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ANALYSIS OF THE FINANCIAL CRISIS OF 2007-2009 AND ITS IMPACT ON INTERNATIONAL ECONOMIC SECURITY

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ABSTRACT
This report describes the financial crisis of 2007-2009 and technologies for detecting such a crisis. First it addresses the mortgage market and the developments in subprime lending. Then it addresses the events of the subprime lending meltdown and the subsequent financial turmoil. Finally, it addresses the causes and who to blame for the crisis. Technologies for detecting such a crisis are discussed in the Appendix. We believe that economic security is crucial for a secure nation.

This is the fourth in a series of reports we are writing on Security Studies and the application of information technology for providing security and combating terrorism. We will include papers on both cyber security and national security. The purpose of these series of reports is to guide us in the technologies we are developing for both cyber security and national security. The technologies include systems for assured information sharing and assured cloud computing and tools for secure social network analysis and data mining for security applications such as malware detection. Our research to develop these technologies is supported by the Air Force Office of Scientific Research.

DISCLAIMER: The Views and Conclusions contained in this report are those of the authors and do not reflect the policies and procedures of the University of Texas at Dallas, the United States Government or the Air Force Office of Scientific Research.
Introduction
The financial and economic crisis of 2007-2009 ranks among the most serious economic events affecting the United States since the Great Depression of the 1930s. Starting with the subprime meltdown in the housing market, the crisis spread to Fannie Mae and Freddie Mac, the government-sponsored enterprises. Then the crisis hit the banking system and other financial institutions holding assets backed by collapsing real estate. Once the entire financial system was infected with the subprime virus, the health of the real economy took a turn for the worse.

There are many factors, market participants and regulatory institutions that can be blamed for creating the current financial crisis. Some blame the greed of Wall Street bankers and brokers whose compensation structure encouraged them to break ethical standards and undertake unreasonably high risks. Others blame quantitative analysts for creating “weapons of mass destruction”\(^1\) in the form of complex financial products such as credit default swaps, and rating agencies that assigned high ratings to those risky and difficult-to-value derivatives. Economists point out that due to the securitization process, mortgage originators were able to transfer credit risk on to the investing community and thus created informational asymmetries. Many note that excessively low rates kept by the Federal Reserve from 2002 to 2005 contributed to the problem. Some cite the failure of regulatory bodies in monitoring Wall Street, and others cite the government’s push to increase home ownership for lower and middle classes through the Community Reinvestment Act, Fannie Mae and Freddie Mac. No doubt, all of these factors contributed to the development of the crisis to some extent.

The paper is organized as follows: the first section addresses the mortgage market and the developments in subprime lending. The following two sections address the events of the subprime lending meltdown and the subsequent financial turmoil. Finally, the last section addresses the causes and who to blame for the crisis. Potential information technologies for detecting such a crisis are discussed in the Appendix.

Part I: Mortgage Market
As mentioned earlier, the current crisis had its origins in the housing market. Because of its linkage to other sectors of the economy, the state of the housing sector is an important indicator of the health of the whole economy of the country. Homeownership has often been cited as an integral feature of the American Dream and has been one of the main values of the US social and economic system. Homeownership is believed to promote community-based values and provide stability and prosperity to the system. From an economic point of view, the appreciation in home values, the main asset held by a household, would help households to build wealth which in turn would provide a continuous increase in consumption, the driving force of the US economy\(^2\). Because homeownership is such a significant economic factor, a great deal of attention is paid to the mortgage market. The government has long been enacting various policies to encourage homeownership. For example, the federal government created a number of agencies designed to increase access to the funds for financing mortgages, including the Rural Housing Service, the Federal Housing Administration, and the Federal Home Loan Banks. Additionally, homeowners enjoy a number of tax benefits, such as deductions for mortgage interest and real estate taxes, as well as a sizable exclusion on capital gains from home sales.

Homeownership in the U.S. has maintained a relatively high level and has been growing relatively steadily over time. As shown in Figure 1, in the U.S. there were two periods in the last century when the homeownership rate increased dramatically, from 1940 to 1960, and during the recent home price boom

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2. George Bragues: Leverage and Liberal Democracy
since the 1990’s. The first period of increase, from 1940 to 1960, saw the most dramatic increase. This was a result of the government policies aimed to promote homeownership in response to a decline in the homeownership rate during the Great Depression. For the next 35 years, this rate was hovering near the 64 percent level. However, in 1995, after decades of relative stability, the rate of U.S. homeownership began to surge and reached 69 percent in 2004.

![U.S. Homeownership Rate, 1930 to 2004](image)

**Figure 1.** Source: Federal Reserve Bank of St. Louis Review September/October 2006. Recent Trends in Homeownership by Garriga, Gavin and Schlagenhaufl

The increase in the homeownership rate during that period is largely due to innovations in the mortgage finance industry that may have helped a large number of households buy homes more easily than they could have before.

**Developments in Subprime Lending**

Subprime lending is relatively new and was virtually nonexistent prior to the 1990’s when it became a rapidly growing segment of the mortgage market. U.S. mortgages can be divided into the following four groups:

1. **Prime conforming mortgages** are those mortgages that are made to good-quality borrowers. Conforming mortgages "conform" to the mortgage underwriting guidelines of the government-sponsored enterprises, (GSEs) Fannie Mae or Freddie Mac. Meeting these requirements enables originators to sell these mortgages to GSEs.

2. **Jumbo mortgages** are those mortgages that exceed limits set by the Office of Federal Housing Enterprise Oversight (OFHEO), and therefore, not eligible to be purchased, guaranteed or securitized by Fannie Mae and Freddie Mac (The national conforming loan limit for mortgages that finance single-family one-unit properties is set at $417,000 for 2006-2008, with limits 50 percent higher for four statutorily-designated high cost areas: Alaska, Hawaii, Guam, and the U.S.

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Virgin Islands. Since early 2008, a series of legislative acts have temporarily increased the one-unit limit to up to $729,750 in certain high-cost areas in the contiguous United States.5)

3. **Alt-A mortgages** are those mortgages that do not conform to the Fannie Mae and Freddie Mac definitions. The risk profile of Alt-A mortgages falls between prime and subprime. Alt-A borrowers normally have higher credit ratings than subprime borrowers and typically have clean credit histories, but the mortgage is viewed as nonprime because of some issues that increase its risk profile. These issues include limited or no documentation about income and assets, higher loan-to-value and debt-to-income ratios, the purchase of a second home, or some combination of these characteristics.

4. **Subprime mortgages** are those mortgages that lie below Alt-A mortgages and are typically granted to individuals with poor credit histories (often below 600) who, as a result of their deficient credit ratings, would not be able to qualify for conventional mortgages. Two main benefits of this type of mortgage are the increased number of homeowners and the opportunity for these homeowners to build wealth.

Since late 1990’s, the growth of the subprime market has been quite dramatic. Dwight Jaffee documents two distinct periods of exceptional expansion in subprime lending (Figure 2). The first expansion occurred during the late 1990s, when subprime lending reached an annual volume of $150 billion, which is 13 percent of the total annual mortgage originations. That expansion ended in 2000-2001 as the dot-com bubble burst. The second period of expansion started in 2002, reaching annual loan volumes of over $600 billion in 2005 and 2006, representing over 20 percent of the total annual mortgage originations in those years.6

![Figure 2. Subprime Mortgage Originations, Annual Volume and Percent of Total. Source: Inside Mortgage Finance](image)

There are many factors that contributed to the growth of the subprime mortgage market. Chomsisengphet and Pennington-Cross argue that changes in law opened the door for a development in the subprime

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7 Ibid.
The Community Reinvestment Act of 1977 (CRA) was designed to encourage commercial banks and savings associations to meet the needs of low- and moderate-income borrowers. Critics of the CRA contend that the law pushed banking institutions to undertake high risk mortgage lending. The Depository Institutions Deregulation and Monetary Control Act, adopted in 1980, allowed banks to charge high interest rates and fees to borrowers. The Alternative Mortgage Transaction Parity Act in 1982 preempted state laws that restricted banks from issuing any mortgage except conventional mortgages. In other words, it permitted the use of adjustable-rate mortgages, balloon payment mortgages and interest-only mortgages. And of course, big developments in the mortgage market brought the Tax Reform Act of 1986. The Tax Reform Act increased demand for mortgage debt because while prohibiting the deduction of interest on consumer loans, it allowed interest deductions on mortgages for a primary residence and one additional home. That made mortgage debt highly attractive for borrowers as this kind of debt was cheaper than consumer debt for many homeowners. In the late 1990’s, interest rates were declining and house prices were increasing. These conditions allowed low-cost access to the equity in homes. More than half of all subprime mortgages originated were used for cash-out refinancing.

Paul Mizen notes another factor influencing the development of subprime lending - the desire of mortgage originators to maintain the volume of new mortgages for securitization by expanding lending activity into new markets. For instance, in urban areas of some U.S. cities, such as Detroit, Miami, Orlando, Las Vegas etc., where homeownership was previously uncommon, subprime mortgages became highly concentrated.

Several financial innovations in the mortgage market spurred the rise of the subprime market during the 1990s and into the 2000s. The most notable changes in the mortgage market that promoted the growth of subprime lending came from innovations that reduced costs for lenders in assessing and pricing risks. In particular, the increased use of credit scoring models made it easier for lenders to gather and process information on credit quality of prospective borrowers and the value of the collateral. These models improved risk management and lenders’ ability to better estimate repayment probabilities, especially for borrowers with poor credit quality. As a result, credit scoring helped more people to become eligible for a mortgage and also helped reduce the down-payment requirements for others. As discussed in Doms and Krainer, innovations such as lowering of down-payment requirements increased flexibility in repayment schedules, and the reduction of costs associated with extracting equity from homes boosted demand for homeownership from the consumers that are traditionally cash constrained.

The financial innovation of securitization

One problem with mortgage loans is that they are illiquid, e.g. non tradable. Traditional lending practices involved lending to a home buyer and holding mortgages on the books of the mortgage originator until the loan was repaid. There are two disadvantages of this strategy: concentration of risk in the industry, and limited funds flowing into mortgages. Mortgage-backed securities were created to solve this problem.

In the 1930s, the federal government established Fannie Mae to create a liquid secondary mortgage market by buying Federal Housing Administration (FHA)-insured mortgages from depository institutions, principally savings and loan associations and therefore encouraging more lending. In 1970, to provide

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9 Ibid.
10 Ibid.
competition for Fannie Mae (which was sold to private investors in 1968) and to further increase the availability of funds to finance mortgages and home ownership, the federal government established Freddie Mac. Both firms had an aim to develop the secondary market for mortgages and mortgage-backed securities which they did in two ways: 1) by purchasing prime mortgage loans, which they financed by selling bonds in capital markets, 2) by securitizing mortgages.\(^\text{14}\)

Securitization is a financial process which allows one asset to be grouped with others to create a marketable security guaranteed by the cash flows. Securitized credit, such as the issuance of mortgage-backed securities (MBSs), is when loans are purchased from the originators (banks, mortgage companies, and others) and then assembled into pools. These MBSs, which are the rights to the principal and interest payments made by borrowers on a pool of mortgages, are then sold to investors.

For years, the securitization of residential mortgages was dominated by the government-sponsored enterprises (GSEs), Fannie Mae and Freddie Mac, which primarily securitized conventional prime loans. In order to be eligible to sell loans to GSEs, the originator must agree to follow GSE underwriting guidelines, which specify types of loans that GSEs will buy and the processes for verifying the credit quality of borrowers. Although the mortgages underlying the GSE programs are not government guaranteed, Fannie Mae and Freddie Mac guarantee that investors in their MBS will receive timely payments of principal and interest. Because the GSEs were expected to be implicitly backed by the federal government, their guarantee was treated by investors as a government guarantee, and therefore their MBSs were perceived as risk-free. Securitization was a dramatic innovation in the secondary mortgage market. By pooling together similar loans, GSEs are able to pass mortgage payments through to the investors, and that made the secondary mortgage market more attractive to investors and lenders as well.

Because the GSEs were limited in the size and quality of mortgages they could purchase, non-agency or private MBS issuers controlled the rest of the securitization market. Countrywide Financial, Lehman Brothers, and Wells Fargo, Washington Mutual and Bear Stearns were some of the largest issuers of mortgage-backed securities in 2006.

Non-agency institutions, such as commercial and investment banks, thrifts, or mortgage banks undertake securitization through special purpose vehicles (SPVs), which are tax-exempt financial entities created for a specific purpose – usually to engage in investment activities using assets transferred to them by banks. The advantage of their off-balance sheet status allows SPVs to make use of assets for investment purposes without incurring risks of bankruptcy to the parent organization.\(^\text{15}\)

Here is how the non-agency “originate and distribute” approach works (Figure 3).

First, a commercial or investment bank acquires a set of mortgages by originating them or by buying from an originator. It creates the SPV, and then "pools" a large portfolio of assets and transfers to the SPV. The special purpose vehicle issues mortgage-backed securities either back to the originator, who then takes it to the market, or to the investors. The holders of the securities get the rights to the cash flows available to the SPV. However, unlike GSE securities, these MBS are not guaranteed from the credit loss. Most importantly, the securities are structured – each class of the securities is referred to as a tranche (senior, mezzanine, junior). Each tranche has a different level of credit protection or risk exposure than another with the senior classes representing the lowest risk, and the most junior class being the most exposed to payment risk. Originators often retain a connection to their assets following a securitization by acting as a


servicer - the agent collecting regular loan payments and forwarding them to the SPV. And the special purpose vehicle passes collections to the investor. The senior classes have first claim on the cash that the SPV receives, and the more junior classes only start receiving repayment after the more senior classes have repaid. In the event of default, the servicer takes actions against debtors as a SPV’s agent. If losses are realized, they are distributed in the reverse order of the hierarchy - that is, the most junior tranche take the loss first. The senior tranches remain unaffected until the losses exceed the entire amount of the subordinated tranches.

Figure 3. Originate-to-Distribute

Mortgage-backed securities are rated by independent credit rating agencies (CRA). CRAs analyze the probability of cash flows associated with each tranche using proprietary models based on historical data and assign a credit rating to each debt tranche. Due to the complexity of structured investments, these ratings were widely used by market participants as a guide to the credit quality of the securities. A very large share of the structured investments was the highly rated tranches, such as AAA or AA. These ratings led many investors to believe that the structured credit carried very low risk.

Securitization has been an extremely positive innovation for credit markets. The main advantages of the securitization are more diversification and distributing of risks, the extension of credit to new borrowers and lowering the cost of lending. As the securitization of mortgages became dominated by the private financial sector and the market became more complex, further innovations in securitization emerged. “Financial engineers did not just stop at pooling mortgages”\textsuperscript{16} and creating mortgage-backed securities. The same techniques used to create senior trances out of a pool of mortgages were used to create highly rated securities out of pools of junior tranches of MBS. These products are known as a collateralized debt obligations (CDO). Figure 4 illustrates the construction of the CDOs created from mortgages.

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\textsuperscript{16} Stephen G. Cecchetti “Monetary Policy and the Financial Crisis of 2007-2008”
CDOs issuers purchased junior tranches from many different MBS and pooled them together with other asset-backed securities (ABS). These ABS were backed by credit card loans, student loans, business loans, and auto loans. CDO is a “re-securitization” of existing securities, because unlike an MBS, whose assets consist of actual mortgage payments, a CDO’s assets are securities that collect those payments. Some tranches of CDOs were also pooled and resold as CDOs of CDOs.

Another product is a credit default swap (CDS), which was used to protect against the risk of an MBS, CDOs and other assets defaulting. The buyer of a credit default swap receives credit protection and agrees to pay the seller a fixed stream of payments. Whereas the seller of the swap guarantees the credit worthiness of the product and agrees to a payoff if a “reference entity” (issuer of MBS or CDO security) experiences a “credit event”, or default in other words. By doing this, the risk of default is transferred from the holder of the security to the seller of the swap. These transactions are done in the Over the Counter (OTC) markets and are not overseen by regulators. Only parties involved in the transaction have knowledge of the contract terms. Therefore, there is no public knowledge of the volume of CDS transactions most institutions have.

The first forms of credit insurance were developed by mono-line insurers such as Municipal Bond Insurance Association (MBIA) and American Municipal Bond Assurance Corporation (Ambac) which

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19 Ibid.

20 Monoline bond insurers participate in financial guaranty insurance and related products only. The Association of Financial Guaranty Insurers, AFGI http://www.afgi.org/monoline.htm
emerged in the 1970s and were municipal bond insurers. By the early 2000s, the mortgage-backed CDO market was growing rapidly. The mono-lines began to become involved in these deals, typically by selling CDS protection on the CDO tranches.

Structured products can generate huge profits in good times, but their complexity and lack of public information about them made them the source of panic and massive losses in the financial system.

Part II. Subprime Crisis

Developments in the subprime mortgage market were the trigger for the crisis. That is why it is often called the “subprime crisis”.

**Housing bubble**

The recent downturn in house prices was preceded by its rapid growth. Figure 5 shows the inflation-adjusted home price series, developed by Robert Shiller, from 1920 to the present.21

![Inflation-Adjusted Home Prices](image)

Figure 5. Source: FCIC Preliminary Staff Report “The Mortgage Crisis” April 2010.

Over the period between the 1920’s and late 1990’s, the growth in home prices was more or less steady and moderate. In the late 1990’s, prices began to accelerate and rose dramatically to unprecedented levels in 2006, and far faster than household incomes. An increase in house prices represents an asset bubble when it (increase) is not based on fundamental economic changes, such as changes in income and demographics. An asset bubble exists “if the reason that the price is high today is only because investors believe that the selling price is high tomorrow - when ‘fundamental’ factors do not seem to justify such a price.”22 Homebuyers expected future prices to continue to appreciate and therefore were willing to pay inflated prices. These expectations of future price increases were a significant factor in inflating house prices.

As housing prices were rising, the demand for housing increased significantly. This can be explained by a number of factors.

Early in 2000, the dotcom bust plunged the U.S. economy into a mild recession. The situation was worsened by the terrorist attacks on September 11, 2001. In response to the fear of a deeper recession, the Federal Reserve injected liquidity into the market by lowering interest rates to increase the money supply and encourage borrowing. This widespread availability of credit affected everyone from individuals with

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good credit to those with poor credit. In the environment of cheap credit, growing home prices, and extra liquidity in the system which brought down the risk premium, investments in higher yielding subprime mortgages became very attractive for investors seeking higher returns. As subprime borrowers, previously shut out of the mortgage markets, became attractive customers for mortgage lenders, the demand for housing started to grow, which in turn helped inflate home prices. The growing demand for houses was accompanied by the increased availability of mortgage credit. The availability of mortgage credit was due to the fact that the underwriting standards on mortgage loans were eased. Loan-to-value ratios were increased, debt-to-income requirements were less strict and lenders were more willing to accept limited or no documentation of borrowers’ income and assets.

This easy credit and the loose underwriting practices fueled the boom in the housing sector that was inevitably reversed. The subprime meltdown evolved as a number of factors conspired the burst of the bubble.

From 2004 to 2006 the Federal Reserve started tightening monetary policy to fight growing inflation by increasing interest rates. Most subprime mortgages were designed as a hybrid adjustable rate mortgage with the initial “teaser” rate fixed for two - three years, and then adjustable every half a year thereafter. The first adjustment can be a quite substantial increase in rate and creates an incentive to the borrower to refinance the mortgage. In case of appreciating house prices, the increase in rates would not be so bad, as most borrowers are able to accumulate enough home equity to refinance fairly easily. However, home prices started to fall at the end of 2005. The sharp drop in housing prices left many borrowers with negative equity, which is when they owe more on the house than it is worth 23. Another factor that contributed to the increase in mortgage defaults was a rise in unemployment. Ohio, Michigan and Indiana were the first states to see high rates of defaults. The high delinquencies in these states were preceded by difficult economic conditions and elevated unemployment rates 24.

The slump in the housing market led to a chain of events that caused lenders and ultimately banks and hedge funds to sustain large losses on mortgages. This is known as the subprime crisis.

**Part III. Financial Turmoil**

Financial turmoil was triggered by the subprime crisis. This section explores the series of events leading to full blown financial turmoil and the most severe recession since the Great Depression.

**Liquidity Crisis**

The signs of the emerging problems were seen in early 2007 when HSBC was the first major bank to announce that it estimated larger than expected losses from rising defaults on subprime mortgages. Although this announcement did not get much attention, the subprime mortgages soon became a very hot topic on Wall Street 25. As default rates continued to rise, policymakers, regulators and market participants started to realize that subprime mortgages were very high-risk instruments. In February 2007, Freddie Mac announced that it would no longer buy the most risky subprime mortgage and mortgage-related securities 26. Soon, some of the largest subprime lenders such as New Century Financial and American Home Mortgage Corporation filed for bankruptcy.

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23 FCIC Preliminary Staff Report “The Mortgage Crisis” April 2010
Despite the rising subprime mortgage delinquencies, the market was still pretty confident in highly rated tranches of subprime MBS through the first half of 2007. Only in June and July, credit rating agencies began downgrading residential MBS (RMBS) products. The first mass downgrade of RMBS occurred on July 10, 2007 when S&P announced it was placing a number of subprime RMBS tranches on a watch list. The same day, Moody’s downgraded securities valued at $5.3 billion. Between the third quarter of 2007 and the second quarter of 2008, $1.9 trillion of mortgage-backed securities received downgrades. These downgrades raised concerns about the reliability of ratings of structured-credit products.

On July 18, Bear Stearns announced that it would lose nearly all the money held by its two ailing hedge funds, High-Grade Structured Credit Fund and High-Grade Structured Credit Enhanced Leveraged Fund. Their big mistake was to buy highly-rated mortgage-backed paper with borrowed money. When the paper fell in value, the funds' leverage meant they were wiped out. Bear Stearns funds were borrowing the money against the value of their portfolios. When those portfolios dropped in value, the prime brokers started making margin calls, forcing the funds to sell their paper at a loss.

When these two funds collapsed, it was revealed that many of the bonds and CDOs that caused troubles at the funds had carried relatively high ratings. Investors became highly nervous. No one was sure whether other firms were holding similar types of securities to those that were held by the Bear Stearns funds, and therefore might experience similar losses. Because hedge funds use leverage – i.e. borrowed funds – the losses in hedge funds are not only a problem for their investors but for their creditors and counterparties as well. Since hedge funds are unregulated and do not disclose their sources of funds, this created uncertainty about which institutions were exposed to credit risk from hedge funds. The collapse of the Bear Stearns hedge funds led many to think that other hedge funds were likely facing difficulties too.

Conduits and SIVs funded their purchases of CDOs and other securitized assets by issuing asset-backed commercial paper (ABCP). There was an unprecedented increase in the volume of outstanding ABCP from 2005 until mid-2007. ABCP issued by the conduit to finance the purchase of CDOs normally has a term that is less than that of the underlying assets. Because of this mismatch in maturities, ABCPs have to be “rolled over”; to do so, the conduit normally issues additional commercial paper and uses the proceeds to retire maturing commercial paper issues. Investors were buying ABCP because it was considered very low-risk commercial paper. When the value of subprime mortgages became highly uncertain and rating agencies began downgrading subprime mortgage securities, the value of the CDOs and the credit-worthiness of the SIVs that hold the CDOs plummeted. As a result, markets became unwilling to purchase ABCP because they were anxious that the assets backing these commercial papers would plunge in value. “Probably everything in most of those portfolios {behind commercial paper} is fine but people do not know for sure, and people do not want to take risk.”

As the ABCP market shut down, SIVs could not roll over matured commercial papers and were deemed to fail. In late July 2007, IKB, a conduit of the German bank was unable to roll over its ABCP due to concerns about credit quality of its holding. The bank did not rescue the conduit and a public bail-out was arranged. In some cases, banks chose to rescue the conduits they created. The need for rollover funding created pressure on banks’ liquidity and forced them to sell assets at “fire-sale” prices. The risk that many banks believed had been shifted off-balance sheet to the SIVs was returned back onto their balance sheets. The ABCP market was the first to display clear signs of liquidity disruptions, which soon spread to the interbank money market. As liquidity in financial markets began to evaporate, many large banks and investment firms, such as UBS, Merrill Lynch, Citigroup and others were exposed to large losses (Figure 6).

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27 FCIC Preliminary Staff Report “Credit Ratings and the Financial Crisis” June 2010
30 FCIC Preliminary Report “Shadow Banking and The Financial Crisis” May 2010
Figure 6. Top Corporate Writedowns\textsuperscript{31}

Declining confidence in the valuation of mortgage-related and structured credit products and concerns about the scale of the losses led to the interbank market\textsuperscript{32} disruptions. Uncertainty about their own needs combined with concerns about safety of potential borrowers made banks unwilling to lend to each other. On August 9, 2007 the interbank rate spiked in response to announcement by BNP Paribas, a French bank, that it was suspending withdrawals from funds invested in illiquid (and thus hard-to-value) credit securities. Rather than lend out, anxious banks hoarded liquidity in case they needed to cover any losses they might experience. Central banks use the LIBOR-OIS spread (the London Interbank Offered rate – LIBOR minus the overnight index swap rate – OIS) to describe the increase in the cost of interbank lending\textsuperscript{33}. Another spread in rates that provides a useful basis for gauging the severity of the current liquidity crisis is the TED spread (Treasury-Eurodollar spread). In August 2007, the LIBOR-OIS spread and the TED spread widened markedly. This indicated that the availability of funds in the financial markets had shrunk. These spreads adversely affected financial institutions that relied on the markets for their funding.

The panic in the financial markets was met by several Federal Reserve (Fed) policy actions aimed to stabilize markets by providing liquidity. These actions included:

- **Discount window rate**\textsuperscript{34} On August 17, the primary lending rate was reduced from 100 to 50 basis points above the federal funds rate target. However, banks that can borrow at the Fed’s discount

\begin{table}[h]
\centering
\begin{tabular}{|l|c|}
\hline
Bank & Writedowns (billion U.S.) \\
\hline
Citigroup & 46.40 \\
Merrill Lynch & 36.80 \\
UBS & 36.70 \\
AIG & 20.23 \\
HSBC & 18.70 \\
RBS & 16.50 \\
IKB Deutsche & 14.73 \\
Bank of America & 14.60 \\
Morgan Stanley & 11.70 \\
Deutsche Bank & 11.40 \\
Ambac & 9.22 \\
Barclays & 9.20 \\
Wachovia & 8.90 \\
MBIA & 8.41 \\
Credit Suisse & 8.13 \\
Washington Mutual & 8.10 \\
HBOS & 7.50 \\
\hline
\end{tabular}
\caption{Table 1. Writedowns by Bank}
\end{table}
window are usually reluctant to use this facility because of the associated stigma - the fear that discount window borrowing might signal a lack of creditworthiness on the interbank market.

- In addition, the term of discount window lending was extended from overnight to 30 days.

- Federal funds rate cuts. Between September 2007 and December 2008, the target federal funds rate was cut 10 times from 5.25% to 0 - 0.25%. At first, the Fed’s liquidity injections appeared effective. But in November it became clear that earlier estimates of losses in the mortgage markets had to be revised. Many banks took large write-downs. As the TED spread widened again in December, it appeared that the Fed’s cuts in the federal funds rate and the discount rate were not effective in easing the liquidity crunch.

- Term Auction Facility On December 12, 2007, the Federal Reserve announced the creation of the Term Auction Facility (TAF). This facility gives banks another way besides the discount window to benefit from the Fed’s lending facility. TAF is a temporary program designed to “address elevated pressures in short-term funding markets” and to “promote the efficient dissemination of liquidity when the unsecured interbank markets are under stress”. Under the program, the Fed auctions collateralized loans with terms of 28 and 84 days to depository institutions that are “judged to be in generally sound financial condition… and that are eligible to borrow under the primary credit discount window program”. Crisis lending data released by the Fed on December 1, 2010 provides an insight into how major U.S. banks relied on the Fed’s funding programs. For example, Citigroup used TAF 26 times, Barclays Capital 49, MetLife Bank 19, and J.P. Morgan Chase used it only seven times. As it is seen from Figure 7, the LIBOR-OIS spread began to decline with each of the auctions. However, after falling from over 100 points in December to less than 30 basis points in January, it started to climb again in February.

- Term Securities Lending Facility In response to increased pressures in the markets, on March 11, 2008 the Fed announced an expansion of its securities lending program and pledged $200 billion to this facility in an attempt to relieve liquidity pressure in the credit markets. Under this new Term Securities Lending Facility (TSLF), the existing lending program transformed in two ways. Firstly, rather than overnight lending, the new program provides securities for a term of 28 days. Secondly, the broader collateral was accepted, including “federal agency debt, federal agency residential-mortgage-backed securities (MBS), and non-agency AAA/Aaa-rated private-label residential MBS”. Using this facility, primary dealers including Fannie Mae, Freddie Mac and major banks could access highly liquid and secure Treasury securities in exchange for much less liquid and riskier securities. Citigroup used the TSLF 65 times, Goldman Sachs 53, and Morgan Stanley used it 34 times.

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37 Ibid.
38 Term Auction Facility (TAF) data is in Excel file http://www.federalreserve.gov/newsevents/reform_taf.htm#data
41 Term Securities Lending Facility (TSLF) and TSLF Options Program (TOP) Data is in Excel file http://www.federalreserve.gov/newsevents/reform_tslf.htm
When the housing market declined, defaults soared to record levels on subprime mortgages and financial guarantors faced growing payment obligations. In late 2007, leading rating agencies issued credit outlook warnings to Ambac and MBIA, as they were concerned the insurers did not have sufficient capital to support their ratings. Many municipal bond issuers decided against insuring bond insurance because of doubts about whether bond insurance provides any value. In January 2008, Ambac’s rating was reduced from AAA to AA by Fitch Ratings. That made Ambac insurance “toxic.” Other mono-line insurers were placed on negative watch lists by credit rating agencies. The downgrade of a major mono-line triggered doubts about protection of municipal and institutional bonds. Bondholders in the auction-rate securities (ARS) market rushed to liquidate their positions. Major firms such as Goldman Sachs, Lehman Brothers, Citigroup, Merrill Lynch, and UBS decided not to bid on auctions they ran and therefore liquidity in ARS markets was evaporating thus causing auction failure.

Due to massive sell-offs, Dow Jones and Nasdaq were down 5 to 6 percent, indicating a large drop in the U.S. equity market. As a result, the Fed decided to cut the federal funds rate by 75 basis points to 3.5 percent, the first emergency cut since 1982. On January 30, the Federal Open Market Committee cut the federal funds rate another 50 basis points.

42 Ibid.
45 FCIC Preliminary Report “Shadow Banking and The Financial Crisis” May 2010
**Bear Stearns**

The collapse of Bear Stearns, the fifth largest U.S. investment bank, was a major event in the financial industry. The move by the Federal Reserve to rescue Bear Stearns was an attempt to prevent systemic risk - the risk of collapse of the entire financial system.

Bear Stearns had invested heavily in structured finance products. Concerns regarding its leverage and quality of MBS on its books had been growing since the collapse of Bear Stearns hedge funds in the summer of 2007. On March 10, 2008, Moody's Investors Service downgraded 163 tranches of 15 mortgage bonds underwritten by Bear Stearns, the second-largest underwriter of mortgage bonds in 2007 behind Lehman Brothers Holdings Inc.\(^48\) Reportedly, Goldman Sachs indicated that it would not take exposure to Bear Stearns\(^49\). Despite Bear Stearns Chief Executive Officer Alan Schwartz’s statement that company's finances “remain strong”\(^50\), the Moody’s report together with spreading rumors regarding Bear Stearns’ insolvency and liquidity problems led to a run on Bear Stearns accounts from its clients and other counterparties. In the following four days, the bank literally spent all of its liquid assets in order to meet its investors’ and counterparties’ demands\(^51\).

Investment banks such as Bear Stearns or Lehman Brothers financed their activities by borrowing very short term. Two of the most common types of short term borrowing are the asset-backed commercial paper and overnight repurchase agreement loan or “repo”. As it was discussed previously, the market for ABCP shut down in 2007. In December, Chief Financial Officer Sam Molinaro said Bear Stearns reduced its reliance on short-term commercial paper and increased secured term funding\(^52\), in other words it relied on “repo” funding. Overnight repos are a type of “collaterized borrowing”\(^53\), where one bank’s assets are collateral in an overnight loan with another bank. This type of funding is very important for investment banks. As the run on the bank occurred and negatively affected its balance sheet, and rumors continued to mount, the bank’s ability to fund its activities was reduced and Bear Stearns could no longer get loans in the short term repo market. Other banks refused to lend it money because of the fear that problems would spread to other institutions. “In any situation where it appears that a large firm is about to fail, secured lenders will rapidly head for the exit and terminate as many of their repo transactions as possible,” says Joe Abate, money-market strategist at Barclays Capital\(^54\).

To prevent a Bear Stearns failure, the Federal Reserve of New York stepped in providing a 28-day $30 billion loan to JPMorgan Chase on March 14, 2008, which enabled JPMorgan Chase to extend a $30 billion short-term line of credit to Bear Stearns. Over the next weekend, it was revealed that the takeover of Bear Stearns would be necessary\(^55\). JPMorgan Chase agreed to acquire Bear Stearns, paying $10 per share (initially the price was set at $2 per share). A special-purpose vehicle (Maiden Lane, LLC) received


\(^{50}\) Ibid.

\(^{51}\) FCIC Preliminary Staff Report “Governmental Rescues of To-Big-To-Fail Financial Institutions” August, 2010


a ten-year, $29 billion loan from the Fed to acquire a designated portfolio of mortgage-related Bear assets, after JPMorgan absorbed the first $1 billion in losses. At that time, Bear Stearns had about 150 million trades spread across various counterparties. It was therefore considered “too interconnected” to be allowed to fail suddenly because it could have cause a “chain reaction” of failures of its counterparties and impose systemic risk on the entire financial system. The Fed provided support to JPMorgan Chase to acquire Bear Stearns due to “exigent and unusual circumstances” under section 13.3 of the Federal Reserve Act.

After approval of the JPMorgan Chase acquisition of Bear Stearns, on March 16, 2008 the Federal Reserve established the Primary Dealer Credit Facility (PDCF). PDCF allowed investment banks to directly borrow from the Fed at the primary discount rate, a facility that was previously not available to primary dealers. This step was made in order to protect the repo market and other U.S. funding markets from disruption following the near-bankruptcy of Bear Stearns and encourage financial markets to function more effectively. According to the crisis lending data released by the Fed on December 1, 2010, Goldman Sachs used the overnight loan program from the Fed 85 times and Morgan Stanley used PDCF 212 times. A few foreign banks benefited from this facility such as Deutsche Bank and UBS.

Fannie Mae and Freddie Mac

Other “too-big-to-fail” enterprises that received governmental support are Freddie Mac and Freddie Mac. As mortgage delinquency rates continued to increase, both GSEs took significant losses and concerns regarding their solvency grew. Fannie Mae and Freddie Mac were publicly traded but government-sponsored agencies with “debt of $1.5 trillion, direct guaranties to mortgages to the value of $5 trillion, and insurance for a further $2 trillion of other institutions mortgages, which means, directly or indirectly, they support more than half of the $12 trillion mortgage market”.

In July 2008, Congress passed the Housing and Economic Recovery Act (HERA), which established the Federal Housing Finance Agency (FHFA) as the regulator of Fannie Mae and Freddie Mac. In September, “to avoid unacceptably large dislocations in the financial sector” GSEs were placed in the government conservatorship. This event led to a “credit event” for a large number of outstanding CDS triggering large payments to those who had bought these swaps. As a conservator, FHFA’s obligation was “to preserve and conserve the Company’s assets and property and to put the Company in a sound and solvent condition”.

As Alan Greenspan said in his recent paper “The Crisis”, the biggest problem with the “too big to fail” bailout of Fannie Mae and Freddie Mac is that market participants “are going to believe that every significant financial institution, should the occasion arise, would be subject to being bailed out with taxpayer funds”. And it will take a lot of effort from legislators to prove that it is otherwise.

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56 FCIC Preliminary Staff Report “Governmental Rescues of To-Big-To-Fail Financial Institutions” August, 2010
58 FCIC Preliminary Staff Report “Governmental Rescues of To-Big-To-Fail Financial Institutions”
59 The facility expired on February 1, 2010
60 [Primary Dealer Credit Facility (PDCF). Data on PDCF transactions is provided in Excel file](http://www.federalreserve.gov/newsevents/reform_pdcf.htm)
62 Ben S. Bernanke “U.S. financial markets” Testimony Before the Committee on Banking, Housing, and Urban Affairs, U.S. Senate September 23, 2008 [http://www.federalreserve.gov/newsevents/testimony/bernanke20080923a1.htm](http://www.federalreserve.gov/newsevents/testimony/bernanke20080923a1.htm)
Failure of Lehman Brothers

Like Bear Stearns, Lehman Brothers, the fourth largest U.S. security firm, was one of the top underwriters of subprime MBS and CDOs. Lehman’s condition worsened in 2008.

Lehman faced big losses as a result of a high degree of leverage and large positions in subprime and other lower-rated mortgage tranches. In 2008, Lehman lost $2.8 billion in the second quarter and the shares lost 73 percent of their value that year.65

Because Lehman did not own a commercial bank, it was exempt from the Federal Reserve’s supervision. However, during the financial crisis, the Fed began to monitor the financial state of Lehman Brothers and other primary dealers.66 When the Fed established the Primary Dealer Credit Facility, Lehman was using that facility heavily. In order to prove the ability to repay, all borrowing firms were required to provide financial information to the Fed. Several stress tests conducted by the Fed and Securities and Exchange Commission (SEC) during the spring and summer of 2008 revealed “significant deficiencies in available liquidity, which the managers were strongly urged to correct.”67 Between March and September, Lehman was trying to raise capital to improve its liquidity condition. However, these efforts proved unsuccessful. Lehman was looking for potential buyers. On September 9, 2008, Korea Development Bank, previously interested in buying Lehman, announced it would not purchase Lehman. The next day Lehman announced that it expected to report a $3.9 billion loss for the third quarter and that it was planning to sell its investment management division.68 As the repo market evaporated, Lehman faced the same problems as Bear Stearns earlier that year. On Saturday, September 13, 2008, Timothy Geithner, president of the Federal Reserve Bank of New York, called a meeting on the future of Lehman. Lehman reported that Barclays Capital and Bank of America were possible buyers. However, regulators were unable to arrange the sale because both Barclays and Bank of America refused to take over Lehman without a government guarantee. Treasury and Fed officials decided not to offer a guarantee funded by tax payers, because as Fed Chairman Ben Bernanke stated, “the troubles at Lehman had been well known for some time, and investors clearly recognized - as evidenced, for example, by the high cost of insuring Lehman’s debt in the market for credit default swaps - that the failure of the firm was a significant possibility.”69 As a result, on September 15, 2008 Lehman filed for bankruptcy. With $639 billion in assets and $619 billion in debt, the Lehman bankruptcy filing was the largest in history.

Just before Lehman filed for bankruptcy, Merrill Lynch, the third-largest U.S. securities firm, announced that it had sold itself to Bank of America for $50 billion. Merrill Lynch had some of the same toxic debt on its balance sheet as Lehman did. The firm was hit hard by the credit crisis and wrote down billions of dollars. The perception that the Lehman failure would lead to a spread of the contagion to the other surviving investment banks, as well as a loss of confidence in Merrill Lynch’s solvency and ability to refinance short-term debt, made it obvious that Merrill Lynch could suffer the same fate as Lehman. Merrill thus decided to sell itself to Bank of America so as to avoid bankruptcy.

AIG

65 For Lehman, More Cuts and Anxiety By JENNY ANDERSON and ERIC DASH
67 Ibid.
69 Ben S. Bernanke “U.S. financial markets” Testimony Before the Committee on Banking, Housing, and Urban Affairs, U.S. Senate September 23, 2008 http://www.federalreserve.gov/newsevents/testimony/bernanke20080923a1.htm
Immediately after the Lehman collapse, it became clear that American International Group (AIG), the world's largest insurance company with more than $1 trillion in assets and operations in more than 130 countries, was faced with the possibility of the failure. According to the Congressional Oversight Panel, the primary causes of AIG’s distress were the collateral calls relating to its CDSs and securities lending program.

The trigger of AIG’s collapse came from AIGFP, an AIG financial subsidiary that was a leading underwriter of CDS on collateralized debt obligations backed by subprime mortgages\(^{70}\). AIGFP’s trading in credit derivatives led to enormous losses which essentially brought down the entire AIG. As many CDOs protected by AIGFP’s CDS were downgraded by rating agencies, the AIGFP portfolio was deteriorating rapidly and the demand for collateral calls from counterparties accelerated\(^{71}\). In addition, AIG had significant losses from its securities lending operation.

Another cause of AIG difficulties came from the securities lending program. Several of AIG’s life insurance subsidiaries participated in the securities lending program, which essentially aggregated the securities held by them and lent them out to authorized borrowers in exchange for cash collateral. This cash was used to buy securities, including RMBS. As the subprime crisis deepened, and investors became nervous about AIG’s solvency and began minimizing their exposure to AIG. Between September 12 and September 30, 2008, securities lending counterparties demanded that AIG return approximately $24 billion in cash. However, due to the illiquid market for RMBS, the repayment of cash collateral appeared to be difficult for AIG and that worsened their liquidity problems\(^{72}\).

Then on Friday, September 12, the company’s deterioration accelerated. Standard & Poor's Ratings Services placed its ratings on AIG and subsidiaries on CreditWatch with negative implications. Robert B. Willumstad, CEO of AIG, called Warren Buffett, CEO of Berkshire Hathaway, to discuss a possible investment in AIG. However, Buffett turned him down by saying that the assets for sale were not attractive enough, and he would have had trouble raising the $25 billion that AIG would have needed to receive for its business\(^{73}\). Also Friday, the Treasury and the New York state insurance regulators learned about AIG’s severe liquidity problems, due to increasing demands on cash collateral under its securities lending program and collateral calls on AIGFP’s CDS portfolio. As AIG was unable to obtain funding, it was deemed to be insolvent. Hence, on September 16, 2008, the Fed exercised its authority under Section 13.3 of the Federal Reserve Act again, and made an $85 billion loan to AIG. In return the government took a 79.9 percent ownership in AIG. The AIG bailout was extended by a further $37 billion in October and another $40 billion in November.

When the news about AIG’s rescue became public, there was an immediate question as to why AIG was rescued and not Lehman brothers. The Fed’s Chairman Ben Bernanke explained it in testimony before the Committee on Banking, Housing, and Urban Affairs at the U.S. Senate on September 23, 2008. In the case of Lehman Brothers, it was determined that the failure of the bank could not be prevented. In the case of AIG, the Federal Reserve rescued the company “because it judged that, in light of the prevailing market conditions and the size and composition of AIG's obligations, a disorderly failure of AIG would have severely threatened global financial stability and, consequently, the performance of the U.S. economy,”\(^{74}\).

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\(^{71}\) Ibid.

\(^{72}\) Ibid.

\(^{73}\) Ibid.

\(^{74}\) Ben S. Bernanke “U.S. Financial Markets” Testimony Before the Committee on Banking, Housing, and Urban Affairs, U.S. Senate September 23, 2008 [http://www.federalreserve.gov/newsevents/testimony/bernanke20080923a1.htm](http://www.federalreserve.gov/newsevents/testimony/bernanke20080923a1.htm)
The Lehman bankruptcy, combined with the unexpectedly rapid collapse of AIG, sent global markets into turmoil. On September 15, 2008 the Dow Jones industrial average slid 504 points, or 4.42 percent, and the Standard & Poor's 500 index fell 59 points, or 4.71 percent – these changes were the biggest one-day point drop since September 2001. Money market withdrawals increased substantially, as the Reserve Primary Money Fund “broke the buck” – meaning that net asset value of its shares had fallen below $1 due to the losses incurred on the fund’s holdings of Lehman commercial paper. The pullbacks in money markets disrupted liquidity in the markets. As the pools shrank, interbank lending markets were under pressure and less funding was available to repo borrowers because lenders were concerned about both the creditworthiness of borrowers and the riskiness of the collateral. Credit default swap premiums for major financial firms shot up, as each bank tried to protect itself against the default of other banks.

**Government response**

The Federal Reserve took some actions to stabilize the condition of the markets. To support the liquidity of primary dealers, the Fed expanded the PDCF by accepting all collateral used in tri-party repo transactions, “including all investment-grade debt securities. Previously, only Treasury securities, agency securities, and AAA-rated mortgage-backed and asset-backed securities could be pledged.”

“Borrowing through the PDCF soared to $59.7 billion on Wednesday, September 17, from no activity during the previous week.”

Following the collapse of Lehman Brothers, the conditions in the markets for short-term financing by corporations deteriorated. Money market mutual funds purchase commercial paper from creditworthy companies issuing commercial paper to fund their operations. Due to increased counterparty risk, money market funds reduced their purchases of commercial paper, and many corporations were unable to finance their operations. In response to the liquidity squeeze in the commercial paper market, the Fed created three programs to extend its lending facilities beyond primary dealers.

To prevent runs on money markets, the Fed established the Asset-Backed Commercial Paper Money Market Fund Liquidity Facility (AMLF) on September 19, 2008. AMLF is a lending program that provided new funding to U.S. financial institutions to purchase asset-backed commercial paper from money market mutual funds to prevent default on investors’ redemptions.

To stabilize the functioning of the commercial paper market, which experienced considerable strains in the weeks following Lehman Brothers’ collapse, the Fed announced the creation of the Commercial Paper Funding Facility (CPFF) on October 7, 2008. The CPFF allowed access to the Federal Reserve’s discount window to issuers of commercial paper. The facility was used by companies such as Chrysler Financial Services, Verizon, General Electric, AIG, American Express and many others.

“We used the CPFF to support our investors’ need for liquidity during the financial crisis and to manage the company’s commercial-paper maturity profile. The program was successful, and it stabilized the market,” said Russell Wilkerson, a GE spokesman.

The Money Market Investor Funding Facility (MMIFF) was another program implemented by the Fed and was designed to support a private sector initiative to provide liquidity to money market investors by facilitating the purchase of commercial paper from money market mutual funds directly. These three facilities (AMLF, CPFF and MMIFF) helped to reduce the borrowing costs for businesses in their daily operations.

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77 Commercial Paper Funding Facility (CPFF) Data is an Excel file http://www.federalreserve.gov/newsevents/reform_cpf.htm
On October 3, 2008, the Emergency Economic Stabilization Act was signed into law. It established the Troubled Asset Relief Program (TARP) which had three goals: to stabilize financial markets, to support housing markets by preventing foreclosures and supporting mortgage finance, and to minimize potential losses to taxpayers. TARP authorized the U.S. Treasury to make equity investments in, purchase troubled assets from, and provide loans to a variety of entities, including banks and other financial institutions. On October 14, 2008, the Treasury announced that it had established the Capital Purchase Program (CPP) under the TARP “to encourage U.S. financial institutions to build capital to increase the flow of financing to U.S. businesses and consumers and to support the U.S. economy.” Under the program, instead of buying troubled assets from the financial institutions, the Treasury agreed to buy up to $250 billion of senior preferred shares of stock in qualifying U.S. controlled banks, savings associations, and certain bank and savings and loan holding companies engaged only in financial activities. Treasury Secretary Paulson also announced that the Treasury would buy $125 billion of preferred equity stakes in Goldman Sachs, Morgan Stanley, J.P. Morgan Chase, Bank of America (including newly acquired Merrill Lynch), Citigroup, Wells Fargo, Bank of New York Mellon and State Street.

Another government intervention to encourage liquidity in the interbank lending market was establishment of the Temporary Liquidity Guarantee Program (TLGP) by the Federal Deposit Insurance Corporation (FDIC) on October 13, 2008. The TLGP was created to supplement the TARP by providing liquidity assistance to banks and thrifts. Because banks and investment managers were reluctant to lend to each other, finding alternative sources of funding at a reasonable cost became very difficult for the financial institutions. The goal of the TLGP was to decrease the cost of bank funding so that bank lending to consumers and businesses would normalize. The program consisted of two components: the Debt Guarantee Program, by which the FDIC would guarantee the payment of certain unsecured credit obligations by qualifying institutions, most notably certificates of deposit and commercial paper, and the Transaction Account Guarantee Program, by which the FDIC increased its insurance coverage for depository accounts held at certain noninterest-bearing transaction accounts in FDIC-insured institutions.

Most analysts agree that the Treasury’s announcement of TARP and TLGP programs in October 2008 had a visibly calming effect on highly stressed credit markets. The LIBOR-OIS spread declined from a record high of 364 basis points in October 2008 to approximately 100 basis points in early 2009. The TED spread declined to its pre-crisis levels by 2009 after reaching a record high of 450 basis points in October 2008.

On February 10, 2009, now Treasury Secretary Geithner introduced the new Financial Stability Plan. Under the Plan, three new programs were established to stabilize and repair the financial system. Firstly, banking institutions were required to go through a comprehensive stress test initiated by the government agencies with authority over major banks. This test helped to determine banks’ ability to withstand severe deterioration in the economy. All banking institutions with more than $100 billion in assets were required to undergo a supervisory review process and comprehensive stress tests. The goal...
was to make banks’ balance sheets “cleaner and stronger”\textsuperscript{86}. Those banks that had undergone stress tests were eligible for the Capital Assistance Program (CAP), e.g. to have access to a Treasury-provided “capital buffer” through the Financial Stability Trust that would serve as a bridge to receiving private capital. This capital assistance came with conditions to help ensure that every dollar of assistance was used to generate a level of lending greater than what would have been possible in the absence of government support; and it would encourage the institutions to replace public assistance with private capital as soon as that was possible\textsuperscript{87}.

Secondly, the Fed, the FDIC, and the private sector established a Public-Private Investment Program designed to combine government capital and government financing with private capital to help get private markets working again.

Thirdly, working jointly with the Federal Reserve, the Treasury committed up to a trillion dollars to support a Consumer and Business Lending Initiative. This lending program was built on the Federal Reserve’s Term Asset Backed Securities Loan Facility (TALF) and designed to lend money and accept assets backed by student loans, consumer and auto loans, and credit card payments. The financing provided through the TALF was intended to enhance demand for asset-backed securities (ABS) and therefore spur new issuance of ABS in order to increase the availability of credit to households and businesses.

Finally, the Financial Stability Plan launched a comprehensive housing program to address the housing crisis. To keep people in their homes, the Treasury and the Federal Reserve committed $50 billion to reduce monthly payments and establish loan modification guidelines for government and private programs. The Financial Stability plan would also require all firms receiving federal funds to participate in foreclosure mitigation plans to stem the housing crisis.

\textbf{Part IV. Who is to blame?}

There is no single cause for the financial crisis. Instead it was a combination of factors that contributed to the downturn. This section explores some of these factors.

\textbf{A: The Role of Lenders and Homebuyers}

One of the important catalysts for the financial crisis was the easy credit and lax underwriting standards that fueled the housing boom. Access to loans became easier as underwriting standards on mortgage debt eased. Over time, it contributed to the growth of subprime lending in the U.S. housing sector, and many families were able to get loans to buy a home they could not previously afford due to the lack of income and down-payment. However, the ability of almost everyone to get a mortgage pushed housing prices faster than the growth of incomes. As the housing bubble burst and housing prices began to fall, the predatory underwriting practices and mispricing of the risk became apparent.

Deteriorating lending standards were one of the reasons in early payment defaults. As Mayer, Pence and Sherlund noted, mortgages that are underwritten well are unlikely to default in the first year of origination. Their study shows that at the end of 2006 lenders such as Ownit, New Century, and Novastar reported an unusually high delinquency rate in early payment defaults.\textsuperscript{88} One of the explanations to this is that these loans were poorly underwritten.

As the mortgage market shifted to an “originate-to-distribute” model, under which mortgage brokers originated loans and then sold them to institutions that securitized them, originators cared little about the quality of the loans provided they met the minimum requirements for mortgages to be repackaged and

\textsuperscript{86} Ibid.
\textsuperscript{87} Ibid.
The practice of selling mortgages to investors may have contributed to the deterioration of underwriting standards. As the originator sells a loan, the risks are also passed on to the investors. As the originator’s revenue was tied to the number of loans closed, the objective of some lenders was to increase the volume of loans rather than to ensure the quality of these loans. Some originators used technological improvements such as automatic underwriting to meet the requirements of downstream purchasers of the mortgage debt. In 2007, 40 percent of all subprime loans resulted from automated underwriting.

Lax standards included an increase in loan-to-value ratios, less stringent debt-to-income requirements and limited or no documentation of borrowers’ income and assets.

Increased loan-to-value ratios suggest that the lower down-payments could have been a contributor to the mortgage crisis. In 2001, at least half of new subprime mortgages had down-payments of 20 percent or less, and at least a quarter had down-payments of 11 percent or less. By 2006, at least half of new subprime mortgages had down-payments of 10 percent or less, and at least a quarter had no down-payment at all. The median combined loan-to-value ratio on subprime purchase originations rose from 90 percent in 2003 to 100 percent for 2005 to 2007 originations. The default rate on these mortgages also shot up. Subprime purchase loans originated between 2005 and 2007 had both the highest default rates and the highest combined loan-to-value ratios at origination.

Similarly to the loan-to-value ratio, there was a notable increase in the debt-to-income ratio. In 2001, 42 percent of new subprime mortgages had debt-to-income ratios that exceeded 34 percent (which is considered a high ratio, meaning borrowers may face some payment stress), while by 2006 this had increased to 62 percent.

The amount of subprime mortgages with no or low documentation of borrower’s income or assets rose from 32 percent of originations in 2003 to 38 percent in 2007. Loans with no or limited documentation were a solution for borrowers whose income was variable or difficult to document, such as self-employed workers. However, over time, borrowers and lenders often used these loans to hide the fact that the borrowers might not be able to repay the loans due to a lack of income. Over the period from 2005 to 2008, defaults on no- and low-doc subprime mortgages rose from 5 to over 25 percent, compared with a rise from 5 to about 20 percent for fully documented loans.

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92 Loan-to-value ratio is lending risk assessment ratio that financial institutions and others lenders examine before approving a mortgage. High LTV ratios are generally seen as higher risk. LTV is calculated as amount of mortgage divided by the appraised value of the property.
95 Debt-to-income ratio is a measure that compares an individual's debt payments to the income he or she generates. The higher this ratio, the more burden there is on the individual to make payments on the debts.
96 Joseph S. Tracy “What the Fed Did and Why” Remarks at the Westchester County Bankers Association, Tarrytown, New York, June 25, 2010
The default rates were highest on subprime loans because they were originated to the borrowers with poor credit quality. Whether it was borrowers, lenders, or both who should be blamed for matching the riskiest borrowers with the most complicated products, lack of due diligence and fraud occurred on both sides of mortgage transactions.

Often subprime borrowers started with no initial equity, in other words there was no down-payment. Such a loan requires a high interest rate and high monthly payment to compensate the lender’s risk. However, borrowers with low income cannot afford high monthly payments. The solution to this problem comes in Adjustable Rate Mortgages (ARMs), which had a low initial interest rate, the so-called “teaser rate” that would last for two or three years, before resetting to a higher rate. News accounts often suggested that borrowers were steered into subprime adjustable-rate mortgages. Borrowers were told by lenders that in a few years the price of their house would have increased enough to allow the mortgage to be re-financed with a conforming or prime jumbo mortgage on more favorable terms. It made sense as long as house prices continued to rise at a good pace. As the real estate market peaked in 2005 and 2006, teaser rates and the “interest-only” loans (where no principal payments are made for the first few years) were increasingly pushed upon homeowners. As these loans became more common, fewer borrowers questioned the terms and were instead enticed by the prospect of being able to refinance in a few years. The practice whereby borrowers are induced to take out mortgage loans that are not in their best interest is called predatory lending. One part of the problem of predatory lending is that the mortgages can be quite complex, with options to defer payments and to refinance, as well as offering choices that include fixed and adjustable rates, and switching from fixed to floating rates over time. If the borrowers had full disclosure and understanding of the actual loan terms, they would presumably not have taken out such risky loans. Another issue is that mortgage brokers obtain their fees as soon as the mortgage is originated, and some brokers were more interested in closing the deal rather than in the borrower’s future ability to repay the mortgage. A third problem is that fraudulent practices have appeared within the origination process. 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. While mortgage-related fraud is a nationwide problem, the levels of illegal activity are worse in some locations than in others. States identified as the top 10 “hot spots” for mortgage fraud are Georgia, South Carolina, Florida, Michigan, Illinois, Missouri, California, Nevada, Utah and Colorado. Such fraudulent practices include: overstating borrower income or house values, understating the extent of a borrower’s debt and manipulation of credit scores.

Misrepresentation by borrowers and predatory lending practices by lenders were often linked together. A mortgage broker whose commission is tied to the amount of mortgages closed might be directly interested in “helping” the borrower to go through the application process by leaving out damaging and unfavorable information. Sometimes a broker might want to help a family navigate the application process so they can buy a house they really can afford. In any case, the investors in the mortgage securities and the borrowers who ultimately default are both harmed by such activity.

B: The Role of the Financial Sector

Financial Innovations

Financial innovations are risky undertakings especially when they create new classes of risky assets and securities. In the conditions of low interest rates and easy credit, investors were seeking higher returns through riskier investments. Demand for high-yielding assets led to the creation of complex mortgage backed securities and credit derivative products, which were sold not only nation-wide but globally.

Starting in 2004 and 2005 with sharp increases in subprime originations, the ABS CDO market boomed. ABS CDO volume doubled each year starting in 2003. Total issuance jumped from $22 billion in 2003 to $58 billion in 2004, $106 billion in 2005, and $217 billion in 2006. Issuance then dropped in 2007 to $162 billion and dried up in 2008\(^{100}\).

The complexity of the structured products increased the difficulty of assessing the exposure to subprime and other low-quality loans. When delinquencies rose and lenders foreclosed, the claims on underlying assets were not clearly defined. When the credit crunch hit the markets in summer 2007, many banks spent months evaluating the extent of their losses.

As discussed earlier in the paper, securitization is the process through which an issuer creates a financial instrument by combining other financial assets and then selling different tranches of the repackaged instruments to investors. The advantages of securitization are greater diversification and reduced risk of total default, potentially broadening access to credit and lowering its cost. Given that 80 percent of the subprime MBSs were rated AAA and 95 percent rated at a minimum of grade A\(^{101}\), the securities appeared to be highly attractive investments. These subprime RMBSs found their way into the portfolios of a wide range of investors in the U.S. and abroad, such as pension funds, hedge funds and other financial institutions.

When default rates began to mount in 2006, policymakers, regulators and market participants began to realize that subprime mortgage-backed securities were very high-risk instruments. It became apparent that risks were not necessarily reduced by creating securitized products because the defaults were positively correlated. One of the reasons why the crisis was so severe is that most of the subprime exposure has been concentrated in the highly leveraged financial sector\(^{102}\). Financial institutions concentrated the risks by leveraging their positions with borrowed funds, which in turn also were funded with short-term borrowing. When asset prices are rising, the cost of borrowing is low and banks maximize their borrowing. However, as housing prices took a downturn and defaults rates began to rise, leveraged investors were at risk of losing most of their capital. Leverage of 20:1 transforms a 5 percent realized loss into a 100 percent loss of initial capital, therefore, even if default rates are quite low, a highly leveraged investor risks to lose all of its capital.

One problem with securitization is that the originate-to-distribute model lending led to the origination of riskier loans. As noted earlier, when originators sell the loans they originate, they have little or no incentive to review mortgage borrowers more carefully. This incentive problem is referred as moral hazard\(^{103}\). There is another problem, adverse selection, which is when originators have better information than the secondary market about the quality of the mortgages originated, and they keep the best loans in their portfolio, while the worst loans with highest default risk are sold in the secondary market\(^{104}\). Therefore, securitization may have caused deterioration in the underwriting standards in mortgage origination, which in turn caused more risky mortgage originations, and consequently greater default rates when the housing bubble burst.

Another innovation is Credit Default Swaps (CDS) which allowed investors to transfer default risk from the holder of the mortgage-backed security and CDO to the seller of the swap. CDS is a private contract between two parties in which the buyer of the protection agrees to pay a series of payments to a seller of

\(^{100}\) FCIC Preliminary Staff Report “Credit Derivatives and Mortgage-Related Credit Derivatives” June 19, 2010 Available at http://www.fcic.gov/reports/pdfs/2010-0630-psr-credit-derivatives.pdf


\(^{103}\) FCIC Preliminary Staff Report “Securitization and the Mortgage Crisis” April 7, 2010

\(^{104}\) Ibid.
protection over a period of time. In return, the seller of protection agrees to pay the buyer a payoff in case of a “credit event”, such as bankruptcy or default. A CDS contract is similar to an insurance contract, the difference being that CDS is an investment that bets on whether a “credit event” will or will not occur. CDS transactions are carried out in the Over the Counter (OTC) markets and are not regulated; therefore, it is hard to determine the exposure of financial institutions to these products.

Over the last decade, the CDS market changed in a number of ways. Firstly, more parties became involved in the CDS market due to the development of secondary markets for sellers and buyers of protection. Often the original two parties that entered into the CDS contract were not the current holders of the rights of the protection. Some CDS contracts could pass 10-12 different parties. As a result, it became hard to “unwind” parties in case of a credit event. Secondly, CDS started to be issued for Structured RMBS and CDO securities. Due to the lack of understanding of the underlying assets of these securities, it was hard to determine the strength and appropriate risk of a particular loan or bond. Finally, speculation became widespread in the market. Many investment companies and hedge funds were writing CDS contracts on securities they did not own. They were “betting” on the possibility of a credit event for a specific asset. For example, before the collapse of Lehman Brothers, investors could have made huge profits buying CDS protection against Lehman default even if they did not own the bank's bonds.

CDS is a valuable innovation because taking the default risk out of the underlying security facilitates lower funding costs and provides access to the liquidity. In 2006, Alan Greenspan called them “the most important instruments in finance.” However, problems in the subprime mortgage sector exposed problems in the CDS market. As CDS are tied to CDO and other mortgage-related securities, it appeared that growing defaults on subprime mortgages would require sellers of protection to make large payments. A firm that sold CDS protection normally hedges that risk against another bank or investor. They may in turn do the same. If any party in this chain of liabilities cannot settle on their obligations, more defaults could be triggered.

The uncertainty about exposure of financial institutions to CDS contracts led to a decline in trust in counterparties. This and the fear that many financial institutions could face large losses or possibly even default themselves were contributing factors to the massive decrease in lending liquidity during the fall of 2008.

Poorly underwritten subprime loans were used in the construction of very complex mortgage-related securities, with risks not well understood and largely mispriced. The big issue with these products of financial innovation was that often investors chasing the extra return did not understand how these products worked and the risks that were involved. As a result, many market participants, including financial institutions and other sophisticated investors, relied on credit rating agencies for assessment of the risk. As many of the structured investments originally were given the highest ratings, many investors assumed that they posed little risk.

**Credit Rating Agencies**

Credit ratings played an important role in the development of the CDO market. Investors almost exclusively relied on ratings to assess CDO investments. A crucial part of the process of creating and selling a subprime RMBS and CDO is obtaining favorable credit ratings on the securities. The credit rating reflects the credit rating agency’s view of the creditworthiness of the debt instrument in terms of

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105 Richard R. Zabel “Credit Default Swaps: From Protection to Speculation” Published in the September 2008 issue of Pratt's Journal of Bankruptcy Law Available at: http://www.rkmc.com/Credit-Default-Swaps-From-Protection-To-Speculation.htm
106 Ibid.
107 Ibid.
108 Ibid.
the likelihood that the issuer would default on its obligations to make interest and principal payments on
the debt instrument\textsuperscript{110}. The initially favorable ratings on the structural products securitized from subprime
residential mortgages and other debt obligations were crucial for the successful sale of these products to
various categories of investors. However, as delinquency and foreclosure rates for subprime mortgage
loans dramatically increased, the performance of residential mortgage-backed securities backed by
subprime loans and collateralized debt obligations linked to such securities began deteriorating. As a
result, the three major rating agencies that rated these instruments downgraded a significant number of
their ratings. Consequently, the accuracy of the credit ratings and credit rating agencies themselves came
under criticism. Although rating agencies did fail to adequately assess the credit risks in RMBSs and
CDOs, they are not the only ones to be blamed. Investors over-relied on the ratings, often treating ratings
as buy/sell recommendations and using credit ratings instead of performing their own due diligence. Even
sophisticated investors, such as pension funds, municipalities, insurance companies, and university
endowments, have relied on credit ratings to provide impartial and accurate analysis of the securities.
Also, government support of credit rating agencies promoted investors to trust in them. For example, the
Basel II Accord encourages banks around the world to rely on external credit ratings when calculating net
capital reserve requirements. Also, pension funds and some mutual funds have a fiduciary duty to invest
in only AAA rated securities. Therefore, the fact that rating agencies incorrectly rated the risks on RMBS
and CDO securities caused big losses for these funds when downgrades occurred as they had to sell these
products at fire-sale prices. As it became apparent that ratings can be inaccurate, many market
participants lost their trust in the ratings that these agencies produce. And as a result, it became more
difficult for investors to determine the creditworthiness of the security or issuer.

The failure of credit rating agencies to adequately assess the credit risks associated with mortgage-linked
securities occurred for a number of reasons:

- **Inaccurate rating models.** The main reason of the failure of the credit rating agencies was over-
  reliance on automated highly complicated models and inputs whose accuracy appeared to be
doubtful. Credit rating agencies use complex quantitative models called Monte Carlo simulations
to predict the probability of default for the mortgages underlying the RMBS and CDO securities.
The problem was that the mortgage industry had changed dramatically over the last decade. With
little real data on default rates of high risk mortgages like subprime, interest-only, ARMs, and
hybrids, the credit rating agencies made assumptions in their models that turned out to be wrong.
Another flaw in their models is that they used historical data with property prices largely
increasing over time, and never crashing. A catastrophic event of declining house prices was not
factored into the model.

- **Growing complexity of RMBSs and CDOs.** As the volume of RMBS and CDO deals rated by the
  rating agencies increased over the period between 2002-2006, the complexity of these products
  also was increasing tremendously and “some of the rating agencies appear to have struggled”
  with the growth in this complexity\textsuperscript{111}.

- **Reliance on information provided to them by the sponsor of RMBS.** Credit rating agencies have
  been criticized for their lack of independent verification of the information received from the
  sponsor of securities where such information was used to issue ratings for structured finance
  securities. There is no requirement that a rating agency verify the information provided by the
  sponsor of RMBS or insist that issuers perform due diligence. Therefore, the rating agencies
  relied on the information provided to them by the sponsor of the RMBS and did not verify the
  integrity and accuracy of such information\textsuperscript{112}. Credit rating agencies failed to incorporate into

\textsuperscript{110} SEC “Summary Report of Issues Identified in the Commission Staff’s Examinations of Select Credit Rating

\textsuperscript{111} Ibid.

\textsuperscript{112} Ibid.
their models factors such as increased credit risk due to mortgage fraud and lax underwriting standards.

- **Conflict of interest and competitive pressures.** The fact that credit rating agencies received high fees from the underwriters of the securities they had to rate creates a conflict of interest and puts in doubt the agency’s ability to give unbiased assessment of risk. The argument is that credit rating agencies were vulnerable to the pressure from the issuers and investment banks. In order to keep receiving high fees and not to lose the client to a competitive rating agency, credit rating agencies were enticed to give favorable ratings.

- **Failure to re-evaluate.** By 2006, credit rating agencies realized that the models they used to rate securities failed to accurately predict their performance and began to revise the models. However, instead of warning the market early about growing problems with risky mortgages and securities linked to them, the rating agencies delayed the re-evaluation of existing RMBS and CDO securities until July 2007 when mass downgrades took place. The reaction was immediate and eventually led to the collapse of the secondary markets for RMBS and CDO securities, leaving investors with unmarketable securities.\(^{113}\)

**Shadow Banking**

Shadow banking refers to bank-like financial activities that are conducted outside of the traditional commercial banking system. Shadow banking encompasses entities like investment banks, finance companies, money market funds, hedge funds and special purpose vehicles.

The instability of shadow banking became apparent in the recent financial crisis. The Financial Crisis Inquiry Commission in its preliminary report\(^ {114}\) identified the following vulnerabilities of shadow banking:

- **High Leverage.** Since shadow banks are not part of the formal commercial banking system, they are not subject to the same strict regulations as banks, and thus can use high leverage to gain quick and large profits in good times but also huge losses in bad times.

- **Reliance on short-term funding.** Shadow banking institutions obtain financing at short durations through the money markets, and they invest these funds in longer-term financial assets. Because investment banks do not have a core deposit base, they are more vulnerable to potential runs in times of crisis.

- **Lack of Explicit Government Support.** Prior to the financial crisis, shadow banking institutions did not have access to government backup facilities. The lack of this support made the shadow banking system fragile and as a result almost the entire emergency rescue policy was designed to prevent a collapse of shadow banking through a number of “temporary” and “extraordinary” government interventions.

**Special Purpose Vehicles and Off-balance Sheet Financing**

As discussed earlier in the paper, securitization was undertaken by commercial and investment banks through special purpose vehicles (SPV). SPV is an off-balance sheet financial entity created by banks for a specific purpose. For example, structured investment vehicles (SIV) are created to hold RMBS and CDO securities. One of the biggest constraints that banks are faced with is the need to meet capital requirements, which means they have to fund a given percentage of their assets with shareholders’ capital.


rather than with debt\textsuperscript{115}. Establishing SPV is a way of getting around these requirements and allows banks to leverage their assets more than they can on their balance sheets. SIVs funded themselves with short-term asset-backed commercial paper. Until the crisis hit in 2007, the SIV mechanism worked well for many years. In mid-2007, commercial banks operated several dozen SIVs, with total assets of between $350 billion and $400 billion\textsuperscript{116}. The primary reason for SIV’s financial trouble is a “maturity mismatch” between the long-term securities they were invested in and short-term funding. As the asset-backed commercial paper market dried up, SIVs were unable to rollover their short-term funding. As a result of the SIV’s funding crisis, many banks were forced to take SIVs back onto their books, thus worsening their own financial difficulties. Major banks did not allow SIVs to fail because of the reputational damage that would follow, but the associated losses were considerable. Also, as SIVs were off-balance sheet entities, few in the markets had an accurate idea of the scope or nature of their activities until the crisis. For example, Citigroup’s SIVs held about $100 billion in assets at the peak, but the firm’s quarterly report to the Securities and Exchange Commission for the second quarter of 2007 contained no reference to them\textsuperscript{117}.

\textbf{Mark-to-Market and Fair Value Accounting}

In the last few years, there has been considerable debate on the advantages and disadvantages of the mark-to-market accounting system. This debate has been triggered by the financial crisis. There are two sides to the controversy in the debate. On the one hand, investment firms have been forced to write down assets to fair value, and therefore they blame this accounting standard for worsening the credit crisis. On the other hand, accountants and investors maintain that mark-to-market standards have provided greater transparency into bank losses and have exposed the weakness in the banking system.

Mark-to-market was introduced in 1993 in response to the savings and loans crisis when accounting standards allowed many troubled thrifts to appear solvent on their books\textsuperscript{118}. Book value of assets was calculated based on the cost at which an asset was purchased and not at the current market price. As a result, balance sheets were unaffected when asset values declined. Mark-to-market was a solution to this problem and was aimed to bring greater transparency to banks’ balance sheets.

The Statement of Financial Accounting Standards No. 157 (“SFAS 157” or Standard) was issued in September 2006 and is an accounting standard that provides guidance on how entities should measure fair value. SFAS 157 defines fair value, expands disclosure requirements around fair value and specifies a hierarchy of valuation techniques based on whether the inputs to those valuation techniques are observable or unobservable.

The Standard defines fair value as the “price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date.”

Prior to issuance of the Standard, many measures of fair value under GAAP (generally accepted accounting principles) were based on the entry price (the price at which the asset could be bought, the ask price) or management’s “good faith” measurement. Under the Standard, the entry price cannot represent fair value.

Fair value is measured using all assumptions used by marketplace participants. The measurement assumes an orderly, hypothetical transaction in the principal market for the asset or liability. If no principal market exists and there are multiple markets, then the most advantageous market is used. For illiquid securities, a market may not exist. This complicates the marking process. A fair value approach had to be developed based upon a hypothetical market which incorporates assumptions that potential market participants


\textsuperscript{117} Ibid.

would use in purchasing the security. An entity is allowed to use its own assumptions, but the objective is still the same: what would be the current value in a sale to a willing buyer? In developing its own assumptions, the entity cannot ignore any available market data, such as interest rates, default rates, prepayment schedules, etc.

During 2008, many bankers have been blaming accounting standards for requiring them to use the market value when reporting the value of mortgage-related securities they own. They believe that forcing companies to recognize unrealized accounting losses when prices are distressed was one of the main factors that contributed to the failure of companies such as Lehman Brothers and AIG. Markdowns of mortgage-related assets negatively affected the balance sheets of leading banks. For example, from Citigroup’s 2007 Annual Report:

“Revenues of $81.7 billion decreased 9% from 2006, primarily driven by significantly lower revenues in CMB due to write-downs related to subprime CDOs and leveraged lending.” “During the second half of 2007, the Company’s Securities and Banking (S&B) business recorded unrealized losses of $19.6 billion pretax, net of hedges, on subprime-related direct exposures.” 119

Furthermore, bankers maintain that this accounting added fuel to the fire of the crisis. “Banks and some regulators have attacked mark-to-market accounting, saying it gives too much weight to downbeat assessments of securities valued by panicked investors. Critics say the approach ignores long-term values, while ensuing losses deplete bank capital when they need it the most” 120. In a letter sent to the SEC in September 2008, the American Bankers Association, the banking industry’s lobbying group, said the fair value standard fails to explain what to do when “sellers are not selling and typical buyers are not buying in meaningful volumes”. Because the market for mortgage securities literally became nonexistent, the ABA says that fair value does not reflect an asset’s intrinsic value. Therefore, many holders of these assets do not sell them because they know the economic value of these securities is higher than the fire-sale prices they get in the market. “The fair value accounting rules are problematic in the current market, are not providing useful information to shareholders or regulators, and are having a strong pro-cyclical impact in the marketplace,” wrote Edward Yingling, the president and CEO of the ABA in his letter to the SEC. For these reasons, critics insisted on suspending SFAS 157. The Financial Accounting Standards Board, pressured by U.S. lawmakers and financial companies, voted to relax fair-value accounting rules in April 2009. Changes to fair-value, or mark-to-market accounting, approved by FASB allow companies to use “significant” judgment in gauging prices of some investments on their books, including mortgage-backed securities. Analysts say the measure may reduce banks’ write-downs and boost net income.

C: The Role of Government

Fed Monetary Policy, Savings Glut and Search for Yield

One of the often cited causes of the financial crisis is the Federal Reserve’s monetary policy. For example, Beori and Guiso 121 argue that the monetary policy of low interest rates introduced by Greenspan in response to the post 9/11 recession and the collapse of the dotcom bubble was one of the main causes of the financial crisis. Following the bursting of the dotcom bubble in 2000 and the stock market downturn of 2002, the Federal Reserve reacted by sharply lowering short-term interest rates. The Fed lowered the Fed Funds target rate beginning in January 2001 from 6.5% to 1% in June 2003. The problem was that it held rates at this low level for too long, creating the environment for a credit bubble.

119 Citigroup’s 2007 Annual Report on Form 10-K
If the Fed had not kept short-term rates as low for as long as it did, it might not have changed long-term rates that much. In June 2004 the Fed began to slowly increase the Fed Funds rates and the yield curve slowly narrowed. Fed Chairman Alan Greenspan described this narrowing of spreads between short-term and long-term rates as a “conundrum” during testimony in February 2005. The chairman expected long-term rates to rise in line with short-term rates. However, the tightening of monetary policy caused by raising short-term rates was slowing the economy and reducing demand for long-term borrowing.

As a result of low short-term interest rates, financial institutions were able to fund themselves with cheap short-term money while lending out at higher long-term rates. This strategy is profitable so long as the yield curve remains positively sloped. However, it creates a liquidity risk if the yield curve was to become inverted and banks would have to refund themselves at expensive short-term rates while losing money on longer term loans.

Paul Mizen argues that while low short-term interest rates and rising housing prices did contribute to the growing lending, it was not a main reason for the expansion of credit. Another factor that played an important role in the expansion of credit is the “global saving glut”, identified by Bernanke in March 2005. Foreign capital inflows from China, Japan, Germany and the oil exporters into the US in the mid-2000s led to lower long-term interest rates.

Mizen writes that after the Asian crisis of 1997, many countries began to accumulate reserves in currencies that are unlikely to be affected by speculative behavior. As a result, demand for U.S. Treasuries and bonds grew significantly, in turn raising the prices for them and lowering the long-term interest rates. Large savings inflows from emerging countries allowed the U.S. to keep short-term interest rates low.

The combination of low short-term borrowing costs and low long-term rates led to a “search for yield” and an under-pricing of risk. Search for yield occurs when interest rates are low and investors can no longer find appropriate rates of return on Treasury bonds, and therefore they turn to riskier assets. The Governor of the Bank of England explained the strong demand for high-yielding assets:

“Dissatisfaction with these rates gave birth to the “search for yield.” This desire for higher yields could not be met by traditional investment opportunities. So it led to a demand for innovative, and inevitably riskier, financial instruments and for greater leverage. And the financial sector responded to the challenge by providing ever more sophisticated ways of increasing yields by taking more risk.”

The demand for high-yielding assets was largely satisfied by subprime mortgage-related securities such as RMBSs and CDOs because of the high returns. In search for yield, many investors underestimate the risks of owning particular assets. As sellers of subprime mortgage securities and investors expected house prices to continue to grow and interest rates to remain low, they underestimated default risk of the risky mortgage-related securities. These underpriced risks started the crisis when many subprime mortgage-related securities defaulted as a result of the downturn in the housing market.

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122 The term structure of interest rates or the yield curve is the shape formed by a graph showing U.S. Treasury Bill or Bond interest rates on the vertical axis and time to maturity on the horizontal axis. When short-term interest rates are lower than long-term interest rates the yield curve is said to be “positively sloped”. This encourages an expansion in money supply. When long-term interest rates are lower than short-term interest rates the yield curve is said to be “inverted”. This favors a contraction in money supply. When long term and short term interest rates are equal the yield curve is said to be “flat”.


Regulation and Transparency

Speaking at a hearing before the Financial Crisis Inquiry Commission in Washington, D.C. on September 2, 2010, Ben Bernanke said that lack of regulation in the shadow banking system was one of the key triggers in the 2008 economic and financial crisis.125

The big problem was that financial regulation was limited and ineffective. The shadow banking system was not subject to the prudential regulation that applied to banks. One of the explanations for that is that they were not thought to be systemically important, as banks were understood to be. For example, there were no restrictions on the leverage and liquidity policies of shadow banking system entities. “No regulatory body restricted the leverage and liquidity policies of these entities, and few if any regulatory standards were imposed on the quality of their risk management or the prudence of their risk-taking,” Bernanke said.

These differences in regulation made it more attractive for banks to evade capital requirements by transferring risk into these entities. As a result, the shadow banking network grew so large that they became indeed systemically important or in other words they were “too big” and “too interconnected” to fail.

Another area, where the lack of regulation existed was the fact that the complex mortgage-related securities were traded over the counter (OTC). These OTC transactions were beyond government regulation and oversight. The market for these securities was opaque, with trades not reportable to any central agency.

Additionally, there was no regulation of ratings agencies for mortgage-backed securities. Rating agencies had incentives to rate securities favorably as they earned fees from the investment banks that created the products. This conflict of interest was never addressed by the government.

Furthermore, the government did not do enough to regulate mortgage origination practices. In fact, they pushed the loosening of mortgage origination standards by adopting the Community Reinvestment Act of 1977 (CRA). The CRA encouraged commercial banks to make loans to much riskier borrowers. Later during the Clinton and Bush administrations, there were amendments that promoted subprime lending even further. This eventually fueled the market for the securitization to shift default risks away from the originators.

The crisis revealed a lack of transparency in the financial markets. William Dudley observed that “in the years leading up to the crisis, the lack of transparency contributed to increased risk and leverage in off-balance sheet vehicles, structured credit products and in over-the-counter securities such as asset-backed securities, commercial mortgage-backed securities, residential mortgage-backed securities and collateralized debt obligations.”127 The lack of transparency created by the layers of complex financing made it difficult to assess the degree of and exposure to risk among financial institutions. When the crisis hit, these opaque vehicles and securities contributed to concerns about counterparty credit risk. This uncertainty led to a liquidity squeeze, which in turn intensified the crisis.


126 Ibid.

Dudley identifies three main areas where a lack of transparency was present. Firstly, because CDOs and other securitized obligations were complex and difficult to value, there was a lack of transparency in the valuation process. When the market for structured securities became illiquid, it was not clear how to value these securities in the distressed market conditions. This in turn reduced liquidity, pushed down prices and increased uncertainty about the solvency of institutions holding these assets. Secondly, sometimes identical securities were valued differently at different financial institutions. This lack of pricing information led to a loss of confidence about accounting marks. Thirdly, because shadow banks are not regulated and not required to report data that reveals risk exposures, market participants did not know much about the concentration of risk. This led to a reluctance to engage with counterparties. As a result, liquidity decreased even further.

5. Economic Security and Impact on Terrorism

Any financial crisis would be conducive to terrorism. There are two reasons for this. One is that it is easier to recruit unemployed youth to become terrorists and second a country that is in an economic turmoil will be too preoccupied with its troubles that it will create a conducive environment for terrorists to operate. Typically terrorist groups target youths from poor backgrounds who are disgruntled. For example various terrorist organizations target minority communities who are unhappy and depressed due to discrimination and frustrated after having lost jobs. We often hear about people taking guns and going to their offices to shoot their coworkers after getting laid off from their jobs. Therefore government has to make sure that disgruntled communities are provided with the support to get back into the work force. Second, a country that is in a depression or even a recession is too preoccupied with its problems that it can create an environment for terrorist to attack. While we are focusing on getting jobs and getting the basics to live, we may not pay attention to the precautions that have to be taken. Furthermore, there may be massive layoffs within the law enforcement agencies. With fewer police patrolling the communities, there is bound to be more violence.

Due to these reasons it is critical that financial crisis such as the one we encountered in the late 2000s has to be stopped early on. For this we need to develop appropriate technologies to determine trends and patterns. That is, we need to have examples of all prior crises that have occurred over the past several years in various parts of the world. A good starting point is the great depression of 1929. There are some parallels between this depression and the crisis of 2007-2009. Data about the stock market collapse of 1987 and the dot.com bust of 2000 will also be useful. Furthermore, the economic and financial models that were used to analyze the various financial crises are also needed. Data about the various corporations including their performance over the last several decades have to be gathered. Next, the data that is gathered have to be shared among the various parties including the government, the corporations and the financial analysts and economists. Corporations are not willing to share the data in general. Therefore, appropriate confidentiality, privacy and trust policies have to be enforced to share the data. During emergency situations more information may need to be shared. Essentially, the various information sharing and dissemination technologies have to be examined for this purpose.

Although having data is critical, it’s equally important to make sense out of the data and extract useful nuggets. We need appropriate data mining tools to accomplish this. For example, can one make associations between the data? If an event in 1928 seems to be quite similar to an event in 2006, then perhaps one could predict some of the follow-on events. Next, can anomalies be detected from the data? Current data mining tools work well with known events. This means if similar events occur say in 1928 and 2006, then one can determine the type of follow-on events that could occur. However, new events are much harder to detect. Some machine learning tools are emerging for detecting new activities. Such tools have to be examined for detecting and preventing financial crisis which in turn will reduce crimes and terrorist acts.
Conclusion
We have witnessed a deep financial crisis that has gripped the world over the past few years. The trigger for this crisis is often seen as the subprime lending meltdown. However, the causes of this downturn had its roots many years ago.

The past two decades saw unprecedented growth in house prices and home ownership. Subprime lending also became more widespread as a larger group of the population had access to mortgages to buy homes. This fueled the appetite for securitization, as financial innovation on Wall Street enabled mortgages to be packaged up as mortgage-backed securities. CDO and derivative CDS securities became more heavily used to transfer risk and allow mortgage originators to safely issue more mortgages to fuel the enormous mortgage market.

In 2007, the subprime crisis first emerged. As house prices began to slump, foreclosures were on the rise and there was little confidence in securities backed by subprime loans. This led to the collapse of two Bear Stearns hedge funds which were heavily invested in such securities. The virus spread in the financial sector into a full blown crisis as more loans were in default, and thus all securities related to mortgages were viewed as toxic. Bear Stearns nearly failed and had to be rescued by a Fed-guaranteed acquisition by JP Morgan Chase. Lehman Brothers was not so fortunate as it failed amid enormous write-downs of these mortgage-related securities. The Lehman collapse triggered a general recession the likes of which has not been seen since the Great Depression.

There are many factors that contributed to the financial crisis. Some blame the mortgage lenders and home buyers as lending standards deteriorated and the “originate-to-distribute” model gave way to over-eager lending without consideration for whether the mortgage was affordable to the buyer. There was also fraud on both sides, such as falsifying mortgage documentation to reach a deal.

The role of the financial sector undeniably played a large part as financial innovation (such as securitization) enabled risk to be shifted away from mortgage originators and introduced *moral hazard* as originators had little incentive to ensure mortgages could be repaid. The credit rating agencies must take some of the blame as they incorrectly rated some securities as the safest AAA by using inaccurate assumptions in their models that house prices would always increase and never suffer a severe downturn. There was also a conflict of interest given that investment banks paid these ratings agencies, and therefore the agencies’ source of revenue from banks was implicitly linked to favorable ratings on the bank-issued securities. The practices of the largely unregulated shadow banking sector (such as high leverage, heavy reliance on short-term financing, lack of traditional-banking government support, and off-balance sheet financing) certainly left the sector vulnerable to instability. Mark-to-market accounting also contributed to large write-downs and losses in the financial sector as banks were forced to mark the value of mortgage securities down to depressed market prices.

Finally, the government played a significant role in allowing the crisis to occur. First, the Fed kept short-term interest rates at record lows for a considerable amount of time, thus fueling a credit boom. However, due to the global savings glut from foreign nations into U.S. treasuries, the Fed’s move to increase interest rates had no effect as long-term yields and rates stayed low. This in turn further expanded cheap credit. The government did little to regulate the shadow banking sector, thus allowing tightly-regulated banks to transfer securities and risk to a loosely regulated off-balance sheet entity. OTC derivatives and credit rating agencies also did not come under close government scrutiny, leading to the rapid expansion of these securities with inaccurate ratings. Mortgage origination standards were loosened as a result of government policy over the past two decades to push home ownership amongst lower income families. The Community Reinvestment Act (CRA) was a catalyst to the boom in subprime lending. Finally, during the actual crisis, a lack of transparency was revealed as shadow banks did not need to report off-balance sheet transactions. Valuation of the securities was extremely complex, and in depressed market conditions, pricing was difficult to establish. This contributed to the overall feeling of uncertainty as investors were unsure of the true nature of losses and counterparty default risk in the financial sector.
As demonstrated, there were a variety of factors that led to the great recession in the past few years. No single factor can be solely blamed for the crisis. It was a collective failure of government, the financial sector, and mortgage origination that led to the most severe economic downturn since the Great Depression.
References


6. Bragues, George: Leverage and Liberal Democracy


26. FCIC Preliminary Staff Report “Credit Ratings and the Financial Crisis” June 2010
27. FCIC Preliminary Report “Shadow Banking and The Financial Crisis” May 2010
28. FCIC Preliminary Staff Report “Governmental Rescues of To-Big-To-Fail Financial Institutions” August, 2010
34. The Federal Reserve’ website http://www.federalreserve.gov
38. FHFA Questions and Answers on Conservatorship Available at
40. HSBC Reports Rise in Troubled Loans by REUTERS February 8, 2007 Available at
44. Kearns, Jeff and Onaran, Yalman “Bear Stearns Denies 'Rumors' on Liquidity After Shares Plummets” March 10, 2008 Available at: http://www.bloomberg.com/apps/news?pid=newsarchive&sid=ah_wFIHpWUAo
   http://online.wsj.com/article/SB10001424052748703865004575648942102949502.html
55. SEC “Summary Report of Issues Identified in the Commission Staff’s Examinations of Select Credit Rating Agencies.” July 2008. Available at:
56. Senate Subcommittee Hearing “Crisis: The Role of Credit Rating Agencies” April 22, 2010
59. Tracy, Joseph S. “What the Fed Did and Why” Remarks at the Westchester County Bankers Association, Tarrytown, New York, June 25, 2010 Available at:
61. Zabel, Richard R. “Credit Default Swaps: From Protection to Speculation” Published in the September 2008 issue of Pratt's Journal of Bankruptcy Law Available at:
   http://www.rkmc.com/Credit-Default-Swaps-From-Protection-To-Speculation.htm
Appendix

Technologies for Detecting the Crisis

This report has described the financial crisis for 2007-2009 and technologies for detecting such a crisis. First it addressed the mortgage market and the developments in the subprime lending. Then it addressed the events of the subprime lending meltdown and the subsequent financial turmoil. Finally, it addressed the causes and who to blame for the crisis. In this appendix, we will discuss potential information technologies for detecting such a crisis.

First of all, we need to have examples of all prior crises that have occurred over the past several years in various parts of the world. A good starting point is the great depression of 1929. There are some parallels between this depression and the crisis of 2007-2009. Data about the stock market collapse of 1987 and the dot.com bust of 2000 will also be useful. Furthermore, the economic and financial models that were used to analyze the various financial crises are also needed. Data about the various corporations including their performance over the last several decades have to be gathered.

Data that are gathered have to be in a format that can be machine processable. Semantic web technologies such as XML (eXtensible Markup Language) and RDF (Resource Description Framework) are useful tools for representing the data. Another challenge is integrating the various pieces of data. That is, the financial data, the models and examples have to be integrated so that the data can be analyzed. Therefore, information integration technologies including ontologies are needed. Furthermore, metadata has to be extracted from the data so that the metadata can be used for information integration. Efficient data management techniques are also needed to manage the large quantities of data that are gathered.

Next, the data that is gathered have to be shared among the various parties including the government, the corporations and the financial analysts and economists. Corporations are not willing to share the data in general. Therefore, appropriate confidentiality, privacy and trust policies have to be enforced to share the data. During emergency situations more information may need to be shared. Essentially, the various information sharing and dissemination technologies have to be examined for this purpose.

Although having data is critical, it’s equally important to make sense out of the data and extract useful nuggets. Therefore, appropriate data mining tools are needed to accomplish this. For example, can one make associations between the data? For example, if an event in 1928 seems to be quite similar to an event in 2006, then perhaps one could predict some of the follow-on events. Next, can anomalies be detected from the data? Typically current data mining tools work well with known events. That means if similar events occur say in 1928 and 2006, then one can determine the type of follow-on events that could occur. However, new events are much harder to detect. Some tools are emerging for novel class detection. Usually the classes are pre-determined, but with novel class detection, some new classes that did not exist previously could be detected. The tools for novel class detection typically use unsupervised machine learning techniques.

Finally, knowledge management is an effective technology for crisis detection. Knowledge management is about using past experiences and trends to enhance the business of an organization. Knowledge management techniques will include finding experts in an organization, learning from experience and managing the resources of an organization. With appropriate knowledge management techniques, one could analyze previous events and determine the best strategies to follow.

In summary, effective data, information and knowledge management techniques are important for handling the business strategies of an organization. The technologies will include data management, data analysis, data integration and data mining. The goal is to learn from the experiences and make sound decisions so that such a major financial crisis is not repeated.

DISCLAIMER: The Views and Conclusions contained in this report are those of the authors and do not reflect the policies and procedures of the University of Texas at Dallas or the United States Government.
This is the second in a series of reports we are writing on Security Studies and the application of information technology for providing security and combating terrorism. We will include papers on both cyber security and national security. The purpose of these series of reports is to guide us in the technologies we are developing for both cyber security and national security. The technologies include systems for assured information sharing and assured cloud computing and tools for secure social network analysis and data mining for security applications such as malware detection. An outstanding introduction to security and security studies.” - Michael C Williams, Graduate School of Public and International Affairs, University of Ottawa.

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