securitization was already well established among conforming loans, as the GSEs had been securitizing them for two decades; 72 percent of conforming loans were securitized in 2001. The real boom in securitization since 2001 came from subprime and Alt-A loans, as the share of these loans that were securitized had jumped 75 percent since 2001. *By 2006, securitization was funding most of the mortgage loans in the lower rated categories — the loans that are in trouble now.*

FIGURE 5:

Securitization Rates by Type of Mortgage, 2001 and 2006; percent



Source: Inside Mortgage Finance

20. Inside Mortgage Finance 2008 Mortgage Market Statistical Annual; authors' calculations

More Securitization and More Leverage—CDOs, SIVs, and Short-Term Borrowing

As noted, while the GSEs dominated the securitization market during the 1980s and 1990s, by 2000 they began losing market share to private financial institutions as more and more subprime mortgages began to be securitized. As the securitization market came to be dominated by the financial sector, it grew more complex, and more opaque. Not only did the market become riskier and less transparent, but it shifted into a financial world that was unregulated and little understood. As banks, brokers, hedge funds, and other institutions utilized new financial innovations to maximize their exposure to these products, they fuelled the demand for risky mortgages and inflated the bubble that ultimately burst in August 2007.

As discussed above, securitization has been an extremely positive innovation for credit markets. By allowing banks to sell whole loans off their books, and by distributing risk according to the risk appetite of investors, it (presumably) has lowered the cost of lending for all and facilitated the extension of credit to new borrowers who otherwise would be shut out of credit markets.²¹ However, as the market became increasingly opaque and complex, new instruments based on technical computer models were wildly traded by highly leveraged institutions, many of whom did not even understand the underlying models. In good times, these arcane instruments were sources of enormous profits, but their complexity and the lack of any serious infrastructure and public information about them created a massive panic in the financial system that began August 2007.

One of the central reasons the current crisis has been so severe (and that the bubble inflated so enormously) was that much of the subprime mortgage exposure has been concentrated in the leveraged financial sector. The term “leverage” typically refers to the use of borrowed funds to magnify returns on any given investment. If asset prices are rising, and

the cost of borrowing is low, then banks will naturally try to maximize their exposure to rising asset prices by borrowing as much as they can. While borrowed funds are central to the concept of “leverage,” its definition can expand to any instrument through which a bank can magnify its exposure to a given asset. We discuss such instruments below.

Collateralized Debt Obligations

As the securitization of mortgages increasingly became an affair of the private financial sector, it spurred further innovation in products that in good times generated large profits, but have also been the source of some of the biggest losses since the crisis unfolded in 2007. Collateralized Debt Obligations (CDOs) represented a further step into the brave new world of securitization that really exploded after 2000. CDO issuers purchased different tranches of MBS and pooled them together with other asset-backed securities (ABS). The other ABS were largely backed by credit card loans, auto loans, business loans and student loans. A “senior” CDO was made up predominantly of the highly rated tranches of MBS and other ABS, while “mezzanine” CDOs pooled together a higher share of junior tranches. Unlike an MBS, whose assets consisted of actual mortgage payments, a CDO’s assets were the securities that collected those mortgage payments; in a sense CDO’s “re-securitized” existing securities. Figure 4 would look very much the same to describe a CDO rather than an MBS. Indeed, a CDO essentially “re-applied” the structure of an MBS. A CDO could thus further re-distribute the risk of its assets by re-tranching and selling off new securities. In a seemingly miraculous form of “ratings arbitrage,” a mezzanine CDO could pool together low-grade junior tranches of MBS and other ABS and could convert some of them into new senior AAA-rated securities. The payment stream of an AAA-rated tranche of a mezzanine CDO was thus based on junior-rated MBS and ABS.

21. For a more technical explanation of structured finance, see Ashcraft and Schermann (2008) or Gorton (2008).

The issuers worked directly with ratings agencies to structure the CDO tranches so that they could optimize the size of highly-rated tranches in order to lower the funding costs of the CDOs; since the coupon rate on AAAs is lower than those on A- or BBB, it costs less to issue a highly-rated security than a lower one. Naturally, an issuer wants to maximize the size of the senior tranche so as to lower the cost of funding. However, the higher the share of senior tranches, the lower the subordination and thus protection of those tranches. As an additional protection, CDO issuers would purchase credit default swaps (CDS) or credit insurance to raise ratings on the securities they issued and to shield the AAA tranches from the default risk (see discussion below). However, when a wave of CDO downgrades hit in 2007²², many previously highly-rated tranches became exposed to losses. In practice, therefore, the reduced net risk exposure that CDOs appeared to embody was mostly illusory and, importantly, this second round of securitization made it even more difficult for investors to determine what risks they were actually taking.

The first CDO was created in 1987 by the now-defunct Drexel Burnham Lambert, but this security structure was not widely used until the late 1990s when a banker at Canadian Imperial Bank of Commerce first developed a formula called a Gaussian Copula that theoretically could calculate the probability that a given set of loans could face correlated losses.²³ Annual CDO issuances went from nearly zero in 1995 to over \$500 billion in 2006. As CDO issuances grew, so did the share of them that was devoted to mortgages: Mason and Rosner (2007) tell us that 81 percent of the collateral of CDOs issued in 2005 were made up of MBS, or about \$200 billion total. Thus, during the last several years of the

housing bubble, CDOs increasingly funded mortgage loans, especially subprime ones.

Indeed, Mason and Rosner (2007) go even further to explain the insight that CDOs added significant liquidity to, and thus helped fuel the demand for, subprime mortgages and MBS. They estimate that in 2005, of the reported \$200 billion of CDO collateral comprised of subprime MBS assets issued in that year, roughly \$140 billion of that amount was in MBS rated below AAA (i.e. “junior” tranches). They then use figures from the Securities Industry and Financial Markets Association to estimate that roughly \$133 billion in “junior” tranche MBS were issued in 2005. Thus, CDOs purchased more “junior” tranche MBS in 2005 than were actually issued that year! While these estimates are not precise, they make the clear case that CDOs provided nearly all the demand for lower-grade subprime MBS during the later boom years, and in so doing provided a critical credit source for subprime mortgages, fueling demand and inflating the bubble.²⁴

Structured Investment Vehicles and Off-Balance Sheet Entities

One of the constraints on banks and some other institutions is that they must meet capital requirements, that is to say, they must fund a given percentage of their assets with shareholders’ capital rather than with some form of debt. Capital requirements for banks are mandated jointly by the FDIC, the Comptroller of the Currency, and the Federal Reserve. As we will discuss in a forthcoming report, since 1989, when the international Basel Accord went into effect, U.S. banks have had to meet both the Basel requirement and a separate U.S. standard. Capital requirements lower the profitability of the

22. Moody’s (2008a) reports that of the CDOs it rated, a record 1,655 were downgraded in 2007 – 10 times the amount downgraded in 2006.

23. For a very interesting discussion of this formula, and its implications for the recent explosion in CDO issuances, see Mark Whitehouse, “Slices of Risk: How a Formula Ignited Market that Burned Some Big Investors,” *Wall Street Journal*, September 12, 2005.

24. A technical fact that further illustrates the degree to which CDOs fueled demand for subprime MBS comes from the financing structure for securitized products. Mason and Rosner (2007) explain that while a typical MBS consists of 90 percent senior tranches and only 10 percent junior tranches, the junior tranches must be sold first before any of the senior tranches can be sold. Thus, presumably an MBS issuer cannot sell any AAA-rated tranches from a pool of mortgages before it gets rid of the lower-grade tranches first. By seemingly providing the sole demand for junior tranches, CDOs thus added the liquidity necessary to sell the entire MBS structure.

banks, since they limit the extent to which banks can leverage any initial shareholder investment (plus accumulated retained earnings). Naturally, therefore, banks looked for ways to circumvent the requirements. The favored means of getting around these mandated capital requirements became what were known as Structured Investment Vehicles (SIVs), an off-balance sheet SPV set up by banks to hold MBS, CDOs and other long-term institutional debt as their assets.²⁵ By dodging capital requirements, SIVs allowed banks to leverage their holdings of these assets more than they could on their balance sheets. To fund these assets, the SIVs issued asset-backed commercial paper (ABCP) and medium term notes as their liabilities, mostly with very short-term maturity that needed to be rolled over constantly. Because they obtained the legal title of “bankruptcy remote,” SIVs could obtain cheaper funding than banks could, and thus increased the spread between their short-term liabilities and long-term assets — and for awhile they earned high profits. SIV assets reached \$400 billion in July 2007 (Moody’s 2008b).

Until the credit crunch hit in August 2007, this business model worked smoothly: a SIV could typically rollover its short term liabilities automatically. Liquidity risk was not perceived as a problem, as SIVs could consistently obtain cheap and reliable funding, even as they turned to shorter term borrowing (see Figure 6). Technically, the SIVs were separate from the banks, constituting as a “clean break” from a bank’s balance sheet as defined by the Basel II Accord (an international agreement on bank supervision and capital reserve levels), and hence did not add to the banks’ capital or reserve requirements. Once the SIVs ran into financial trouble, however, the banks took them back onto their balance sheets for reputational reasons, to avoid alienating investors and perhaps to avoid law suits.²⁶

Leverage and the Push To Short-Term Borrowing

The increase in leverage over the course of the subprime bubble was widespread, spanning across many financial institutions and across many forms of instruments. This increase in leverage, as well as the growth in aggregate liquidity, was linked to the prolonged rise in house prices and asset prices across the board. Adrian and Shin (2007) illustrate the perhaps counterintuitive, but extremely important, empirical insight that when financial institutions are forced to mark-to-market, meaning that they must assign a value to an asset based on its current market valuation, rising asset prices immediately show up on banks’ balance sheets, which increases the banks’ net worth and directly reduces their leverage ratio. If banks were passive, their total leverage would fall. However, financial institutions are far from passive; when asset prices are rising it is highly unprofitable for a bank to be “under-leveraged” and they will look for ways to utilize their new “surplus capital.” This search to utilize surplus capital means banks will look to further expand their balance sheet and increase their leverage. This phenomenon, for which the authors provide empirical evidence, leads to an expansion in aggregate liquidity and aggregate leverage in the financial system. As the authors put it on page 31, “Aggregate liquidity can be seen as the rate of growth of aggregate balance sheets.”

In the context of the housing bubble, a feedback loop was created as the sustained rise in asset prices in mortgage-related products increased the net worth of banks, which, in turn, fueled the search for more leverage and further increased the demand for these assets. When the crisis hit asset prices plummeted, and the feedback loop worked in the opposite direction as leveraged institutions

25. IMF (2008) cites Standard and Poor’s to estimate that close to 30 percent of SIV assets were MBS as of October 2007, with 8.3 percent in Subprime MBS; 15.4 percent was in CDO’s.

26. The seeming contradiction that a SIV could be considered a “clean break” from a bank’s balance sheet, yet the bank could still act as the “bailout of last resort,” was made possible by a legal footnote called “implicit recourse” outlined in the Basel II Accord that says a sponsoring bank may provide support to a SIV that exceeds its “contractual obligations” to preserve its “moral” standing and protect its reputation.

found themselves exposed with very little capital and sharply increased leverage and were forced to shrink their balance sheets. This loop contributed to the “freezing up” of liquidity in credit markets.

Investment banks were not supervised like deposit-taking commercial banks and did not have the same capital requirements, thus they were able to increase leverage to a greater extent. Nor were investment banks subject to the regulatory restrictions that accompany the capital requirements. Institutions such as Bear Stearns and Lehman Brothers borrowed at very short term and held risky longer-term assets, with low levels of capital or reserves to cover changing market conditions. Greenlaw et al (2008) calculate that while commercial banks are on average leveraged 9.8:1, broker/dealers and hedge funds are leveraged at nearly 32:1 (the GSEs were leveraged at 24:1 even though they were regulated).

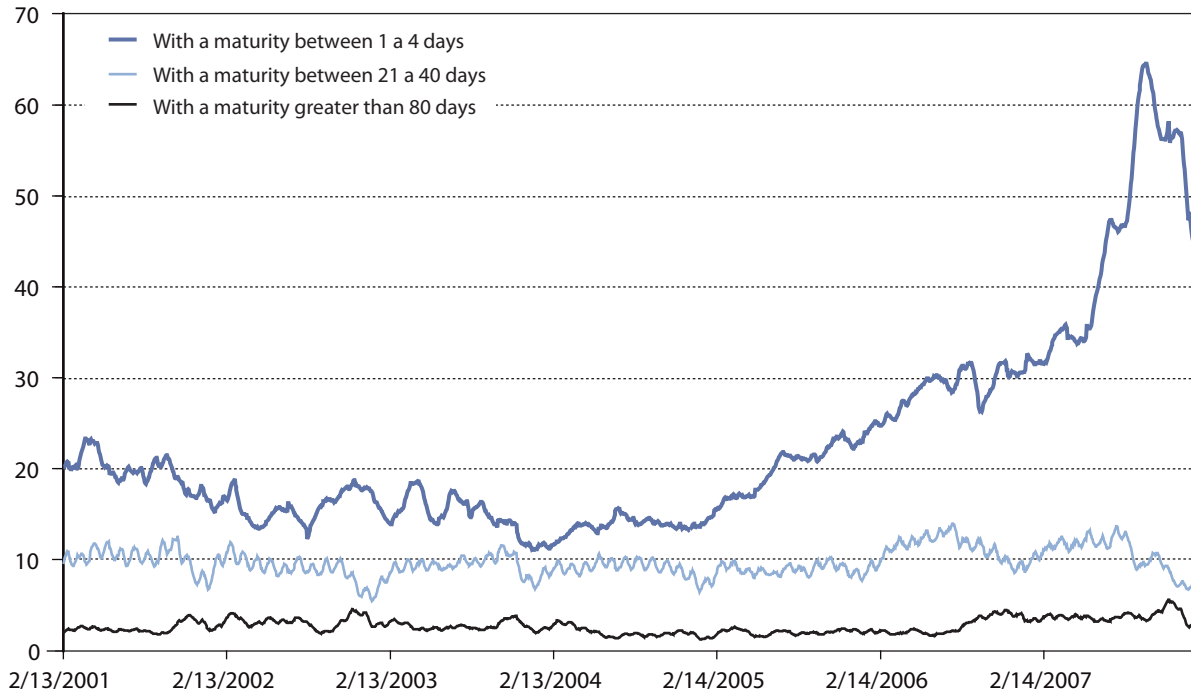
One of the favorite instruments of short-term borrowing for investment banks became the overnight repurchase agreement, or “repo loan” (See Morris and Shin 2008 for an insightful discussion). Overnight repos are a form of “collateralized borrowing” whereby a bank pledges its assets as collateral in an overnight loan with another bank. To oversimplify, Bank 1 sells a portion of its assets to Bank 2, with the understanding that it will buy back the assets the next day at a slightly higher price. This process was deemed a low credit risk during the good times, but had profound systemic implications because it connected financial institutions to each other so that when one got into trouble, its problems spread to the other institutions with which it was trading. Overnight repos became an increasingly important

source of funding for investment banks. Brunnermeier (2008) shows that from 2001 to 2007, overnight repos as a share of total investment bank assets grew from roughly 12 percent to over 25 percent. That is, by 2007, investment banks were rolling over liabilities equal to *one quarter of their balance sheet* overnight.

Figure 6 shows another example of the rapid increases in short-term borrowing, with maturity as low as one day that occurred as the boom peaked in 2006 and early 2007 in Asset-Backed Commercial Paper markets. As discussed above, ABCP is issued by off-balance sheet entities like SIVs to fund long-term assets. Like repos, ABCP was a form of “collateralized borrowing,” meaning that the issuer put up a certain value of its assets as collateral for the paper it issued. As many large banks set up off-balance sheet entities to escape regulatory scrutiny, ABCP became an important source of funding for many large institutions. Figure 6, though, illustrates the striking fact that the growth in ABCP issuance since around 2004 was nearly entirely in extremely short-term paper with maturity between 1 and 4 days. Overnight ABCP, like repos, increasingly became a way for banks to rely on shorter and shorter term borrowing to fund their assets. This source of funding was cheaper than longer-term borrowing, and until August 2007, it could be rolled over like clockwork. The drying up of these short-term funding markets has been an important element in the financial crisis since August 2007. When short-term liquidity funding like ABCP and repos suddenly dried up, financial institutions effectively faced a “run” and found themselves exposed with very little capital.

FIGURE 6:

Total Value of Asset-Backed Commercial Paper Issuance by Date of Maturity, Daily 30-day Moving Average since February 2001 in billions



Source: Federal Reserve

In summary: the potential advantages securitization offers are that it allows loanable funds to shift easily among regions and even countries; and it distributes risk to lenders most willing to bear it, which reduces the price of risk. It was also expected to shift risk out of the heart of the payments system and reduce the risk of financial crisis. The increased use of leverage and short-term borrowing complemented the rise in securitization, as institutions sought to magnify

their exposure to rising asset prices. As we discuss in future reports, while securitization was meant to spread out risk away from the center of the financial system, exactly the opposite happened. When the credit crisis hit in August 2007, risk that was meant to be dispersed throughout the system was in fact heavily concentrated among leveraged institutions at the heart of the financial system.

Credit Insurance and Tremendous Growth in Credit Default Swaps

The process of securitization was further aided by the growth of credit insurers and derivatives called Credit Default Swaps (CDS), which in principle allowed the default risk to be taken out of mortgage-backed securities and CDOs before they were marketed to general investors. The first forms of credit insurance were developed by so-called mono-line insurers such as MBIA and Ambac, which had emerged in the early 1970s to back municipal bond issues. These insurance companies had very strong credit ratings and they sold default insurance to issuers of municipal bonds. By providing default insurance, the mono-lines allowed the municipalities to borrow at AAA rates, whereas without insurance they would have faced lower ratings and hence higher borrowing costs. The mono-lines collected fees and the municipal borrowers ended up with lower net costs even after paying the fees. This proved to be a good if not exciting line of business because defaults are rare on municipal bonds. The mono-lines were able to take advantage of “ratings arbitrage” and it worked out well because the rating agencies were overestimating the chances of defaults on municipal bonds—at least until now.

Having developed this line of business, the mono-line companies, along with banks, hedge funds, and financial guarantors such as AIG expanded their business model into structured products related to the housing market, selling Credit Default Swaps to insure holders of MBS, CDOs and other assets against mortgage default risk. So, just as in the case of municipal bonds, the CDS was an instrument for a ratings arbitrage, providing an outside credit enhancement to the issuers of MBS and CDOs to obtain AAA ratings for their bonds – many of which would otherwise be considered lower-grade. Like credit insurance, a CDS transaction involves a “protection buyer” – a bond issuer trying to raise ratings

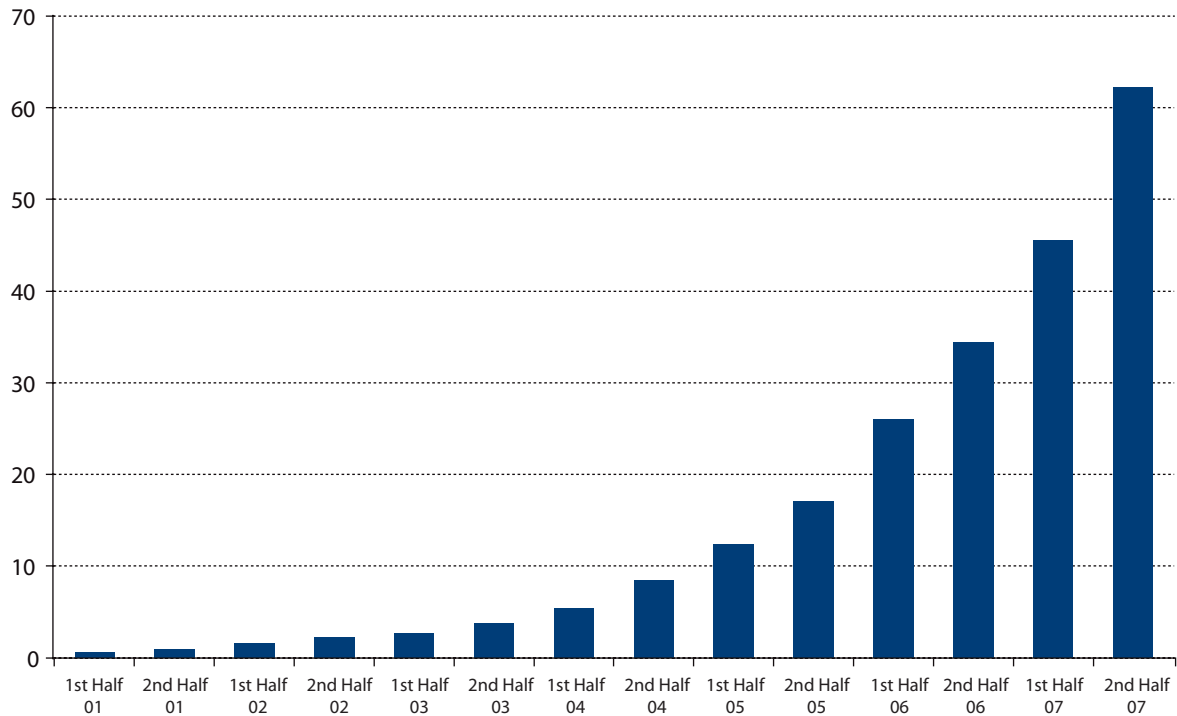
and shield certain bonds from default risk – and a “protection seller,” a counterparty who receives a fixed income stream in return for assuming the default risk. However, these transactions were not overseen by any regulatory body. They were done in Over the Counter (OTC) markets, so that no one other than the two parties knew the terms of the contract. Thus, there exists no public knowledge as to how many CDS transaction most institutions have made.

Furthermore, there are no minimum capital or asset requirements for the protection seller, so there is no guarantee that in the case of default the seller will have adequate funds to make full payment — an issue called “counterparty risk,” which has especially become a concern since Bear Stearns, a giant derivatives trader, collapsed in March 2008. In good times, though, CDS were yet another way for financial institutions to leverage their exposure to the mortgage market. An AIG executive said as late as August 2007 that “It is hard for us, without being flippant, to even see a scenario within any kind of realm of reason that would see us losing one dollar in any of those [CDS] transactions.”²⁷ Just over a year later, the federal government provided AIG with an \$85 billion loan to cover losses it faced on its CDS contracts (then followed by an additional \$38 billion).

Especially since 2000, the business of insuring mortgage-related assets, along with corporate bonds and other assets, grew exponentially. Figure 7 illustrates the exponential growth in the CDS market since 2000. The size of outstanding CDS reached a staggering \$60 trillion in 2007. As of September 2008, AIG, a financial guarantor, had itself sold nearly \$500 billion worth of CDS — most of it insuring ill-fated CDOs. As the CDS market ballooned, so did the share of CDS sold by leveraged institutions

27. Gretchen Morgenson, “Behind Insurer’s Crisis, Blind Eye to a Web of Risk.” *The New York Times*; September 27, 2008.

FIGURE 7:
Value of Credit Default Swaps Outstanding; in trillions



Source: International Securities and Derivatives Association

like hedge funds and investment banks, relative to more capital-intensive mono-line insurers. According to Fitch (2007), hedge funds drove nearly 60 percent of CDS trading volume in 2006. As the CDS market spread further into the unregulated, opaque financial world, its enormous scale and systemic implications went largely unnoticed until the crisis hit in August 2007.

Credit insurance and CDSs are valuable innovations because by assuming the default risk of a transaction, they facilitate lower funding costs and easier access to funding liquidity for institutions that may otherwise not have access to it. In May 2006 Alan Greenspan called them the “most important instrument in finance,” adding, “What CDS did is lay-

off all the risk of highly leveraged institutions...on stable American and international institutions.”²⁸ However, this powerful tool became a big problem because of the enormous size of the market and because participants created an instrument which financial institutions used to leverage their exposure to an asset class and put very little capital on the line. Furthermore, contrary to Greenspan’s 2006 comment, the biggest source of recent growth in the CDS market was not among “stable” institutions, but rather among unregulated “highly leveraged” institutions like hedge funds and investment banks. Insurance for life and property and casualty, on the other hand, are highly regulated and very capital intensive.

28. From remarks on May 18, 2006 to the Bond Market Association in New York.

The Credit Rating Agencies

The lack of transparency of CDOs made the market reliant on the grades of ratings agencies as a signal of the risk of CDO assets. Regulators were not involved in these markets, so rating agencies essentially acted as proxies for regulators; indeed, an office as high as the U.S. Office of the Comptroller of the Currency, which regulates nationally chartered banks, depended on rating agencies to assess CDO quality.²⁹ Furthermore, CDOs are themselves such complex instruments that independent judgment of risk is very difficult.

The principal rating agencies – Moody’s, Fitch and Standard & Poor’s -- used complex quantitative statistical models called Monte Carlo simulations to predict the likely probability of default for the mortgages underlying the CDOs and eventually to structure the CDO (or MBS) in the way described in the previous section: separating the risk into the different tranches and calculating the required amount of subordination and credit enhancement for each tranche as computed by the model. The information fed into these models to calculate default probabilities consisted of the characteristics of the mortgage pool, in terms of credit scores of the borrowers, the cumulative loan-to-value (CLTV) ratio, documentation of income (or lack thereof), whether the mortgages were for the borrower’s primary residence, as well as historical default rates on similar mortgages.

At the outset, this approach was problematic in that the historical default rates used in these models were largely from the years 1992 until the early 2000s³⁰ – a period when mortgage default rates were low and home prices were rising. By basing their estimates of default probabilities of newly issued CDOs on a historical period during a housing boom when home prices increased each year in both real and nominal terms, they did not factor in correctly the possibility of a general housing bust in which many mortgages are more susceptible to go into default. The reduction of risk in a pool of mortgages depends on the extent to which default probabilities within the pool are not correlated. If there is a general downturn in housing across the country (which no one at the time believed was possible), then the probabilities of default go up across the board.

Unlike the case of corporate bonds, where a ratings agency passively rates the risk of a company, with structured products the agencies “run the show.”³¹ The ratings agencies advised CDO issuers on how to structure the CDO with the lowest funding possible. To do so, CDO issuers would work with the agencies to optimize the size of the tranches in order to maximize the size of highly-rated, lower yielding tranches. Since the agencies were receiving substantial payments for this service, it created a clear conflict of interest. If CDO issuers did not get the rating they

29. Richard Tomlinson and David Evans, “The Ratings Charade,” *Bloomberg*, July 2007. As we discuss later, federal law requires or relies upon the use of credit ratings in many other contexts.

30. Ashcraft and Schuerman (2008)

31. Quote taken from Charles Calomiris, professor at Columbia, in Richard Tomlinson and David Evans, “The Ratings Charade,” *Bloomberg*, July 2007.

wanted, they could try another agency, taking their fees with them – an act known as “ratings shopping.” According to the *New York Times*, Moody’s profits tripled between 2002 and 2006 to \$750 million, mostly because of the fees from structured finance products.³² According to Coval et al (2008), fees from structured finance products made up 44 percent of Moody’s revenue in 2006.

While the rating agencies appear to have faced perverse incentives, it was the opacity of the entire system that magnified the effect of their poor judgment and “ratings inflation.” Not only did markets in CDOs and other structured products become so complex that ratings became the only way investors could judge risk, but most institutional investors face rules that only allow them to purchase investment-grade assets, as judged by the rating agencies. Thus the three agencies became the effective “arbiters of risk” for the entire market in structured finance products.

32. Roger Lowenstein, “Triple-A Failure, *New York Times Magazine*, April 27, 2008.

Federal Reserve Policy, Foreign Borrowing and the Search for Yield

One of the culprits often cited for the financial crisis is the Federal Reserve's policy of keeping interest rates low for a long time in order to help the economy pull out of the 2001 recession. The unemployment rate was rising and inflation was falling (see the analysis in Taylor (2007)). The Federal Funds rate was moved down to 1 percent in mid 2003 and held at that level until mid 2004. With short term rates as low as 1 percent, many financial institutions struggled to earn returns they considered adequate. Money market mutual funds had trouble covering expenses and paying any return above zero to their investors, while other fund managers searched desperately for higher yielding assets without taking on undue risks. One fund manager described the situation to us as follows: he felt compelled to purchase mortgage and other asset-backed securities because they offered superior yields and were highly rated by the credit agencies. He knew that the risks might turn out to be larger than were being allowed for, but his clients would have pulled their money out of his funds had he not made the investments. Competing investment funds were advertising high returns and low risks. Because it kept short-term interest rates so low for so long, it is argued, the Fed encouraged this behavior.

Should the Federal Reserve have kept interest rates at a higher level, or raised them sooner in order to avert the housing price bubble? Edwin Truman and Michael Mussa of the Peterson Institute have both argued that monetary policy should be adjusted when there are clear signs of developing asset price bubbles. See Mussa (2004) and Truman (2005). For example, equity prices moved very high in the late 1990s, especially technology stocks but the whole market also. The equity bubble then burst and many Americans were severely impacted. There had been overinvestment in technology capital stock in the 1990s, and the subsequent slump in technology investment after the tech bubble burst was instrumental in causing the 2001 recession. If interest rates had been moved up

more quickly in the 1990s, perhaps this bubble could have been avoided or reduced in size. Again in the 2000s, the housing bubble resulted in a huge construction boom and associated spending on furniture, appliances and so on. Since the Federal Reserve is charged with keeping the economy on an even keel, there is a case that monetary policy should have become tighter sooner to counteract the overinvestment in housing. Some small amount of economic growth might have been sacrificed in 2003 to 2007, but to the benefit of economic growth later, if the slump had been avoided.

Our Brookings colleague Douglas Elmendorf (2007, 2008) has made the counter argument. He concluded that monetary policy was only a little too expansionary in the early part of this decade when judged by the outcomes of unemployment and inflation. Given the other forces affecting the aggregate economy, low interest rates were appropriate. He notes that countercyclical policy is a very blunt tool, and the impact on the overall economy would need to be very large to ensure that an asset price bubble was actually deflated.

He also points out that it is very hard *ex ante* to determine when asset price appreciation is really part of a bubble. For example, then-Fed Chairman Alan Greenspan warned about "irrational exuberance" in the stock market in 1996 when the Dow Jones index was only at 6,000. Anyone getting out of the market at that point, as some did, would have missed out on large and sustained capital gains. More recently, an article by Jonathan McCarthy and Richard W. Peach (2004) of the New York Federal Reserve Bank concluded that there was little evidence of a bubble in house prices at that time. Thus, counting on the Fed to accurately assess asset price bubbles is problematic.

Although in past writing we have found this argument persuasive, we now side with those favoring adjustments of monetary policy to ameliorate asset price bubbles. The housing bubble and collapse has been

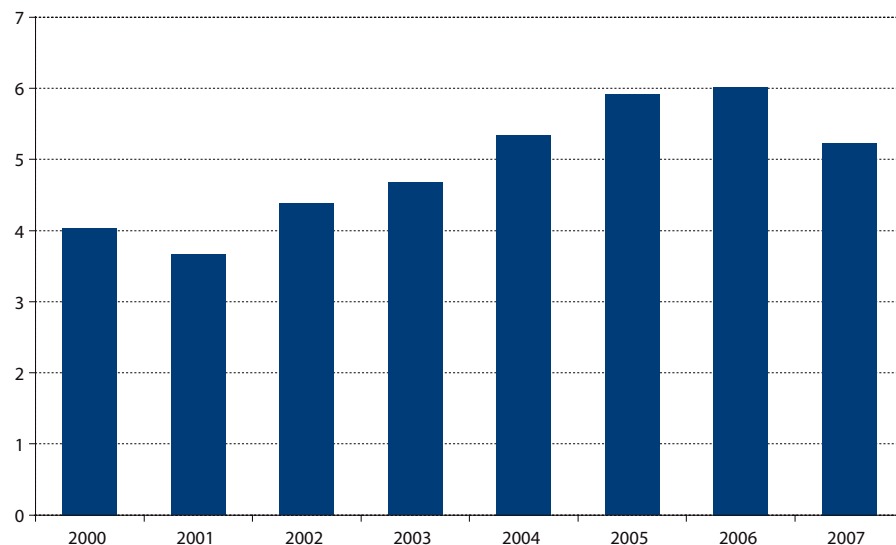
so costly to taxpayers and the economy that it would have been worth the price in terms of slower economic growth 2004-2007 in order to lessen the collapse we are now going through. While it is difficult to know for sure if there is an asset price bubble when it is happening, there are situations where the probability of there being a bubble is high. Most careful observers of the housing market in 2006 knew that a collapse was very possible. Even if McCarthy and Peach were correct about there being no bubble in 2004, there sure was one a couple of years later. We now conclude that monetary policy, which kept interest rates so low, was one reason for the financial crisis.

Even so, it is a mistake to overstate the possible impact that might have resulted from a different path for the short-term Federal Funds rate. The Fed sets this rate but not the broad spectrum of interest rates, as can be seen back in Figure 1. The Fed tightened monetary policy starting in 2004 but the mortgage interest

rate stayed very low compared to its past history.³³ Apart from Fed policy, one very important reason interest rates have remained low in the United States and around the world is because the supply of savings has been large relative to the demand for funds for investment.³⁴ The United States is a low saving, high borrowing economy and has financed both its budget deficits and residential investment by foreign borrowing. In part, this has been direct funding by foreign institutions of U.S. companies and mortgage debt instruments. But since money is fungible, it does not matter greatly which assets foreigners were buying; the key is that they were willing to finance a very large capital inflow to the United States. The inflow of capital has as its counterpart the current account deficit and Figure 8 shows the very large and growing U.S. deficit in recent years. Because of the globalization of financial markets and because of all the money from around the world looking for returns, the U.S. economy was able to finance its housing boom at low interest rates.³⁵

FIGURE 8:

Capital Inflows to the US Economy (Equal to the Current Account Deficit) Reached Over 6 percent of GDP in 2006



Source: Bureau of Economic Analysis

33. One important factor in the crisis is that institutions were borrowing short and lending long, as we noted earlier. To a degree, the low short-term interest rate policy of the Fed encouraged this, but importantly, this pattern persisted and even intensified even well after the Federal Funds rate was raised to 5¼ percent. The undoing of the short-term borrowers came when the risk premium increased sharply, as we describe in the following report.

34. Economists have not developed a consensus theory of the determination of interest rates and we do not intend to get into the middle of that debate. It is sufficient to note that both monetary policy and the global supply of and demand for savings are important.

35. There is another way of looking at this issue which says that it is not that the inflows allowed the U.S. to keep interest rates low; rather it is that capital inflows and the associated high dollar and weak demand for our net exports required us to keep interest rates low in order to generate enough aggregate demand to maintain full employment. If there had been no global savings glut many things would have been different, with more U.S. net exports and the FED would have operated a different monetary policy with higher interest rates. A key issue is the composition of economic growth and whether an economic expansion is “balanced.”

We cannot know exactly the counterfactual of what the U.S. economy would have looked like if foreigners had not been willing to lend to the U.S. on such favorable terms. But it seems highly likely that there would have been higher U.S. interest rates and less of a housing boom. In some sense, therefore, one can assign a fraction of the “blame” for the housing bubble on those who sent capital to the U.S. economy. That is a tricky argument, however. An important policy goal for the U.S. has been to keep interest rates low on average to encourage investment and economic growth. The discipline in the federal budget developed in the 1990s was justified, correctly, on this basis. Generally, it is

better to finance investment with savings generated at home, but if those savings are not forthcoming, it is better to keep investing productively and borrow the money. Without access to foreign funds, the U.S. economy would have invested less in all kinds of capital. The problem was the diversion of too much investment into housing that was not productive at the margin, a problem we should blame on ourselves more than on those who lent the money. Moreover, foreign investors have taken a big hit from their lending to us as banks all across the globe have faced heavy losses on their assets related to US mortgages.

BOX 3:**A Timeline of the Initial Wave of the Crisis****December 2006**

- Ownit Mortgage Solutions files for bankruptcy.

February 8, 2007

- HSBC Holdings, a large London-based bank, announces a \$10.5 billion charge for bad debt, topping analysts' estimates by over \$2 billion. The company claims that the 20 percent increase in the charge is due to its U.S. subprime mortgage portfolio.

February 28

- Freddie Mac announces that they will no longer purchase subprime loans.

March 13

- Mortgage. Banker Association data for the last three months of 2006 shows late or missed payments on mortgages rose to 4.95%, rising to 13.3% in the subprime market.

April 3

- New Century Financial a large subprime mortgage lender files for Chapter 11 bankruptcy.

June 10-12

- Moody's downgrades the ratings of \$5 billion worth of subprime RMBS and places 184 CDO tranches on review for downgrade. S&P places

\$7.3 billion of 2006 vintage RMBS on downgrade watch and announces a review of CDO deals exposed to subprime RMBS bonds.

June 12

- Bear Stearns announces trouble at two of its hedge funds, High-Grade Structured Credit Strategies Enhanced Leverage Fund and Bear Stearns High-Grade Structured Credit Strategies Master Fund, citing deterioration in the value of highly rated mortgage backed securities.

June 22

- Bear Stearns attempts to bailout its hedge funds by injecting \$1.6 billion in liquidity in the “Enhanced” fund, which has lost nearly all its value.

July 31

- The two troubled Bear Stearns hedge funds file for bankruptcy.

August 1

- French insurer AXA SA's money-management unit has offered to cash out investors in a billion-dollar bond fund after the fund shrank in size by about 40% in the last month. Two of the AXA fund's sub-funds had lost 13.5% and 12.6% of their value.

Timeline, continued**August 2**

- German bank IKB Deutsche has to be bailed out by a German state-run bank due to troubles from exposure to U.S. Subprime loans.

August 6

- American Home Mortgage Investment Corp files for Chapter 11 bankruptcy.

August 9

- French bank BNP Paribas said it was freezing three funds due to subprime-related losses.
- The European Central Bank and the Federal Reserve expanded funds for lending to banks in response to a widespread liquidity shortage.
- For the first time in years, the amount of Asset-Backed Commercial Paper (ABCP) outstanding falls, signaling a seizing up of credit markets.

August 16

- The Fed announced a half-percentage point cut of its discount rate to 5.75 percent.

August 17

- Countrywide draws down its entire \$11.5 billion line of credit and faces a run.

August 23

- Countrywide receives a \$2 billion liquidity injection from Bank of America.

September 14

- British bank and mortgage lender Northern Rock faces a run on its deposits and receives a liquidity injection from the Bank of England.

September 18

- Federal Reserve lowered the Federal Funds rate by half a percentage point, to 4.75%.

October 15

- Citibank announces a \$6.4 billion write-down.

October 24

- Merrill Lynch & Co. announces an \$8.4 billion write-down.

October 31

- The Fed cuts its target for the Federal Funds rate by a quarter point, to 4.50 percent.

November 4

- Citigroup increases its write-down to \$11 billion and its CEO resigns.

November 7

- Morgan Stanley takes an additional \$3.7 billion write-down.
- Rating agency Fitch says it will review the ratings on CDOs insured by guarantors including Ambac and MBIA.

November 14

- HSBC takes a higher-than-expected \$3.4 billion charge and takes \$41 billion in SIV assets onto its balance sheet.
- Bear Stearns takes a \$1.2 billion write-down for the fourth quarter.

December 11

- Fed announces a quarter percentage-point cut in the Federal Funds rate.

December 12

- In coordination with four other central banks, Fed extends up to \$40 billion in special loans in the next eight days to banks.

December 13

- Citigroup Inc. brings \$49 billion in distressed assets onto its balance sheet.

January 18, 2008

- Washington Mutual Inc reports a \$1.87 billion loss in the fourth quarter.
- Fitch Ratings downgrades Ambac.

January 21

- While U.S. markets were closed for the Martin Luther King Jr. holiday, major worldwide indexes fell, including drops of 7.2% in Germany, 7.4% in India and 5.5% in Britain.

January 22

- Fed cuts Federal Funds rate by three quarters of a percentage point.

March 16

- It is announced that Bear Stearns is to be sold to J.P. Morgan Chase for \$2 a share under an agreement brokered by the Federal Reserve and the Treasury, and enhanced by a \$30 billion loan guarantee from the Fed. This was to forestall the impending bankruptcy of Bear Stearns. This is the first time that the Federal Reserve has provided support to an investment bank.

Regulation and Supervision

For over 30 years there has been a thrust in U.S. policy towards reduced regulation of private markets. Airlines and trucking were deregulated in the 1970s; President Reagan was a supporter of deregulation, as was his philosophical ally, Mrs. Thatcher, in the U.K. Financial markets have also gradually been deregulated, going back to the ability of money market mutual funds to issue interest-bearing checking accounts, through the ending of Glass-Steagall prohibitions on banks. Determining how much deregulation is optimal is tricky, however, as we have seen in the electric power industry. The financial sector is just as tricky, or more so.

In order to prevent bank runs, there has been deposit insurance in the United States since the 1930s that has parallels in other advanced economies. If depositors know their funds are protected, they do not have to rush to withdraw money at the first rumor of trouble. Recently the U.K. bank Northern Rock got into trouble and depositors were lining the streets outside Northern Rock branches because the deposit insurance program in the U.K. did not provide adequate coverage. In addition, the Federal Reserve, like other central banks, stands as the lender of last resort to provide additional liquidity to banks in difficulty, a role that was extended to the investment bank Bear Stearns in March 2008, and since then has effectively been extended to the entire financial system.³⁶ The Federal government has taken on the role of protecting individual bank depositors and the role of protecting the financial sector as a whole.

Given that the Fed and U.S. taxpayers are on the hook to insure deposits and preserve the stability of the financial system, it is appropriate to have regulators that make sure the institutions are behaving

responsibly. In addition, there is a further case for supervision of the mortgage market because buying a house is usually the largest investment a family makes in their lifetime and requires a level of sophistication in financial matters that many or most households do not possess. Markets do not work well when there are information asymmetries and this is such a market.

There is a clear case, therefore, for better regulation in mortgage and financial markets. And in practice, there was still an extensive regulatory apparatus in place in financial markets. As described by a senior executive at one of the large U.S. banks, there were “roomfuls of regulators” going over the books. On the consumer side, anyone who has taken out a mortgage knows that there is a stack of papers to sign created by state and federal (RESPA and TILA) regulators with the goal of protecting borrowers. Why did this level of regulation not work?

This is an issue that will be explored more fully in future papers in this series as we look at what should be done to avoid the same problems in the future, but a couple of points here are notable. There is no unified system of bank supervision, rather a patchwork of state and federal regulators. In researching this paper we have been struck by the complexity of SIVs and CDOs, but also astounded by the byzantine complexity of the U.S. regulatory structure. The FED supervises all bank holding companies and banks that are members of the Federal Reserve System. The Federal Deposit Insurance Corporation provides \$100,000 (recently boosted to \$250,000) of deposit insurance and is the federal regulator of about 6,500 state-chartered banks that are not in the FED system. The Office of the Comptroller of the Currency charters and regulates 1600 national

36. At the time, the Federal Reserve could not provide funds to Bear Stearns directly because it was not a deposit-taking bank, which is why it had to step in through JP Morgan, which was a deposit-taking institution.

banks while 50 state banking departments charter and regulate state banks. Membership in the Federal Reserve System is required for national banks. The Office of Thrift Supervision supervises what is left of the S&Ls. The Financial Standards Accounting Board regulates accounting rules and the SEC regulates corporations, including the investment banks and ratings agencies. No one has clear authority. We have developed a national mortgage market with global connections and yet we have no national, uniform regulatory authority.

Along with the byzantine nature of the federal regulatory system, a significant share of the subprime mortgages — those that are at the root of the current financial crisis — were originated by institutions outside the purview of federal regulation in the first place. Indeed, it is estimated that over half of subprime loans originated in 2004 and 2005 were originated by independent mortgage companies — non-depository companies unaffiliated with any bank (see Cole (2007)). These independent companies were not covered by the FDIC, Federal Reserve, or federal regulation, but rather only by state regulation.

Looking at the kinds of loans that are delinquent now, and thus at the root of the current financial turmoil, it is clear then that a significant share of now delinquent loans were originated “under the radar” of federal regulation. Data from the Mort-

gage Bankers Association says that 6.4 percent of all mortgage loans were delinquent as of 2008Q2, and we estimate that about one quarter of those were originated outside of the federal regulatory system. The same is true of roughly 30 percent of mortgages that entered foreclosure in 2008Q2.³⁷ Thus, even if they were willing and apt enough to rein in on lax lending standards, federal regulators did not have the direct authority to do so for a sizeable share of the market.

The fact that much of subprime lending occurred outside the purview of federal regulators does not exonerate them. Despite the limitations of its authority, the Federal Reserve should have done much more to slow or stop the erosion of mortgage lending standards. Then-Fed governor Edward M. Gramlich warned his colleagues of the decline of lending standards and the dangers that this posed as early as 2000. There is a consumer advisory board that briefs the Fed on its views and its concerns. The minutes of this group’s meeting in 2005 reveal that they were aware of the problems emerging in the mortgage markets and warned the Fed about them. The Federal Reserve had the stature to change things and to influence state regulators. Appropriate warnings given privately or publicly could have significantly reduced the amount of bad lending even in markets where the Fed had no direct legal power. And of course state and federal regulators should have done better also.

37. We estimate these numbers as follows. MBA data shows that as of 2008Q2, 6.41 percent of mortgages were delinquent. Subprime ARMs made up 6.8 percent of all outstanding loans, and 33 percent of them were delinquent. Subprime FRMs made up 6.3 percent of all loans, and 12 percent of them were delinquent. We calculate $(.068) \times (.33) + (.063) \times (.12) = .03$. Thus subprime loans that are delinquent make up 3 percent of all loans. We said above that roughly half of subprime loans were originated by independent mortgage companies, so delinquent subprime loans originated by independent companies make up 1.5 percent of all loans, or $(.015 / .0641 = .23)$ 23 percent of all currently delinquent loans. The calculation for foreclosure starts in 2008Q2 is similar.

The Failure of Company Risk Management Practices

Many financial companies have lost huge amount of money in the aftermath of the crisis and CEOs have lost their jobs. The crisis is not just or even primarily a failure of regulation; it reflects poor internal corporate governance, poor infrastructure in and oversight of opaque financial markets, and most of all, mistakes made by decision-makers in the private sector.

There have been two important assessments made of the failures (and successes) of risk management practices at financial institutions in the wake of the crisis. On March 6, 2008 the Senior Supervisors Group of the Financial Stability Forum issued a report “Observations on Risk Management Practices During the Recent Market Turbulence.” This report was based on a survey of eleven of the largest banking and securities firms (plus there was a roundtable meeting that included five additional firms). The report identifies risk management practices that helped some of these institutions avoid the worst of the losses and the practices that led to failures.

On April 18, the Swiss bank UBS issued a “Shareholder Report on UBS’s Write-Downs” at the request of Swiss banking authorities. It is a lengthy and extraordinary *mea culpa* detailing the problems that resulted in the very large losses that UBS experienced in the mortgage security market.

Readers are referred to the reports themselves for the detailed analysis of best and worst practices, but a couple of points emerge that are the most important. The biggest problems occurred where top managers failed to monitor and control the parts of

their companies that were trading in CDOs and related securities. Financial institutions had in place risk management rules, but they were not followed, largely because so much money was being generated during the boom times. Without exercising adequate supervision, senior managers believed that the risky assets were simply being sold in the marketplace and not held on the balance sheets of the banks. In fact, large amounts were being held, partly because there was a lag between the issuance of the securities and their sale, and partly because holding the securities was (for a time) so profitable.

As we have noted earlier, a major problem was that the credit ratings provided by the agencies were accepted without adequate knowledge of the risks of the underlying mortgage portfolios. And there was not adequate stress testing of the portfolios against a correlated shock (a broad market decline), nor did the institutions take a complete view of their risks. Different parts of the businesses were considered separately, rather than as part of larger company-wide portfolios.

Faced with low interest rates and competitive pressures to generate high returns for investors and high profits for shareholders, several of the financial institutions failed to apply the risk management practices that they already had in place. They have now learned a lesson and doubtless will behave differently in the future, at least for a while. This is a discouraging story, however, because the Sarbanes-Oxley Act of 2002 was intended to beef up risk management practices and make senior managers take full responsibility for avoiding this kind of crisis.

The Impact of Mark to Market

One of the changes in accounting rules that has been introduced gradually into corporate reporting standards is the practice of marking assets on the balance sheet to the value they would have if sold in the marketplace. For many economists this is a common sense move in which companies can no longer carry on their books assets that no longer hold the value being calculated through historical cost and depreciation. Assets that have become more valuable can also be recognized by this approach.

Mark to Market was introduced in 1993 after the S&L crisis, when then backward-looking GAAP accounting standards prolonged the crisis by allowing many thrifts to appear solvent on their books, even though their equity had effectively been wiped out. Because book value of assets was calculated based on the cost at which the thrift bought it, rather than its current market price, bank balance sheets appeared unaffected as asset values plummeted. This opacity allowed banks that should have been shut down to linger on and prolong the crisis. Mark to Market was seen as the solution to bring greater transparency to balance sheets and prevent an S&L type debacle from happening again.

There are two problems that can arise with mark to market accounting, however. The first is that many assets are unique and are not traded regularly in markets. There really is no market price readily available at which to value them. And second, market prices are very volatile and can overshoot on the upside when a bubble is forming, but may

overshoot on the downside when the bubble bursts. Both kinds of overshooting can be problematic. On the upside, company asset values become overstated when marked to market and, as we described earlier, this rise in asset prices can tempt companies to expand lending and over-leverage. When the bubble bursts, asset prices fall too much and banks are forced to contract lending sharply and they may become insolvent if liabilities exceed the value of assets when marked to market. If the institutions were allowed to hold the assets to maturity, in this case, they would realize a greater present value of their cash flow than the short term market valuation would indicate.

An important rationale for the TARP program proposed by Treasury as part of its response to the crisis was to try and restore more accurate and transparent pricing to bank assets. The reverse auction that they proposed was designed to work as a “price discovery” mechanism, allowing markets to find out what some of the distressed assets were really worth when evaluated in terms of their “hold to maturity” value, rather than at the fire sale prices that had prevailed in the atmosphere of the crisis.

There are observers who conclude that mark to market accounting bears a great responsibility for the crisis, forcing institutions into bankruptcy when they had positive net worth, if evaluated on a long-term value basis. At this point in the crisis, the jury is still out on that issue. We just do not know yet what the true value of some of the assets will be.

Lessons from Studying the Origins of the Crisis

This concludes the discussion of the origins of the crisis. We include a timeline of the initial wave of the crisis in Box 3, starting in late 2006 and up to the collapse of Bear Stearns in March 2008. This final section presents a few lessons from the story so far. The next piece in the Fixing Finance series will discuss the spread of the crisis to global markets, the response by regulators, and how it has played out in the Main Street economy.

- Some factors that contributed to the crisis are ones that are not amenable to change, except at unacceptable cost. For example, the housing boom would surely not have continued as it did if funds had not been available on a large scale from foreign lenders. But closing off the U.S. borders to foreign capital is not acceptable. The price would be too high and, given the integration of U.S. companies with the rest of the world, it would be infeasible.
- A more aggressive tightening of monetary policy earlier in the cycle might have constrained the housing boom. We think this would have been a good idea, but there are limits to how much could have been done this way. There were better ways to avoid crisis than pushing the economy into stagnation in 2004 or 2005.
- The erosion of mortgage lending standards stands out as something that could and should have been stopped, especially when there were fears of a housing bubble. The challenge going forward is either to create an incentive structure within the “originate to distribute” model that leads to the outcome we want, or to provide a better and more integrated force of regulators to make sure that there is not too much bad behavior. Or to use a combination of the two.
- Securitization of mortgage assets went beyond the point of value and created assets that were not transparent. We know from economic theory that markets with information asymmetries are trouble and the compounding layers of securitization seem to have been designed to exacerbate this problem.
- The infrastructure of the financial system needs to be overhauled. While complex derivatives like CDS have grown exponentially, no one knows how exposed any one institution is to these products because each CDS transaction is done Over the Counter (OTC) rather than on an exchange. This lack of transparency further exacerbates the problem of asymmetric information and magnified the potential for systemic risk.

- Credit Rating Agencies failed to accurately assess the risk of the securitized assets they graded. They faced a conflict of interest in their fee structure. A big part of the credit ratings problem is that the system got so opaque that rating agencies became the de facto “arbiters of risk,” as everyone — even regulators — came to utterly rely on their opinion of risk assessment. There should be reforms in the credit ratings structure and perhaps less reliance on agency ratings.
- Financial institutions did not follow their own best practices for risk management. In the short run, they will surely make internal changes, but experience suggests that some years from now there will be another problem. Is this problem amenable to policy change or not? Sarbanes-Oxley is already creating competitiveness problems for U.S. financial markets and did not work to forestall this crisis. One important issue in this area is determining whether banks were over leveraged and had inadequate capital. Apparently, Basel II rules did not work either.
- The “pro-cyclicality” of liquidity and leverage in the financial system must be addressed in future regulatory discussions.
- The general public was not given adequate warning of the emerging dangers in the mortgage market. We cannot expect policymakers to second guess markets or to know when assets are overvalued. But we can and should expect policymakers to warn of the growing riskiness of certain assets that might generate large rewards but that could also lead to large losses. Households should have been warned that continuing large increases in house prices were not a sure thing.
- Why did Federal and state regulators not do more? An important issue is that they believed that less regulation was better and that the market would take care of any problems. The push to deregulate of the past thirty years has led to a lack of discrimination in policy. We need to get rid of bad regulation that stifles competition and inhibits innovation, but we need to improve regulation where it can make markets work better and avoid crises.

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