

The Global Financial Crisis 2008

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Dedication

This thesis is dedicated to my mentor Dr. Devin Rafferty, my parents and my brother without whose constant support this thesis was not possible. They inspire me and gave me valuable advice whenever I needed the most.

Brief Author Biography: Rashmi Gupta is a major at Finance who will graduate in 2023. She is graduating from the Masters of Science in Finance from Saint Peter's University in May 2023 and with a concentration in Quantitative Finance.

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Introduction

The term 'financial crisis' can describe a variety of situations associated – in general – with a limited supply of money/ financial resources, compared with the demand for money/ financial resources, while liquidity becomes a problem for all the actors in the market. Usually, a financial crisis is anticipated by the existence of a speculative bubble in one sector or several connected sector of the economy, generated usually by the herd behaviour of investors. The beginning of any financial crisis is signalled by the 'burst' of the bubble – often due to the abrupt halt of the prices rising trends. The climax of the crisis is perceived when the negative effects of the lack of liquidity generate the collapse of financial institution and a general mistrust in the financial system (Pop 2009).

The financial market has been experiencing several 'up and down' due to the occurrence of the different financial crisis issues since 1929. The most recent one is the financial crisis of 2008 which has been definitely the greatest crisis faced by the global financial market. The financial crisis of 2007–2009 is widely regarded as the worst financial crisis since the Great Depression of the 1930s (Thakor 2019). In fact, despite the fact that this crisis appeared several years ago, its effects are still affecting the world economy and investors still fear the possibility of another crisis. Because the last financial crisis had so huge negative impact on the economy, investors and economists showed a great fear due to the last financial crisis of 2008 (Apete 2016). The crisis threatened the global financial system with total collapse, led to the bailouts of many large financial institutions by their national governments, caused big declines in stock prices, followed by smaller and more expensive loans for corporate borrowers as banks pulled back from lending, and decline in consumer lending, as well as lower investments in the real sector. The decline in lending to consumers and corporations also caused unemployment to rise (Thakor 2019). For this reason, financial crisis and the collapse of the financial market has been the subject of many researches because economists and investors

tried to understand how the crisis started, and its impact on the economic growth and development in order to avoid a future occurrence (Apete 2016).

The two economists Karl Case and Robert Shiller (Case und Schiller, 2003) were among the first to warn us of the impending crisis. These researchers pointed toward a dynamic of US house prices driven mainly by price expectations. Anticipations of capital gains on housing property led to a bubble of house prices. The trend of rising prices had started in the 1990s and was not affected by the bursting of the internet bubble. This price development was also fuelled by public policies favouring private home ownership and was excessive relative to fundamentals like interest rates, population growth and construction costs. An important further element in this development was the tendency to extend credit to borrowers with low credit ratings (the so-called subprime market). The business of banks and loan brokers flourished because lenders worked with a new business model. Mortgages were sold to other financial enterprises which tailored a range of saleable financial assets based on the underlying credit claims. The various newly engineered assets differed with respect to their default risk. For several years rating agencies granted excellent ratings to the range of these assets privileged regarding default risk. Hence, for a number of years' financial decision makers world-wide considered these financial assets to have a very favourable risk-return profile. Today we know better (Rotheli,2010).

The subprime mortgage crisis of 2007–10 stemmed from an earlier expansion of mortgage credit, including to borrowers who previously would have had difficulty getting mortgages, which both contributed to and was facilitated by rapidly rising home prices. When house prices peaked, mortgage refinancing and selling homes became less viable means of settling mortgage debt and mortgage loss rates began rising for lenders and investors. In April 2007, New Century Financial Corp., a leading subprime mortgage lender, filed for bankruptcy. Shortly thereafter, large numbers of PMBS and PMBS-backed securities were downgraded to

high risk, and several subprime lenders closed. Because the bond funding of subprime mortgages collapsed, lenders stopped making subprime and other nonprime risky mortgages. This lowered the demand for housing. Prices fell so much that it became hard for troubled borrowers to sell their homes to fully pay off their mortgages.

The housing sector led not only the financial crisis, but also the downturn in broader economic activity. Residential investment peaked in 2006, as did employment in residential construction. The overall economy peaked in December 2007, the month the National Bureau of Economic Research recognizes as the beginning of the recession. The decline in overall economic activity was modest at first, but it steepened sharply in the fall of 2008 as stresses in financial markets reached their climax. From peak to trough, US gross domestic product fell by 4.3 percent, making this the deepest recession since World War II. It was also the longest, lasting eighteen months. The unemployment rate more than doubled, from less than 5 percent to 10 percent.

In this thesis I will be arguing on the statement “The collapse of subprime mortgage 2007-08 led to the collapse of financial markets.” The aim of this thesis is to understand the financial crisis happened in 2007-08 and its causes. It will unfold the root cause of the subprime mortgage crisis on how and when it all began.

The first chapter will talk about the financial crisis, the background of the crisis and the research objectives for this study

Origin and the factors of Financial Crisis

Historical Settings

Over several years, the United States' financial markets have been experiencing several issues, whether that involve the collapse of the stock market to financial or banking crises. Most of these issues left their mark on the real economy and pushed researchers to review their causes in order to understand the future path of growth and potential vulnerabilities. The global financial crisis of 2007 has been considered by many economists to be the worst financial disruption since the Great Depression. If financial crises seem to have different causes and circumstances, it is certain that they have a negative effect to slow down the economy. For example, the financial crisis of October 1907 when the New York Stock Exchange dropped over 50%, causing several bank runs and trust company issues. In turn, this led to a period of economic recession because of spill over effects on the market's liquidity issues and unregulated side bets. Thus, what initially began as an attempt to corner the stock market over the United Copper Company in October 1907 triggered the panic that led many local banks and businesses into bankruptcy (Apete 2016).

Another example of a crisis causing a recession is the banking crisis of 1933, which intensified the Great Depression that was already underway in the 1930s that was initially triggered by the fall in stock prices in the United States and which spread worldwide soon thereafter. Jeff Desjardins (2016) stated that the worldwide GDP fell by about 15% between 1929 and 1932, which ultimately made it the longest and deepest Depression. It is important to mention that this crisis has been used as a benchmark to highlight how far the world's economy can decline (Apete 2016).

The crisis of 2007, known as the Great Financial Crisis, was due to the collapse of the subprime mortgage market associated with the housing boom after two years of increasing

policy rates which broke out in early 2007. In turn, the defaults on mortgages trickled into the system built on assets that used these payment streams to fulfill their liability commitments, and hence they affected investment banks who had overleveraged themselves via complicated derivatives. As a result, we have been experiencing a steep recession and prolonged stagnation because of a credit crunch and the collapse of equities markets, which was ultimately stabilized through the Federal Reserve and other central banks actions to boost liquidity. (Apete, 2016)

Origin

The financial crisis of 2007–2009 was the culmination of a credit crunch that began in the summer of 2006 and continued into 2007. Most agree that the crisis had its roots in the U.S. housing market, although the author will later also discuss some of the factors that contributed to the housing price bubble that burst during the crisis. The first prominent signs of problems arrived in early 2007, when Freddie Mac announced that it would no longer purchase high-risk mortgages, and New Century Financial Corporation, a leading mortgage lender to risky borrowers, filed for bankruptcy (Marshall, 2009). Another sign was that during this time the ABX indexes—which track the prices of credit default insurance on securities backed by residential mortgages—began to reflect higher expectations of default risk (Benmelech and Dlugosz, 2009).

While the initial warning signs came earlier, most people agree that the crisis began in August 2007, with large-scale withdrawals of short-term funds from various markets previously considered safe, as reflected in sharp increases in the “haircuts” on repos and difficulties experienced by asset-backed commercial paper (ABCP) issuers who had trouble rolling over their outstanding paper (Gorton and Metrick 2012).

In addition, exacerbating this stress in the short-term funding markets, and specifically in the shadow banking system during 2007, was a pervasive decline in U.S. house prices,

leading to concerns about subprime mortgages (Thakor, 2015). The credit rating agencies (CRAs) downgraded asset-backed financial instruments in mid-2007, and the magnitude of these actions—in terms of the number of securities affected and the average downgrade—appeared to surprise investors (Marshall, 2009; Thakor, 2015). Benmelech and Dlugosz (2009) show that a large number of structured finance securities were downgraded in 2007–2008, and the average downgrade was 5–6 grades, which is substantially higher than the historical average. For example, during the 2000–2001 recession, when one-third of corporate bonds were downgraded, the average downgrade was 2–3 grades.

Consequently, credit markets continued to tighten. The Federal Reserve opened up short-term lending facilities and deployed other interventions to increase the availability of liquidity to financial institutions, but this failed to prevent the haemorrhaging, as asset prices continued to decline. (Thakor, 2015).

In early 2008, institutional failures reflected the deep stresses that were being experienced in financial markets. Mortgage lender Countrywide Financial was bought by Bank of America in January 2008, and then in March 2008, Bear Stearns, the sixth largest U.S. investment bank, was unable to roll over its short-term funding due to losses caused by price declines in mortgage-backed securities (MBS). Its stock price had a pre-crisis fifty-two-week high of \$133.20 per share, but plunged precipitously as revelations of losses in its hedge funds and other businesses emerged. JP Morgan Chase made an initial offer of \$2 per share for all the outstanding shares of Bear Stearns, and the deal was consummated at \$10 per share when the Federal Reserve stepped in with a financial assistance package. (Thakor, 2015).

These liquidity and solvency problems continued as IndyMac, the largest mortgage lender in the United States, collapsed and was taken over by the federal government. Things worsened as Fannie Mae and Freddie Mac (with ownership of \$5.1 trillion of U.S. mortgages)

became sufficiently distressed and had to be taken over by the government in September 2008. Then, finally, the big shock came when Lehman Brothers filed for bankruptcy on September 15, 2008, failing to raise the capital it needed to underwrite its downgraded securities, while, on the same day, AIG, a leading insurer of credit defaults, received \$85 billion in government assistance, as it faced a severe liquidity crisis. The next day, the Reserve Primary Fund, a money market fund, “broke the buck,” which caused a run on its funds and led to interbank rates spiking (Thakor, 2015).

On September 25, 2008, savings and loan giant Washington Mutual was taken over by the FDIC, and most of its assets were transferred to JP Morgan Chase. By October, the cumulative weight of these events had caused the crisis to spread to Europe. In October, global cooperation among central banks led them to announce coordinated interest rate cuts and a commitment to provide unlimited liquidity to institutions. However, there were also signs that this was being recognized as an insolvency crisis so the liquidity provision initiatives were augmented by equity infusions into banks. By mid-October, the U.S. Treasury had invested \$250 billion in nine major banks, yet the the crisis continued into 2009 and by October, the unemployment rate in the United States rose to 10% (Thakor, 2015).

Factors contributed in housing price bubble

In the many books and articles written on the financial crisis, various authors have put forth a variety of pre-crisis factors that created a powder keg waiting to be lit. Lo (2012) provides an excellent summary and critique of twenty-one books on the crisis. He observes that there is no consensus on which of these factors were the most significant, so the author will discuss each in turn.

1. Political factors

Rajan (2010) reasons that economic inequities had widened in the United States due to structural deficiencies in the educational system that created unequal access for various segments of society. Politicians from both parties viewed the broadening of home ownership as a way to deal with this growing wealth inequality—a political proclivity that goes back at least to the 19th century Homestead Act—and therefore undertook legislative initiatives and other inducements to make banks extend mortgage loans to a broader borrower base by relaxing underwriting standards, and this led to riskier mortgage lending. The elevated demand for houses pushed up house prices and led to the housing price bubble. In this view, politically motivated regulation was a contributing factor in the crisis.

This point has been made even more forcefully by Kane (2009, forthcoming) who argues that, for political reasons, most countries (including the United States) establish a regulatory culture that involves three elements: (1) politically directed subsidies to selected bank borrowers, (2) subsidized provision of implicit and explicit repayment guarantees to the creditors of banks, and (3) defective government monitoring and control of the problems created by the first two elements. These elements, Kane (2009) argues, undermine the quality of bank supervision and produce financial crises.

Perhaps these political factors can explain the very complicated regulatory structure for U.S. banking. Agarwal et al. (2014) present evidence that regulators tend to implement identical rules inconsistently because they have different institutional designs and potentially conflicting incentives. For U.S. bank regulators, they show that federal regulators are systematically tougher and tend to downgrade supervisory ratings almost twice as frequently as state supervisors for the same bank. These differences in regulatory “toughness” increase the effective complexity of regulations and impede the implementation of simple regulatory

rules, making the response of regulated institutions to regulations less predictable than in theoretical models and generating another potential source of financial fragility.

A strikingly different view of political influence lays the blame on deregulation motivated by political ideology. Deregulation during the 1980s created large and powerful financial institutions with significant political clout to block future regulation, goes the argument presented by Johnson and Kwak (2010). This “regulatory capture” created a crisis-prone financial system with inadequate regulatory oversight and a cosy relationship between government and big banks.

2. Growth of securitization and the OTD model

It has been suggested that the desire of the U.S. government to broaden ownership was also accompanied by monetary policy that facilitated softer lending standards by banks. Empirical evidence also has been provided that the OTD model encouraged banks to originate risky loans in ever increasing volumes. Purnanandam (2011) documents that a one standard-deviation increase in a bank’s propensity to sell off its loans increases the default rate by about 0.45 percentage points, representing an overall increase of 32%.

The effect of these developments in terms of the credit that flowed into the housing market to enable consumers to buy homes was staggering. Total loan originations (new and refinanced loans) rose from \$500 billion in 1990 to \$2.4 trillion in 2007, before declining to \$900 billion in the first half of 2008. Total amount of mortgage loans outstanding increased from \$2.6 to \$11.3 trillion over the same period. Barth et al. (2009) show that the subprime share of home mortgages grew from 8.7% year-over-year in 1995 to a peak of 13.5% in 2005.

3. Financial innovation

Prior to the financial crisis, we witnessed an explosion of financial innovation for over two decades. One contributing factor was information technology, which made it easier for

banks to develop tradable securities and made commercial banks more intertwined with the shadow banking system and with financial markets. But, of course, apart from information technology, there had to be economic incentives for banks to engage in innovation. Thakor (2012) develops an innovation-based theory of financial crises, which starts with the observation that financial markets are very competitive, so with standard financial products—those whose payoff distributions everybody agrees on—it is hard for financial institutions to have high profit margins. This encourages the search for new financial products, especially those whose creditworthiness not everybody agrees on.

The lack of unanimity of the investment worth of the new financial products limits how competitive the market for those products will be and allows the offering institutions to earn high initial profits. But such new products are also riskier by virtue of lacking a history. The reason is that it is not only competitors who may disagree that these are products worthy of investment but also the financiers of the institutions offering these products, and there is a paucity of historical data that can be relied upon to eliminate the disagreement. When this happens, short-term funding to the innovating institutions will not be rolled over, and a funding crisis ensues. The explosion of new asset-backed securities created by securitization prior to the crisis created an ideal environment for this to occur.

This view of how financial innovation can trigger financial crises is also related to Gennaioli, Shleifer, and Vishny's (2012) model in which new securities—with tail risks that investors ignore—are oversupplied to meet high initial demand and then dumped by investors when a recognition of the risks induces a flight to safety. Financial institutions are then left holding these risky securities, and this explains the 2007–2009 crisis, as well as many previous crises.

4. U.S. monetary policy

Taylor (2009) argues that the easy-money monetary policy followed by the U.S. Federal Reserve, especially in the six or seven years prior to the crisis, was a major contributing factor to the price boom and subsequent bust that led to the crisis. Taylor (2009) presents evidence that monetary policy was too “loose fitting” during 2007–2009 in the sense that actual interest rate decisions fell well below what historical experience would suggest policy should be based on the Taylor rule.

Taylor (2009) shows that these unusually low interest rates, a part of a deliberate monetary policy choice by the Federal Reserve, accelerated the housing boom and thereby ultimately led to the housing bust. The paper presents a regression to estimate the empirical relationship between the interest rate and housing starts, showing that there was a high positive correlation between the intertemporal decline in interest rates during 2001–2007 and the boom in the housing market.

Moreover, a simulation to see what would have happened in the counterfactual event that the Taylor rule interest rate policy had been followed indicates that we would not have witnessed the same housing boom that occurred in reality. And without a housing boom, there would be no bubble to burst and no crisis. Hence, the impact of low interest rates on housing prices was amplified by the incentives the low interest rate environment provided for lenders to make riskier mortgage loans. When the central bank keeps interest loans low for so long, it pushed down banks’ net interest margins, and one way for banks to respond is to elevate these margins by taking on more risk. This induced banks to increase the borrower pool by lending to previously excluded high-risk borrowers, further fuelling the housing price boom.

It was not only the U.S. central bank that followed an easy-money policy that ripened the conditions for a housing boom. Indeed, in Europe, deviations from the Taylor rule varied

in size across countries due to differences in inflation and GDP growth. The country with the largest deviation from the rule was Spain, and it had the biggest boom in housing, as measured by the change in housing investment as a share of GDP. Austria had the smallest deviation from the rule and also experienced the smallest change in housing investment as a share of GDP. Taylor (2009) notes that there was apparently coordination among central banks to follow this easy-money policy, and hence significant fraction of the European Central Bank (ECB) interest rate decisions can be explained by the influence of the Federal Reserve's interest rates decisions.

5. Global economic developments

Jagannathan, Kapoor, and Schaumburg (2013) have pointed to developments in the global economy as a contributing factor. In the past two decades, the global labour market has been transformed, with emerging-market countries—most notably China—accounting for an increasing percentage of global GDP. The opening up of emerging-market economies, combined with centrally controlled exchange rates to promote exports, has led to the accumulation of large amounts of savings in these countries. And the lack of extensive social safety nets means that these savings have not been depleted by elevated domestic consumption. Rather, the savers have sought to invest in safe assets, resulting in huge inflows of investments in the United States in assets like Treasury bonds and AAA-rated mortgages. When coupled with the easy-money monetary policy pursued in the United States over roughly the same time period, the result was a very large infusion of liquidity into the United States and Western Europe, which contributed to exceptionally low mortgage interest rates.

Now, this would normally lead to an increase in inflation as more money is available to purchase goods and services. However, the rise of emerging market economies meant that companies like Walmart, IBM, and Nike could move procurement, manufacturing, and a

variety of back-office support services to these countries with lower labour costs, and consequently, core inflation remained low in the West and put little pressure on central banks to reverse their easy-money monetary policies. It is argued that the flood of this “hot money” found its way into real estate, increasing demand for housing, and pushing house prices to unprecedented levels.

6. Misaligned incentives

There are many who have suggested misaligned incentives also played a role. The argument goes as follows. Financial institutions, especially those that viewed themselves as too big to fail (TBTF), took excessive risks because of de jure safety-net protection via deposit insurance and de facto safety-net protection via regulatory forbearance stemming from the reluctance to allow such institutions to fail (Bebchuk and Fried, 2010). Such risk taking was permitted due to lax oversight by regulators whose incentives were not aligned with those of taxpayers (Boot and Thakor, 1993). Moreover, “misguided” politicians facilitated this with their overzealous embrace of unregulated markets. (Johnson and Kwak, 1993). This is also the essence of the report of the U.S. government’s Financial Crisis Inquiry Commission (FCIC).

The risk taking was a part of the aggressive growth strategies of banks, which were pursued to elevate net interest margins that were depressed by the prevailing low-interest-rate monetary policy environment, as discussed earlier. Banks grew by substantially increasing their mortgage lending, which provided increased “throughput” for investment banks to securitize these mortgages and create and sell securities that enhanced these banks’ profits, with credit rating agencies being viewed as complicit due to their willingness to assign high ratings to structured finance products.

An additional consideration involves reputational concerns Thakor (2005) develops a theory in which banks that have extended loan commitments over lend during economic booms and high stock price periods, sowing the seeds of a subsequent crisis.

The prediction of the theory that there is over lending by banks during the boom that precedes the crisis seems to be supported by the data. There is also evidence of managerial fraud and other misconduct that may have exacerbated the misalignment of incentives at the bank level. Piskorski, Seru, and Witkin (2014) provide evidence that buyers of mortgages received false information about the true quality of assets in contractual disclosures made by selling intermediaries in the non-agency market, and show that misrepresentation incentives became stronger as the housing market boomed, peaking in 2006.

7. Success-driven skill inferences

One weakness in the misaligned-incentives theory is that it fails to explain the timing of the crisis of 2007– 2009. After all, these incentives have been in place for a long time, so why did they become such a big problem in 2007 and not before? Thakor (forthcoming) points out that there are numerous perplexing facts about this crisis that cannot be readily explained by the misaligned incentives story of the crisis, and thus, as important as misaligned incentives were, they cannot be the whole story of the crisis. For example, the financial system was flush with liquidity prior to the crisis, but then liquidity declined sharply during the crisis. Why? Moreover, the recent crisis followed a long period of high profitability and growth for the financial sector, and during those good times, there was little warning of the onset and severity of the crisis from any of the so-called “watchdogs” of the financial system-rating agencies, regulators, and creditors of the financial system (Cortes and Thakor, 2015).

If misaligned incentives were the major cause of the crisis, then one would expect a somewhat different assessment of potential risks from the one expressed above. Thakor (2015)

develops a theory of risk management over the business cycle to explain how even rational inferences can weaken risk management and sow the seeds of a crisis.

The idea is as follows. Suppose that there is a high probability that economic outcomes—most notably the probabilities of loan defaults—are affected by the skills of bankers in managing credit risk and a relatively small probability that these outcomes are purely exogenous, that is, driven solely by luck or factors beyond the control of bankers. Moreover, there is uncertainty and intertemporal learning about the probability that outcomes are purely exogenous. Banks initially make relatively safe loans because riskier (potentially more profitable) loans are viewed as being too risky and hence not creditworthy. Suppose that these safe loans successfully pay off over time. As this happens, everybody rationally revises upward their beliefs about the abilities of banks to manage credit risk. Moreover, because aggregate defaults are low, the probability that outcomes are purely exogenous is also revised downward. Consequently, it becomes possible for banks to finance riskier loans, and if these successfully pay off, then even riskier loans are financed. In this regard, increased risk taking in banking continues unabated, and no one talks about an impending crisis.

However, even though the probability of the event is low initially, it is possible that a large number of defaults will occur across banks in the economy. At this stage, investors revise their beliefs about the skills of bankers, as well as beliefs about the probability that outcomes are purely exogenous. Because beliefs about bankers' skills were quite high prior to the occurrence of large aggregate defaults, investors infer with a relatively high probability that outcomes are indeed driven by luck. This causes beliefs about the riskiness of loans to move sharply in the direction of prior beliefs, and since only relatively safe loans could be financed with these prior beliefs, the sudden drop in beliefs about the risk-management abilities of banks causes investors to withdraw funding for the loans that are suddenly viewed as being "excessively risky."

8. The diversification fallacy

Prior to the crisis, many believed that diversification was a cure-all for all sorts of risks. In particular, by pooling even subprime mortgages from various geographies and then issuing securities against these pools that were sold into the market, it was believed that the benefits of two kinds of diversification were achieved: geographic diversification of the mortgage pool and then the holding of claims against these pools by diversified investors in the capital market. However, many of these securities were being held by interconnected and systemically important institutions that operated in the financial market, so what the process actually did was to concentrate risk on the balance sheets of institutions in a way that created greater systemic risk. Clearly, advances in information technology and financial innovation were facilitating factors in these developments

Causes of the Financial Crisis

The Housing Bubble and the Housing Prices

Many narratives of the 2008 crisis begin with the housing boom. As argued by Robert Shiller, U.S. housing prices rose only moderately, in inflation-adjusted terms, for a century prior to the mid-1990s. Yet, as Figure 1.1 shows, during the decade beginning in 1996, housing prices doubled in real terms, and rose even more dramatically in parts of the United States with inelastic housing supply, such as major cities (Saiz 2010). Figure 1.1 shows also how this dramatic decade-long increase was

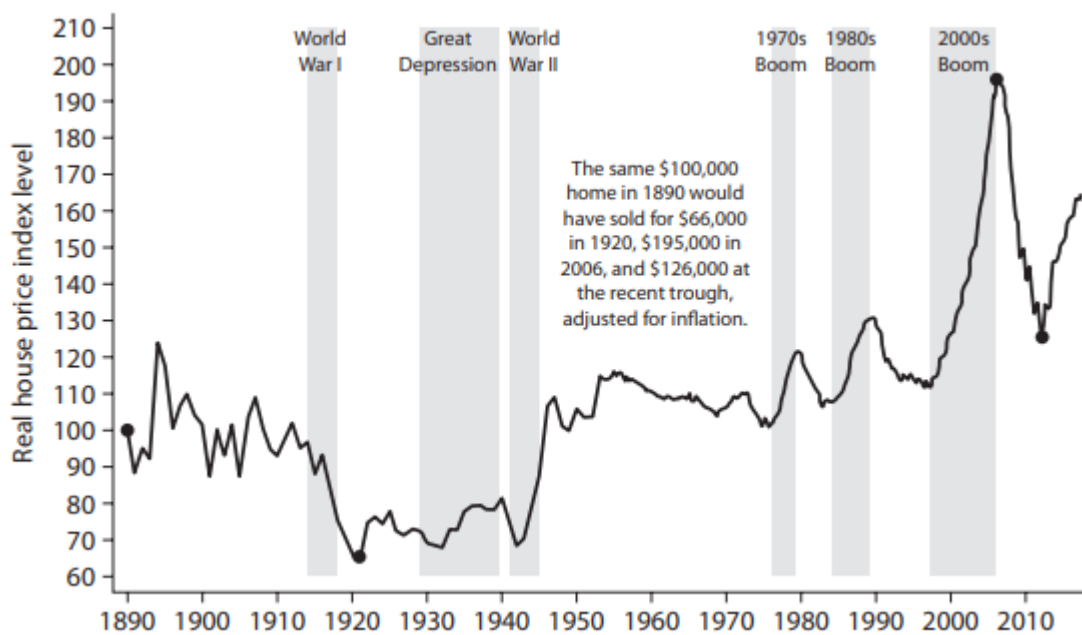


FIGURE 1.1. U.S. Home Values over Time. Robert Shiller's inflation-adjusted index of sale prices of standard existing homes in the United States. The index is set to 100 in 1890. Source: Shiller, Robert J. 2016.

followed by pricing declines that started in 2006 and accelerated into 2007 so that within five years, home prices gave up much of their earlier gains.

It is a common feature of American housing that owner-occupied housing in the United States is largely financed with mortgages, with 80 to 90 percent of purchase prices typically paid with such debt. The rise of home prices was accompanied by equally dramatic growth in household debt, as Figure 1.2 shows. Some of that growth came from home purchases by people who had never owned homes before: the rate of home ownership in the United States rose from 64 percent in 1994 to 69 percent at the end of 2006 (Federal Reserve Bank of St. Louis 2017). Some of the rise in debt came from existing homeowners moving to more expensive residences, some of it took the form of second mortgages (as homeowners took on additional debt to finance home improvements), some of the debt reflected mortgage refinancing as households took out larger mortgages against homes whose prices had recently appreciated in order to “cash out” and perhaps spend some of the housing equity, and finally some was from investors buying multiple homes for speculative purposes hoping to resell as home prices went up (DeFusco, Nathanson & Zwick 2017).

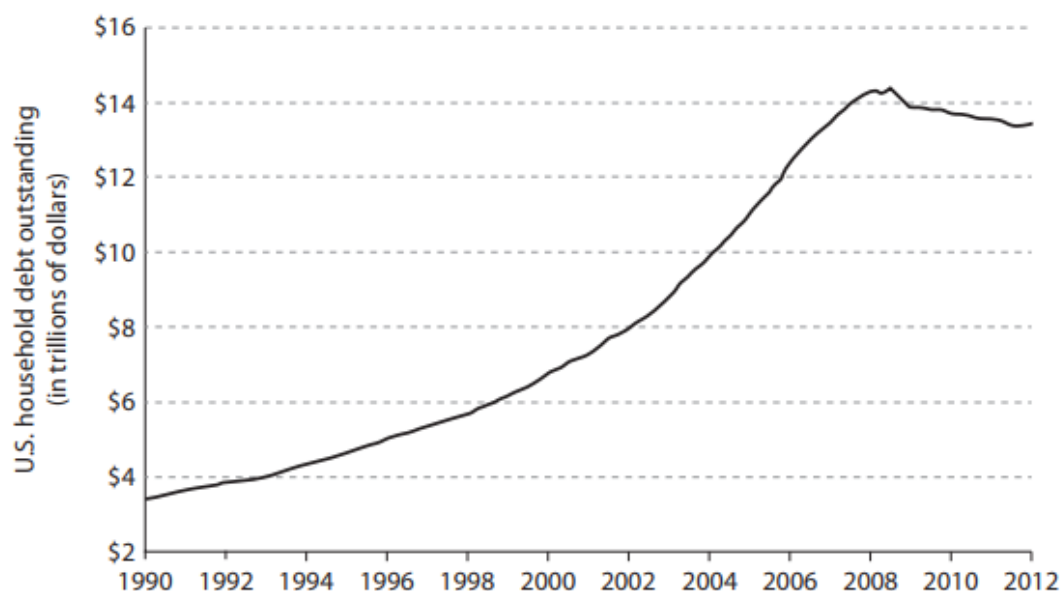


FIGURE 1.2. U.S. Household Debt. Total debt outstanding for U.S. households in trillions of dollars. Source: Board of Governors of the Federal Reserve System.

For all of these reasons, household debt in the United States rose from \$5.7 trillion in 1998 to \$14.0 trillion at the end of 2008, and the ratio of debt to household income rose from about 0.9 to 1.3 over the same period, a truly enormous increase (Board of Governors of the Federal Reserve System 2017; Federal Reserve Bank of St. Louis 2017)

There are two additional features of U.S. housing finance during this decade that deserve special mention. First, many households who were previously unable to get a mortgage because of poor credit scores were now able to do so, while in the past the share of such subprime mortgages was under 10 percent.

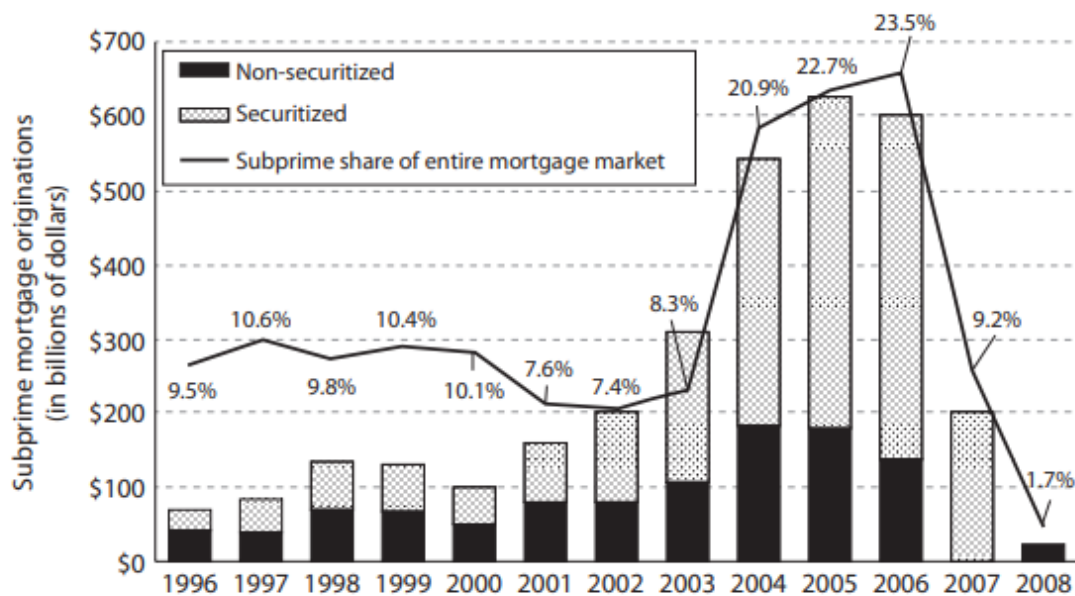


FIGURE 1.3. U. S. Subprime Mortgage Originations. Total U.S. subprimemortgage originations are broken down into those securitized and those non-securitized. U.S.subprime mortgage originations are also given as a percentage of total U.S.mortgage originations. Source: Financial Crisis Inquiry Commission, 2011.

Yet, as Figure 1.3 illustrates, at the peak of the housing boom from 2004 to 2006, between a fifth and a quarter of new mortgage originations by dollar value were subprime. In 2006, households took out \$600 billion of subprime mortgages, and the total over the decade added

up to over \$2 trillion. Because they ended up defaulting at high rates, subprime mortgages played a crucial role in the narrative of the crisis (Gennaioli & Shleifer 2015).

The second puts together a picture from Figures 1.1–1.3 and involves the basic elements of extreme financial fragility. When home prices fall 30 percent or more, and homeowners have borrowed 80 or 90 percent of the price, many households end up with negative equity on their homes and are forced to default on their mortgages, especially if they are experiencing financial hardship such as unemployment. Moreover, even if these families do not ultimately lose their homes, their spending capacity falls sharply, which creates an expenditure drag. Investors who hold these mortgages also lose money when homeowners delay payments or default. The question then becomes what happens to the financial system and to the economy when so much wealth is destroyed and this wealth is held by heavily leveraged entities (Gennaioli & Shleifer 2015).

In the context of the 2008 crisis, a fuller explanation needs to address securitization, a crucial feature of mortgage finance during the housing boom. With securitization, mortgages were packaged and financially engineered into tradable securities, which could be sold off rather than kept on the banks' balance sheets. Through impressive financial innovation, a large share of these securities were believed to be extremely safe, and, for this reason, securitization enabled massive increases in leverage and the fragility of the financial system (Gennaioli & Shleifer 2015).

Securitization

During this period, a bank or other financial intermediary in the United States that issued a mortgage could do one of three things with it. First, it could keep the mortgage on its own books as an asset. Second, the bank could sell mortgages to the government-sponsored housing finance enterprises (GSEs), Fannie Mae and Freddie Mac, whose liabilities were

implicitly guaranteed by the U.S. government. Mortgage-originating banks did this to a substantial extent, but Fannie and Freddie typically only bought conforming mortgages (meaning not too large, not too risky, and sufficiently well documented). Fannie and Freddie sometimes retained these mortgages on their own balance sheets as assets, but more often securitized them, as we describe below. Third, the bank could sell mortgages to private investment banks, which would then securitize and sell them to investors, who thereby took on the risk of mortgage defaults (Gennaioli & Shleifer 2015).

Although all kinds of loans can be securitized, including auto loans and student loans, the most rapid growth of securitization occurred in the mortgage market. Such securitization is a financial operation that creates mortgage-backed securities (MBS) in two steps: pooling and tranching. Pooling refers to building a portfolio or pool of mortgages out of individual ones. It creates safety by diversifying away the uncorrelated risks of individual mortgages. Tranching refers to the creation of claims of different seniority out of the pool of mortgages. This means that, to the extent that mortgages in the portfolio default or delay payments, the losses are allocated to the junior tranches first and to the senior ones only after the junior tranches are worthless. Tranching builds in additional safety for the most senior securities. The combination of pooling and tranching is so powerfully risk-reducing that senior tranches were seen as nearly completely safe. Although securitization was not invented during the housing boom, it achieved unprecedented magnitude in the creation of new MBS products, including both agency MBS issued by GSEs and private-label MBS issued by private originators. (Gennaioli & Shleifer 2015)

The exact reasons for the enormous demand for securitization during this period continue to be debated, but it certainly originated in a huge demand for assets that investors perceived to be safe. Some of that demand came from foreign investors, especially from high-saving Asian countries, who poured trillions of dollars into U.S. markets over this period

(Bernanke et al. 2011). Further, some of the demand came from the increasingly wealthy U.S. households and corporations wishing to keep a share of their wealth in safe assets. By manufacturing AAA-rated senior tranches of MBS, securitization met this demand, and, depending on the estimates, 60 percent or more of MBS by dollar value created through the process ended up being rated AAA (Fitch Ratings 2007). By comparison, only about one percent of corporate bonds by dollar value receive such ratings (Fitch Ratings 2007).

One might ask what happened to the junior tranches of MBS created in securitizations—the tranches designed to absorb the initial losses when some mortgages in the pool default. Some of these tranches were retained by the financial intermediaries, exposing them to concentrated mortgage risks. But even more were themselves securitized, creating so-called collateralized debt obligations (CDOs). For this, an intermediary would assemble the junior tranches of MBS into another pool and then tranche that pool to create a variety of claims. The senior tranches of CDOs, impressively, were also rated AAA. In the mid-2000s, nearly 70 percent of CDOs by dollar value—not just MBS engineered from original mortgages but CDOs engineered from risky tranches of MBS—were rated AAA. CDOs ended up being held disproportionately by financial institutions and became a major source of their losses in the crisis (Gennaioli & Shleifer 2015)

The demand for securitization products was met with supply from both quasi-public and private sources. GSEs securitized conforming mortgages into agency MBS, and then sold them off into the market, keeping some on their own books. Because of implicit government guarantees, agency MBS were perceived as a close substitute for U.S. Treasuries. More consequentially, securitization of mortgages was pursued privately by investment banks using the riskier subprime mortgages as collateral, converting them to a large extent into AAA-rated private-label MBS. These AAA ratings were based not on government guarantees, but on models of default used by the rating agencies (Gennaioli & Shleifer 2015).

Securitizations in the mid-2000s reached staggering volumes. By 2007, over \$4 trillion of agency MBS was outstanding, in addition to over \$2.5 trillion of private-label residential MBS. At its peak in 2006, private label residential MBS issuance exceeded \$1.2 trillion, substantially higher than the issuance of corporate debt. Perhaps even more remarkably, a substantial fraction of these securitizations were backed by subprime mortgages, those too risky to sell to the GSEs. As we saw in Figure 1.3, about 75 percent of subprime mortgage originations in the United States were securitized in 2006. In that year, close to half a trillion dollars of subprime mortgages were pooled and tranced into AAA-rated MBS (Gennaioli & Shleifer 2015).

Aside from its enormous magnitude, securitization plays an outsized role in the narrative of the financial crisis for three distinct reasons. First, there is the chicken-and-egg problem of whether the growth of credit to subprime borrowers drove the housing bubble or whether home price growth drove the credit expansion by increasing the value of available collateral. There is growing evidence that loose credit had an influence on home prices, yet, on the other hand, home prices started growing before the huge expansion of subprime lending in the early 2000s period of very low interest rates, and this growth likely contributed to the expansion of collateral and credit, so there are causal factors running from home prices to credit as well. The author's best assessment is that home price growth and credit growth were mutually reinforcing.

Second, the demand for securitized products encouraged fraud and other questionable practices in the subprime mortgage market, including the misrepresentation of borrower income, borrower credit rating, borrower down payment, and perhaps other information (Keys et al. 2010; Bubb and Kaufman 2014; Piskorski, Seru, and Witkin 2015; Mian and Sufi 2017).

Third, securitization created a massive misallocation of risk. Investors including financial institutions, hedge funds, sovereign funds, and money market funds that bought AAA-rated MBS or CDOs did so because they demanded safe securities, for reasons of preferences or regulations. When home prices began falling and AAA-rated MBS and especially CDOs lost their value and ratings, these investors not only lost money but ended up holding securities they did not want or even were not allowed to hold for regulatory reasons. This caused them to sell, leading to major price declines (Gennaioli & Shleifer 2015).

Buyers of MBS

Figures on the holders of private-label MBS are difficult to come by, but it appears that banks, hedge funds, investment banks, and other leveraged financial intermediaries were significant buyers. They held some of the MBS on their own books, and, in addition, set up separate legal entities, so-called structured investment vehicles (SIVs), to buy private-label MBS.

An SIV would buy a portfolio of predominantly but not completely AAA-rated MBS or CDOs, which would become its assets. The SIV would then finance its assets by issuing short-term liabilities, typically in the form of asset-backed commercial paper (ABCP), which needed to be rolled over every few weeks. During the crisis, SIVs turned into a major problem for banks, which ended up absorbing SIV losses as MBS and CDO prices plummeted (Acharya, Schnabl, and Suarez 2013). The International Monetary Fund (IMF) estimates that, prior to the crisis, U.S. banks bought \$1.5 trillion of residential MBS, and another \$196 billion of commercial MBS, roughly twenty percent of what was outstanding at the time. An even higher fraction, perhaps 25 percent, of CDOs was bought by banks, particularly in less senior tranches. Erel, Nadauld, and Stulz (2014) estimate that at the peak of the crisis, up to \$250 billion of private-label MBS was in SIVs, while Krishnamurthy, Nagel, and Orlov (2014) suggest that 40 percent of AAA-rated private label MBS went into SIVs. Greenlaw et al. (2008) report that

by 2007 the three major investment banks (Goldman Sachs, Morgan Stanley, and Lehman Brothers) saw their equity drop to 3 to 4 percent of their assets. For commercial and investment banks, growth in leverage parallels the growth in assets more generally and not just in this period (Adrian and Shin 2010).

The System under Pressure

Home prices peaked in mid-2006 and started declining afterward, as we saw in Figure 1.1. In 2006, annual default rates on these mortgages were just 2 percent, justifying the perceptions of safety implicit in the AAA ratings and the pricing of subprime MBS and CDOs. In 2007, these rates doubled to about 4 percent, and eventually rose to 16 percent in 2008 and 2009 (Gennaioli & Shleifer 2015).

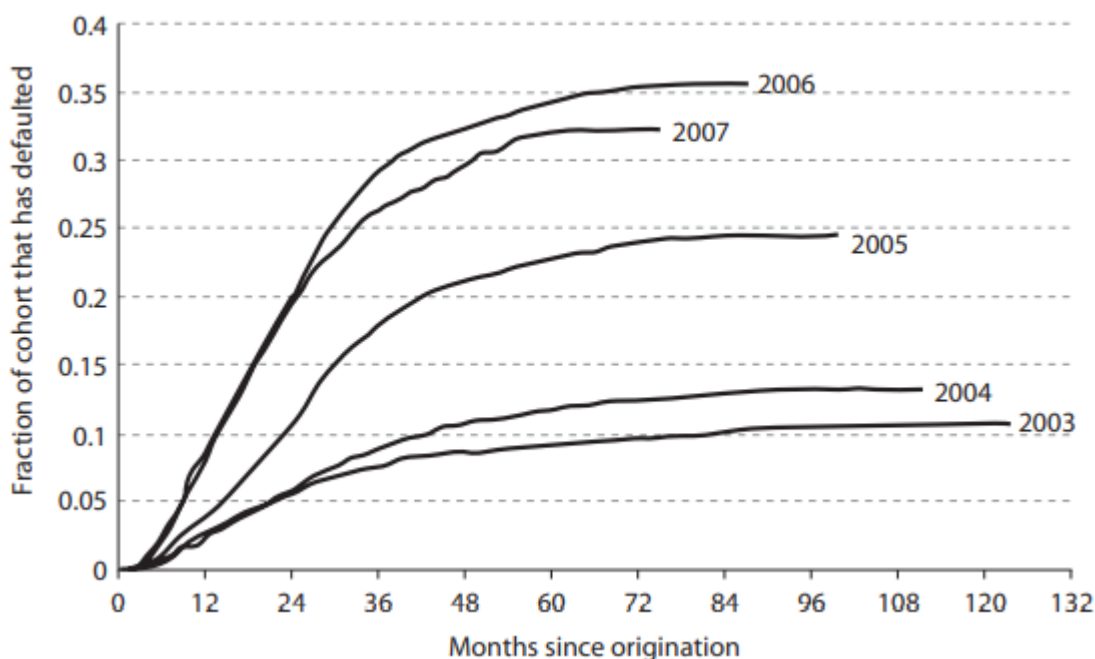


FIGURE 1.4. Cumulative Default Probability by Origination Cohort. The figure tracks the default behaviour of mortgages originated in five different years. Source: Palmer, Christopher J. 2015. “Why Did So Many Subprime Borrowers Default during the Crisis: Loose Creditor Plummeting Prices?”

These defaults were the highest for the most recent vintages of mortgages, those issued in 2006 and 2007. As Figure 1.5 shows, these prices had already fallen sharply by mid-2007, but by summer, and increasingly toward the end of 2007, the high rates of default brought about declines in the prices of AAA-rated senior tranches as well. Eventually, junior tranches of subprime residential MBS became essentially worthless, while the senior ones fell to as low as a third of their initial value before recovering starting in 2009.

The financial system came under stress almost immediately once the prices of AAA-rated MBS began to decline. In April 2007, a leading subprime mortgage lender, New Century, filed for bankruptcy protection. In June 2007, the investment bank Bear Stearns suspended redemptions from its funds holding MBS. The declines in MBS values put huge stress on the short-term financing of MBS holdings, especially in SIVs (Gennaioli & Shleifer 2015).

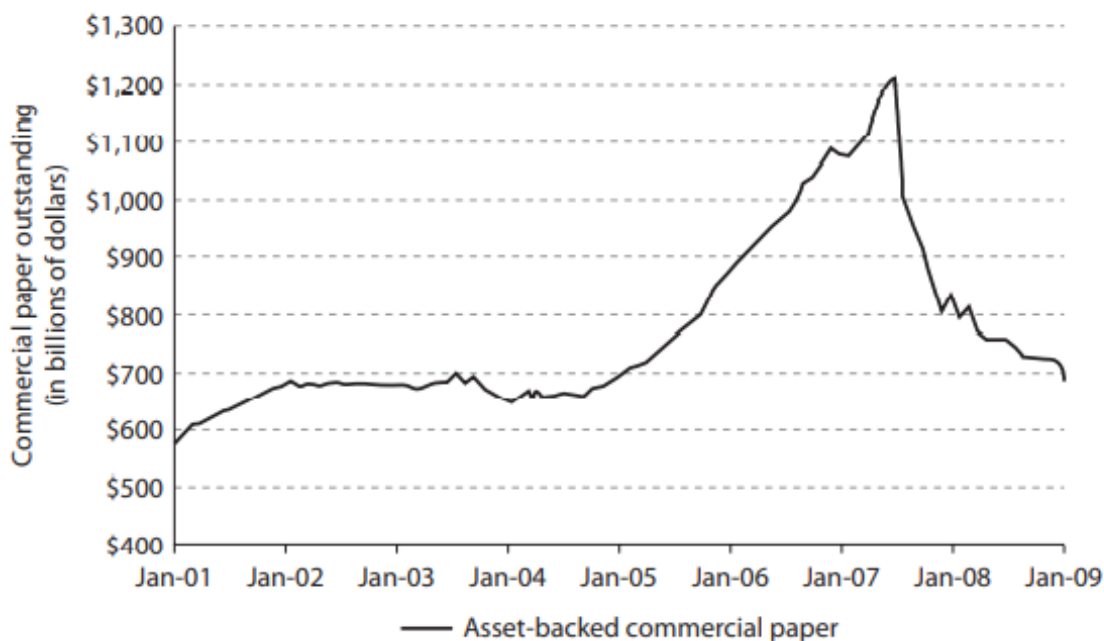


Figure 1.5. Collapse of the Asset-Backed Commercial Paper Market. The figure shows outstanding asset-backed commercial paper. Source: Federal Reserve Bank of St.Louis.

As in Figure 1.5, in the summer 2007, the asset-backed commercial paper market froze, so SIVs could no longer maintain their MBS holdings. During the next six months, home prices fell further, defaults on subprime MBS continued to mount, and MBS prices continued to fall. Short-term financing and interbank markets continued to experience severe stress, and the Fed massively expanded its liquidity operations.

One important event during this period was the rescue of one of the largest investment banks, Bear Stearns, through an acquisition by JPMorgan Chase, which required substantial assistance from the Federal Reserve. Remarkably, despite all the stress, the financial system held together throughout the summer of 2008 (Gennaioli & Shleifer 2015).

Lehman

This calm lasted until early September. On September 7, the GSEs Fannie and Freddie were placed into government conservatorship, essentially nationalized. This was perhaps the single most significant step in fixing the financial system, but it came too late. Over the weekend of September 13–14, the Fed and the Treasury failed to successfully organize rescue plans for one of the largest investment banks, Lehman Brothers, which declared bankruptcy on September 14. Lehman's bankruptcy shocked financial markets, and its effects obviously surprised both investors and regulators. Lehman's failure caused the stock market to drop 500 points on Monday, September 15, and triggered a series of major rescues of financial institutions (Gennaioli & Shleifer 2015).

The failure of Lehman precipitated the second largest financial crisis in U.S. history after the Great Depression. Financial markets were chaotic and disrupted, and short-term financing came to a halt except for that using government securities as collateral. In the course of a few weeks, about half a trillion dollars of liquid savings was lost as investors fled to the safety of government debt and away from securities they previously thought to be safe.

As a measure of the panic that had ensued, consider that before the crisis it cost only \$2.50 to insure \$100 invested in junk bonds. In July 2007 the price moved to above \$4. During the Bear Stearns crisis, the price shot above \$6, but returned to about \$4.50 in June. After the demise of Lehman, the price returned slightly above \$6, a very high level, but comparable to the one experienced around the time of the Bear Stearns crisis. Given that two different policy responses--Bear Stearns was saved, while Lehman not--led to the same market response provides an interpretation that these extreme events forced the market to reassess their risk estimates, regardless of the policy response adopted (Zingales 2008).

Why was Lehman so pivotal? Certainly the news was not that Lehman was in deep trouble, since this was known for months. In fact, policymakers had been publicly trying to convince Lehman to merge with another company for close to half a year, nor was it news that the housing bubble was deflating since by September this was common knowledge. In addition, it also should not have been surprising that financial institutions were losing hundreds of billions of dollars at an incredibly rapid clip since they were highly overleveraged (Gennaioli & Shleifer 2015).

Markets appear to have learned two things from the Lehman filing. The first is that the government was willing to let a systemically relevant financial institution go bankrupt. Although Secretary Paulson repeatedly and extremely publicly insisted that there would be no more bailouts, markets did not quite believe him. Most investors thought that the government would blink, and ironically, the government made a U-turn on this policy immediately after the Lehman bankruptcy (Gennaioli & Shleifer 2015).

Second, what also became clear was that the meltdown would be very hard to control. Investors, and possibly regulators as well, learned that financial institutions facing hundreds of billions of dollars in losses were highly interdependent, both because of their complex

derivatives and other contracts with each other and because they were holding similar assets. The bankruptcy of Lehman accelerated the unwinding of derivatives contracts and sales of assets by investors who sought to rebuild their own capital and liquidity. This process rekindled fire sales and made the meltdown even harder to stop. There is little evidence in the pre-Lehman record that policymakers fully appreciated the system-wide liquidation forces that would be unleashed (Gennaioli & Shleifer 2015).

The Fed and the Treasury responded aggressively to the Lehman fallout, recapitalizing financial institutions, making equity injections, arranging mergers, providing loans against risky collateral, and eventually buying up hundreds of billions of dollars of agency MBS and putting them on the Fed's balance sheet. This ended up being sufficient to stabilize the financial system by the spring of 2009, a truly extraordinary accomplishment for which both the Fed and the Treasury officials justly received considerable praise. These accomplishments should not be underestimated; it is easy to imagine that without these steps the U.S. financial system and economy could have entered a decades-long decline if the problems were not fixed (Gennaioli & Shleifer 2015).

But massive damage was done. The U.S. economy slid into a major recession, which came to be known as **the Great Recession**, and did not recover for several years. Over a decade after the crisis, the loss of output relative to trend was estimated at \$2 trillion. Housing prices continued to decline; construction virtually stopped and then remained moribund even longer than the rest of the economy, and unemployment peaked at ten percent in October 2009 (U.S. Bureau of Labour Statistics 2012).

Policy Implications

This chapter will address measures that have been taken after the crisis to change the existing legal framework in order to salvage the situation and find a way to “prevent excessive risk-taking by large financial firms and make sure that when those firms fail during a future crisis, the government can contain damage to the economy without imposing costs on taxpayers” (Geithner, 2009, p. 1). The chapter will then pivot to a discussion of the actual changes that new legislation brought.

American Recovery and Reinvestment Act of 2009

In 2009, many attempts were taken in order to prevent this situation from occurring again. In February, the American Recovery and Reinvestment Act (hereinafter: ARRA) was approved. ARRA’s (2009, p. 2) major goals were “to preserve and create jobs and promote economic recovery, to assist those most impacted by recession”. In order to fulfil this mission ARRA provided a stimulus package of \$787 billion that was allocated to multiple sectors of the economy including education, infrastructure, health care and more. The Act offered immediate relief to individuals, families and small businesses in the form of tax cuts, deductions and reductions. Unemployed people got an extension of unemployment benefits for thirty-three weeks. Small businesses were eligible to special increased deductions and to tax credits for hiring students or long-term unemployed veterans. ARRA also provided financial support to the health care industry helping finance premiums for laid off workers and paying additional health care costs. Moreover, ARRA also spent \$54 billion to pay for teachers’ salaries and additional educational programs (Grapulin 2018).

The American Recovery and Reinvestment Act proved to be quite a success. According to Macroeconomic Advisers and Moody’s, the bill created roughly 2.5 million jobs, and the Congressional Budget Office (2015) estimated that it increased real gross domestic product

by 1.1% on average and decreased the unemployment rate by 0.3% on average. By 2010, the data improved even more: real GDP further increased by 2.4% on average, while the unemployment rate went down by 1.1%.

Dodd-Frank Wall Street Reform and Consumer Protection Act

The most influential piece of legislation was enforced in July 2010 – Dodd-Frank Wall Street Reform and Consumer Protection Act (hereinafter: Dodd-Frank). It is the most significant and comprehensive reform since the Glass-Steagall Act (Amadeo 2017g). Dodd-Frank reform addresses the issues that arose during the financial crisis and it implements some new regulative steps towards financial stability, accountability and transparency of the financial system (Grapulin 2018).

Among the implemented changes the most significant are:

- The Financial Stability Oversight Committee (hereinafter: FSOC) is created. It promotes efficiency, oversees financial institutions other than banks and their transparency and introduces the term “systemically important financial institution” (SIFI), that is basically an official term for “too big to fail”. Among other things, FSOC has a right to prevent mergers of large institutions from happening (Brose, Flood, Krishna, Nichols, 2014b, p. 19).
- Consumer Financial Protection Bureau: The Consumer Financial Protection Bureau (CFPB), established under Dodd-Frank, was given the job of preventing predatory mortgage lending (reflecting the widespread sentiment that the subprime mortgage market was the underlying cause of the 2007–2008 catastrophe) and make it easier for consumers to understand the terms of a mortgage before agreeing to them. It deters mortgage brokers from earning higher commissions for closing loans with higher fees and/or higher interest rates and requires that mortgage originators not steer potential borrowers to the loan that will result in the highest payment for the originator. The CFPB also governs other types of consumer lending, including

credit and debit cards, and addresses consumer complaints. It requires lenders, excluding automobile lenders, to disclose information in a form that is easy for consumers to read and understand; an example is the simplified terms now on credit card applications (Grapulin 2018).

- The Volker Rule (Sec. 619 of Dodd-Frank) prohibits “proprietary trading and certain relationships with hedge funds and private equity funds”. In other words, banks are not allowed to own or use hedge funds for their own sake, only on behalf of their customers. Banks were given seven years until July 2015 in order to fully comply with these provisions (Grapulin 2018).

- Under the Wall Street Transparency and Accountability Act of 2010 (Dodd-Frank, 2010), hedge funds are now to be regulated by the SEC and the Commodities Futures Trading Commission (hereinafter: CFTC). They are also obligated to provide information about their portfolios and trades, so the SEC could evaluate and control market and other risks. Moreover, the SEC and the CFTC also oversee risky derivatives such as credit default swaps. Previously traded over-the-counter derivatives are now required to be traded through exchanges or clearing houses, overseen by the SEC (Grapulin 2018).

- Within the SEC the Office of Credit Ratings is created. It oversees all nationally recognised statistical rating organizations and among other things requires them to disclose all crucial information such as rating methodologies, policies and procedures (Grapulin 2018).

- The Consumer Financial Protection Bureau was created under the direction of the U.S. Treasury Department which took the responsibility of overseeing credit and debit cards and consumer loans (excluding auto loans), regulating credit cards fees, bank fees and underwriting fees. Banks now have more requirements in terms of mortgage underwriting. The main goal was to protect consumers from excessive fees and risky mortgage loans (Amadeo 2017g).

Furthermore, Dodd-Frank increased supervision of insurance companies, investor protection and encouraged a whistleblower program (Dodd-Frank, Sec. 748, 2010). The Government Accountability Office also got a right to audit the Federal Reserve on various occasions and especially in case of emergency lending (Dodd-Frank, Sec. 1101-1109, 2010).

Dodd-Frank Reform was a major piece of legislation that made changes in such acts as Gramm-Leach-Bliley, the Bank Holding Company Act and others. Previous deregulation tendencies proved themselves inefficient and even harmful and Dodd-Frank attempted to change this course. The implementation of such an extensive piece of legislation will undoubtedly require a significant amount of time since Dodd-Frank affects various areas of financial markets. Many issues still remain to be resolved until regulations are fully adopted (Guynn 2010).

What actually changed and what does it mean?

The author as already established that both ARRA and Dodd-Frank Wall Street Reform were significant and game changing pieces of legislation in the USA that addressed the most critical areas of financial markets. First steps towards changing the system were made, but what does it actually mean? Can taxpayers be sure that a similar financial crisis will not happen in the near future? Have we learned from our mistakes? A decade has passed from the events of the financial crisis and the following paragraphs will provide an overview of what has been accomplished so far (Grapulin 2018).

The American government injected trillions of dollars into the economy after the crisis in an attempt to stabilize the banking system. Interest rates were pushed down to 0 – 0.25% and they stayed on this level till 2015 (Board of Governors of the Federal Reserve System, 2017). Banks paid billions in fines and penalties, in fact, the six largest banks altogether paid at least \$110 billion in penalties (Podkul et al., 2018). Banks and other depository institutions

were ordered to decrease their indebtedness and they did: in 2008 financial sector's outstanding debt was \$18 trillion, while already the next year outstanding debt decreased by 8%. In 2015 it totalled \$15,2 trillion (which is 15,5% decrease compared to 2008). An average number of the financial sector's outstanding debt for three quarters of 2017 was \$15,7 trillion (Board of Governors of the Federal Reserve System). As Gross (2017) noticed, giant unleveraged banks do not exist anymore: Lehman Brothers collapsed, Bear Sterns got acquired by JP Morgan Chase, Morgan Stanley and Goldman Sachs went from investment banking into commercial banking and Merrill Lynch merged with Bank of America. Moreover, the Basel III regulatory framework is being gradually implemented. Among other things, main changes also included a 4,5% common equity requirement (instead of 2%; implemented in 2015), a 6% Tier 1 capital ratio (instead of 4%; valid from January 2015) and introduction of a 3% leverage ratio (implemented in 2013) and additional liquidity requirements (Moody's Analytics, 2013). Full Basel II framework is supposed to be fully implemented by 2019 (Basel Committee on Banking Supervision, 2015).

Among other problems the banking sector was facing there is one worth mentioning again: bonuses and rewards of top banking executives, traders and CEOs. On many occasions they overlooked their customers' goals and chased only their own in order to land such bonuses. Their compensations totalled millions yearly and were far too high for ordinary taxpayers. Did the situation change after the financial crisis? Both, yes and no. According to Dodd- Frank, banks had to come up with new compensation systems that included deferred bonus payments instead of immediate cash bonuses, but all negotiations halted after Donald Trump became President of the United States in 2017 (Hamilton and Dexheimer, 2016). Some banks even implemented so-called clawback provisions, according to which some of the bonuses have to be returned in case of big losses or violation of risk guidelines (Cassidy, 2013). In other words, banks included stocks and stock options in their compensation plans in order to tone

down society's disapproval, but laws remained the same so far. Not only big bonuses did not cease to exist, top bankers also did not carry any responsibility for almost failing the whole economy. "The largest man-made economic catastrophe since the Depression resulted in the jailing of a single investment banker" (Eisinger, 2014). Mr Seragelding, a Credit Suisse executive, who was sentenced to 30 months in prison "in connection with a scheme to hide more than \$100 million in losses in a mortgage-backed securities trading book" (U. S. Department of Justice, 2013).

We have already mentioned that "too big to fail" policy became an official term – a systemically important financial institution. During the financial crisis we have seen how an uncontrollably big financial institution can influence the whole economy, but the consolidation trend became even stronger after the crisis. Many institutions failed, many merged into even bigger conglomerates. According to FDIC (2017), the number of commercial banks decreased dramatically from 7279 in 2008 to 4918 in 2017, that is a 32% drop. Number of failed institutions declined as well since the financial crisis – 140 in 2009, 157 in 2010, while only 8 in 2017. With a lower number of institutions on the market, competition also decreases and banks become more in control – that is an alarming trend. According to Cassidy (2013), the American banking industry is currently dominated by six large banks: Bank of America, Citigroup, Goldman Sachs, JPMorgan Chase, Morgan Stanley and Wells Fargo (Grapulin 2018).

As for credit rating institutions, despite higher transparency requirements implemented by Dodd-Frank, nothing else has changed. CRAs still assign ratings to financial institutions and financial institutions still pay for them, hence the conflict of interest is still present. The Big Three still dominate the market: according to the Wall Street Journal (Podkul, Gianordoli, Kuronen, Paige, Santilli et al., 2018), Moody's Investors Service, S&P Global Ratings and Fitch Ratings earned 94% of total revenues in the credit rating industry in 2016. "One reason,

market participants say, is that many investors remain wedded to the idea that a rating from the big three is an assurance of quality” (Ramakrishnan and Scipio, 2016).

Mortgage debt was falling constantly after the crisis. In the third quarter of 2012, for example, it totalled \$8,03 trillion (Federal Reserve Bank of New York, 2012), the same time in 2013 it decreased even further to \$7,9 trillion (Federal Reserve Bank of New York, 2013). In the next few years, however, it started to rise again and in the last quarter of 2017 it totalled \$8,88 trillion (Federal Reserve Bank of New York, 2017) and surpassed the financial crisis levels. Other household debt such as student loan debt, auto debt and credit card debt is on the rise as well and some say (Podkul et al., 2018) that continuously rising household debt represents an area of concern and may even lead to future bubbles. One thing that stayed unaffected by after-crisis regulations was housing policy. Today, GSEs such as Fannie Mae and Freddie Mac still buy mortgages and repackage them into mortgage-backed securities. Some new capital and liquidity requirements for non-bank mortgage loans servicers were implemented in September 2015 (Beck et al., 2015), but they are far from strict banking regulations. There have been plans to introduce a GSE reform for several years now, but according to the U.S. Department of the Treasury Secretary Mnuchin (in Ramirez, 2018), the reform will most probably not happen this year as well (Grapulin 2018).

Fed Response to policies

The policy responses fell in four major groups: provision of short-term liquidity to financial institutions, provision of liquidity directly to borrowers and investors, expansion of open market operations, and initiatives designed to address counterparty risk.

- i. **Expansion of the traditional role of the central bank as lender of last resort in providing short-term liquidity.**

This set of interventions included the discount window, Term Auction Facility (TAF), Primary Dealer Credit Facility (PDCF), and Term Securities Lending Facility (TSLF). The Federal Reserve also approved bilateral currency swap agreements with fourteen foreign central banks to assist these central banks in the provision of dollar liquidity to banks in their jurisdictions. The discount window has long been a primary liquidity-provision tool used by the Fed. In December 2007, the TAF was introduced to supplement the discount window. The TAF provided credit to depository institutions through an auction mechanism. Like discount window loans, TAF loans had to be fully collateralized. The final TAF auction was held on March 8, 2010. The PDCF was established in March 2008 in response to strains in the triparty repo market and the resulting liquidity pressures faced by primary securities dealers. Primary dealers are broker-dealers that serve as the trading counterparties for the Federal Reserve's open-market operations and thus play a pivotal role in providing liquidity in the market for U.S. treasuries. The PDCF served as an overnight loan facility for primary dealers, similar to the discount window for depository institutions. Credit extension required full collateralization. This facility was closed on February 1, 2010. The TSLF was a weekly loan facility designed to promote liquidity in Treasury and other collateral markets. The program offered Treasury securities for loan for one month against other program-eligible collateral. The borrowers were primary dealers who participated in single-price auctions to obtain these loans. The TSLF was closed on February 1, 2010 (Thakor 2015).

ii. **Provision of liquidity directly to borrowers and investors in key credit markets.**

These interventions included the Commercial Paper Funding Facility (CPFF), ABCP MMF Liquidity Facility (AMLF), Money Market Investors Funding Facility (MMIFF), and the Term AssetBacked Securities Loan Facility (TALF). The CPFF was established in October 2008 to provide liquidity to U.S. issuers of commercial paper. Under the program, the Federal Reserve Bank of New York provided three-month loans to a specially created limited liability

company that then used the money to purchase commercial paper directly from issuers. The CPFF was dissolved on August 30, 2010. The AMLF was a lending facility that provided funds to U.S. depository institutions and bank holding companies to finance their purchases of high-quality ABCF from MMFs under prespecified conditions. The goal of the program was to bolster liquidity in the ABCP market. The AMLF opened on September 22, 2008 and was closed on February 1, 2010. The MMIFF was designed to provide liquidity to U.S. money market investors. Under this facility, the Federal Reserve Bank of New York could provide senior secured loans to a series of special purpose vehicles to finance the purchase of eligible assets. This essentially “insured” money market investors who might have otherwise suffered losses due to the decline in the values of their holdings. The MMIFF was announced on October 21, 2008 and dissolved on October 30, 2009. TALF was created to help market participants meet the credit needs of households and small businesses by supporting the issuance of asset backed securities collateralized by consumer and small-business loans. The goal was to revive the consumer-credit securitization market. The facility was launched in March 2009 and dissolved by June 2010 (Thakor 2015).

iii. **Expansion of Open Market operations.**

The goal of these initiatives was to support the functioning of credit markets and put downward pressure on long-term interest rates. These initiatives involved the purchase of longer-term securities for the Federal Reserve’s portfolio. For example, starting in September 2012, the Federal Open Market Committee (FOMC) decided to purchase agency-guaranteed MBS at the rate of \$40 billion per month. In addition, starting January 2013, the Fed began purchasing longer-term Treasury securities at the rate of \$45 billion per month as part of its “Quantitative Initiatives designed to address counterparty risk.

iv. Initiatives designed to address counterparty risk.

These initiatives included various programs. One was the Troubled Asset Repurchase Program (TARP), which was initially authorized in October 2008 and ended on October 3, 2010. The original idea was for the government to buy troubled, illiquid assets from financial institutions in order to diminish concerns about their solvency and to stabilize markets.⁵⁷ In practice, it took the form of the government buying equity (the Capital Purchase Program) and taking ownership in various financial and nonfinancial firms and providing help to consumers to avoid home foreclosures. The willingness of the U.S. government to take equity positions in banks was also accompanied by regulatory demands that banks recapitalize themselves through other means as well. The implied threat that the alternative to recapitalization via shareholder-provided equity was the infusion of equity (and thus the assumption of some ownership) by the government was an effective one. No bank wanted to be nationalized. The result was that U.S. banks were recapitalized fairly quickly. In retrospect, this may have been one of the most effective policy responses to the crisis, as the contrast with the struggling banking systems in the Euro zone—where regulators did not force banks to recapitalize—reveals (Thakor 2015).

Another program involved the Federal Reserve purchasing direct obligations of housing-related Government-Sponsored Enterprises (GSEs). The goal of these purchases, combined with the purchases of mortgage backed securities by Fannie Mae, Freddie Mac, and Ginnie Mae, was to make it cheaper and easier for people to buy homes. The idea was that this goal would be served if the spread between GSE debt and U.S. Treasury debt narrowed, and it was believed that these purchases would do that. In addition to these programs, the Federal Reserve also introduced stress tests of large banks, in order to determine their ability to withstand systemic shocks of various magnitudes. These simulations were designed to shed light on how much capital and access to liquidity banks would need if confronted with the kinds

of shocks that pummelled banks during the crisis of 2007–2009 and hence to provide early-warning signals to both banks and regulators (Thakor 2015).

Conclusion

The most severe financial crisis was the financial crisis of 2007 which had serious consequences for several years (Apete 2016). The U.S. economy experienced during this period is an almost classic credit crisis. The housing bubble, and its subsequent deflation, are the obvious cause. This bubble was financed with mortgages, substantially converted into MBS, which led to the tremendous growth in leverage of both households and financial institutions. As home prices started falling, the leverage cycle unwound, leading to massive losses in the financial system, liquidations, and declines in asset prices. As the financial system collapsed, only massive government interventions succeeded in reviving it. In the period leading to the collapse of the bubble, the economy (including both households and financial institutions) was bearing a great deal of home price risk. Yet market participants appear not to have fully appreciated the extent of this risk, judging by the vast demand for and manufacture of AAA-rated MBS and especially CdOs that assigned a very low price for that risk, as well as the willingness of the financial sector to retain massive exposure to home price risk. Nor the evidence suggest that either market participants or policymakers appreciated the magnitude of the exposure of financial institutions to housing risk, and the interdependencies between them that posed major systemic risk once home prices started falling (Gennaioli & Shleifer 2015). Some important changes in the allocation of mortgages and credit, GDP or interest rates were also among the consequences related to the financial crisis. These changes pushed policy makers to review and change the different policies and regulations. The impact of the financial crisis was so huge that there has been several research about this topic in order to understand the causes and prevent new occurrence. In fact, the Federal Reserve charged the Financial Inquiry Commission, created in 2009 by the American government in order to investigate the causes of the financial crisis and understand how the central bank failed in the resolution of the crisis (Apete, 2016). After the crisis the policymakers introduced the American recovery and

reinvestment Act (ARRA) major goals were “to preserve and create jobs and promote economic recovery, to assist those most impacted by recession” because the unemployment rate decreased dramatically from 2008 to 2010. The most influential piece of legislation was Dodd-Frank Wall Street Reform and Consumer Protection Act which addresses the issues that arose during the financial crisis and it implements some new regulative steps towards financial stability, accountability and transparency of the financial system (Grapulin 2018).

The financial crisis of 2007 had demonstrated that economic activity and financial stability can be affected by unpredictable assets changes. However, policy makers still need to learn their mistakes and be more careful about the different economic policies in order to prevent a future occurrence. Among the important lessons we need to retain about the financial crisis will be the fact that financial institutions need a change in the design of regulations for the prevention of a new crisis.

In conclusion, due to years of regulations and a lack of strict fiscal and monetary policies, the financial crisis of 2007 has been a real burden for the financial markets because of the different consequences of the global financial crisis. In fact, the primary function of the central bank is to control the nation’s money supply through different actions such as interest rates. In fact, central bank has the power to act as a lender of last resort in special circumstances and inject money to the economy during periods of bank insolvency or financial crisis. However, despite their strong influence, central bank didn’t manage to find a solution in the resolution of the financial crisis. Many researches have been made in order to ascertain why central banks despite all their effort to resolve the crisis failed. One of the major reason for the failure of central banks seems the lack of strong policies and the fact that some major banks such as Lehman Brothers were too big to fail and the failure of such banks was a precursor for the financial crisis (Apete 2016).

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