



The NINJA that Broke the Financial System

An analysis of the financial crisis 2007-2009

Master Thesis

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Executive Summary

This thesis examines the financial crisis of 2007-2009, arguing that unsustainable real estate prices and too lenient lending policies created an environment of excessive leverage and irresponsible private consumption. The range of new structured credit products is discussed in relation to the increase in mortgage lending. Structured products such as asset backed securities and credit default swaps are discussed, and their effect on the crisis is analysed. Focus is on those financial institutions and regulatory/governmental bodies that made it possible for the financial industry to expand its product range and to attract investors on a global scale, and will in particular look at the role of the Federal Reserve, government sponsored entities and rating agencies. The thesis also provides a comprehensive examination of events, which happened during the crisis, allowing an illustration of the magnitude of the crisis and also an analysis of the most significant events using financial theory. The author concludes that two factors play a vital role in explaining the crisis, namely the lack of regulatory supervision and the presence of asymmetric information.

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The Invisible Hand

“He intends only his own gain, and he is in this, as in many other cases, led by an invisible hand to promote an end which was no part of his intention. Nor is it always the worse for the society that it was not part of it. By pursuing his own interest he frequently promotes that of the society more effectually than when he really intends to promote it. I have never known much good done by those who affected to trade for the public good”

Adam Smith, *The Wealth of Nations*, 1776

1. Introduction

1.1 Motivation

In the summer of 2007 *something* changed, and as a result a five-year surge in global asset prices came to an end. Interbank lending ceased to exist, titanic institutions collapsed, fraudsters of unheard dimensions were exposed, millions of people across the globe lost their jobs, house price tumbled and the economic buzz-word “de-coupling” was no longer headlining seminars as the new economic paradigm.

Something definitely changed, but why did it happen? Was it short-sightedness, stupidity and greed? Or was it the former Fed chairman Alan Greenspan’s fault for keeping interest rates too low between 2003 and 2005 as the real-estate bubble inflated, spurring a frenzy of irresponsible borrowing? Or was it perhaps the emergence of an unsupervised market and with it complex exotic derivatives, such as, asset-backed securities (ABSs), credit default swaps (CDSs), collateralised debt obligations (CDOs), CDSs on CDOs and others, which allowed profit seeking (and/or greedy) financial institutions to put the entire financial system at risk.

The most common theory is that the crisis has its origin in the US real estate market. Unsustainable leverage levels and the addition of new complex financial products, coupled with a loose regulatory environment are all factors behind the asset price bubble and the following economic crisis.

The title of this thesis relates to one of the financial instruments developed, just before the crisis, offering mortgage credit to part of the population who previously did not have access to the real estate market. No Income, No Job and no Assets, or NINJA for short, loans were loans offered to people considering only their (low) credit rating, which were often a weak indicator for the actual financial strength. These loans were part of the wider group of loans labelled subprime, which is considered the core culprit in the 2007-2009 US house price collapse.

1.2 Problem Statement

Over the last decades the mortgage and lending practices have seen significant changes in most of the developed world and in particular in the US. Traditionally, banks used their own balance sheets to lend money and would keep debt on their books until expiry or early re-payment. This system provided a long-running relationship between the lender and borrower, and gave the banks the ability to better understand the risk, of their assets. The new system introduced the concept of securitisation, where similar assets are pooled together, relabelled and then sold to external investors. The positive of this new practice is that risk can be spread and better allocated, leading to lower prices (lower interest rates) and additional liquidity.

The problem with this system is, however, that the distance between borrower and lender widens, creating a less transparent system where risk is harder to evaluate. The securitisation process involves a long chain of financial agents and the risk of the individual mortgage is transferred away from the original source. To eliminate the risk investors can hedge their investments using complex financial structured products in form of credit derivatives, or by using specialised financial insurance companies, the so-called monoline insurers, thus further distancing the risk from its origin.

Investment banks were highly leveraged and heavily reliant on short-term funding to finance positions of much longer duration. It was not unusual to rely on repurchasing agreements (known as repos), to fund as much as 25% of the bank's balance sheet. Overnight repos are, as the name indicates, rolled over daily, which makes them extremely reliant on liquidity and well functioning inter-bank money markets. This is all well when the economy is booming, interest rates are steady and financial institutions have confidence in each other and are willing to provide liquidity. But when US mortgage holders started to default, loan syndication came to an end and confidence plummeted, the strategy of relying on short-term lending to fund long-term assets sent the entire economy into free fall.

When the crisis saw the light of day in 2007, investment banks and other financial institutions were using clever techniques to invest in risky asset backed securities. They set up Structured Investment Vehicles (SIVs) to invest in medium-term high yielding assets and funded their asset side by issuing short-term commercial paper. These entities were set up as separate legal units and did therefore not impair the balance sheet of the investment bank itself, and are often referred to as bankruptcy remote entities. The SIVs were examples of a mismatch between short-term liabilities and long-term assets and were among the first structures to be hit when the crisis unfolded, even if they just months earlier had enjoyed triple-A ratings from credit agencies.

Several well-established financial institutions saw themselves succumb to the crises, among the spectacular cases was the fall of Lehman Brothers, Bear Stearns and the two US government sponsored mortgage lenders, Fannie Mae and Freddie Mac. These cases are particularly interesting in relation to the crisis. Take Bear Stearns as an example, almost a year into the crisis the bank was still the fifth largest investment bank in the world, until it suddenly crumbled in March 2008 before being rescued by the Fed and ultimately taken over by competitor JPMorgan Chase (JPM). Bear Stearns' share price dropped a massive 99% in little over one year.

The aim of this thesis is to provide an overview and to analyse the 2007 – 2009 financial crisis, within the framework of academic research and financial literature. The main focus will be on issues related to US mortgage products, as they appear to be at the core of the crisis. Taking the above into account, the key question will throughout the thesis be:

- *What were the key elements responsible for the 2007 - 2009 financial crisis?*

1.3 Thesis Outline

This thesis consists of six chapters, including an introduction and a conclusion. Chapters 2-4 form the theoretical core and chapter 5 applies theory to relevant events during the crisis.

Chapter 2, "The US Housing Market and Subprime Lending", form the beginning of the theoretical part and discusses recent developments in the US mortgage market, with focus being on subprime lending. The centre of attention will be on the US as this region is core in understanding the reasons behind the crisis, and in light of this, effort will also be made to describe the US real estate market. *Chapter 3, "Structured Finance and Securitisation"*, explains the process of pooling mortgages together and creating securities that can be sold on to investors around the world. The main aim is to understand how it is possible to spread the risk of mortgage lending and at the same time distance the lender from the borrower. Special focus will be given to financial products such as, asset backed securities (ABSs), collateralised debt obligations (CDOs) and credit default swaps (CDS's). *Chapter 4, "Financial Institutions"*, discusses the main financial institutions related to the financial products explained in the two previous chapters.

Chapter 5, "The Evolution of a Financial Crisis", provides a timeline from 2007-2010 covering the most important developments of the crisis. Focus will again be on the US, as some of the most dramatic developments took place in that region. The chapter will outline key events from the period, and analyse these events, based on the findings of the previous chapters. *Chapter 6, "Conclusion"*, summarises the main findings and provides an answer to the question raised in the problem statement.

1.4 Methodology & Literature Review

The main body of material used to answer the question asked in the problem statement is recent academic literature. I will first identify the main areas relevant for answering the question and then limit myself to further analysing those areas. Once these areas have been identified I will further analyse the existing literature covering the sub-topics and use the knowledge gained to discuss the problems.

In each sup-topic I will use relevant numerical data series to make my own analysis in relation to answering the problem statement. I will where possible use independent data, published by government agencies or by organisations known for their independence. All data will be referenced with easy links to its origin. In some instances I will use data only available via subscriber databases, in particular Bloomberg and Thompson. The data used will have a strong bias toward to US, as this region offers better available data and also is the origin of many of the problems examined in this thesis.

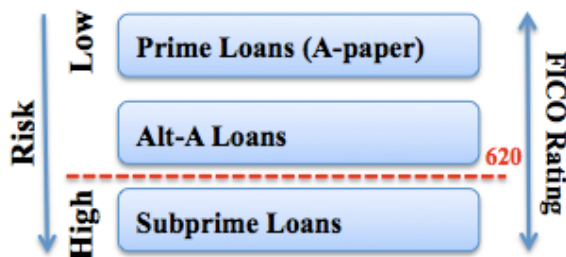
I will to a lesser extent use economic textbooks, if they have superior description of theory, but since most of the subjects covered in this thesis are of newer date and of a nature that the financial world has not previously experienced, I will mainly rely on recent published academic papers. Newspapers and financial magazines will only be used as inspiration, and any analysis made in this thesis will be made independently of such information. I will also use my own experience from the investment banking industry, having worked in the industry for almost four years, and will use conversations with senior bankers as comments. These comments will all be referenced in the footnotes and will be crosschecked where possible.

All analysis and conclusions, not referenced to academic research, are my own and based on the knowledge gained from working on the subject. The final chapter offers a conclusion and answers the problem posed in the problem statement, and in doing so brings together all analysis made throughout this thesis before making a final conclusion.

2. The US Housing Market and Subprime Lending

There is no universal definition of what makes a mortgage either prime or subprime. Some researchers and market participants use the US credit scoring system, FICO¹, and categorise loans with a score below 620 as subprime. This split becomes somewhat arbitrary since both prime and subprime borrowers are offered the same mortgage products, although at different interest rates. Demyanyk et al (2008) talks about subprime loans where the risk of default is high. For the purpose of this thesis, referring to subprime loans will use a broad definition and include mortgage loans to borrowers who traditionally have difficulties obtaining a mortgage and whose credit worthiness is considered low (high risk). Figure 2.1 shows the categorisation of mortgage loans according to risk.

Figure 2.1 US Mortgage Risk Profile



Source: Author's illustration

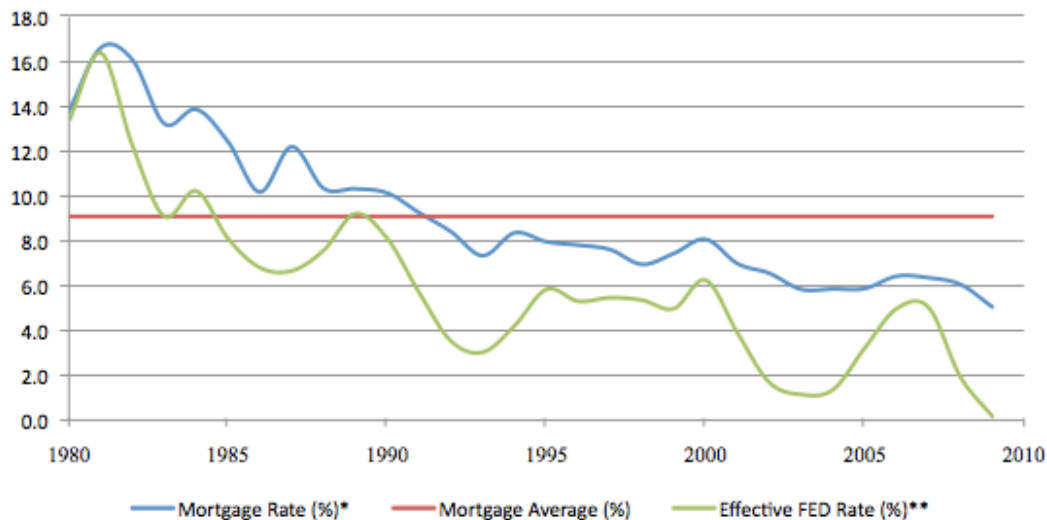
The middle category, Alt-A loans, are given to borrowers with less documentation, lower credit scores, higher loan-to-values than prime loan borrowers. It also includes real estate loans to properties considered to be pure investments. Depending on the data source Alt-A loans are sometimes considered subprime, due to the less than prime risk profile.

¹ The FICO score is the most common US credit scoring model and is calculated statistically, with information from a consumer's credit files.

2.1 How Subprime Lending Started

During then last 20 years mortgage rates in the US have been on a steady decline and well below its 30-year average of 9.1%. Chart 2.1 shows the average annual rate for a 30-year fixed mortgage and the effective Fed fund rate.

Chart 2.1 US Mortgage Rate and Effective FED Rate 1980 - 2009



Source: Federal Reserve

* Contract rate on 30-year, fixed rate mortgage, ** Annualized using a 360-day year.

In 2002 the Federal Reserve (Fed) lowered its lending rate in response to the financial turbulence following the dot-com bubble and the September 11th, 2001 terrorist attacks. Mortgage rates remained sticky, thus widening the spread over the Fed rate. The spread hit a 10-year high in 2002 when it reached 4.9%, thus creating an opportunity for financial institutions to raise funds for portfolios of securitised mortgages (further discussed in chapter 3). As a result of low funding rates and plentiful liquidity, mortgage lenders widened their search for potential borrowers. Rising house prices and more advanced risk distribution meant lenders and investors were willing to accept clients who previously had very limited access to the real estate market, creating a spiral effect that sent house prices even higher (see section 2.2). At the extreme end, people with no income, no job and no assets were approved for highly complicated hybrid mortgages,

which were later repackaged and distributed to investors around the globe. These loans were called NINJA mortgages and illustrated the problem of subprime lending at the extreme.

2.1.1 Government Support to Homeowners

The US government plays an important role in supporting and promoting home ownership. This is done through a range of direct and indirect subsidies. According to Calomiris (2009) there are five primary categories of US government subsidies:

- 1) The ability to tax deduct interest payments on mortgage payments on one's primary home.
- 2) The Federal Housing Administration (FHA), a federal government agency, who insures private loans that are issued for new and existing housing, and loans that are approved for home repairs.
- 3) Indirect support via Federal Home Loan Bank (FHLB) lending as well as liability protection for Fannie Mae and Freddie Mac².
- 4) Policies, including the Community Reinvestment Act (CRA), formed to put pressure on banks to increase credit to low-income and minority groups.
- 5) Default mitigation protocols, which have required banks that originate loans held by Fannie Mae, Freddie Mac and FHA to use standardised procedures when renegotiating delinquent loans in order to avoid foreclosure.

The above policies were all designed to increase the homeownership level by a) expanding the group of people eligible to take a mortgage, or b) promoting higher value mortgages. As we will see in section 2.3 the leverage levels had been rising until 2006, leaving borrowers more sensitive to negative changes in house prices. The FHA credit programme accepted a 97% leverage on new purchase mortgages, and as much as 95% on cash-out refinancing, new mortgages on existing homes where the borrower receives a cash payment as part of the transaction. In addition, the US Congress encouraged the two

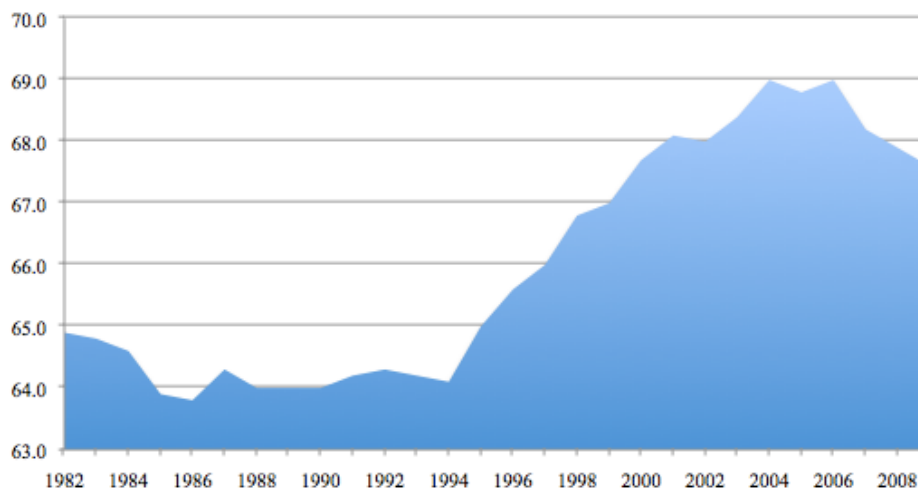
² More on Government Sponsored Agencies (GSEs) in chapter 4

government sponsored enterprises (GSEs), Fannie Mae and Freddie Mac, to expand their subprime portfolios. In 2008 the combined subprime exposure for the two GSEs was more than \$1 trillion³, Calomiris (2009).

2.2 Effects of Subprime

Subprime lending was not all bad news, and it did enable first time buyers and people with doubtful credit history to fulfil the dream of owning their own home. The chart below shows how the US homeownership rate grew from 63.8% in 1985 to a record high of 69% in 2004 and 2006.

Chart 2.2 Homeownership Rates for the United States 1982 to 2009 (in %)



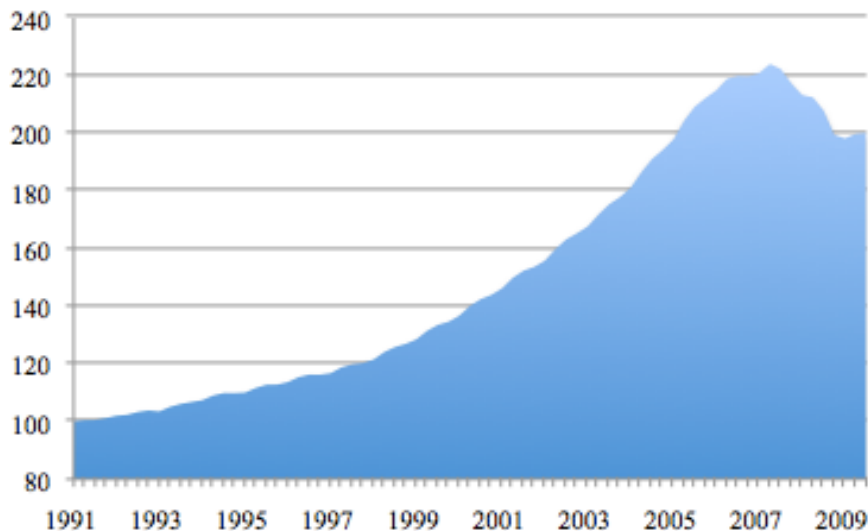
Source: U.S. Census Bureau (third quarter data)

This 8% increase between 1985 and 2004 was in clear line with the US policy goal of enabling more households to own their own property and is by many seen as part of the American Dream. Subprime loans also enabled borrowers, who could previously not enter the mortgage market, to improve their creditworthiness and then qualify as prime borrowers when they needed to refinance. This was fine as long as house prices

³ Including Alt-A loans.

increased, and alongside homeowner equity, but proved catastrophic when house prices began to fall in the second half of 2007.

Chart 2.3 US House Price Development 1991-2009 (1991 = index 100)⁴



Source: Federal Housing Finance Agency

As chart 2.3 above illustrates, US house prices saw a steady increase until the peak in the second quarter of 2007. In the 16 years leading up to the peak, the compounded average annual increase in the value of a single-family home was 5.2%, which explains why borrowers, as well as lenders, blindly believed in constantly rising house prices. Even more dramatic was the increase in the years following the 2001/2002 financial crisis where average house prices jumped 40% in five years, or 7% annually⁵.

An annual return of 7% might not seem as much when the stock market in the same period increased almost 9%⁶, but it is important to understand that investments in real

⁴ Based on the HPI, and index measuring of the movement of single-family house prices using information obtained by reviewing repeat mortgage transactions on single-family properties whose mortgages have been purchased or securitised by Fannie Mae or Freddie Mac. The other popular index is the S&P/Case-Shiller index, which will not be used here.

⁵ Q3 2002 – Q3 2007.

⁶ The S&P rose from 989 in July 2002 to 1503 in July 2007.

estate yields both a capital gain and a gross rental income, the latter typically higher than dividend income from holding stocks, thus making the total return around 13-14%⁷. In addition, the risk associated with investing in real estate has historically been lower than investing in stocks (Sanders et al 1991). Therefore the risk adjusted return on real estate was unsustainably high for an extended period and lured investors into providing liquidity to subprime lending in search of a quick return. Borrowers, on the other hand, were persuaded by both popular media and financial advisors into taking mortgages far beyond their financial capacity.

2.3 Subprime Characteristics

In order to understand why subprime loans per definition carry a higher risk of default than prime loans, it is helpful to look at some vital statistics of US subprime loans originated between 2001 and 2007. The data includes 85% of all securitised subprime loans, accounting for more than 50% of the US mortgage market for the period, Demyanys (2008)⁸.

Table 2.1 summarises the descriptive statistics of the data. In the first section we can see that the total number of subprime loans increased more than four fold in a four-year period before peaking in 2005. Even more remarkable is the development in the total loan value, which jumped 700% until peaking at \$455bn in 2005. As is visible from the chart, subprime origination dropped sharply in 2007. Of the 316,000 new loans in 2007 almost all of them were originated in the first two quarters, illustrating that the industry came to a dramatic halt when the crisis broke out in the summer of 2007.

⁷ Assuming an average annual gross income yield of 6-7%. Net yield is closer to 3-4%, deducting property taxes, maintenance and management costs.

⁸ Mortgage Market Statistical Annual (2007) reports securitisation shares of subprime mortgages each year from 2001 to 2006 equal to 54, 63, 61, 76, 76, and 75 percent respectively.

Table 2.1 US Subprime Loan 2001-2007

	2001	2002	2003	2004	2005	2006	2007
Size							
Number of Loans ('000)	452	737	1,258	1,911	2,274	1,772	316
Average Loan Size (\$'000)	126	145	164	180	200	212	220
Total Loans (\$bn)	57.0	106.9	206.3	344.0	454.8	375.7	69.5
Type							
Hybrid	59.9%	68.2%	65.3%	75.8%	76.8%	54.5%	43.8%
FRM	33.2%	29.0%	33.6%	23.8%	18.6%	19.9%	27.5%
Balloon	6.5%	2.5%	0.8%	0.2%	4.2%	25.2%	28.5%
Other	0.4%	0.3%	0.3%	0.2%	0.4%	0.4%	0.2%
Purpose							
Purchase	29.7%	29.3%	30.1%	35.8%	41.3%	42.4%	29.6%
Refinancing (cash out)	58.4%	57.4%	57.7%	56.5%	52.4%	51.4%	59.0%
Refinancing (no cash)	11.9%	13.3%	12.2%	7.7%	6.3%	6.2%	11.4%
Stats							
Loan-to-Value Ratio	79.4%	80.1%	82.0%	83.6%	84.9%	85.9%	82.8%
Mortgage Rate	9.7%	8.7%	7.7%	7.3%	7.5%	8.4%	8.6%

Source: Demyanyk (2008), First American CoreLogic LoanPerformance Database

Looking at the different types of loans in section two of the table above, it is noticeable that the hybrid loans account for 77% in 2005, and for 67% of all loans in value terms over the entire period. A Hybrid loan is a loan offering a low fixed rate for the first 2-5 years and then adjusts to a higher rate for the remainder of the duration. A popular hybrid loan is the “2-28” loan which has a very low “teaser” rate for two years and then settles into an adjustable rate loan for the remaining 28 years. The adjustable rate is typically a fixed spread over LIBOR of 6-7%. The idea behind this type of loan is that borrowers with a weak cash flow can afford the mortgage for the initial period and then hope that their circumstances have changed when the rate increases after two years, or hope that the property value has increased enough to take out a new loan and refinance. This strategy includes a significant element of “hope” or the economic equivalent term, expectations, which are based on what we have earlier described as an over-heated property market. For the mortgage broker/arranger this loan type is good news as it involved additional fees in a foreseeable future.

Another important statistic is that fixed rate mortgages (FRMs) are declining until 2005 and account for less than 20% in 2006. FRMs are less risky, as the borrower does not

bear the systematic risk of changes in market rates. Compared to prime mortgages this level is very low. According to Kojien et al (2007), 60-90% of all prime and fully amortised single-family mortgages were FRMs. In 2007 the share of FRMs increased as a result of the dramatic fall in hybrid loans.

Balloon loans are mortgages that are not fully amortised over the repayment period and thus require a single large payment at expiry. They are in essence a hybrid between a zero-coupon loan and a FRM. They are more risky than FRMs and the borrower speculate in increasing real estate prices, however the time horizon is much longer than for hybrid loans and does not rely on short-term gains in asset prices. These balloon loans accounted for 29% of subprime mortgages in 2007, but are on value terms at the same level as 2005 due to the overall reduction in subprime loans.

In 2007, 70% of all subprime loans were taken out in order to refinance existing loans and 59% of all loans included an element of cashing out on homeowner equity. This was only possible as house prices kept rising and added to years of above average levels of private spending. An increase in private spending is from a GDP point of view positive, the problem was that rising productivity alone did not fund the increase, but was to a large extent based on speculative gains from house prices. Homeowners became over a 15-year period used to rising equity and assumed that they could fund spending on credit cards and personal loans by refinancing their mortgage every few years. The sudden collapse of liquidity to refinance, and the simultaneous fall in house prices was a wake-up call and a full stop for one of the longest private spending bonanzas in recent history. Herein lies one of the core problems to the length of the 2007 financial crisis.

To make matters worse table 2.1 also shows how the loan-to-value ratio increased to 86% in 2006, and exceptional high number. The 86% is only first lien mortgage loans, in addition to which bank loans, other personal loans and even credit card loans were used to finance real estate purchases, taking the real loan-to-value to 100% and even higher in many instances. As a result even minor changes in house prices had a major impact on

homeowners' solvency, and changes in personal circumstances (loss of job, changes in medical expenses, divorce etc) had significant impact on the ability to repay mortgages and other loan obligations. The statistics as a whole show how subprime lending became a deadly cocktail for many borrowers, who traditionally are on the lower end of the social scale.

2.4 Foreclosures and Delinquencies

Foreclosure is the legal proceeding in which a mortgagee holder obtains a court ordered termination of a mortgagor's right of the property, in order for the lender to later repossess the property, sell it and recover part (or all) of the delinquent mortgage. Data from the leading US mortgage foreclosure tracker, RealtyTrac⁹, shows a dramatic increase in the number of foreclosure filings¹⁰. In the first half of 2009 this number of total foreclosure proceedings reached 1.9 million and the number of houses where foreclosure proceedings had started was 1.5 million. In 2008 the equivalent number was 2.3 million homes, an increase of 81% over 2007 and 225% higher than in 2006. The 2008 levels correspond to 1.84% of all US housing units, up from 1.03% the year before.

A quote from industry specialist, James J. Saccacio¹¹, sums up the problem; “In spite of the industry-wide moratorium [freeze in subprime lending] earlier this year [2009], along with local, state and national legislative action and increased levels of loan modification activity, foreclosure activity continues to increase to record levels ... Unemployment-related foreclosures account for much of this increased activity, and the high number of borrowers who find themselves owing more on their mortgages than their homes are now worth represent a potentially significant future risk.”

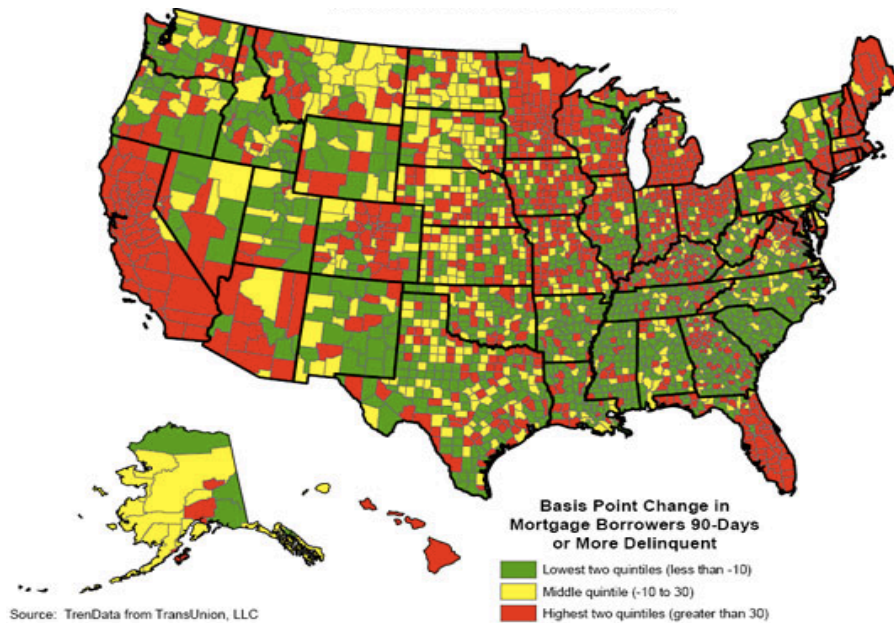
⁹ The RealtyTrac US includes number of properties with at least one foreclosure filing reported for more than 90 percent of the US population.

¹⁰ Note that there can be more than one foreclosure filing on the same property. In 2008 there were 1.36 filings per property under foreclosure.

¹¹CEO of RealtyTrac

Figure 2.2 shows the increases in delinquency rates between 2004 and 2007, with areas in red representing the largest changes.

Figure 2.2 Changes in Mortgage Delinquency by Region (Q4 2004 to Q4 2007)¹²



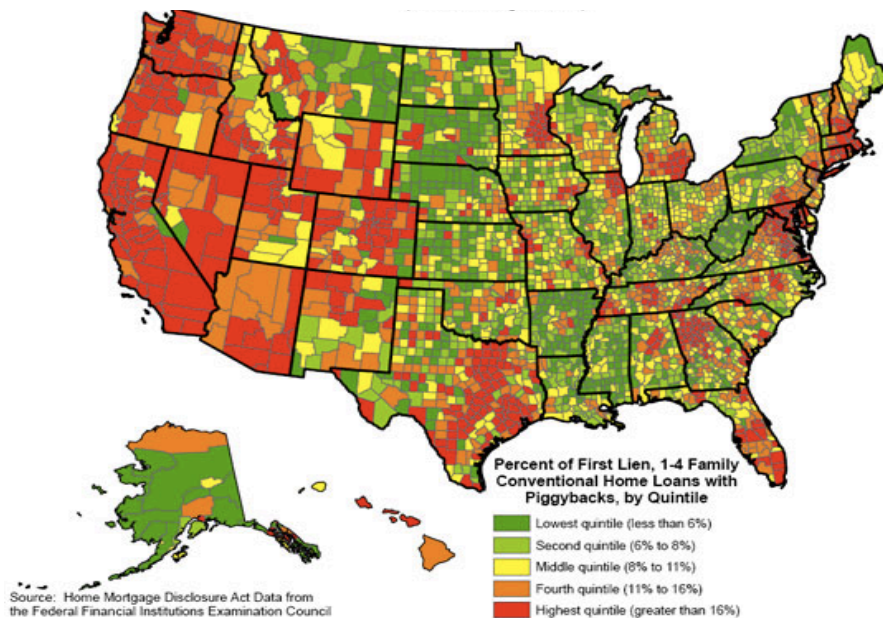
The map clearly illustrates how areas such as California, Nevada, Arizona, Florida, upper Midwest and New England have been hit the hardest, indicating that areas with over average population growth has seen the highest rate of delinquencies. The same areas also show the largest change in unemployment rate, and the largest drop in house prices in the same period. Factors that we in the previous section qualified as causing subprime borrowers to face problems meeting their mortgage obligations.

Table 2.1 in the previous section showed how the loan-to-value ratio reached 86% in 2006. This number only includes first lien loans, or the primary mortgage. Many borrowers would get two or more lenders to offer additional mortgages support on the same loan thus increasing the loan-to-value ratio. These loans are also called junior lien

¹² The heat map is taken from material supporting a speech given by Fed Chairman Ben Bernanke in May 2008.

loans, or piggyback loans and were in particular used to finance larger real estate deals. Figure 2.3 shows the concentration of piggyback loans across the US.

Figure 2.3 Percentages of Mortgages with Piggyback Loans (2006) ¹³



As the map below shows, these loans were most popular on the West Coast, Nevada, Arizona and Southern Florida, which coincide with areas of high loan delinquency, drop in house prices and rising unemployment.

All data points towards high levels of foreclosures in the coming years and the US government are taking a number of initiatives to combat this development. Among these measures are new legislation aimed at boosting private spending and shielding homeowners from foreclosures. In addition the Fed has intervened by lowering interest rates, injecting cash and increasing supervision of financial institutions. These developments will be discussed in detail in the following chapters.

¹³ The heat map is taken from material supporting a speech given by Fed Chairman Ben Bernanke in May 2008.

3. Structured Finance and Securitisation

This chapter explains the concept of securitisation and the wide range of financial instruments that were developed in the name of structured finance. The aim is to analyse what effect the use of these products had on financial markets in relation to the 2007 – 2009 crisis. Distribution of risk, easy access to liquidity and a “money manager” dominated markets will be the core focus. Broadly speaking, structured finance refers to the part of the banking sector occupied with transferring risk by using complex fixed income related products.

First step is to understand the securitisation process and the agents involved in it. Hyman P. Minsky was one of the early scholars on the subject and his thoughts are used in table 3.1 to describe the elements in a general securitisation process.

Table 3.1 Players in the Securitisation Process¹⁴

Debtor	The person or legal entity that borrows money against a promise to pay back a pre-defined cash flow stream.
Paper Creator	Typically a commercial bank or mortgage institution that agrees the terms of the loan document with the debtor and pays out the loan amount. The loan document represents an asset for the paper creator and can be sold on to a third party.
Investment Bank	Bundles the various financial paper into a separate legal entity, such as a trust, a fund or an special purpose vehicle (SPV). The investment bank then creates different classes of securities with the paper asset as collateral and the

¹⁴ Based on Hyman P. Minsky, Washington University, St. Louis, Notes prepared for discussion, June 27, 1987. Later edited by L. Randall Wray (2008).

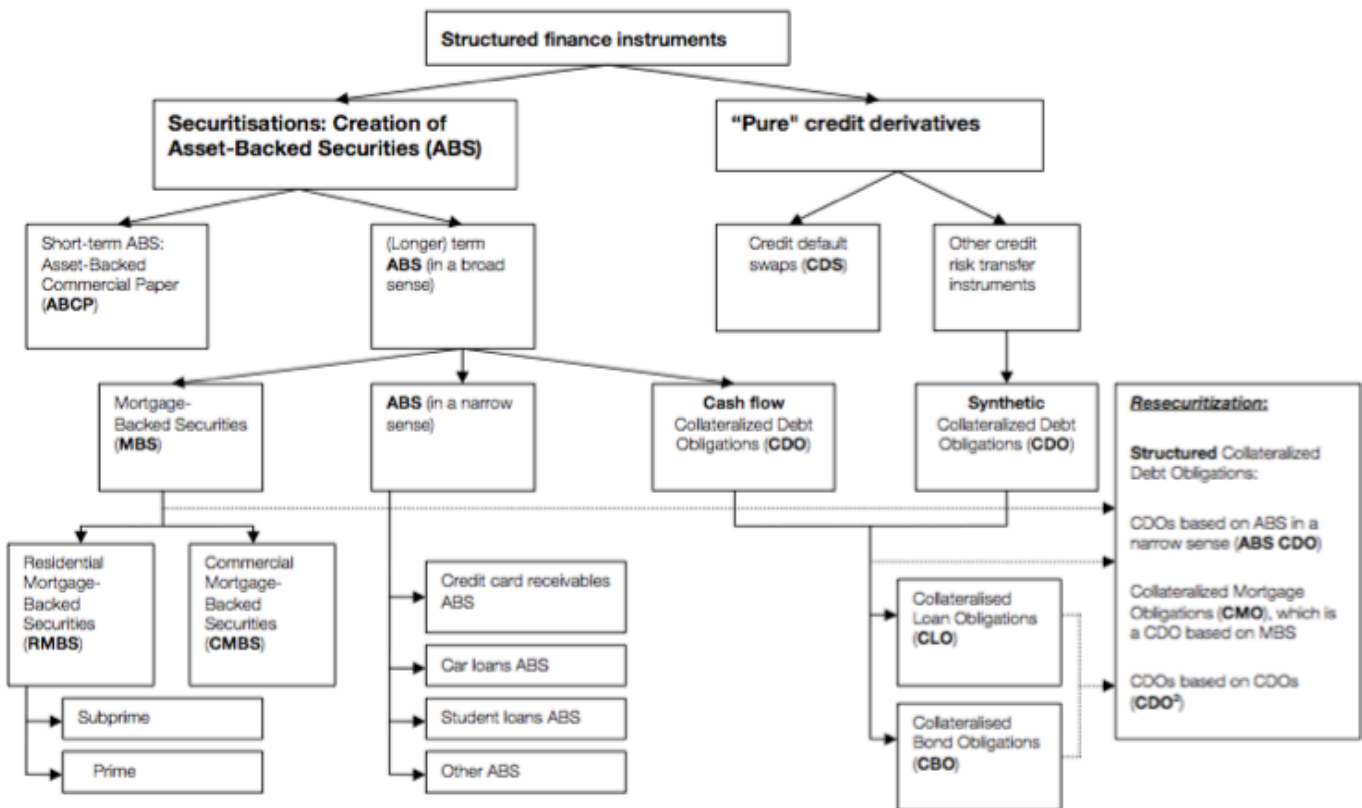
interest payments from the borrowers as income. The different classes represent different risk and rights to the cash flows. The securities are sold to investors to fund the bridge financing offered to the paper creator. In addition, the investment bank appoints a trustee or manager of the SPV.

Trustee	Trust, fund or SPV manager who receives interest payments, and other cash flows originating from the underlying paper, and redistributes to the security holders.
Servicing Organisation	Typically the paper creator itself, as it is the organisation closest to the borrower, collects the interest payments and passes it on to the trustee.
Rating Services	Creates an independent credit assessment on the fund and rates the securities according to the expected risk involved. The rating agency receives a fee for this service. The higher the percentages of securities that fall into the low-risk rating, the easier (cheaper) it is for the investment bank to sell the securities.
Secondary Market Maker	The originating investment bank will typically also act as a market maker for secondary sale of the securities. As this market is often very illiquid, the bid-ask spread will be wide.
Funders / Investors	Anyone from a pension fund, hedge fund, sovereign wealth fund, smaller banks, high net worth individuals or anyone who finds the risk/return profile attractive.

The above is a generalisation of the process and in practice many variations exists. The main take-away is that the securitisation process allows an investments bank to bundle a group of similar assets into a separate entity, and then raise funding by selling securities created on the entity. Such securities are known as asset backed securities (ABSs).

The diagram below interconnects the universe of structured finance products used in the years leading up to the financial crisis and forms the basis for the remainder of this chapter.

Figure 3.1 Structured Financial Instruments and Securitisation



Source: Rixtel et al (2008)

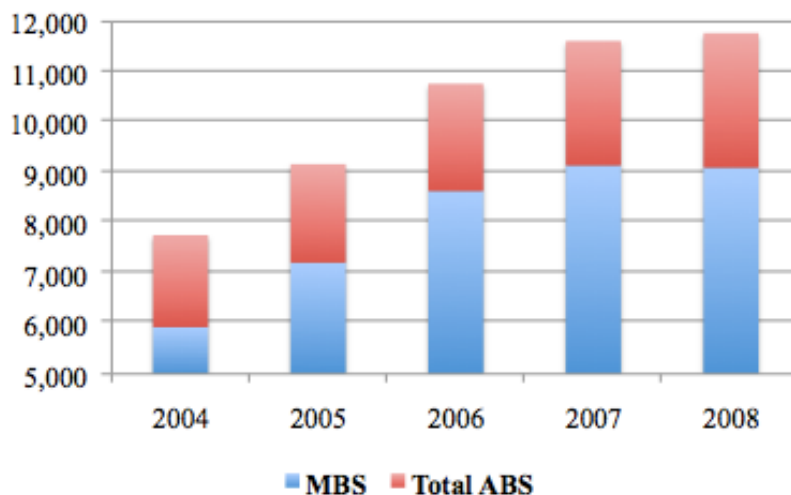
3.1 Asset Backed Securities (ABSs)

The United States Securities and Exchange Commission's (SEC) "official" definition of the term ABS is:

"The term asset backed security is currently defined ... to mean a security that is primarily serviced by the cash flows of a discrete pool of receivables or other financial assets ... that by their terms convert into cash within a finite time period plus any rights or other assets designed to assure the servicing or timely distribution of proceeds to the security holders."

An ABS can be based on different financial asset classes such as car loans, homeowner equity loans, credit card receivables and mortgages. The latter is the largest asset class and is referred to as mortgage backed security (MBSs). The chart below shows the development of ABSs in the US since 2004.

Chart 3.1 Total US Asset Backed Securities Outstanding (US\$bn)



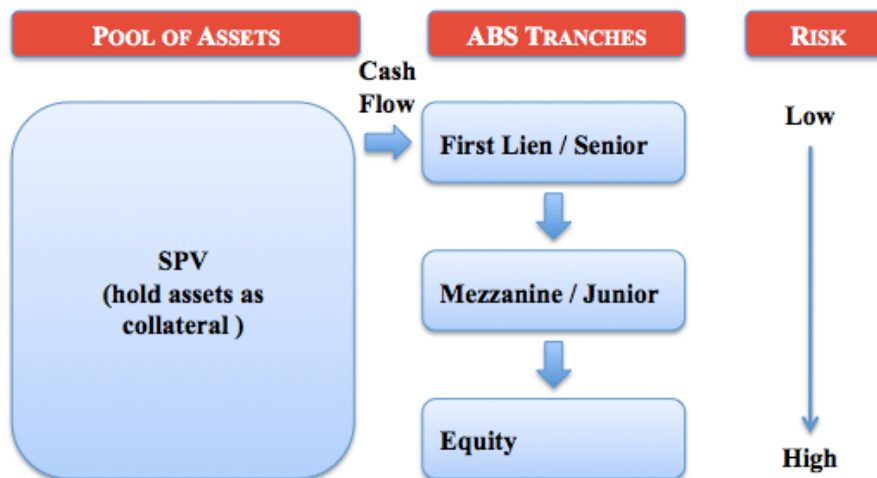
Source: SIFMA (Securities Industry and Financial Markets Association)

In the three years before the crisis, the value of outstanding ABSs rose 50% to US\$ 11.6 trillion. This astronomical number represents 82% of US GDP in 2007 and is roughly the same size as the US stock market, which illustrates the importance of the ABS market.

ABSs are placed in separate legal entities or special purpose vehicles (SPV's), which acts as bankruptcy remote unit used to transfer the assets off the arranging investment bank's balance sheet.

As mentioned earlier ABSs are thinly traded in the secondary market and price transparency is often not very good. ABSs are normally traded over-the-counter (OTC) and held by the investor until expiry. This set-up enables an investor in e.g. Australia to effectively fund an auto loan or house purchase for a US consumer. Compared to a traditional banking/customer set-up, the distance (both geographical and physical) becomes very large, and the investor is therefore reliant on a well-functioning and trusted financial market, as well as a correct and independent risk assessment before making the investment decision.

Figure 3.2 ABS Tranches and Risk Split



Source: Author's illustration

Figure 3.2 illustrates how ABSs are split into different tranches depending on inherent risk. The concept can be explained by a simple example. Let's assume that the value of the SPV is 100 and that the default rate of the assets is expected to be 10%. The investment bank arranging the ABSs could then create 75% first lien notes, 15% junior debt notes and finally 10% in the form of equity. The 75% first lien ABSs would get a

triple-A rating as the likelihood of total defaults higher than 25% is considered very low. This tranche can then raise funds offering only a small spread over the risk-free rate, as the expected risk is low. The junior tranche on the other hand will receive a medium to low credit rating and will be priced accordingly. Finally an equity class is created as a high-risk security that will only be rewarded if both senior and junior tranches are paid in full. In order to make the lower tranches more attractive the SPV might purchase insurance or protecting against default of the underlying assets, such as credit default swaps (CDSs) or monoline insurance.

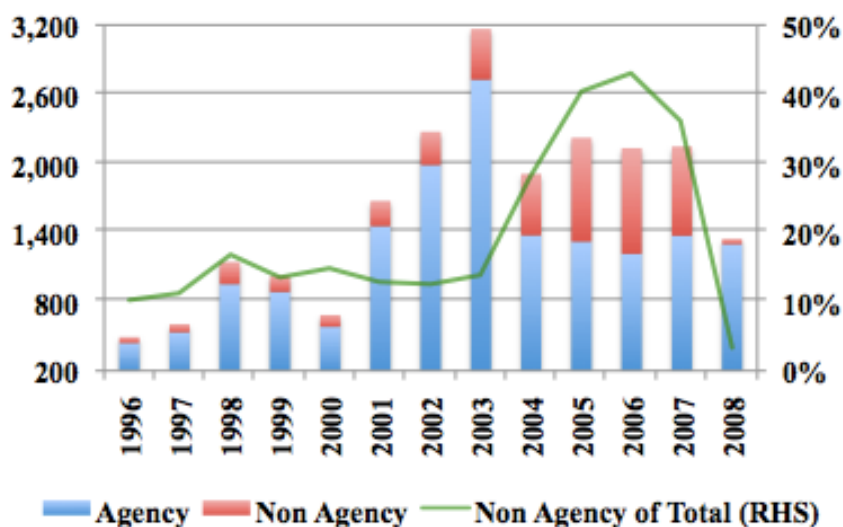
The benefit of splitting the cash flows rights into tranches with different risk profiles is that it makes it possible to create a large portion of securities with a very low risk, which investors demand only a small risk premium to hold. The SPV is in itself diversified through the large number of individually risky assets. The issuer of the ABS is interested in maximising the amount of senior securities and will therefore, together with the rating agency, decide the margin error in the expected defaults acceptable to obtain a triple-A rating for the senior tranche. As assets were booming since 2002 and defaults were low, the error margin became smaller and smaller, for MBSs this was even more so, as real estate prices had been increasing for over 20 years. Once the boom finally came to an end in the summer of 2007, large numbers of triple-A rated ABSs were downgraded and prices went into free fall. The drop in prices was further accelerated by the fact that most trades were done OTC and that confidence in both rating agencies and counterparties almost disappeared overnight.

3.1.1 Mortgage Backed Securities (MBSs)

MBSs are, as mentioned above, a special form of ABS based on mortgages as the underlying asset. Two different types of MBS exist, RMBS, if the mortgage is of residential origin and CMBS, if the paper is on commercial real estate. Most MBSs are constructed using mortgages from different geographical areas in order to diversity the risk of local price pressure.

In addition, several different mortgage types (Prime, Alt-A or Subprime) are included within a single MBS to get a better risk balance. However, a study by Keys et al (2008) shows that portfolios of mortgages likely to be securitised default roughly 20% more than portfolios with similar risk and loan terms. The finding suggests that credit screening of borrowers are adversely affected when the lender plans to create MBSs out of the mortgages. In other words, the mortgage lender is more likely to accept a sub-par screening when the loan will be sold on and thus not affect the asset quality of the originating institution. The problem described illustrates two classic problems of asymmetric information, namely, 1) moral hazard as the mortgage lender accepts more risk in the assessment process than under normal circumstances and 2) adverse selection as the buyer (investor) does not have access to the same information as the seller (investment bank) and as a result is more likely to accept a “bad” product.

Chart 3.2 MBS Related Issuance in the US (US\$bn)



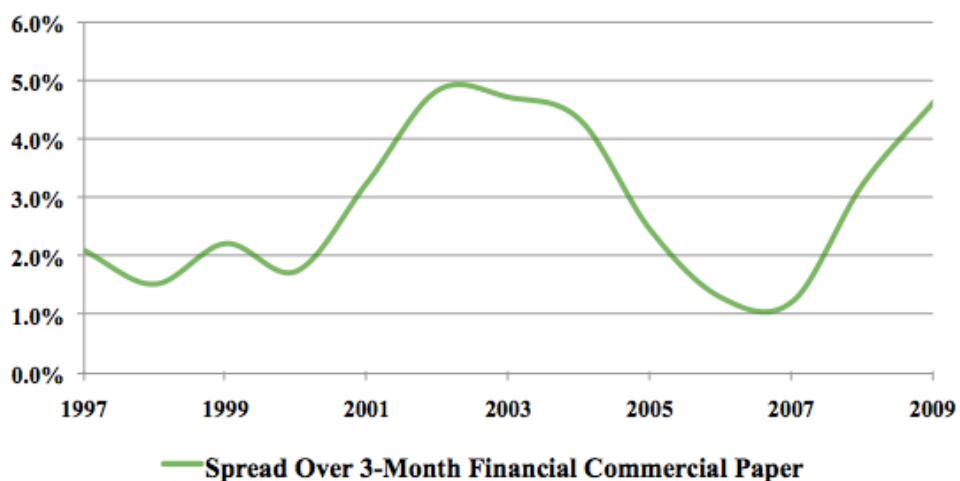
Source: SIFMA (Securities Industry and Financial Markets Association)

Chart 3.2 illustrates the development in new issuances of MBSs since 1996. A distinction is made between agency-issues; those guaranteed by the government or by a government sponsored enterprise (GSE) and non-agency-issues; also called private issues, typically arranged by an investment bank. Firstly, we can see an explosion in the use of MBSs,

which increased 542% from 1996 to 2003. In comparison, the house price index increased a mere 48%, comparison confirming that rising house prices did not alone drive the increase in the MBS market. Secondly, we notice that the share of non-agency issuances went from an average of 13-14% and suddenly shot up to over 40% in a matter of years, and peaked in 2006 where 43% of all new issuances were originated by private institutions. Analysing this sharp increase, it is clear that investment banks saw a profit opportunity in securitising mortgages and selling them on to investors.

Two factors seem to have created the increase in non-agency issuances. 1) The spread between the average mortgage rate and bank funding, and 2) the change in investor appetite for structured products.

Chart 3.3 Mortgage Rate Spread¹⁵



Source: Federal Reserve

As illustrated in chart 3.3 above, the mortgage spread widened around 2002 making it more profitable for banks to issue mortgages and as a result increasing the need for additional funding channels. By creating MBSs, lenders gained access to worldwide funding and investment banks earned fees from acting as arranger and broker in the

¹⁵ The spread is calculated using annual data series from www.federalreserve.gov, and subtracts the 3-months financial commercial paper rate (bank funding rate) from the contract rate on 30-year, fixed rate mortgage.

process. At the same time general risk perception was low and liquidity widely available. Investors were scouting the globe for new investment opportunities and as the majority of MBSs carried a triple-A risk rating, the risk/return profile looked attractive. As mentioned above, an MBS is split into different tranches with unique risk profiles. Investors looking for low-risk would buy the senior tranche; pension funds, endowment funds, insurance companies and other large institutional investors are typical examples of such investors. On the other end of the scale are investors looking after less risk adverse capital, such as hedge funds, prop trading desks and other speculative entities, this group would finance the lower tranches, Gabaix et al (2005).

3.1.1.2 Valuation and Risk Elements of MBSs

The valuation of an MBS is in theory a simple discounted cash flow model. Given that all underlying mortgages have a clearly defined repayment schedule, such a valuation should be straightforward. In practise valuing a MBS is made very complex by two underlying risk elements; a) default risk and, b) prepayment risk, Mason et al (2007).

Default risk, is the risk that the borrower does not meet the obligations set out in the loan document. There are various degrees of default risk ranging from late payments to foreclosure and subsequent repossession of the property. Default risk is the easiest of the two risk types to forecast and industry standards, such as FICO scoring, are used to project the joint default risk of mortgages used to create the MBS. According to a study by Calomiris and Mason (2007) the default rate, in their sample of 4.2 million loans, were 4.3%. The default risk will also change according to macro economic fundamentals, such as GDP growth, unemployment rate, interest rate and changes in house prices. Weaker fundamentals lead, not surprisingly, to higher default rates.

Prepayment risk, the risk that the mortgagor decides to repay the mortgage ahead of time, on the other hand is difficult to forecast and depends on a number of additional factors, including changes in product offerings and market trends. But in particular, changes in available interest rate are important for people's decision to prepay their mortgage. If interest rates are low, borrowers can refinance their existing mortgage at a lower rate and

reduce their monthly outgoings. Table 2.1 in the previous chapter showed how 60-70% of all subprime mortgages were used to refinance (and prepay existing mortgage). This creates a problem for the SPV managing the MBSs as it will have to reinvest the cash received from the prepayment in a market where interest rates are low, thus lowering the return compared to the return received from the mortgage payments. Most mortgages have covenants imposing additional fees if the mortgage is prepaid, but if the refinancing rate is sufficiently low, the benefits outweigh the costs for the borrower. In the Calomiris and Mason (2007) sample, prepayments were made in 67% of all mortgages, with the vast majority being made within the first five years of taking out the original mortgage. In contrast to default risk there is not developed any industry standards on measuring the cost of prepayment risk, which adds to the complexity of correctly valuing an MBS.

In summary, the valuation of a MBS is made complicated by the risk factors discussed above, asymmetric information and the OTC trading. The complexity of valuation is often not understood by investors who mainly look at the triple-A rating from a reputable credit agency and therefore do not price in the valuation risk inherent in the product.

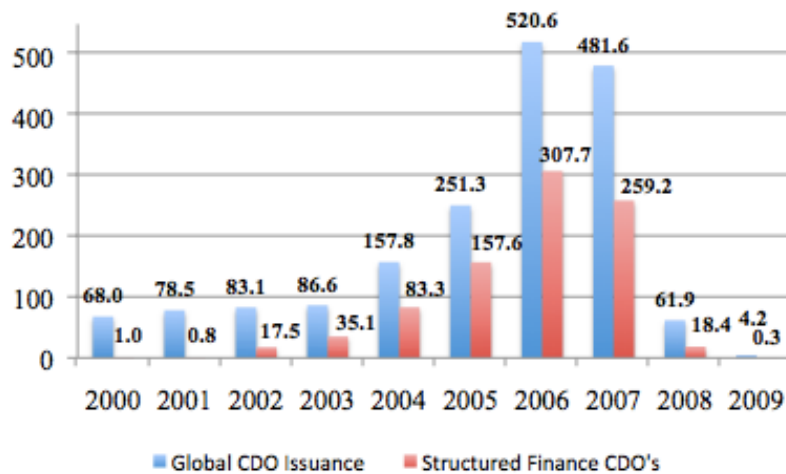
3.1.2 Collateralised Debt Obligations (CDOs)

A collateralised debt obligation (CDO) is a special type of asset backed security where the underlying collateral is a pool of fixed income instruments, including other securitised products. CDOs are named after the collateral used to make it. The most common CDOs are; 1) Collateralised loan/bond CDOs, also referred to as cash-flow CDOs, these instruments are formed using anything from high yield bonds/loans to government bonds; 2) Structured Finance CDOs, which use other ABSs (most often MBSs) as collateral, these are sometimes also called CDO-Squared; and 3) Synthetic CDOs, backed by credit derivatives, such as credit default swaps (CDSs). In addition, there are hybrid CDOs which build on a mix of the types listed above.¹⁶

¹⁶ Various sources are used, including; Longstaff (2007), Mason (2007), Tavakoli (2003) and UBS Investment Bank CDO Primer.

The CDO market is relatively new and data is not readily available. The chart below shows the development in global CDO issuances since 2000, using data collected by the Securities Industry and Financial Markets Association (SIFMA), an organisation which addresses financial regulatory reform issues and rebuilds confidence in the financial markets.¹⁷

Chart 3.4 Global CDOs Issued 2000 – 2009 (US\$bn)



Source: Securities Industry and Financial Markets Association (SIFMA)

As we can see, the CDO market took off in 2004 and peaked at US\$ 521 billion in 2006. In the early part of the decade, CDOs were dominated by cash-flow CDOs evenly split between CDOs collateralised by high yield bonds and government bonds. In 2009 the CDO market was almost dead as a result of the financial crisis. This indicates that investors did not fully understand the risk involved in the market and as liquidity decreased, CDOs were one of the product groups they first exited.

Mason et al (2006) point out how CDOs differ from MBSs and list six fundamental differences. 1) The collateral supporting a CDO is managed, as opposed to constant, and changes to the asset portfolio composition can change dramatically during the life of the CDO. 2) The underlying pool of assets are not always finalised when the CDO

¹⁷ www.sifma.org/about

transaction takes place. 3) CDOs are heterogeneous with respect to granularity of the underlying assets, and consist of a relatively small number of assets, in the hundreds, as opposed to MBSs who are based on 10,000's of different mortgages. 4) Rating volatility is higher due to the complex valuation methods. 5) Investor visibility is decreased as a result of the heterogeneous nature of the collateral, 6) Secondary trading is limited due to the novelty of the products and the complexity of valuation.

The differences listed above are all reasons for concerns and explain why the popularity of CDOs fell so dramatically during the financial crisis. The table below gives a more exact picture of the collateral composition within the CDO market.

Table 3.2 Global CDO Issuance by Collateral

Collateral Type	2005	2006	2007	2008	2009
Structured Finance	65.0%	59.1%	53.8%	30.2%	6.7%
High Yield Loans	26.2%	33.0%	28.8%	42.9%	48.3%
Investment Grade Bonds	1.5%	4.8%	16.3%	25.4%	45.0%
High Yield Bonds	1.1%	0.2%	0.4%	0.0%	0.0%
Other	6.2%	2.9%	0.7%	1.5%	0.0%
Total in US\$bn	272	521	482	61	4

Source: Securities Industry and Financial Markets Association (SIFMA)

The table above and chart 3.4 both illustrate how the issuance of structured finance CDOs became increasingly popular up until the financial crisis started in 2007. The majority of those CDOs were based on MBSs, often of subprime nature, and was thus directly linked to the performance of the housing market. The way they were structured was to pool junior tranches of MBS paper into a CDO and then create multiple levels of CDO tranches in order to further split the risk. In other words it was possible for financial engineers to create a low risk CDO tranche out of prominently high risk MBS paper and in the process decrease the transparency as well as increase the distance between investor and asset. CDOs are consequently a very risky instrument and the near disappearance of new issues in 2009 clearly shows that the future for this market is very uncertain in today's financial climate.

3.1.3 Measuring the Risk of ABSs (the ABX Index)

As the popularity of ABSs increased, so did the need for market participants to get a quick estimate of the risk involved, as a response the ABX indices were launched in January 2006¹⁸. The Index is based on credit default swaps (CDSs), a credit insurance product, and is as such a synthetic index seeking to explain the risk involved in particular tranches of MBSs. There are 24 different indices¹⁹ each relating to different MBS tranches. Each ABX-Index refers to the time it was launched and the rating of the MBSs it refers to. For example, the ABX.HE.BBB-.06-1, was launched in the first half of 2006 (06-1) and explains the risk in BBB- rated MBS tranches originated in the latter half of 2005. There are 20 constituent CDSs in every ABX-Index, which each account for 5% of the value. As a result of the financial crisis there was not issued enough CDSs to compose new ABX indices and consequently no new ABXs have been constructed since 2007.

A consortium of credit derivative dealers trade the ABX indices and the price reflect investors' willingness to trade default protection based on their views of the risk in the underlying subprime loans. Pricing the ABX Index is a complicated matter and the exact pricing is not important to understand the development of the index. In simplified terms ABX pricing can be written as:

$$\text{Price} = 100 + PV(\text{coupon}) - PV(\text{writedowns, interest rate shortfalls})$$

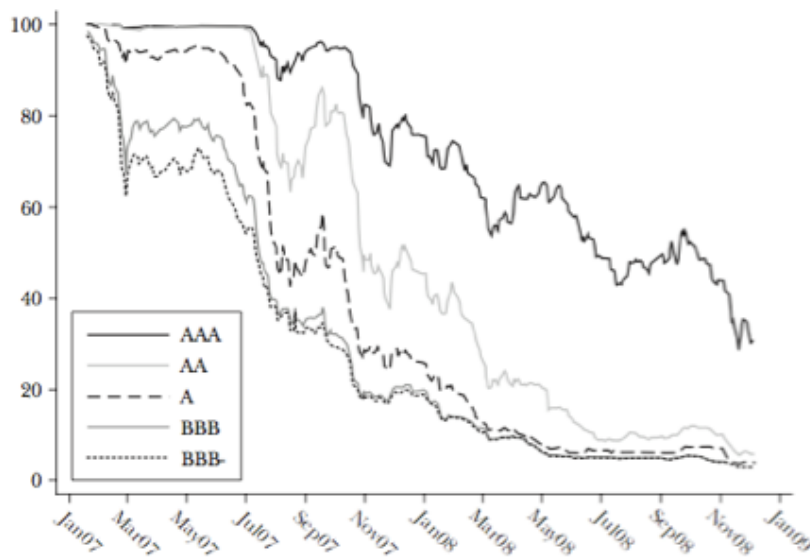
The coupon is paid by the protection buyer as a fixed payment over the life of the index, and the writedown and shortfall payments are paid by the seller, conditional upon any principal writedowns or interest rate shortfalls as determined by the administrator and calculation agent for the ABX indices. The last part is particularly interesting as it gives information about the actual and expected number of writedowns in the underlying MBS tranches. Broadly put, 10 immediate writedowns (i.e. half of the underlying MBS

¹⁸ These indices are started by a private company, Markit Group, who manages the indices and sells access to the data.

¹⁹ As of 28-January 2010, www.markit.com.

tranches) will result in a price of 50, whereas 15 writedowns (75% of all tranches) imply a price of 25.²⁰

Chart 3.5 ABX Index series 07-1²¹



Source: Brunnermeier (2009)

The chart above shows the price development for the ABX series initiated in January 2007 and is split into five ratings categories. The series is based on 20 liquid CDSs issues in the second half of 2006 and the ABX Index is therefore also an indication of the development in CDS prices and the quality of the underlying MBSs. As we can see, the prices have fallen dramatically over the period, and indicates that the risk of default for the underlying assets have increased to the same magnitude. It may not be surprising that the lower ratings have dropped most, but the extent of the drop is noteworthy. More shocking is it that the AAA rated series have dropped some 60%, indicating that around 12 out of the underlying 20 CDSs are expected to have writedowns or interest shortfalls. The timing corresponds well with the fall in house prices, subprime related products and

²⁰ This paragraph (including the simplified valuation equation) is based on Bank for International Settlement (BIS) Quarterly Review, September 2008.

²¹ Obtaining data for the ABX series is extremely difficult as Markit, the data provider, has a very strict licensing policy. The chart above is copied from Brunnermeier (2009).

dried up inter-bank lending. The CDS market will be described in detail in the next section.

3.1.4 Credit Default Swaps (CDSs)

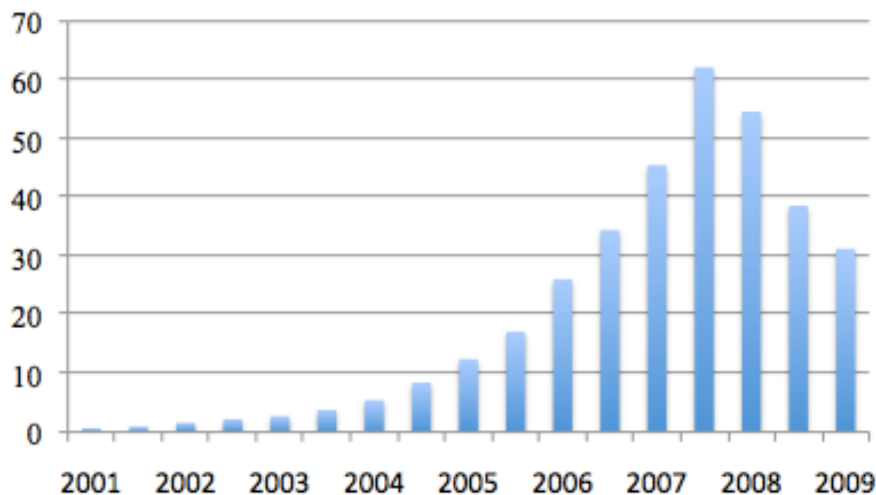
A credit default swap (CDS) is a financial derivative offering the buyer protection (insurance) against losses resulting from default of a credit instrument, such as a bond, a loan or an ABS. In exchange for being secured against default, the buyer of the CDS pays an annual premium to the seller, expressed as a percentage of the transaction's notional value, which makes up the market quote for the CDS. In return the seller guarantees to compensate the buyer for any loss that might arise as a result of the underlying party's default. By entering into a CDS agreement the credit risk is transferred to a third party, Scheicher (2008). An important difference between traditional insurance providers and the CDS market, is that the CDS seller is not subject to the same capital requirements as banks, mortgage providers or traditional insurance companies and as a result, many CDS issuers could not meet the obligations set out in the CDS contracts when the financial crisis developed. This very serious aspect of counterparty risk was to a large extent not priced into the CDS market before the summer of 2007.

The CDS market is one of the largest financial markets in the world, if valued as the aggregated value of the underlying assets covered by the total outstanding CDSs.²² In the second half of 2007 the market peaked at US\$ 62 trillion. This number is the amount payable by the CDS issuers if all underlying assets defaulted at the same time. This is of course a very unlikely scenario but as discussed earlier in this chapter, the total value of outstanding MBSs surpassed US\$ 9 trillion in 2007, many of whom have CDSs issued to cover the risk of default, and a large part of those are based on highly dubious subprime mortgages and inflated real estate prices. In addition, ratings on many blue-chip companies have fallen below investment grade, which in some instances activates payout covenants in CDS agreements.

²² The value of the fees paid for CDS contracts is much smaller and data on this is not available.

Chart 3.6 shows the development in the CDS market since 2001. During the six-year period the market increased 100-fold, but has since its peak in 2007 halved and the trend is continuing as very few new CDSs are being issued these days.²³

Chart 3.6 Global CDSs Outstanding (US\$ trillion)



Source: International Swaps and Derivatives Association (ISDA)

The objective behind creating CDSs is to price and transfer risk in order to optimise the risk allocation between investors. Creating a CDS makes it possible for buyers of a risky junior tranche in an ABS or holders of a corporate junk-bond to create down-side protection at a fixed price. It also enables investors, who have limits on the risk they are allowed to include in their portfolio, to broaden the universe of potential investments. The concept of optimal risk allocation is a sound financial argument, one that in theory increases economic wealth. The problem, as it turned out, was that price didn't reflect all the relevant risk parameters and that some risks were grossly misjudged. As mentioned before the counterpart risk was not properly priced, nor was the price of illiquidity in times of crisis. In addition, the price assumption was based on correct credit ratings of the underlying asset, ratings that turned out to be very wrong in many instances.

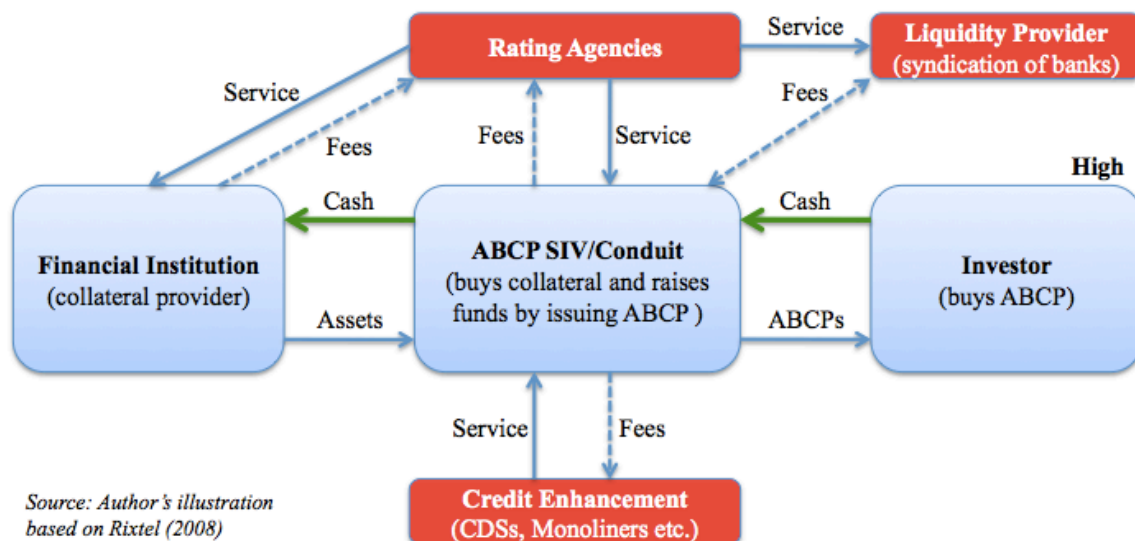
²³ According to Chief Economist at UBS Investment Bank, Paul Donovan. Private conversation January 2010.

The sophistication and multiple layers in pricing a CDS quickly became the Achilles heel when investors rushed back to basic asset classes, such as gold, government bonds and blue-chip equity. In hindsight the CDS market created a false sense of security on a massive scale and when confidence in the product evaporated, investors all wanted to exit at the same time, creating substantial downward pressure on CDS prices.

3.2 Asset Backed Commercial Paper

Asset backed commercial paper (ABCP) is a collateralised debt instrument created to provide medium term (typically 3-6 months) financing for financial institutions. The structure is as follows: a) the institution in need of financing sets up a bankruptcy remote separate legal entity, in this context referred to as a conduit or special investment vehicle (SIV), b) the SIV purchases financial assets from the financial institution using short-term funding, provided in the form of a bridge loan from a syndication of banks²⁴, c) the SIV creates ABCP which is sold to investors across the globe. The income from the sale of the ABCP is used to repay the bridge financing and any fees paid in the process of arranging the ABCP. Figure 3.3 illustrates the steps explained above.

Figure 3.3 Creating Asset Backed Commercial Paper

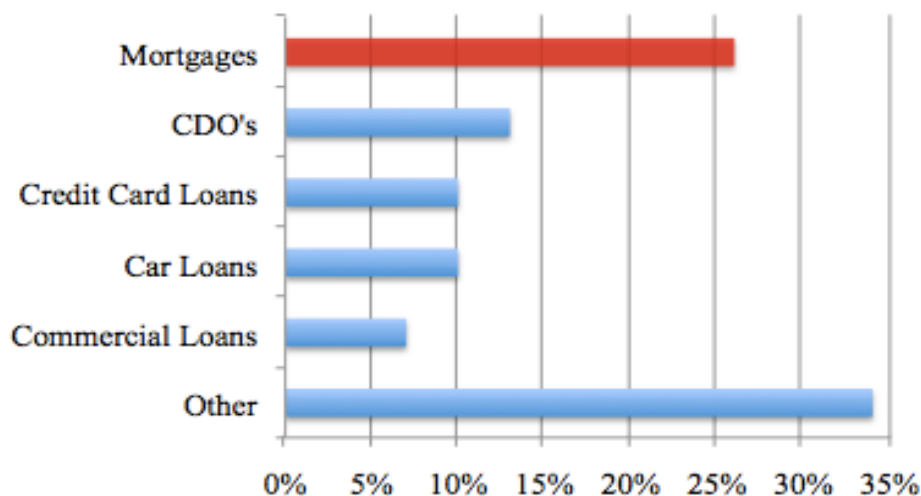


²⁴ Since the summer of 2007 loan syndication practically came to a halt as banks concentrated on preserving cash.

The red boxes in figure 3.3 represent the external parties involved in the ABCP transaction. The rating agency rates the quality of the combined asset pool held by the SIV, a vital element to enable investors to assess the risk/return profile of the paper. The rating agency receives a fee for its service – a typical principal/agent problem present in most of the products described earlier in this chapter. In order to optimise the credit rating, and subsequently the pricing, the SIV can use external credit insurance to limit the perceived risk of credit losses.

According to Rixtel (2008), the composition of the assets (collateral) used to support the ABCP can be of a very diverse nature, including e.g. loans (including prime and subprime mortgages), debt securities (including bank debt, high yield bonds), ABSs and CDOs. As the popularity of MBSs grew in 2005 – 2007 the value of ABCP linked to mortgage products was an estimated US\$ 300bn, or 26% of the total ABCP market. Chart 3.7 shows a snapshot of the collateral composition in March 2007. In addition to the high percentages of mortgage related papers, CDOs accounted for 13%, or US\$ 145bn of which a large part was CDOs connected to mortgage products.

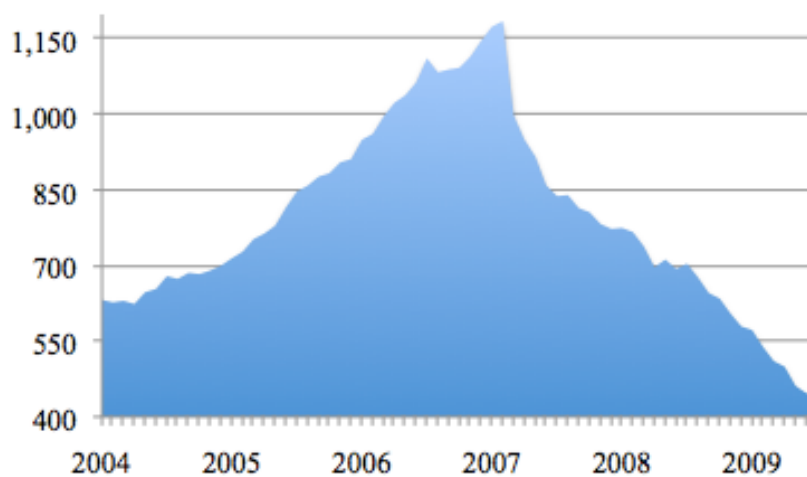
Chart 3.7 US ABCP market by collateral (March 2007)



Source: JPMorgan (2007)

The high concentration of mortgage related products in the ABCP market resulted in a 62% drop in the value of outstanding ABCP from its peak in Jul 2007 to Dec 2009. In fact the ABCP market lost US\$ 326bn in the first four months after the crisis broke out in Jul 2007. According to industry insiders, secondary trading in ABCP came to a complete stop and banks were no longer willing to offer bridge financing to new SIVs, and even relatively firm commitments were cancelled.²⁵

Chart 3.8 US Outstanding ABCP (US\$bn) (Jun 2004 – Dec 2009)



Source: SIFMA (Securities Industry and Financial Markets Association)

At the end of 2009 the ABCP market in the US stood at US\$ 450bn, of which the mortgage related part has fallen to under 10%. As with the other products discussed in this chapter it has been mortgage related products that have seen the biggest drop in value, thus confirming the connection between the US real estate market and the crisis that unfolded on financial markets around the world in the summer of 2007.

²⁵ This view is based on conversations in July/August 2007 with UBS Chief Economist, Paul Donovan and UBS Head of Leveraged Finance and Loan Syndication, John Senik.

4. Financial Institutions

This chapter describes the institutional structures that surround the financial industry, particularly in relations to the regulations and conventions that enabled banks and other financial agents to take on unsustainable risk positions. Focus will be on institutions that played an important role in relation to the economic crisis including, credit agencies, government sponsored entities (GSEs) and the Federal Reserve (Fed). The institutions examined in this chapter are not the only parties involved in the mortgage and ABS market, but they are selected, as they are the most influential in the market place and actions taken by these institutions explain to a large extent the problems creating the global economic crisis.

4.1 Credit Rating Agencies

A credit rating agency is a private company that through independent analysis provides a credit rating, which reflects the agency's opinion, of the creditworthiness of a particular company, security, or obligation. The rating is a snapshot of the financial capability in a particular moment in time. The U.S. Securities and Exchange Commission (SEC) recognises three such agencies and labels them as “nationally recognised statistical rating organisations,” which are: Moody's Investors Service (Moody's), Standard & Poor's (S&P) and Fitch, SEC (2003).

Credit agencies have existed for more than a century and what started out as a US product has now spread to cover most corners of the world. In addition, the importance of the ratings has become more and more essential as the complexity of financial products have evolved. Traditionally, agencies would rate the cash flow quality of a company and rate the likelihood of default in relation to a bond issued by the company. This is a relatively simple assignment based on analysing the cash flows and financial strength of the specific company, using audited and mainly publicly available reports. Such ratings still play a large part in the corporate bond markets, but as new complex structured credit products, such as ABSs, CDOs and CDSs, became more popular, so did the need for credit ratings to provide an independent assessment on these products.

Ratings are divided into two major categories: investment grade and sub-investment grade, also referred to as speculative grade or simply a junk rating. Each rating agency has a slightly different rating denomination, but generally a triple-A rating is the highest and single-C the weakest.

Table 4.1 Basic Rating Structure

	MOODY'S	S&P	FINCH
Investment Grade Rating	Aaa Aa A Baa	AAA AA A BBB	AAA AA A BBB
Junk Rating	Ba B Caa Ca C	BB B CCC CC C	BB B CCC CC C

Source: Brealey, Myers & Allen (2006)

A triple-A rating is given to investments considered very safe, such as government bonds and stable corporate bonds. In addition, many senior tranches of ABSs were given triple-A ratings as rating agencies viewed the risk of default as extremely low. This assumption later proved wrong as 66% of all CDOs based on ABSs were downgraded between 2005 and 2007. In fact 44% were downgraded from investment grade to a junk rating, with severe consequences for CDO prices. For MBSs the picture was similar, albeit less dramatic: 17% were downgraded, and 10% were downgraded from investment grade to speculative grade, Crouhy et al (2008).

Rating agencies played a vital role in the expansion of the structured credit products discussed in the previous chapter. First of all the transparency of the various products are

often limited, compared to investments in more plain vanilla products, and investors relied on external and independent analysis to understand the risk profile of such investments. In addition, many investors have restrictions on the investments they can invest in: for example, US pension funds and municipalities are restricted to investing in investment grade assets, money market funds can only invest in triple-A assets and base their investment decision on the rating endorsed by the rating agencies. As long as ratings on average are of good quality, investors feel confident and are willing to rely on the ratings. But when triple-A securities are downgraded to junk status within weeks, confidence in the whole rating industry is lost, Crouhy et al (2008). Even Alan Greenspan acknowledged the problem and as early as May 2005, the former Fed chairman warned that “the credit risk profile of CDO tranches poses challenges to even the most sophisticated market participants” and warned investors “not to rely solely on rating agency assessments of credit risk.” Mason (2007).

4.1.1 How ABS Ratings Differ From Corporate Debt Ratings

In order to understand how rating agencies produced ratings of such questionable quality, as was the case before the 2007 crisis, it is necessary to look at the difference between traditional ratings (corporate debt rating) and ABS credit ratings. In a study by Ashcraft & Schuermann (2007) the main differences are split into five areas.²⁶

1. Portfolio Argument: Corporate bond ratings are mainly based on an assessment of the unsystematic risk specific to the individual firm. Ratings on ABSs on the other hand are concerned with the systematic risk of a portfolio of underlying assets. MBSs are typically constructed using thousands of mortgages, which created diversification and protections against the risk of default in a single mortgage. In addition, the MBS portfolio will hold mortgages from different geographical areas as well as different types of mortgages (prime, Alt-A and subprime), which lowers the correlation between default events. The rating is thus mainly sensitive to the systematic risk affecting the entire market. According to Moody’s, this changes the ratings mitigation so that rating changes are less

²⁶ The following five headline differences are own interpretation and analysis, but broadly based on Ashcraft & Schuermann’s (2007) findings.

likely for ABS ratings, but when such rating changes are made, they are more likely to be of a larger magnitude. This explains why the rating changes in 2007 came as such a surprise to investors and why the changes often were severe downgrades.

2. Static Assets: The pool of assets making up the ABS is static over the life of the security and management of the portfolio is purely administrative. In contrast, a corporation is a dynamic entity and if the firm becomes distressed, it has the option to change investment strategy or to raise additional equity capital. Investors thus have an assumption that the firm will take steps to avoid ending up in bankruptcy, whereas investors in the ABS should not rely on any external factors to support a poorly performing pool of fixed assets. This means that once an ABS rating is adjusted downward, it is very unlikely that the rating will revert upward.

3. Quantitative Models: As the ABS involves large quantities of static data, rating agencies have built extensive quantitative models to explain risk behavior. Corporate ratings rely on “soft” analysis of business strategy, market conditions, competitive environment, long-term trends etc. Such analysis is to a large extent influenced by a human factor, and does not blindly look at large data sets. This rather mechanic approach to ABS ratings is more likely to produce incorrect outcomes, as it misses out on important inputs that are hard to quantify numerically.

4. Macro Economic Forecast: Given the nature of the quantitative models, ABS ratings are extremely sensitive to forecasts of general economic conditions. When corporate ratings are made they evaluate the risk of default during neutral economic conditions, this is not possible for ABSs, in particular MBSs, as the likelihood of default to a large extent is linked to general economic parameters. The rating is thus more an indication of the rating agency’s expectation of macro economic developments and the sensitivity of the ABS to such changes.

5. Expected Loss: A particular credit rating should indicate the same loss expectation irrespective of being attached to an ABS or a corporate bond. However, the volatility of losses relating to ABSs is higher and even if the expected loss might be the same, the magnitude of the loss differs.

The above differences mainly evolve around the fact that ABSs have a large number of similar assets in their portfolio and that rating analysis is sensitive to systematic risk and macro economic forecasts. As a result, rate changes are less frequent, but larger in magnitude when they do occur. In addition, most ABSs are exposed to the same factors and react similar to events leading to rating changes across a large number of ABSs at the same time. In summary, ratings of ABSs are more volatile and less predictable, and thus riskier than ratings on traditional corporate debt.

4.2 Government Sponsored Entities

Government sponsored entities (GSEs) are private companies that have been established by the US Congress on the back of federal legislation. According to a congressional report by Kosar (2007), the following describes a GSE; a) created by a Federal Charter, b) privately owned, c) governed by a board of directors, of which the majority are elected by the owners and d) a financial institution who give loans and guarantees to a specific sector (mainly housing and farming) and raise funds by borrowing, or to guarantee the debt of others in unlimited amounts. There are currently seven GSEs, and of those are two of particular interest in relation to the financial crisis; the Federal National Mortgage Association (Fannie Mae), the Federal Home Loan Mortgage Corporation (Freddie Mac).

The GSEs were originally created to “improve the efficiency of capital markets” and to overcome “market imperfections which otherwise prevent funds from moving easily from suppliers of funds to areas of high loan demand”, Stranton, (1988)”

The legalisation governing the GSEs states their primary obligations²⁷:

1. Provide stability in the secondary market for residential mortgages.
2. Respond appropriately to the private capital market.
3. Provide ongoing assistance to the secondary market for residential mortgages by increasing the liquidity of mortgage investments and improving the distribution of investment capital available for residential mortgage financing.
4. Promote access to mortgage credit throughout the US by increasing the liquidity of mortgage investments and improving the distribution of investment capital available for residential mortgage financing.

Congress created Fannie Mae in 1968 and its shares were sold to the public and traded on the exchange. The aim of Fannie Mae is to buy and hold conventional mortgages not guaranteed by any other government institution. Freddie Mac was established in 1970, as a GSE, but it did not become a publicly traded firm until 1989. Originally, Freddie Mac did not hold mortgages in its portfolio. Instead, Freddie Mac created MBSs and sold these on to investors. These MBSs benefitted from the fact that risk of default was guaranteed by Freddie Mac, Jaffee (2007). Today the two GSEs conduct their business very similarly, and for the purpose of understanding their relation to the financial crisis the most important fact is that MBSs issued by any of the two institutions are considered extremely safe, due to the perceived government backing.

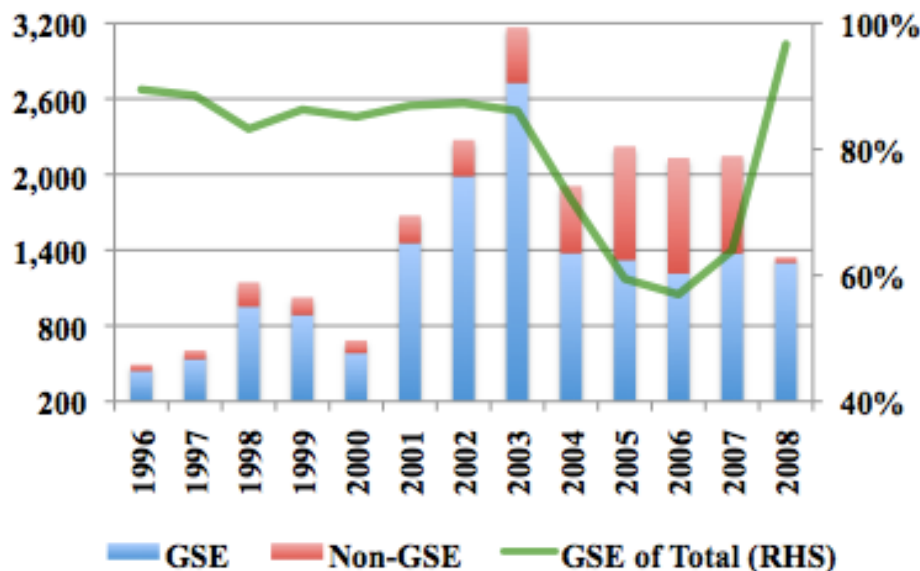
McDonald (2008) highlights that even though the debt issued by Freddie Mac and Fannie Mae were not formally backed by US government, GSE debt typically trades at interest rates only a few basis points higher than equivalent government issued debt. As a result it is fair to assume that investors had a firm expectation that the US government would step in and support the two GSEs in the event of a crisis. An assumption that was confirmed when both Freddie Mac and Fannie Mae were taken off the exchange and placed under

²⁷ The following is taken from Jaffee (2007).

conservatorship²⁸ by the US Federal Housing Finance Agency (FHFA)²⁹ in September 2008. FHFA was set up in 2008 and serves according to its mission statement the following goal; to “provide effective supervision, regulation and housing mission oversight of Fannie Mae, Freddie Mac and the Federal Home Loan Banks to promote their safety and soundness, support housing finance and affordable housing, and support a stable and liquid mortgage market”.

The existence of GSEs has been the main driver behind the increase in securitised mortgage products and until 2003 accounted for over 75% of all new MBSs issued in the US. As discussed in the previous chapter this changed dramatically in the years before the 2007 crisis. But as we can see from the chart below the picture has reverted to GSE dominance on the MBS market, and in 2008 the GSE share was 97% of all new issued MBSs.

Chart 4.1 GSE Issued MBSs in the US (US\$bn)



Source: SIFMA (Securities Industry and Financial Markets Association)

²⁸ Conservatorship is a legal concept in the US, where an organisation is subjected to the legal control of an external entity or organisation. When referring to government control of private corporations such as Freddie Mac or Fannie Mae, conservatorship implies a looser, more temporary control than nationalisation.

²⁹ According to the mission statement of FHFA.

The effective government backing of debt issued by GSEs, and the goals set out in the charter described above, were both catalysts in the massive growth in MBSs in the past decade. On the positive side, the US achieved very high levels of private homeownership, reaching 69% in 2004 and 2006, as illustrated in chart 2.2 (chapter 2). In addition it sparked a surge in house prices and eventually created a massive house price bubble. The main problem lies with the entrance of investment banks into the MBS market. These banks were not established with a goal of higher social welfare, as defined in the mission statements of the GSEs, but rather as private profit seeking corporations.

The fact that investors historically have perceived MBSs as safe investments, as most were issued by GSEs, is very likely to have created a false sense of security as the amount of non-agency MBSs exploded in the period 2003-2007. It remains to be seen whether confidence in MBSs will be re-established now that conditions are back to pre-2003 standards. Both Freddie Mac and Fannie Mae have been taken off the exchange and are now effectively guaranteed by the US Treasury, who currently holds 79.9% of the shares in both GSEs. The FHFA announced, in relation to being appointed conservator for Freddie Mac and Fannie Mae, that the two GSEs “will be allowed to grow their guarantee MBS books without limits and continue to purchase replacement securities for their portfolios, about \$20 billion per month, without capital constraints”.

4.3 Federal Reserve

The Federal Reserve (Fed) is the US central bank and dates back to 1913, and is without doubt the single most influential financial institution in today’s financial system. The main objectives are according to the Fed’s mission statement³⁰:

1. Conducting the nation's monetary policy by influencing the monetary and credit conditions in the economy in pursuit of maximum employment, stable prices, and moderate long-term interest rates.

³⁰ see <http://www.federalreserve.gov/aboutthefed/mission.htm>

2. Supervising and regulating banking institutions to ensure the safety and soundness of the nation's banking and financial system and to protect the credit rights of consumers.
3. Maintaining the stability of the financial system and containing systemic risk that may arise in financial markets.
4. Providing financial services to depository institutions, the US government, and foreign official institutions, including playing a major role in operating the nation's payments system.

The objectives boils down to ensuring stable financial markets, controlling the money supply in the US and setting the target discount rate, in addition the chairman of the Fed is responsible for advising the President, Senate and Congress on economic issues. The Fed's organisation is rather complex, reflecting a historical desire to decentralise decision-making. The main elements of the Fed are the 12 separate Federal Reserve Banks (FRBs), the Board of Governors and the Federal Open Market Committee (FOMC), Mishkin (2004).

4.3.1 The Fed Funds Rate

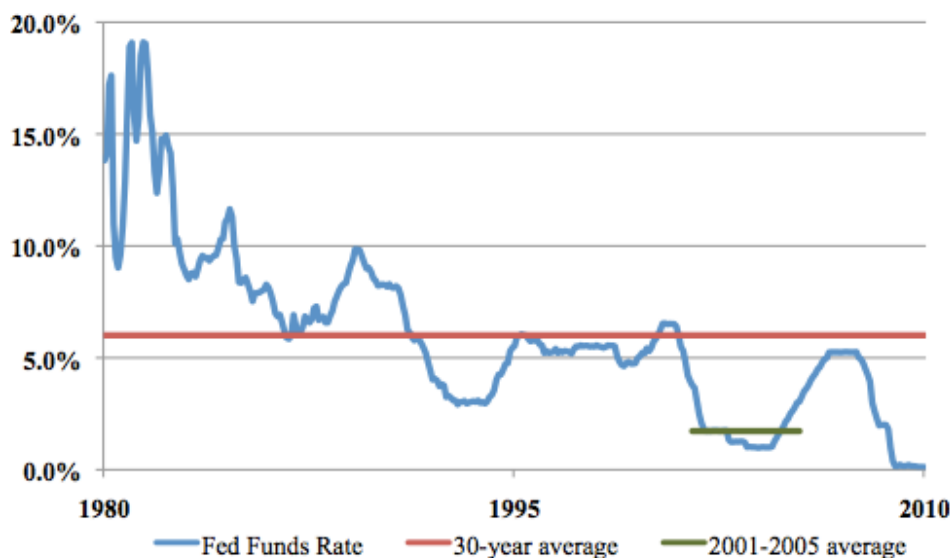
The FOMC meets 8-9 times a year and makes decisions on how to conduct open market operations. In practise, the FOMC directs the FRB of New York³¹ on which actions to take in order to adjust the monetary policy in the direction the FOMC has decided. The FOMC is often referred to as the Fed and after each meeting the chairman, currently Ben Bernanke, makes a public announcement that sums up the committee's view on the economy and the current target discount rate, also referred to as the Federal Funds Rate (Fed rate).

The Fed rate is the overnight interest rate financial institutions pay on loans from the reserve and is also the primary indicator of the committee's position on monetary policy. In 1984 the Fed started to announce changes to the target rate to the public and since

³¹ The FRB of NY houses the open market desk, which is responsible for the purchase and sale of bonds and thus the reserve and rates in the market.

1995 the exact target rate has been published. This rate is followed closely by all parts of the financial market and drives prices in everything from equities, bonds, foreign exchange and derivatives, to the wide range of structured products discussed in the previous chapter. The various effects will not be analysed in this context, but putting it simply, a low Fed rate, also known as expansionary monetary policy, aims to increase investments and spending in the economy. An increase in the Fed rate signals a desire to slow down the economy to fight inflation. The chart below shows the development in the effective Fed Rate since 1980. The red line is the 30-year average rate and the dark green illustrated the average Fed rate in the four-year period prior up to the 2007 crisis.

Chart 4.2 Fed Funds Rate 1980 - 2010



Source: Federal Reserve

In the past 30 years the average Fed rate has been 6.0%. Since 2001 the rate never exceeded 6.0% and in fact the average rate from July 2001 until July 2005 was a mere 1.7%. Former Fed chairman Alan Greenspan began lowering the rate in 2000 in response to falling financial markets after the tech-boom came to an end. The monetary easing was accelerated after the September 11th terrorist attacks. In fact, the Fed target rate dropped 175bps in the four months following the attack.

4.3.2 The Greenspan Effect

Many scholars and market commentators have talked about the effect of former Fed chairman Alan Greenspan's monetary policy and his free-market approach to financial oversight. As mentioned earlier in this chapter, part of the Fed's role is "supervising ... institutions to ensure the safety ... of the nation's banking and financial system" and "maintaining the stability of the financial system". Greenspan was in strong favour of self-regulating markets and free-market theory, and did very little in his 18-year tenure as Fed chairman to curb the development of structured financial products. He later stated in his testimony to the US Congress, October 2008, that he made a mistake in believing that banks, operating in their own self-interest, would do what was necessary to protect their shareholders and institutions, which he labelled as "a flaw in the model ... that defines how the world works." In addition, he said that the consequences and results were far beyond anything he could have imagined and called the financial crisis a "once-in-a-century credit tsunami".

Randall (2007) blames the low interest rates of the Greenspan era for pushing investors into more exotic products as the return on traditional debt instruments became less attractive. The result was an expansion of structured credit products, which we saw in the previous chapter, carrying much higher risk than originally anticipated. Banks and mortgage brokers became reliant on fee income from constructing and selling these new products and as a result the quality of control became lower and lower. With no, or very limited, SEC regulation on many of these new financial products, investors were left relying on profit seeking organisations for their belief in the product's financial soundness. In addition, Greenspan urged homeowners, in an effort to increase private homeownership, to take out adjustable rate loans, which proved catastrophic when interest rates finally began to rise in late 2005.

The Fed's free market, no involvement policy had its critics and as early as 2000 Fed governor, Edward Gramlich, voiced his concern against the increase in subprime lending and tried to get Greenspan to increase oversight of subprime lending institutions. Even if

many of the loans were originated by institutions traditionally not subject to Fed oversight, the 1994 Home Equity and Ownership Protection Act did, according to Kuttner³² (2007), give the Fed authority to monitor underwriting standards, including those on otherwise unregulated entities such as subprime mortgage originators. Had Greenspan acted on the concerns raised by Gramlich in 2000, the subprime problem might have been mitigated to some extent, as it wasn't until 2001 underwriting standards began to fall considerably.

It appears that the Fed's willingness to support the growing US economy by keeping interest rates exceptionally low was a vital factor for investors to look for alternative investment opportunities and for investment banks to fulfil this product gap by inventing still more sophisticated financial products. Add to this a very liberal approach to market regulation and free market theory, a political desire to increase homeownership and we have part of the explanation for the boom and subsequent bust on financial markets over the last eight years, a bust which created problems for economies across the globe.

³² Robert Kuttner is an American economist and writer who also sits on the board of the Economic Policy Institute, a US think tank.

5. The Evolution of a Financial Crises

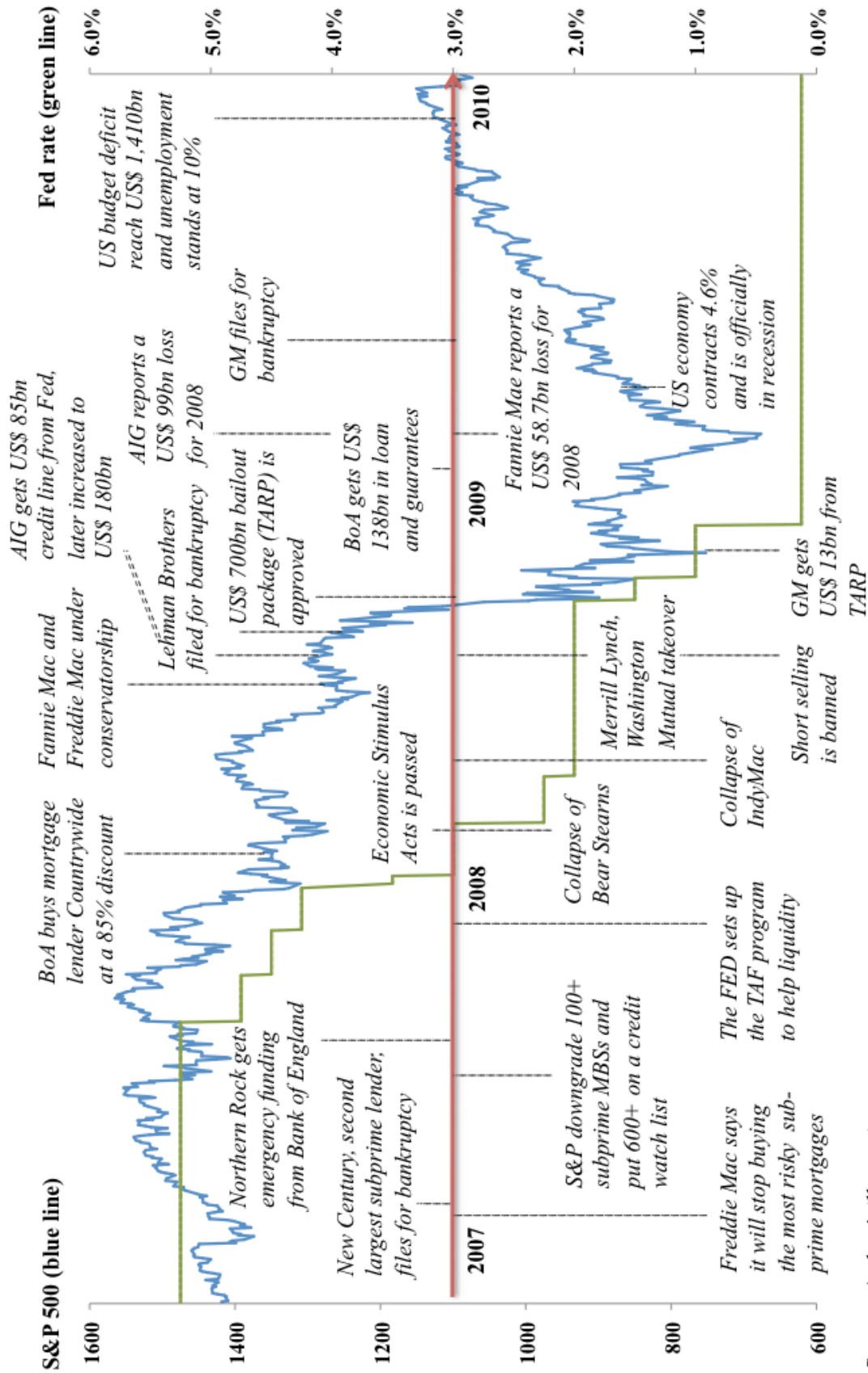
This section offers the reader a chronological breakdown and discussion of the most important events of the financial crises, starting with the early signs in 2007. The information in this chapter is based on various sources, including newspaper articles, press releases, government publications, academic articles etc. The aim of this exercise is to give the reader an overview of the most significant and dramatic events since 2007 and to illustrate the problems described in the previous chapters using concrete examples.

As we will see, the crisis started in the first half of 2007 but was at the time limited to the financial sector, and primarily to debt markets. US subprime lenders were among the first companies to succumb to the crisis. The problems spread like rings in water and by the summer of 2007 the crisis had turned global, freezing interbank lending. Short-term interest rates skyrocketed and liquidity became a major problem for banks.

2008 became a turning point when the crisis expanded beyond financial markets. Financial institutions were having trouble valuating their asset base and counterparty confidence plummeted. Major investment banks collapsed and others came under partial government ownership. President Bush approved a massive US\$ 700bn support package and the Fed lowered the target rate to 0-0.25% in an attempt to stop a looming recession.

The recession officially came in 2009 and lasted nine months. Banks and most other sectors realised massive losses and unemployment in the US ended at 10%. Stock markets saw some signs of recovery in the second half of the year, and GDP growth turned positive again. The recovery is fragile and 2010 looks far from a safe haven.

The figure on the next page highlights the most significant events in chronological order from Jan 2007 to Jan 2010. The blue line is the development in the SP 500 Index, which gives some reference as to how equity markets reacted in the same period, and the green line shows the Fed rate.



Source: Author's illustration

5.1 Annual Breakdown of Events

Before discussing the various events it is important to fully understand the size of the dollar amount mentioned. Losses in the billions, and bailout packages of hundreds of billions became familiar headlines and it is easy to forget the enormity of the sums involved. A few examples are provided to put things into perspective.

The US\$ 700bn bailout package is roughly twice the size of the GDP of Denmark, or the same as the total production of the African continent (disregarding South Africa and Nigeria), it also represent roughly US\$ 2,300 to every US citizen or 5% of US GDP in 2008. When AIG was extended a US\$ 180bn credit line by the Fed the same amount would be enough to buy UBS, Morgan Stanley, Deutsche Bank, Nordea, and still have enough funds left to buy Ford Motor Company at today's prices. HSBC managed to report a one-quarter loss of US\$ 17bn, approximately the current market value of the largest Danish bank, Danske Bank.³³

Looking at it in a non-financial light the US\$ 700bn bailout package, if paid out in 1-dollar bills and stacked on top of each other would take reach 76,454 km out into space, or roughly 25% of the way to the moon. Placed flat on the ground next to each other they would form a chain 132,3000,000 km long, almost the distance from Wall Street to the Sun. US\$ 700bn could also feed the entire planet with hamburgers for four months, a rather disturbing scenario. The numbers are truly astonishing and underline the magnitude of the crisis.³⁴

The remaining part of the chapter provides an annual breakdown of events since 2007. Some of the following events are simply stating facts and others are analysed using lessons learned from the previous chapters. In any case they highlight the dramatic evolution of the worst global economic crisis in recent history.

³³ All share prices are as of 15-Feb-10.

³⁴ Although this passage does not have a direct link with financial theory, it does provide the reader with a dramatic illustration underling the size of the crisis.

2007: Early Signs, Downgrades and the Collapse of Interbank Lending

February: Freddie Mac announces that they, in an effort to reduce the risk of future defaults, will stop buying subprime ARM if the borrower would not qualify for a fully amortising FRM loan of the same amount. In addition, such loans will no longer be purchased if the underwriting documentation is low, as was the case with many of the most risky subprime mortgages.³⁵

April: New Century Financial Corporation files for chapter 11 bankruptcy, two weeks after the company had been taken off the New York Stock Exchange (NYSE). New Century was at the beginning of 2007 the second largest subprime mortgage lender in the US and had a market value of US\$ 1.8bn. When the company was delisted the market value had dropped 97% to US\$ 55 million.

June/July: S&P first downgrades in excess of 100 subprime MBSs backed on junior tranches. A month later an additional 612 subprime MBSs are placed on a credit watch, a negative action indicating that the included securities are likely to be downgraded in the near future. UBS Investment Bank said that interbank lending broke down in July and that loan syndication was no longer available in the market. Bear Stearns filed for liquidation of two of its subprime related hedge funds that invested in triple A-rated structured financial instruments, including MBSs and other credit derivatives. The statement gave poor performance as the reason for closing the funds.

August: BNP Paribas, France's largest bank, announces that it will stop redemptions, i.e. investors, withdrawals, on three of its investments funds as "it is no longer possible to value fairly the underlying US ABS assets" and that they as a result can not calculate the net asset value (NAV) of the funds. In other words, BNP don't know the true values of the assets due to lack of liquidity and inability to get market prices.

³⁵ See press release of 27-Feb-07 available on www.freddiemac.com.

September: Northern Rock, a large UK savings and mortgage bank, received liquidity support from the Bank of England as a result of lack of short-term funding. At the time, UK Financial Services Authority (FSA), judges that Northern Rock was solvent, exceeded its regulatory capital requirement and has a good quality loan book.³⁶ The bank was five months later nationalised by the British Government and was the first major non-US casualty of the liquidity crisis.

December: The Fed sets up a temporary³⁷ Term Auction Facility (TAF), under which depository banks can bid for funds, in the form of credit lines, using a wide range of collateral. The aim is to provide short-term liquidity to institutions that have been unexpectedly hurt by the breakdown of inter-bank lending.³⁸

2007 in Summary

2007 became known as the credit-crunch year and was characterised by lack of liquidity and problems within the US subprime mortgage market. Problems were to a large extent contained within the financial sector and specifically within debt-related areas. Equity markets came out flat, after 5 strong years, and the economy as a whole seemed strong with low unemployment and high GDP growth. People within the industry were speculating that the problems relating to subprime could spread to other areas, but it wasn't until the following year that investors and consumers alike realised that the problems would spread like wildfire across the globe.

Vital US Statistics for 2007 (31-Dec.)

<i>GDP growth:</i>	<i>Unemployment:</i>	<i>S&P500 change:</i>	<i>Fed Funds rate:</i>
+5.1%	5.0%	+0.4%	4.25%

³⁶ See press release of 14-Sep-07 available on www.hm-treasury.gov.uk.

³⁷ Still in place February 2010.

³⁸ See press release of 12-Dec-07 available on www.federalreserve.gov.

2008: Bank Collapses, Bailout Money and Falling Markets

January: Bank of America (BoA) announced a friendly bid for US mortgage lender, Countrywide Financial Corp. Countrywide had since August 2007 been in severe liquidity trouble as a result of decline in the secondary market for MBSs. The takeover is accepted by shareholders in June 2008 and valued the company at US\$ 4bn, around 15% of the value 12 months earlier. The Fed, realising that the problem is not contained to the banking industry, lowers the Fed rate twice in little more than a week. This unprecedented step takes the target rate from 4.25% to 3.0% in an effort to mitigate the looming global crisis.

February: After testimony from Fed chairman Ben Bernanke, warning US politicians against a possible recession, Congress pass the Economic Stimulus Act of 2008. The law creates tax breaks on income for American citizens, and is aimed at keeping private spending up, to avoid a decrease in GDP and employment rates. The law also increased the limit on mortgages eligible for purchase by GSEs and according to a budget report the total cost of the act would be US\$ 152bn.³⁹

March: Bear Stearns, a former top tier global investment bank, collapsed and was taken over by JPMorgan Chase (JPM) in an emergency rescue deal facilitated by a favourable loan from the FRB of New York. The Fed provided JPM with a US\$ 29bn loan using the assets of Bear Stearns as collateral. At the time Ben Bernanke said that the bailout was necessary to shield the economy from negative effects and that a bankruptcy of Bear Stearns “could have caused a chaotic unwinding of investments across the US markets”. To put things in perspective the deal was done at US\$ 2 per Bear Stearns share, which had been US\$ 172 only a year earlier, a 99% drop. According to Christopher Cox, chairman of the SEC, “the collapse ... was due to a lack of confidence, not a lack of capital”. This comment is in line with the conclusions from the previous chapters, and points out that the complexity of the structured products and the low quality of credit ratings created an inefficient financial market.

³⁹ Budget Report: H.R. 5140: Economic Stimulus Act of 2008.

In addition to bailing out Bear Stearns, the Fed announced an extension of the TAF program and added a facility of US\$ 200bn where Treasury securities would be lend out to banks against a range of different MBSs as collateral.

March/April: Investment banks make massive subprime related writedowns. HSBC reports a writedown loss of US\$ 17.2bn, AIG announces a US\$ 11.1bn writedown on its largest CDS portfolio, Royal Bank of Scotland reports a US\$ 5.9bn impairment charge, Deutsche Bank writes down US\$ 3.9bn and UBS takes a whopping US\$ 19bn hit on their US holdings, shattering a life-long reputation as a conservative wealth management institution.

May: As a result of the subprime crisis and cross border writedowns, rating agency Fitch estimates that banks on a global scale will loose as much as US\$ 400bn on subprime related MBSs exposure.⁴⁰

Until this point, equity markets have stayed relatively flat, but in late May 2007 the S&P 500 begins to turn south, a decline which continues for the next 10 months and resulted in a 53% drop. The credit crunch was fast turning into an economic downturn of dimensions not seen since the Great Depression in the 1930s.

July: IndyMac, at the time the seventh largest mortgage originator in the US, went bankrupt, the fourth largest bank failure in US history. The bank was originally spun-off from Countrywide, and focussed on securitising mortgages that were too large for the GSEs to purchase. IndyMac was renown for approving risky mortgages to borrowers with little prove of income and assets. The concentration of these subprime-light loans and NINJA loans, as well as a geographical focus on California, which we saw in chapter 2 was hit particularly hard by falling house prices, led S&P to significantly downgrade

⁴⁰ Fitch Ratings (2008).

MBSs issued by IndyMac. As a result the bank was not able to maintain a sufficient capital ratio and was forced into liquidation.

On the public arena, the Fed further extend the access to TAF loans and auctions out an additional US\$ 50bn and then President Bush signed the Housing and Economic Recovery Act of 2008, which authorises the Treasury to purchase GSE obligations and puts the regulatory supervision of the GSEs under a newly formed Federal Housing Finance Agency (FHFA).

September: Arguably the most dramatic month of the crisis. First shock came when the FHFA placed both Fannie Mac and Freddie Mac under conservatorship. The details of this were discussed in chapter 4, but in this context it is worth mentioning that the two institutions at the time either owned or guaranteed loans for US\$ 5.4 trillion and the Fed immediately provided US\$ 100bn in financial aid to each company.⁴¹

The TAF program was expanded to include almost any asset as collateral and an additional US\$ 150bn was scheduled in two auctions.

Second shock came on September 15th when Lehman Brothers filed for bankruptcy. Lehman Brothers was a truly global and reputable investment bank with roots back to the 1800s. The collapse came as a real shock to the financial market and proved that the assumption of “too big to fail” did not hold any longer. When Lehman filed for bankruptcy the bank’s (simplified) balance sheet consisted of bank debt of US\$ 613bn, US\$ 155bn in bond debt, and assets worth US\$ 639bn. On the same day Bank of America announced that it had agreed to acquire Merrill Lynch for US\$ 50bn. The takeover came after Merrill Lynch had posted significant losses due to a massive drop in the value of its large CDO portfolio. It is fair to say that confidence in the financial system on this day was extremely low, and commentators across the media talked about the worst conditions on financial markets in modern times and proclaimed an end to free-market theory.

⁴¹ See press release of 7-Sep-08 available on www.ustreas.gov.

Many blamed hedge funds and predatory investors for the collapse of Lehman and other banks, as they used short-selling to speculate in falling share prices and thereby accelerating the drop in prices. As a response, the SEC imposed an unprecedented ban on short-selling of stocks on companies within the financial sector.⁴² In the months of September and October 2008 equity markets worldwide plummeted the S&P 500 lost a shocking 25%.

Third shock came the day after when it was announced that the Fed had agreed to extend AIG a US\$ 85bn credit facility using the combined assets of the group as collateral. AIG is one of the largest insurance companies in the world and had its credit rating downgraded from triple-A to below AA in September. The US\$ 85bn credit facility enabled the company to meet increased collateral obligations and thus prevented speculative pressure on the company's debt and equity. In exchange for the financial support, the Fed was issued warrants for 79.9% of the companies stock, which could be changed to equity if AIG would not be able to settle the debt. The total financial support the Fed provided AIG later increased and by March 2009 the total amount was over US\$ 180bn.⁴³

The final shock came on the last week of September when Washington Mutual, at the time the largest savings and loan bank in the US, went bankrupt and became the largest bank failure in US history. The bank was subsequently taken over by JPMorgan Chase in a highly controversial deal which left shareholders almost wiped out.

October: After the dramatic events of the past 14 months, the US government stepped in and approved a US\$ 700bn bailout packages the Emergency Economic Stabilisation Act of 2008. The bill authorises the US government to “purchase and insure certain types of troubled assets for the purposes of providing stability to and preventing disruption in the

⁴² See press release of 17-Sep-08 available on www.sec.gov.

⁴³ See press release of 2-Mar-09 available on www.federalreserve.gov.

economy and financial system”⁴⁴. The law established the Troubled Asset Relief Program (TARP), which allowed the US Treasury to purchase securities related to the US mortgage market, including MBSs, CDOs and CDSs. In addition it allowed the Treasury to buy any other financial asset if the Fed deems it necessary to stabilise the economy. Since the establishment of the TARP, several privately owned banks have agreed to sell preferred stocks to the Treasury in order to tap into the US\$ 700bn bailout cash. The list includes highly reputable financial institutions such as; Goldman Sachs, Morgan Stanley, JPMorgan Chase, Bank of America, Citigroup, AIG, Wells Fargo, American Express and also a number of non-financial companies, namely General Motors and Chrysler. Some of these companies have since bought back the preferred stocks as their conditions improved.

The TARP has been the subject of great discussion on both sides of the political divide and although the bill was signed by then President Bush, many see it as an example of how the crisis has led to government intervention in a society traditionally against large government involvement. From a crisis management point of view, the program appears to have been a success as no major US financial institutions have since failed as a result of inefficient market behavior. Many European governments rolled out similar relief programmes in a global effort to save the financial sector from further collapse.

November: The financial crisis is fast evolving into a recession and has hit the cyclical US auto industry hard and executives from Ford, Chrysler and General Motors (GM) request access to the TARP in a congressional testimony. The request is granted a month later and loans of US\$ 13.4bn to GM and US\$ 4.0bn to Chrysler are approved, using funds from the TARP.⁴⁵

December: To combat deteriorating labor market conditions, falling consumer spending, corporate investments and industrial production, the Fed lowers the target rate to a range

⁴⁴ See bill H.R.1424, which can be found on www.thomas.loc.gov.

⁴⁵ See press release of 19-Dec-08 available on www.treas.gov.

between 0-0.25% and says that “weak economic conditions are likely to warrant exceptionally low levels of the federal funds rate for some time”.⁴⁶ Later the same month the SEC announces that it will buy for up to US\$ 600bn worth of MBSs backed by Fannie Mae and Freddie Mac in order to “support the mortgage and housing markets and to foster improved conditions in financial markets more generally”.⁴⁷

2008 in Summary

2008 turned out to be one of the most turbulent years in modern economic history. The crisis first brought the entire financial sector to its knees, imposing partial government ownership of a long list of high profile banks, before expanding far beyond the financial sector. Private and corporate spending came to an almost complete standstill and companies across the globe downgraded earnings expectations for 2008, 2009 and 2010. The last quarter of 2008 also became the first quarter since 1990 to show negative US GDP growth, which came in at -5.4%, the largest quarterly decline in 50 years.⁴⁸ Unemployment in the US increased by 2.4 percentage points and equity markets declined across the world.

Vital US Statistics for 2008 (31-Dec.)

<i>GDP growth:</i>	<i>Unemployment:</i>	<i>S&P500 change:</i>	<i>FED Funds rate:</i>
+2.6%	7.4%	-38.5%	0 - 0.25%

⁴⁶ See press release of 16-Dec-08 available on www.federalreserve.gov.

⁴⁷ See press release of 30-Dec-08 available on www.federalreserve.gov.

⁴⁸ The data is taken from the US Department of Commerce’s Bureau of Economic Analysis and are seasonally adjusted and in current dollars, see www.bea.gov.

2009: Corporate Losses, Auto Industry in Trouble and Rising Unemployment

January: Bank of America taps into the TARP again and sells US\$ 20bn of preferred stocks to the Treasury. In addition, the Treasury agrees to guarantee a portfolio of loans, securities and other troubled assets, worth an estimated US\$ 118bn, in exchange for preferred stocks. The deal takes the total support extended to BoA to US\$ 163bn.⁴⁹

The US auto industry is struggling after 2008, the worst year for new car sales since 1992, with the three US automakers selling 20-30% fewer cars than the year before. Worst hit was Chrysler which saw sales drop 53% in December. Falling consumer spending hit the auto industry as car financing had become difficult to obtain, limiting the number of customers who could afford to buy a new vehicle. As a result, Chrysler received US\$ 1.5bn from the TARP to finance a special purpose entity created to increase new consumer auto loans. January was also the month President Obama was inaugurated.

IMF says in its World Economic Outlook published 28-Jan that “world growth is projected to fall to 0.5% in 2009, its lowest rate since World War II. Despite wide-ranging policy actions, financial strains remain acute, pulling down the real economy”.

February: The Fed announces that it will increase the Term Asset-Backed Security Loan Facility (TALF), a program initiated on November 2008 to support the issuance of ABSs and a range of other loans. The TALF facility is increased from US\$ 200bn to US\$ 1 trillion, and will now include triple-A rated assets as eligible collateral.⁵⁰

President Obama introduces the Homeowner Affordability and Stability Plan, designed to help homeowners refinance their existing mortgages and reduce their monthly payments. The plan creates a US\$ 75bn fund available to Fannie Mae and Freddie Mac to cover costs resulting in improving terms on mortgages. In addition the preferred stock purchase programme is increased to US\$ 200bn for the two GSEs. The aim of the plan is to limit

⁴⁹ See press release of 16-Jan-09 available on www.federalreserve.gov.

⁵⁰ See press release of 10-Feb-09 available on www.federalreserve.gov.

the amount of foreclosures and to ensure that homeowners can refinance ARMs at viable terms.⁵¹ Fannie Mae reports its full year results for 2008 the same months, which came in at a staggering loss of US\$ 58.7bn.

Years of excessive consumer spending have come to an end and two of the largest credit card issuers, American Express and Citigroup, report default rates around 9%, the highest levels in over 20 years. The high level of private spending was accelerated by easy access to consumer credit facilities. As long as borrowers could refinance their mortgage and take out cash from increased home equity, they were able to pay off expensive credit card debt. When house prices dropped and credit became in short supply consumers were left paying the bill.

March: AIG receives the final part of support money from the TARP after posting the largest corporate loss ever recorded. AIG lost US\$ 61.7bn alone in fourth quarter 2008 and US\$ 99.3bn for the full year. As a result of AIG's and other weak results across almost all sectors, the stock market falls to the lowest level since 1997. On March 9th the S&P 500 closes at 677, down 57% from peaking in October 2007, only 18 months earlier. Later the same month Freddie Mac reports a loss of US\$ 50.1bn for 2008. Due to the very weak results of the GSEs, the Fed increases its balance sheet by purchasing an additional US\$ 750bn MBSs from GSEs, bringing the total Fed purchase to US\$ 1.25 trillion.

The auto industry gets additional support in the form of a US\$ 5bn credit facility. The program gives suppliers financial protection against losses arising from a potential collapse of any US auto company. The Treasury states that the facility will “support an industry employing more than 500,000 American workers” and “provide confidence in the supplier base at an important time for the domestic auto industry”.⁵² The package, along with direct help to the three US auto producers, is subject to international criticism

⁵¹ See press release of 18-Feb-09 available on www.ustreas.gov.

⁵² See press release of 19-Mar-09 available on www.ustreas.gov.

from anti-protectionism voices, but the President has little choice but to approve the plan after the amount of support given to the financial industry.

April: US GDP data from the first three months of the year comes in at -4.6% confirming that the US economy is now “officially” in recession. The recession lasts another quarter until the economy finally expands 2.6% in Q3 2009.

The IMF reports that writedowns on US originated assets by all financial institutions are expected to be \$2.7 trillion over 2007 to 2010 and says that the “global economy is in a severe recession inflicted by a massive financial crisis and acute loss of confidence” and that “world output is projected to decline by 1.3% in 2009 as a whole and to recover only gradually in 2010”.⁵³

June: Despite significant relief support from the US government, General Motors files for chapter 11 bankruptcy on June 1st. The following two weeks the US and Canadian administration enter into a restructuring agreement in order to save the over 200,000 jobs at stake. The US Treasury eventually invests US\$ 57.6bn TARP money and becomes the majority shareholder in the company.

July: Banks are slowly recovering and equity markets are trending upward across the globe, Fed chairman Ben Bernanke says in a report to Congress that “the extreme risk aversion of last fall has eased somewhat, and investors are returning to the private credit markets”.⁵⁴

December: Financial companies are starting to become profitable and access to capital via equity offerings and private debt issuance becomes easier. AIG buys back part of the preferred stocks held by the Fed and BoA announces that they will repay the entire US\$

⁵³ World Economic Outlook, April 2009.

⁵⁴ See press release of 21-Jul-09 available on www.federalreserve.gov.

45bn debt accepted under the TARP. Citigroup along with a number of other institutions also pays back debt issued by the Treasury in exchange for preferred stocks.

2009 in Summary

The year started out with massive corporate losses, an economy entering into a second quarter of negative growth and the Fed continued to pay out money from the relief program. Hundreds of thousands of jobs were at stake as the US auto industry struggled to cope with the dramatic drop in new cars sold. President Obama stepped in and extended the TARP to include automakers in an attempt to curb an escalation of the recession. The Fed keeps the target rate at 0 - 0.25% and took several initiatives to reform the financial industry. The latter half of the year showed signs of recovery in the financial sector, and a stabilising of the housing market, but the fundamental economic statistics are still gloomy.

Vital US Statistics for 2009 (31-Dec.)

<i>GDP growth:</i>	<i>Unemployment:</i>	<i>S&P500 change:</i>	<i>FED Funds rate:</i>
-1.3%	10.0%	+23.5%	0 - 0.25%

2010: Policy Changes and a Fragile Recovery

January: With unemployment at significant levels and the budget deficit reaching US\$ 1.4 trillions (around 10% of GDP), the US economy looks in a fragile state. The TARP was a big contributor to the increased budget deficit and public debt. President Obama proposed restrictions on trading activity for banks, in particular for a prohibition on banks owning or investing in hedge funds, private equity funds and proprietary trading operations for their own profit.

The aim of this thesis is not to predict the direction of the US or the world economy, but it's clear that problems are not over and political focus is now on preventing a repetition of problems discussed in this chapter.

6. Conclusion

A quote from President Obama from January 2010 sums up the crisis quite well; “This economic crisis began as a financial crisis, when banks and financial institutions took huge, reckless risks in pursuit of quick profits and massive bonuses. When the dust settled, and this binge of irresponsibility was over, several of the world's oldest and largest financial institutions had collapsed, or were on the verge of doing so. Markets plummeted, credit dried up, and jobs were vanishing by the hundreds of thousands each month. We were on the precipice of a second Great Depression”.⁵⁵

On the surface, the financial crisis came as a surprise to almost everyone. Experienced bankers expressed how they were unable to foresee the events that unfolded and former Fed chairman Alan Greenspan said that the consequences were far beyond anything he could have imagined. Politicians were largely satisfied as unemployment was low and GDP growth high, in addition house prices were rising and more people became owners of their own homes. In hindsight, the big question is why did no one see this coming, given that, as discussed in this thesis, so many indicators pointed toward unstable conditions.

Chapter 2 pointed out that US house prices increased at an annual rate of 5.2% from 1991 to 2007. Why didn't anyone question this development and look into the reasons behind a seemingly never-ending housing boom? It might have been prudent for the SEC or the Fed to fulfil its supervisory responsibility and impose limits on mortgage products and capital requirements on the players involved in this market. On the other hand, the increase in homeownership was in clear line with domestic policy, so why slow down what looked like a successful development?

The problems leading to one of the most dramatic economic crises in modern history are all interconnected and it is therefore not possible to point out a single determining factor.

⁵⁵ White House press release of 21-Jan-10.

Banks acted in line with shareholders' expectations of higher returns and within the boundaries of current regulations. Investors looked across borders for innovative financial products yielding satisfying returns, considering the apparent risk profile. New homeowners happily took out mortgages as lenders convinced them that they could afford the repayments, and existing homeowners capitalised on increased house prices and took out cash to use for higher private consumption. The whole system worked like a ponzi scheme in its early stages until the many faults were exposed and everything collapsed in a short period of time.

To answer the question posed in the beginning of this thesis; "*What were the key elements responsible for the 2007 - 2009 financial crisis?*", this thesis has identified two areas that are central to explaining the roots of the crisis, namely lack of supervision and the presence of asymmetric information.

1. Lack of Supervision

Private corporations are at the core concerned about maximising shareholder value and cannot be expected to act altruistically in the best interest of the greater society. The interests of shareholders and those of the wider society will often be aligned, as higher corporate profits lead to higher investments, lower unemployment, higher GDP and higher national wealth. When this alignment is present, a strategy of low government involvement is superior as it encourages companies to trade, to be innovative and to take rational risks. However, some industries are vital for the wellbeing of the entire society and necessitate additional supervision. The financial industry is one such industry, and regulation is already heavy compared to other sectors. However, during the last decade the industry changed and offered new products that did not fall under traditional regulatory supervision. The low involvement strategy of the Fed, the SEC and other relevant regulators, was in hindsight not successful and enabled an unsupervised escalation of mortgage products and agents.

The discussion of which regulatory supervision is necessary in the future is enough for a separate thesis, but the analysis in this thesis shows that the lack of active government involvement undoubtedly facilitated a dangerous environment of excessive risk taking, at the expense of the entire society. Adam Smith's famous invisible hand simply did not work in the complex world of modern finance.

2. Asymmetric Information

The crisis is in many ways a result of inefficient markets and problems of asymmetric information. Investors were left relying on rating agencies to quantify risk. Rating agencies produced low-quality ratings, as a result of wrong market assumptions, but also due to their reliance on fees from investment banks that preferred high ratings on their credit products. This principal/agent problem is not new to the industry, and has long been highly controversial, but the complexity and volumes of these new structured products resulted in ratings of much lower quality than previously, and given that rating agencies were making significant profits as a result of their dependency on investment banks' business, they did not raise any concerns. Investors, who due to low risk-free rates, were looking for new areas of low-risk investments, relied blindly on the risk ratings assigned by the agencies. The result was that investors did not understand the actual risk involved and therefore made wrong investment decisions. Further aggravating these problems, investment banks and mortgage originators were able to pass on debt to investors and away from their own balance sheet. This created a moral hazard problem as bankers in a search for higher fees and bonuses constructed and approved high-risk loans, which they most likely would not have accepted if they were to bear the risk themselves.

I will end this thesis with a quote from President Obama "... people have paid a very high price. We simply cannot return to business as usual. That's why we're going to ensure that Wall Street pays back the American people for the bailout. That's why we're going to rein in the excess and abuse that nearly brought down our financial system. That's why we're going to pass these reforms into law".⁵⁶

⁵⁶ White House press release of 21-Jan-10.

Literature List

Academic Research

- Aschraft, Adam B. and Schuermann, Til (2007), “*Understanding the Securitization of Subprime Mortgage Credit*”, Federal Reserve Bank of New York, December 2007.
- Ayotte, Kenneth M. and Gaon, Stav (2005), “*Asset-Backed Securities: Costs and Benefits of Bankruptcy Remoteness*”, Columbia Business School, 2005.
- Burnnermeier, Markus K. (2009), “*Deciphering the Liquidity and Credit Crunch 2007-2008*”, Journal of Economic Perspective, Vol. 23, Winter 2009.
- Calomiris, Charles W. (2009), “*The Subprime Turmoil: What’s Old, What’s New and What’s Next*”, The Journal of Structured Finance, Spring 2009.
- Crouhy, Michel G., Jarrow, Robert A. and Turnbull, Stuart M. (2008), “*The Subprime Credit Crisis of 07*”, various institutions, July 2008.
- Demyanyk, Yuliya, and Hemert, Otto Van (2008), “*Understanding the Subprime Mortgage Crisis*”, Federal Reserve Bank of St. Louis, Supervisory Policy Analysis Working Paper, August 2008.
- Frame, W. Scott and Wall, Larry D. (2002), “*Financing Housing through Government-Sponsored Enterprises*”, Federal Reserve Bank of Atlanta, Economic Review, Q1 2002.
- Gabiax, Xavier; Krishnamurthy, Arvind and Vigneron (2005), “*Limits of Arbitrage: Theory and Evidence from the Mortgage-Backed Securities Market*”, MIT and NBER, January 2007.
- Geradi, Kristofer; Shapiro, Adam Hale and Willen, Paul S. (2008), “*Subprime Outcomes: Risky Mortgages, Homeownership Experiences, and Foreclosures*”, Federal Reserve Bank of Boston, May 2008.
- Greenlaw, David; Hatzius, Jan; Kashyap, Anil K. and Shin, Hyun Song (2008), “*Leveraged Losses; Lessons from the Mortgage Market Meltdown*”, US Monetary Policy Forum 2008.
- Jaffee, Dwight M. and Quigley, John M (2007), “*Housing Subsidies and Homeowners: What Role for Government-Sponsored Enterprises?*”, Brookings-Wharton Papers on Urban Affairs, 2007.
- Keys, Benjamin J.; Mukherjee, Tanmoy; Seru, Amit and Vig, Vikrant (2008), “*Did Securitization Lead to Lax Screening? Evidence From Subprime Loans 2000-2006*”, various institutions, January 2008.
- Kojer, S. J. Ralph; Hemert, Otto Van and Nieuwerburgh, Stijn Van (2007), “*Motgtage Timing*”, NYU Stern and others, April 2007.

- Longstaff, Francis A. and Rajan, Arvind (2007), “*An Empirical Analysis of the Pricing of Collateralised Debt Obligations*”, UCLA Anderson School, January 2007.
- Mason, Joseph R. and Rosner, Joshua (2007), “*How Resilient Are Mortgage Backed Securities to Collateralised Debt Obligation Market Disruptions?*”, Hudson Institute, February 2007.
- McDonald, Daniel J. and Thornton, Daniel L. (2008), “*A Primer on the Mortgage Market and Mortgage Finance*”, Federal Reserve Bank of St. Louis Review, January/February 2008.
- Minsky, Hyman P. (1987) [Preface and Afterword by L. Randall Wray], “*Securitisation*”, The Levy Economics Institute of Bard College, Policy No. 2, 2008.
- Rixtel, Adrian van and Criado, Sarai (2008), “*Structured Finance and the Financial Turmoil*”, Banco de Espana (National Bank of Spain), Document No. 0808, 2008.
- Sanders, Anthony (2008), “*The subprime crisis and its role in the financial crisis*”, Journal of Housing Economics, August 2008.
- Sanders, Chan and Hendershott (1991), “*Risk and Return on Real Estate: Evidence from Equity REIT's*”. National Bureau of Economic Research, Working Paper no. 3311, October 1991.
- Scheicher, Martin (2008), “*How Has CDO Market Pricing Changed During the Turmoil?*”, European Central Bank, Working Paper No. 910, June 2008.
- Stanton, Thomas H. (1988), “*Government Sponsored Enterprises: Their Benefits and Costs As Instruments of Federal Policy*”, Public Administration Review, 1988.
- Tashman, Heather M (2007), “*The Subprime Lending Industry: An Industry in Crisis*”, Banking Law Journal, May 2007.
- Tavakoli, Janet M (2003), *Collateralised Debt Obligations and Structures Finance*, Wiley (First Edition).
- Wray, L. Randall (2007), “*Lessons from the Subprime Meltdown*”, The Levy Economics Institute of Bard College, Working Paper No. 552, December 2007.
- Wray, L. Randall (2008), “*Financial Markets Meltdown*”, The Levy Economics Institute of Bard College, Policy Brief No. 94, 2008.

Academic Books

- Brealey, Myers and Allen (2006), “*Corporate Finance*”, McGraw Hill, Eight Edition 2006.
- Griffith-Jones, Gtephany; Ocampo, Jose Antonio and Stiglitz, Joseph E. (2010), “*Time for a Visible Hand, Lessons from the 2008 World Financial Crisis*”, OUP Oxford, First Edition 2010.
- Mishkin, Frederic S. (2004), “*The Economics of Money, Banking and Financial Markets*”, Pearson/Addison Wesley, Seventh Edition, 2004.

Other Sources

- Bank for International Settlements (2008), “*International Banking and Financial Market Developments*”, BIS Quarterly Review, September 2008.
- Bernanke, S. Ben (2008), “*Mortgage Delinquencies and Foreclosures*”, Speech at the Columbia Business School, May 5, 2008.
- Bernanke, S. Ben (2008), “*The Future of Mortgage Finance in the United States*”, Speech at UC Berkeley/UCLA, October 2008.
- Bloomberg, general data access.
- JPMorgan (2007), “*An ABCP cheat sheet*”, Short-term Fixed Income Research Note, US Fixed Income Strategy, August 2007.
- Kosar, Kevin R. (2007), “*Government-Sponsored Enterprises (GSEs): An Institutional Overview*”, CRS Report for Congress, April 2007.
- McCulley, Paul (2009), “*The Shadow Banking System and Hyman Minsky’s Economic Journey*”, PINCO Publication, May 2009.
- O’Kane, Dominic (2008), “*The Subprime Crisis Explained*”, Article poster EDHEC-Risk Institute, January 2008.
- Sorkin, Andrew Ross (2009), “*Too Big to Fail: The Inside Story of How Wall Street and Washington Fought to Save the Financial System and Themselves*”, Viking Adult, October 2009.
- Sumerlin, Marc and Katzovits, Loren M. (2007), “*Collateral Debt Obligations*”, International Economy Magazine, Summer 2007.
- S&P CDO Spotlight: Update to General Cash Flow Analytics Criteria for CDO Securitisations, October 16, 2006.
- Thomson, general data access.
- UBS Investment Bank CDO Primer, Internal Educational Material, London 2007.

Internet Links

- www.census.gov (U.S. Census Bureau)
- www.federalreserve.gov/releases/h15/data.htm (Federal Reserve Data)
- www.fhfa.gov (Office of Federal Housing Enterprise Oversight)
- www.huntingtonnews.net/columns/090116-kinchen-columnsforeclosures.html
- www.realtytrac.com (leading US mortgage foreclosure tracker)
- www.sifma.org (Securities Industry and Financial Markets Association)
- www.markit.com (ABX-Index data provider)
- www.isda.org (Data on CDSs)
- www.businessweek.com (News magazine)
- www.factiva.com (News paper article database)
- www.timeline.stlouisfed.org (Timeline of events provided by FRB of St. Louis)
- www.bea.gov (Bureau of Economic Analysis)
- www.bls.gov (Bureau of Labor Statistics)
- www.imf.org (for World Economic Outlook reports)