Executive summary

The purpose of this thesis is to analyze the differences between the Danish and the American mortgage backed securities market to see if the factors that contributed to losses in the American can be found in the Danish. The difference between the two mortgage markets is significant; the American market has a free link between funding and lending, where the Danish market in many years has been characterized by mortgage backed securities where interest and principle payments are passed through to the final investor. Especially in relation to credit risk this is important. The issuers of Danish mortgage backed securities are not allowed to sell of the credit risk on the mortgages which, on the contrary, is possible in America. This thesis analyzes the implications that this difference has on especially contracting problems, where the American market experiences more moral hazard and adverse selection problems as a consequence.

The findings of this thesis are that both contracting problems and macro economical factors contributed to the unexpected losses in the American mortgage market. Since 2001 the macro economic factors, especially low interest rate, have been a driver for the expansion of mortgages to less credit worthy borrowers the so-called sub-prime borrowers. Thus, macro economic factors played an important role to the losses seen in the American mortgage backed securities. Though, macro economic factors do not explain it all; an analysis of the securitization of sub-prime loans finds several moral hazard problems. These problems are driven by a fee-based structure that promotes moral hazard behavior. The moral hazard problems in the structure of the American mortgage backed securities market cause an increased complexity in the securities which increases the need for credit rating agencies to ensure the quality of the securities. Many of the ratings did turn out to be too optimistic and thus the investors in American mortgage backed securities experienced losses and writedowns as a consequence.

Last, the thesis analyzes the Danish market to see if a similar situation could happen on this market. With the historical tight connection between funding and lending of the Danish mortgage backed securities, many of the problems in the American market are not found in the Danish. This is primarily due to the balance principle that ensures that the originators of mortgages are also kept responsible for adequate underwriting standards. New legislation on the Danish mortgage market can potentially expose the market for some of the problems in the future. Though, the thesis does not find that the problems are similar with the once found in the American market.

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1. Introduction

In 2007 the American economy experienced a great shock, the financial markets were suffering as a consequence of a declining housing market. This caused large unexpected losses in the financial markets and resulted in reports of distress in financial institutions all over the world. The main driver behind these losses was mortgages to non-creditworthy borrowers, the so-called sub-prime loans.

Many have questioned how the financial institutions were able to oversee the great danger in issuing mortgages to sub-prime borrowers. The technique used by the Wall Street companies is called securization. This phenomenon is well known within the financial sector, and has been used for a long time, mainly in conventional mortgage market, but also in other relations. The securization of sub-prime mortgages showed how to transform unhealthy mortgages into grade A investment papers. By having investors buying the securities and originators selling them, the market did not suspect that unexpected losses would be at such high level as seen in the sub-prime mortgage backed securities.

This thesis will analyze the structure of the American mortgage market to uncover the factors that contributed to the losses in mortgage backed securities. The American mortgage market is one of the largest in the world and can therefore work as a model for countries which are less developed in this respect. Another major market for mortgages is the Danish, which despite its small population is one of the largest in the world. The Danish mortgage market has not suffered any losses on its mortgages backed securities from 2006 till 2008 and the last 200 years[1],[2]. This thesis will analyze the structures and differences in the American- and the Danish market for mortgage backed securities, and afterwards to examine whether the weaknesses in the American market exists in the Danish market as well.

1.1. Problem formulation

The problem description can be expressed in the following problem formulation with connecting working questions.

What problems exists in the structure of the American mortgage backed security market, and are the same elements present in the structure of the Danish mortgage backed security market?

[1] C. Christiansen el al. "Denmark - A Chapter on the Danish Bond Market**"** Working Paper Series No. 146, 2003, direct link: http://www.cls.dk/caf/wp/wp-146.pdf
[2] Finanstilsynet, "Markedsudviklingen i 2007 for realkreditinstitutter" May 14, 2008, Source: http://www.finanstilsynet.dk/sw36121.asp

- What is a mortgage backed security and how is it used to financing housing?
- Did macro economic factors contribute to the losses in American mortgage backed securities, and if so what was their influence?
- How is the American mortgage backed securities market structured in comparison to the Danish market for mortgage backed securities?
- How does moral hazard and adverse selection affect the American mortgage backed securities market? And to what extend does these problems apply to the Danish mortgage backed securities market?

By using these underlying working questions I will be able to answer the main question in the problem formulation.

1.2. Motivation

The problems that we have seen in the financial sectors, with bankruptcies in financial institutions and high interbank rates through the end of 2007 and throughout 2008, were triggered by the American mortgage market. These troubles have resulted in uncertainty within the financial institutions worldwide, causing problems in the whole economy. Therefore, the background of the crisis, the American mortgage market, is a very intriguing and up to date topic of examination. The structure of the American mortgage backed security market is very complex and it seems that it is from exactly this structure that the problem materialized in the market.

The losses in the financial sector have been linked to the mortgage backed securities in some way or another. The complexity of the market has made the structure opaque which has made it difficult to determine which institutions would take the losses. This lack of transparency later developed into the so called “credit crisis” where the banks held back on lending which caused an increase in the intra bank rates. Most investors in mortgage backed securities are banks and companies affiliated with the bank. Until now, losses in connection with sub-prime mortgages are exceeding $700 billion. The list below shows which institutions that have made writedown and have been hit by sub-prime related losses. [3]

[3] Rodney Yap and Dave Pierson in “Banks' Subprime Market-Related Losses Top $732 Billion” in Bloomberg.com December 15 2008

Sub-prime Market-Related Losses and writedowns ($1,000,000)	
Washovia Corporation	96.5
Citigroup Inc.	67.2
Merrill Lynch & Co.	55.9
UBS AG	48.6
Washington Mutual Inc.	45.6
HSBC Holdings Plc.	33.1
Bank of America Corp.	27.4
National City Corp.	26.4
JPMorgan Chase & Co.	20.5
Lehman Brothers Holdings & Inc.	16.2
Morgan Stanley	15.7
Royal Bank of Scotland Group Plc	15.6
Wells Fargo & Co.	14.6
Bayerische Landesbank AG	14.4
IKB Deutsche Industriebank AG	14.0
Other	220.2
TOTAL	**732.9**

Table 1Largest Sub-prime Market-Related Losses and writedowns between financial institutions

The Danish mortgage bond market is, in absolute terms, the second largest in Europe[4], and is by many considered one of the best systems in the world. This is related to the fact that in its 200 year history it has never taken losses on the mortgage backed securities. It is therefore interesting to analyze both the American and the Danish market, to see if a situation similar to what happened in the American market could happen in the Danish mortgage market in the future too.

Another interesting issue about the Danish mortgage market is that the traditional system has been replaced with a new system that aligns the market with European standards. How this has affected and will affect the market in the future is thus an interesting question. Most importantly, why change a mortgage backed security system that has functioned well for over 200 years? And, how will this development expose the Danish market to the factors that caused the losses in the American market.

2. Methodology

Section 2 describes the structure of the thesis and the terms and theory used. This is done to show how the work has processed to answer the problem formulation. After reading section 2 the reader is equipped with the precise design of the study including the methods and theory used.

[4] IMF "The Danish Mortgage Market A Comparative Analysis" an IMF Country Report No. 07/122, March 2007

2.1. Structure

This thesis is divided into two main part-analyses in section 4 and 5, which together will create information to the final analysis in section 6 that answers the main research question: "What are the problems with the structure of the American mortgage backed security market, and can these be transferred to the Danish mortgage backed security market?".

As section 1 described, the goal of this thesis is to analyze the issues that caused losses in the American market. This is reached by using primarily agency theory and more specifically contracting problems which include moral hazard and adverse selection[5]. From preliminary research it was found that the problems in the American market could be sought explained by analyzing for moral hazard and adverse selection problems[6]. This means that findings in the analysis revolve around the problems that moral hazard and adverse selection theory can explain. Using these theories on the American market therefore constitutes a deductive approach.

When these findings are applied on the Danish mortgage market it is done in an inductive way. Induction is when theory is built on an isolated event. Hence, the issues that caused the losses in the American market are also assumed to be issues that would cause losses in the Danish market. This is a useful method because the goal is to analyze the exposure of the Danish market to the problems found in the American. However, it goes along with the disadvantage that problems unique to the American market are sought to be applied to the Danish market. To mitigate this problem, the issues that caused losses in the American market are found using primarily theories that are applicable on contractual problems, which are assumed to be present in both markets. This is due to the fact that even the simplest loan agreement is a contractual interaction between minimum two parties, and hence the theory applies. Unique issues within the American market will be discussed as to the extent that it could potentially happen in the Danish market as well. The description and the use of the respective theories, is found in section 2.4.

Throughout the analysis macro economical perspectives will be employed to provide further explanation. The connections between these macro economic factors and issues in mortgage backed securities will be mentioned explicitly. To provide the sufficient knowledge about the markets, section 3 contains a historical and factual description of the American market and analysis of macro and structural factors that have lead to the present situation. It is important to have an extensive

[5] Kathleen M. Eisenhardt "Agency Theory: An Assessment and Review" in "The Academy of Management Review", Vol. 14, No. 1, January 1989

[6] Almost all newer literature concerning the sub-prime mortgage market is touching on the moral hazard issues.

description of these issues as they provide the knowledge foundation to make the main analysis. The structure of the thesis is illustrated in the figure below.

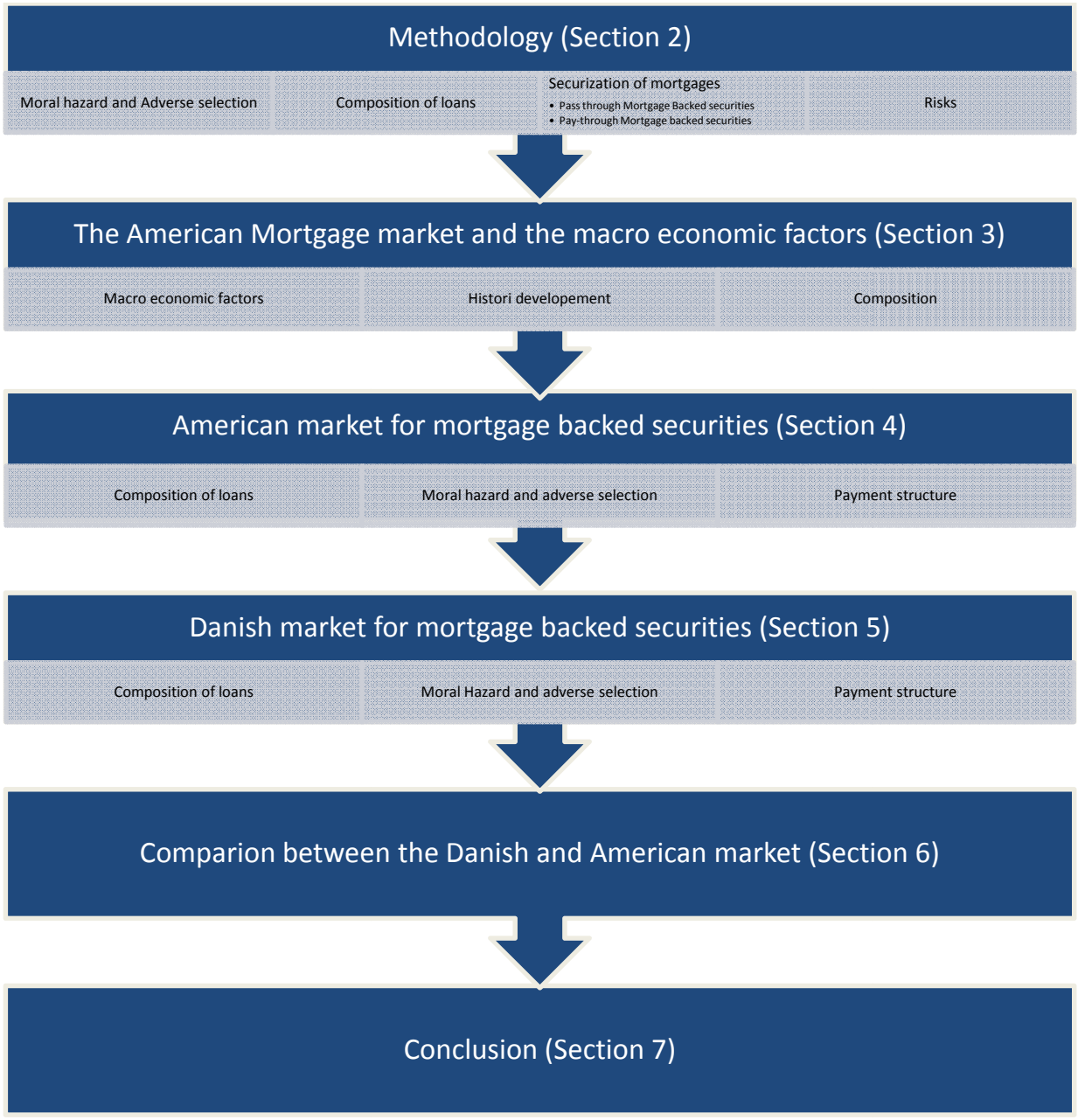


Figure 1- Illustration of the structure in the thesis

2.2. Delimitations

This thesis will only look at residential mortgages and thus leave out mortgages for commercial use. Moreover, tax will not be taken into account in regards to mortgage financing. This delimitation is both from investors' and from borrowers' point of view.

Al though the choice of subject is motivated by the financial crisis of 2008, there are no links to the crisis in the thesis. Analyzing the problems in the mortgage backed securities market that increased

the difficulties the financial market is yet another very intriguing topic, though not suitable to the subject of this thesis.

It is only briefly described in section 3 how the depository institution operates in connection with direct lending. This is due to the fact that there does not exist an equivalent the Danish mortgage market, where depository institutions do not hold mortgages on their own balance. The amount of outstanding loans held by depository institutions has been decreasing over the last 30 years[7], which reduces the importance in comparison to the securization method. Last, it is the author's opinion that the problems in the American mortgage backed security market do necessary apply to the mortgages held by depository institutions.

2.3. Information sources

Background material for the thesis primarily takes its basis in books, articles, working papers and research papers. Statistical information stem from government sources and in some cases private companies. The legitimate information is also found through government sources that publish laws through online databases. As a way to insure unbiased information the sources are primarily government institutions and universities that are believed to be objective. When sources are used where the author might has had a conflict of interest it is explicitly emphasized in the text. Additionally, statistical information is used to underline the arguments and to give a picture of the developments of the issues which they describe. Therefore, the information used in this thesis is based on secondary data.

2.4. Key issues and theory used

This section will run through some of the prevailing terminologies utilized in this thesis. The different sections will provide a description and how it is employed in the thesis. Section 2.4.1. describes the contractual problems in relation to mortgage backed securities. Contractual problems deal with asymmetric information and the risks it involves. Hence, as a natural succession section 2.4.2. provides a description of what constitutes a mortgage backed security and the risks associated with it. Finally, section 2.4.3. looks at the composition of loans and which effect that composition has on the mortgage backed security market.

2.4.1. Moral hazard and adverse selection

Moral hazard and adverse selection issues mostly have their basis in the traditional agency theory which arises when ownership and control are separated. Two aspects of the agency problem can

[7] John Kiff and Paul Mills, "Money for nothing and checks for free: Recent development in U.S. Subprime" an IMF Working Paper No. 07/188 July 2007, p 1-18

arise during asymmetric information and conflicts of interests: The hidden action problem (moral hazards) and the hidden characteristics problem (adverse selection), which relates to information during and in the design of the contract[8].

Moral hazard behaviors occur if one party has more information about a transaction but different risks connected to it. If a party, isolated from risk, acts differently than it would have if it was fully exposed to the risk of its actions, then we speak of moral hazard behaviors. Insurance is a good example of moral hazard behaviors. The insured individual, that does not take as good care of his properties as he would have if there was no insurance, is conducting moral hazard behaviors. The risk of his properties is on the insurance company which changes the way the insured acted would he not have been insured.

The principal generally has two different ways of solving the moral hazard problem; monitoring the agent directly/by appointing a monitor or by creating incentives for the agent through incentive schemes/contracts[9]. As it is not possible to monitor all the transactions within the industry of analysis, proper incentive schemes needs to be in place. The incentive scheme can be in form of a contract that holds all those parties involved responsible for their actions. In a loan system with many potential links between the borrower and the final investor, it is important that the level of moral hazard is minimal. As for the mortgage backed securities market moral hazard is used to analyze its structure of for issues that increase the parties' incentive to opportunistic behavior. The thesis assumes that people are profit maximizing, meaning that people will engage in moral hazard behavior if the right incentive scheme to prevent it, is not in place. It is therefore also assumed that a system with a minimum moral hazard behavior protects the investors against unexpected losses.

Adverse selection problem arise when a buyer is unable to distinguish good products from bad products. When there is a problem of this kind, the buyer assumes that the seller will sell the bad products first and thus only buys at a low price. In the end, only bad products will be sold because the seller does not want to sell good products at a premium. The main problem is asymmetric information, the harder it is for the seller to select good products from bad, the more adverse selection problem aggravates[10]. This problem can be transferred into the mortgage backed security market, because the originator usually has more information than the rest of the parties in the

[8] G. Hendriksen "Economics and Management of Organization" published by McGraw-Hill, 2003
9 Kathleen M. Eisenhardt "Agency Theory: An Assessment and Review" in "The Academy of Management Review", Vol. 14, No. 1, January 1989 and. Alchain and Demsetz, "Production, information costs, and economic organisation " in "American Economic Review" Vol. 62, No. 5, December 1972
10 Nicolae Gârleanu and Lasse Heje Pedersen "Adverse Selection and the Required Return" in "The review of Financial Studies", Vol. 17, No. 3 (Autumn, 2004), pp. 643-665

securization process. Adverse selection has a negative effect on the structure, because buyers demand lower prices or more safety in order to buy the products. In general, less transparent markets leads to more adverse selection problems. Thus a mortgage backed securities structure with minimum adverse selection problem is preferable as investors might experience unexpected losses or demand a bargain on prices.

2.4.2. Key issues in mortgage backed securities

When people want to finance a house it is generally done in two ways, either from their own equity or by going through the loan market. As most people do not have adequate capital to pay out the house from their own equity, they apply for a mortgage. Mortgages are financed by banks, thrifts and mortgage banks that can provide funding.

Originally, mortgages were issued by a depository institution, often a bank, in the form of direct lending. This method of lending money is allowing the banks to hold the mortgages on their own balance. When using this method of lending the bank fund themselves though the financial markets, debt or in the case of a depository institution, the money can come from the banks own deposits. Another way the mortgages can be financed is though the secondary market. The method of doing so is called asset backed securization and presents the main focus in this thesis. Asset backed securization is by the United States Security and Exchange Commission (SEC) defined as:

" a security that is primarily serviced by the cash flows of a discrete pool of receivables or other financial assets, either fixed or revolving, 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"[11]

The whole idea behind asset backed securization is to transform assets that normally are unmarketable or illiquid into marketable securities. This is done in a securization structure where the holder of a pool of mortgages creates a Special purpose vehicle (SPV) and transfers the mortgages to this unit. The institution that creates the SPV is called the arranger. A SPV is a so-called ghost corporation, a company that is legitimate separated from the arranger, but still under its corporate control. The arranger is creating the SPV to move the assets from its own balance to the balance of the respective SPV.

As the definition states, it is possible to securitize most assets. The list of assets covers all from car loans till whole businesses. In theory, there is no asset class that cannot be securitized as long as it carries a stream of cash flows. This thesis will focus on mortgage backed securities which are ABS'

[11] United States Securities and Exchange Commission "SEC Release No. 33-8518, Asset-Backed Securities" December 22, 2004, direct link: http://www.sec.gov/rules/final/33-8518.htm

that is backed by mortgages. The stream of cash flow from the borrower to the investor can be transferred either directly, or the cash flow can be altered. Two different ways to do this is defined in this thesis as the pass-through method and the pay-through method.

2.4.2.1. Pass –through method

The simplest way to securitizes assets is the pass-through method. This method is widely used in mortgage backed securities. Payments from the mortgages are simply passed through from borrowers to SPV and transferred to the investors. This means that both interest -and principal payment are paid less the SPVs fee. In America, the pass-through mortgage backed securities have a build-in option that allows the borrowers to pre-pay the mortgage at par. This option is also inherent in the Danish mortgage backed securities[12]. You might say that the pass-through mortgage backed securities are the core in the securization of mortgages because all types mortgage related securities are revolving around pass-through mortgage backed securities. Below the pay-through method is described which uses the cash flow from pass-through securities to create new securities.

2.4.2.2. Pay-through method

The pay-through method allows the issuer to alter the payments from the borrower to design bonds with different maturities and different risk levels. The pay-through method is especially used in the American market to satisfy and reach a broader investor need[13]. In the following it is dealt with in more depth considering different maturities and different risk-levels.

Different maturities

Unlike the pass-through method, the pay-through method provides securities with different maturities. The investors in mortgage backed securities are not interested in the liquidation of assets before maturity since the investor might not be able to reinvest at the same interest level. This problem can be handled because the issuer knows that some of the bonds are being pre-paid fast and others are held to maturity. This knowledge about different maturities within the pool of mortgages is employed to create securities backed by pass-through mortgages that have different maturities. By doing this, the arranger may offer securities with e.g. 10, 20 and 30 years maturity, also called investment tranches or classes. The interest rates offered are leaning towards the government bonds with the same maturity. Because of the discrepancy in cash flows from borrower to investor, this method is called pay-through.

[12] Allen Frankel et. Al., "The Danish mortgage market" in BIS Quarterly Review, March, 2004
[13] Josehp Hu, "Basics of Mortgage-Backed Securities" Published by John Wiley and Sons Inc, 1997

Different risk level

The securization of mortgages into different investment tranches has been widely used since its birth in 1983[14]. The pay-through method is not only related to the maturity of the bonds, it is also possible to create tranches with different risk level connected to them. The following section will show how to utilize the pay-through method to create securities with different risk levels connected to them.

The starting point for securization is that a bank or financial institution (originator) gets a mortgage on its balance sheet that will create a future cash flow. When the originator gets a significant pool of mortgages, there is basis for securization of these assets. Once the mortgages have been transferred to the SPV, it is the arranger's responsibility to sell the mortgages to investors. The reason why it is so popular to divide the mortgages into different investment tranches lies in the fact that securities with different risk levels from a pool of assets may be tailored. The least risky of the tranches will usually receive the highest rating which is the AAA. Moody, one of the three largest credit rating agencies, divides the pool into tranches, floating from the highest AAA to the lowest Ba1[15]. All other tranches are subordinated to the AAA tranche, meaning that any losses in the pool of mortgages will affect the lower ranking tranches before they affect the AAA tranche. Lower ranking tranches are therefore primarily in place to protect the AAA trance in case of defaults in the underlying pool of assets. In this instance, the lower ranking tranches will absorb all losses until the principal balance is completely exhausted. Of course this means that there is a smaller chance that the AAA bond will default. The process of dividing the pool into tranches is called subordination and is a way of credit enhancing the AAA securities thus making them more secure. Other types of credit enhancement are employed to improve the quality of the asset pool. These credit enhancements work both as an explicit insurance provide by an issuer, but also internally though structural features in the credit enhancement. There is a range of different credit enhancement methods, the following are the most common[16]:

Overcollateralization is where the arranger provides the bonds with extra security by adding e.g. government bonds or cash into the mortgage pool. By doing so, the first losses are covered by these added securities. In general, the arranger uses overcollateralization to add more equity and thereby receive better ratings on the tranches.

[14] Josehp Hu, "Basics of Mortgage-Backed Securities" Published by John Wiley and Sons Inc, 1997
[15] Information gained through www.moodys.com
[16] John Kiff and Paul Mills, "Money for nothing and checks for free: Recent development in U.S. Subprime" an IMF Working Paper No. 07/188 July 2007, p 1-18

Excess spread is characterized by the difference between the net interest rate on the underlying asset and the weighted-average coupon on the securities. The excess spread is used as a form of internal overcollateralization as it is meant to cover losses on the different tranches. Usually, the excess spread is used as an overcollateralization to the AAA tranche up to a certain level and a certain period of time. If the target has been reached after that period, the excess spread is used to cover losses in the subordinary tranches.

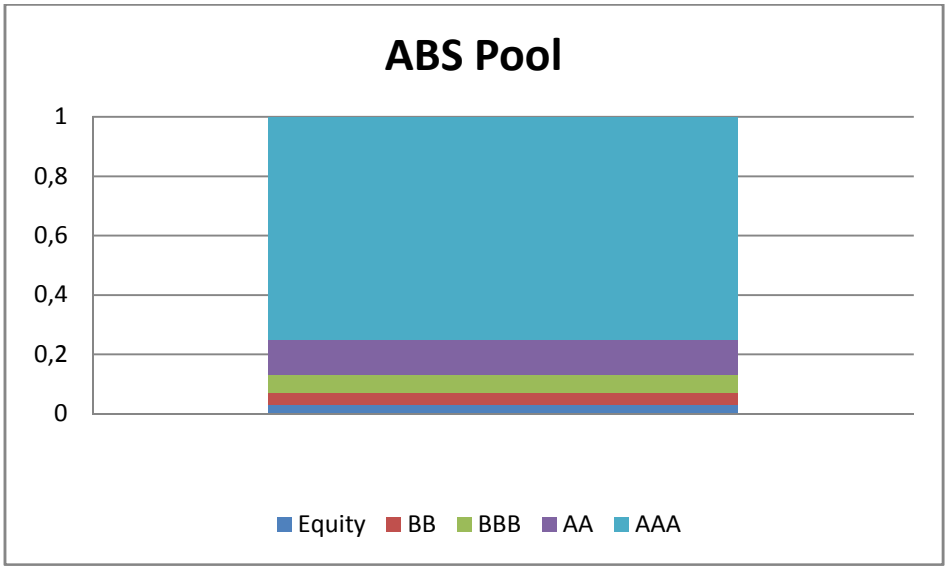


Figure 2: Illustration of ABS pool with five tranches, authors own illustration

Figure 2 is an illustration on an ABS pool with 5 different tranches. In this case 75% of the securities are rated AAA, meaning that 25% of the assets in the pool have to default before the AAA bonds are affected. The lower ranking tranches are named mezzanine tranches and usually range from AA to B and provide a higher risk than the AAA bond. The mezzanine tranches are, because of the lower rating, also subject to higher exposure to risk. As a result of this, they provide a higher interest payment to the investors in these tranches. The equity tranche is the lowest of the tranches and is usually purchased by the institution that issues the securities. Another popular expression for the equity tranche is toxic waste which is referring to the high risk of defaulting.

2.4.2.3. SPV

The first issue of a pay-through was in 1983 with the creation of a Collaterized Mortgage Obligation (CMO) which offered three investment tranches. Following the years of 1983, the CMO became very popular among investors in mortgage backed securities, however one problematic issue with the CMO remained. CMOs were issued as debt, meaning that the issuers were in need of large equity requirements to support the outstanding CMOs as a consequence of capital requirement regulations. In 1986, the congress allowed the use of multiclass pass-through's. These are

essentially the same as CMO with the difference that mortgages can be moved to a SPV and hereby reduce the capital requirements[17].

The SPV is one of the important entities in ABS transaction, why there is need for further clarification. Within mortgage backed securities the SPV is also called Real Estate Mortgage Investment Conduit (REMIC). In mortgage literature CMO and REMIC is used interchangeably. The REMICs are distinct from other SPVs by only being allowed to carry qualified mortgages and permitted investments, including single family or multi-family mortgages, commercial mortgages, second mortgages, mortgage participations, and federal agency pass-through securities. Non-mortgage assets, such as receivables, leases, and auto loans are ineligible investments. The status as a REMIC has the advantage of having no legal capital requirements which enable them to sell all the investments to the respective SPV without having to comply with such[18].

The arranger is selling the assets to the SPV in order to isolate the performance of the assets unto the SPV. From a legal point of view this is important in two ways. First, in the event of the arranger's bankruptcy the SPV will have no obligations to him. This is advantageous, as it protects final investors against bankruptcy of the arranger. In other words, the investors can be sure that the risk on the ABS is tied exclusively to the performance of the collaterizing assets and leaves out any of the arranger's operating risk. This will of course work both ways, so that the arranger is also kept out of harm if the assets default, unless an explicit guarantee has been given. If the arranger keeps the assets on his balance and issues bonds instead, he will be kept responsible in case the assets do not perform.

2.4.2.4. Risk

There are several different kinds of risks associated with mortgage backed securization. In a traditional mortgage backed securities transaction the risk is transferred with the mortgages into the SPV. This allocation means that the risk, that the originator used to have in connection with direct lending, is moved to the investor. The different risks involved in investments concerning mortgage backed securities are going to be looked at in the next sections.

Liquidity risk

The liquidity risk is the risk of not being able to sell the security without losing money on the transaction. Some important factors in this connection are the size of the transaction and the volatility of the market. If the cost of trading the security is high, it will increase the liquidity risk.

[17] Josehp Hu, "Basics of Mortgage-Backed Securities" Published by John Wiley and Sons Inc, 1997
[18] Wikipedia: http://en.wikipedia.org/wiki/REMIC Checked 2008.12.23

Uncertainty regarding how fast you are able to sell or buy assets or the uncertainty about price has an increasing effect, too[19]. The less investors present in the market, the higher the risk is going to be. Liquidity risks are also found by looking at the spread between buy and sell in the market. If this gap is large, there is an increased liquidity risk. E.g. government bonds have much lower spread than "over the counter derivatives"[20].

Prepayment risk

Especially when looking at mortgage backed securities, the prepayment risk is an important factor. This is the risk associated with early unscheduled return of principal on a fixed-income security[21]. The problem with prepayment is the need to refinance the return on principal. If the market rate has dropped, the investor is not able to get the same yield on his investments.

The borrowers can refinance their mortgage in order to receive a lower interest on their mortgage. Many mortgages have a build-in option that gives them the right to refinance their loans to the par value. This option increases the chance that borrowers will refinance their loans when interest rates have declined. In this event, investors will have to reinvest and thus receive a lower interest rate payment.

Credit risk

The credit risk is associated to losses due to the borrowers' lack of fulfilling the loan commitment, both the installment -and interest payment. In general, the credit risk is the potential loss that may occur in a credit event. A credit event means a change in the counterparty's conditions as to the ability to fulfill its obligations. Thus, a change in market prices, credit rating or market perception of default is also considered to be a credit risk[22].

This risk is crucial in the mortgage industry and a main factor to determine the conditions that the borrowers can get on a mortgage loan. The lower the credit risk is the better loan conditions the borrower is able to receive. In connection with mortgages, the lender will look at different key-figures, such as how much the borrower has to loan in comparison to the value of the collateral (loan to value ratio), income level and credit history etc.

The mortgage banks have understood that investors have a large interest in investing in the mortgage market, but at the same time they prefer to avoid the credit risk associated with the

[19] F. Reilly, K Brown "Investment Analysis and Portfolio Management, seventh edition" published by Thomson, 2003
[20] Philippe Jorion, "Value at Risk, third edition, international edition" Published by "McGraw-Hill", 2007, pp. 22-27,
[21] Investopedia: http://www.investopedia.com/terms/p/prepaymentrisk.asp - checked 2008.12.23
[22] Philippe Jorion, "Value at Risk, third edition, international edition" Published by "McGraw-Hill", 2007, pp. 22-27,

individual mortgage. This is exactly what securization provides, through a pooling of mortgages investors are not exposed to individual credit risk.

Market risk

Another risk that investors have to consider is the market risk. It is related to the losses that may occur due to movement in the level or volatility of market prices[23] and covers a variety of different risks. When it comes to mortgage loans, the most important is the interest rate risk. There is a difference in risk depending on how the financial institution chooses to finance the loan and the payment structure of the mortgage. Some structures such as fixed rate mortgages (FRM) assign the market risk to the investors and in other structures such as adjusted rate mortgage (ARM) the market risk is carried by both investor and borrower. The market risk can be removed with financial derivatives such as interest rate swaps[24].

Counterparty risk

Counterparty risk is the potential exposure that a company bears in a financial transaction, namely that the counterparty cannot fulfill its obligations as stated in the contract. The risk is often sought to be mitigated by means of derivatives where a third party sells protection on the agreement. Nevertheless, counterparty risk is also inherent in option contracts if the seller cannot fulfill his obligations. Within the mortgage backed securities, the counterparty risk occurs through the securization process. Many of the transactions are between parties that use contracts to enforce the commitments, thus creating a counterparty risk. With the increased use of derivatives in the structure, there is also higher counterparty risk.

2.4.3. Loan structure

Within the loan market there are generally two different ways a mortgage can be constructed, these two are the adjusted rate mortgage (ARM) and the fixed rate mortgage (FRM). Due to the usual upwards sloping term structure of interest rate, the ARMs are the loans with the lowest initial interest rate. The adjustments on the loans are the factor that exposes the ARM-borrower to risk. In America, most ARMs are adjusted to an underlying index which fluctuates with the market. Although the ARM is the loan with the lowest initial cost, the interest rate is adjusted during the life of the corresponding loan. This factor makes the cost on the ARM sensitive towards the underlying index and thus carries market risk.

[23] Philippe Jorion, "Value at Risk, third edition, international edition" Published by "McGraw-Hill", 2007, pp. 22-27,
[24] TD Commercial Banking: http://www.tdcommercialbanking.com/foreignx/solutions/risk_swaps.jsp - checked 2008.12.23

The composition of loans in the mortgage market is an indicator of how the borrowers will be hit by increases in the interest rate. With a high ratio of ARM in the composition there is a higher risk that they will experience payment shocks. Also there are different ways in which the ARM can be constructed which has an impact on the potential payment shock. High payment shocks can have the consequence that the borrower is forced to default on the mortgage. As borrowers' defaults may affect the value of the mortgage backed securities the thesis will analyze this issue. It should be emphasized that the payment shock again is closely connected with the borrower's ability to pay higher mortgage payments, so that there is a focus on underwriting, determining the lending conditions of borrowers, in the two markets. Thus, a loosening of underwriting standards causes an extra exposure to mortgage backed securities because of the potential inability to pay the mortgage payments.

2.5. Operationalization

This section sums up the methodology employed. While section 2.4 gave a picture of the theories and key issues dealt with in this thesis. Risk is essential to its findings as it is being used in both the analysis of the payment method, moral hazard, adverse selection and loan composition which are its main concerns. Moral hazard is used to find problems with opportunistic behavior resulting in higher risk of unexpected losses in the markets. Adverse selection is looked at to locate difficulties with transparency in the market, which also affects the risk of unexpected losses

The payment structure of the mortgages is a factor that differentiates the two markets and has an effect on the level of contractual problems in the market. Hence, the payment structure has a high influence on the existence of moral hazard and adverse selection. Last, the composition of mortgages in the two markets is a factor that provides information about the exposure of the markets to increases in interest rate. An investigation of the composition and the underwriting process is going to be analyzed for the two markets.

3. The American mortgage market

This section will provide an understanding of the different ways Americans can finance a house purchase. Throughout the years the domestic mortgage market has developed a lot into the market we see today. Originally, house purchases were financed through banks and thrifts that lend out money, usually coming from the respective bank's deposits. As a consequence of the depression in the 1930s borrowers struggled to pay their house loans which eventually led the US Congress to establish several agencies that would prevent a similar situation occurring again in the future. The

main role for these agencies was to promote a secondary market for mortgage securities and to provide liquidity to the established commercial banks[25]. Today, the agencies that were established after the depression are still functioning and are still playing a main role in the loan market. Appendix 1, goes through the most significant agencies created through the years.

The last decade has witnessed financial innovation which has developed a private market that can compete with the traditional mortgage channels. These private label mortgages are now a significant player on the market and are therefore an important factor when looking at the American mortgage market.

3.1. Types of borrowers and the lending opportunities

In the American market loans are distinguished between prime loans and a range of other types of loans. This chapter will run through the different mortgage financing options an American borrower has when wanting to finance a property. Prime loans are given to people that fit into the criteria of a prime borrower[26].

- The borrower needs to have a good credit history. This means that bills as well as down payments and rents on other loans are paid when they are due.
- The lender needs to have a good credit score. The credit score is calculated from the lender' income, net worth etc.
    - Score below 620 are considered sub-prime, 620-680 are considered near-prime and above 680 are prime
- The borrowed amount cannot be higher than 417,000 dollars[27].
- The debt service-to-income (DTI) ratio cannot be higher than 55 percent
- The mortgage loan-to-value (LTV) cannot be higher than 85 percent.
- Income and property value have to be fully documented.

Many borrowers cannot live up to all the criteria of a prime borrower, but this does not necessary mean that they are not eligible for a house loan, many of these are called near-prime borrowers. They include the Alt-A borrowers and the Jumbo prime borrowers. A borrower who wants to buy a house that costs more than the maximum amount of $417,000 is characterized as Jumbo borrower. Those with general good credit rating, but who cannot live up to one of the other criteria are called

[25] Franco Modigliani and Frank Fabozzi, "Capital Markets, Second Edition" Published by "Prentice Hall", 1996
[26] Nationalbanken –" Kvartalsoversigt – 3. Quarter 2007" Source: http://nationalbanken.dk/dndk/Publikationer.nsf/Artikler.HTML?openview&RestrictToCategory=Kvartalsoversigt
[27] The 2007 rate, the maximum growth in the loan limit is set each year by the Federal Housing Finance Board, and is related to the growth in average house prices.

Alt-A borrowers. The main reasons that people apply for an Alt-A loan are unusual loan conditions or poor documentation of income, but other conditions may apply[28]. In terms of credit risk the Alt-A borrowers are positioned between prime and sub-prime borrowers[29].

3.1.1. Conforming loans

The Government sponsored enterprises (GSEs) are responsible for much of the financing of mortgages that are so-called conforming loans. The distinction between these and non-conforming loans determines whether or not the originator is able to sell the mortgages to the GSE. In order to keep the rating high on the GSE mortgage backed securities there are regulations on the underwriting standards. In general, there is a close connection between prime-loans and conforming loans. Conforming loan criteria are determined by the government which also observes if there should be changes in these[30]. Two criteria are increasingly important here, the loan limit and the LTV.

The loan limit is fixed at $417.000 for single family homes and is required to be first lien. For second lien mortgages, the loan limit is 50% of the first lien limit. Similarly important is the LTV factor where the GSEs are not accepting loans with a LTV ratio of over 80% unless one of the following credit protections is made:

- mortgage insurance from an approved mortgage insurer,
- a seller's agreement to repurchase or replace any Mortgage that has defaulted and
- retention by the seller of at least a 10% participation interest in the Mortgages.

Other issues are also in play, such as the type of property the mortgage is used for, the existence of special financing agreements and the market where the mortgages property is located.

3.1.2. Non-conforming loans

Borrowers that cannot fulfill the conditions of prime borrowers and have a low credit score are called sub-prime borrowers. Not surprisingly, they include primarily low-income people or first time buyers. These borrowers have two options if they want to purchase a house: apply for a FHA/VA loan or borrow a sub-prime loan.

Mortgages under the FHA (Federal Housing Administration) and VA (Veteran's Administration) program are explicitly backed by the government. With regard to the FHA loans the government is

[28] Judy Sheen "Alt A Loans `Disconcerting,' Jumbos Weaker, S&P Says" in Bloomberg.com, June 25, 2007
[29] Michel Cruhy et.al. "The Subprime Credit Crisis of 2007" September 12, 2007
[30] "Freddie Mac Mortgage Participation Certificates" March 17, 2008 direct link: http://www.freddiemac.com/mbs/docs/pcoc_031708.pdf

completely guaranteeing the credit risk of the lenders whereas it is guaranteeing 25 %[31] of the mortgage principal concerning the VA program. Both the FHA and the VA loans are established by the government explicitly to enable people that were not eligible for a conforming loan to still have the option to buy a house. Due to the governments guarantee on the loans, the FHA/VA has other terms than other loans. First, the FHA loans permit down payments down to only 3-5% of the mortgage principal. Second, borrowing money for the insurance and closing costs is facilitated. And last the FHA allows for a larger portion of the borrowers income to be used for the mortgage and therefore a higher DIT ratio.[32]

The FHA/VA loans used to be the primary choice for sub-prime borrowers as the explicit guarantee by the government enabled sub-prime borrowers to get cheap financing. The second option for Sub-prime borrowers is the private-label sub-prime loan. Like the FHA loans, these loans, do not require fulfillment of the conforming loan standards to qualify for a mortgage.

3.2. Macro economic factors

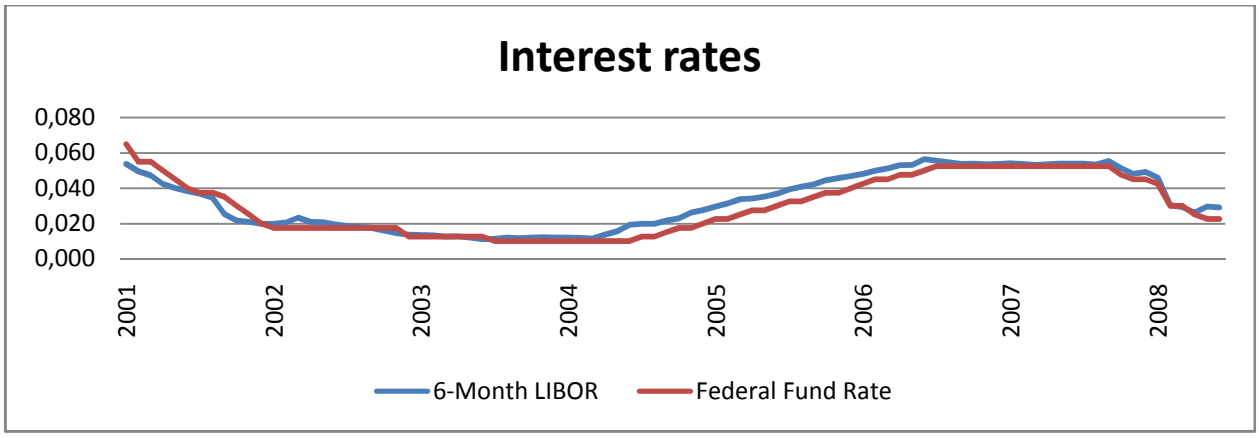
Macro economical factors play a large role in the mortgage backed security market. Much of the losses there can be explained by means of these in the economy. Section 3.3. captures the most important movements in the leading economical factors.

3.2.1. Development in the interest rate

Since most of the sub-prime mortgages are ARMs, they are highly dependent on the market rate. The Federal Reserve controls the Federal Fund Rate which directs the different market rates. It is this interest rate at which depository institutions lend balances at the Federal Reserve to other depository institutions overnight. The Federal Reserve lowered the interest rate 11 times only in 2001 which caused the rate to drop from 6.5% to 1.75% only in 2001. The lowest interest rate was in 2003 with an interest rate at 1%. The Federal Reserve started its first increase the 30th of June 2004 which was followed by 16 increases the following two years. Graph 1 shows the six-month LIBOR ((London Intra Bank Offer Rate) and the Federal Fund Rate from 2001 until summer 2008.

[31] The maximum amount guaranteed is 104,250 which is 25% of 417,000 dollars. Source: http://www.valoans.com/va_facts_whatis.cfm

[32] Monroe, Albert. "How the Federal Housing Administration Affects Homeownership." in Harvard University Department of Economics. Cambridge, MA. November 2001. http://www.jchs.harvard.edu/publications/governmentprograms/monroe_w02-4.pdf



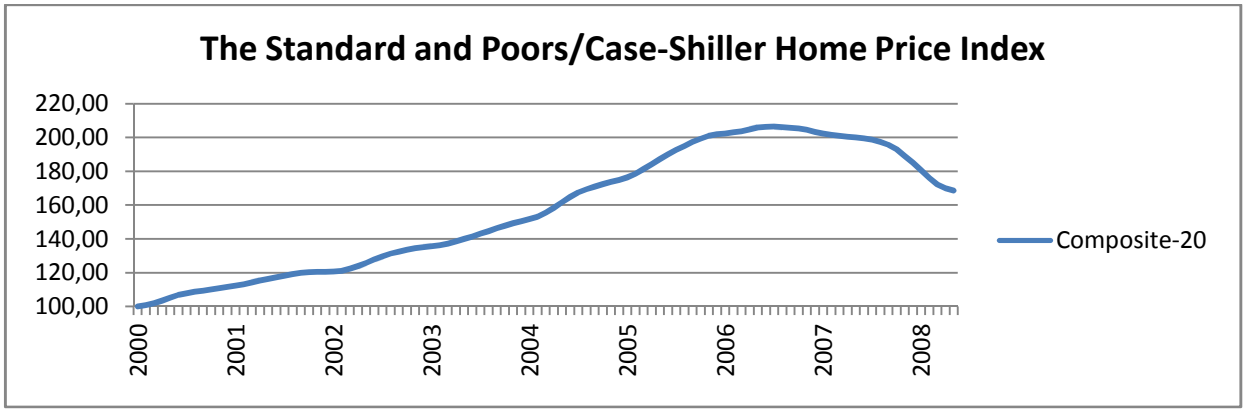
Graph 1- Development in the LIBOR and Federal Fund Rate from 2001-2008

LIBOR is the main index which the sub-prime mortgages are connected to. It is obvious from the graph that the LIBOR follows the Federal Fund Rate. To analyze the development of the rates, the graph is divided into three smaller pieces which are interesting for this report. First of all we see a drastic fall in the LIBOR from the start of 2001 until mid 2004 where the FED lowered the Federal Fund Rate several times. The reason for this decrease was a response to low economic growth and lack of sale and production in the economy. In this period, the economy was also hit by low consumer confidence and increasing cost of energy[33]. On top of this, the IT-bobble and terrorist attack worsened the situation. Primarily due to the fear of recession and high uncertainty in the economy, the Federal Reserve continued to lower the interest rate to stimulate the economy. The loose monetary policy caused inflation to increase and on the 30th of June 2004 a long series of increases in the Federal Fund Rate started, primarily in an attempt to control this situation[34]. The increases that occurred gradually over the next two years signaled the end of a period with economic problems in the United States. After that two year period a new problem raised. The troubles on the financial markets caused the Federal Reserve to lower the Federal Fund rate several times. The main arguments for this decrease were to help stabilizing the financial market and to minimize the difficulties in the housing market[35]. After the first decrease in September 2007 the Federal Reserve lowered the interest rate 10 times to the current 0-0.25%[36].

33 Federal Reserve Board "Federal Reserve press release", January 3, 2001 source: http://www.federalreserve.gov/newsevents/press/monetary/2001monetary.htm
34Federal Reserve Board "Federal Reserve press release" June 30, 2004, source: federalreserve.gov
35Federal Reserve Board "Federal Reserve press release" September 18, 2007, source: federalreserve.gov
36 Federal Reserve Board, "Open Market Operations" source http://www.federalreserve.gov/fomc/fundsrate.htm, checked March 8, 2009

3.1.1. House prices

The Standard and Poors/Case-Shiller Home Price Index registers price changes from the 20 largest metropolitan regions across America. The index uses repeat sales price techniques to measure housing market. Basically, the index captures the resale price from the sold price.



Graph 2 - House price development from 2000-2008

Graph 2[37] clearly shows the large increase in housing prices from 2001 until summer 2006. It is from this development we can find the explanation for the increase in non-conforming mortgages originations. Some of the development should stem from speculations in the housing market where the increase made it a lucrative investment.

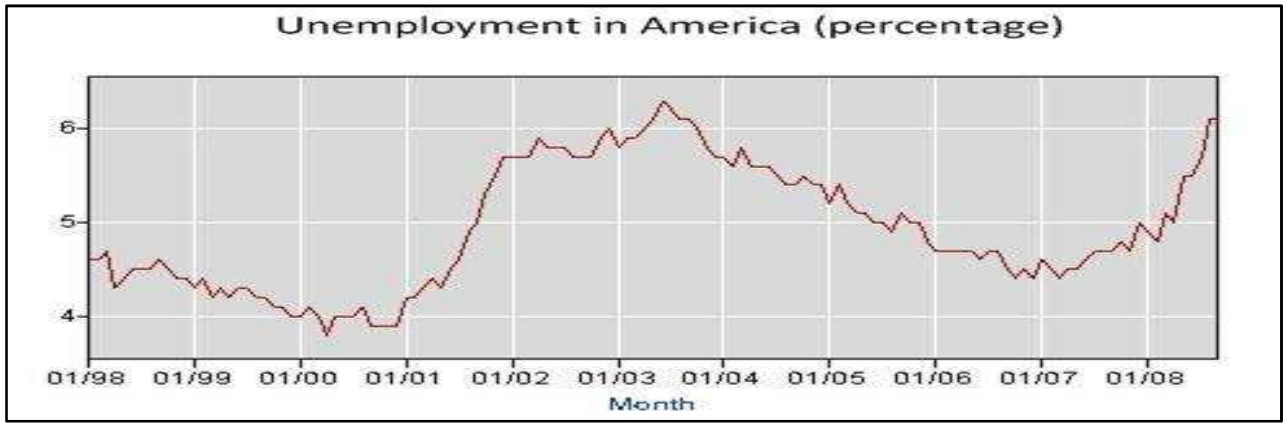
3.1.2. Unemployment

The unemployment rate is generally speaking an important factor in the mortgage market; evidence shows that there is a positive correlation between home ownership and unemployment rates[38]. Graph 3[39] shows that there has been a sharp decline in the unemployment rate from 2003 till 2007 where the house prices have equally increased.

[37] The Standard and Poors/Case-Shiller Home Price Index, published October 28, source: http://www2.standardandpoors.com/portal/site/sp/en/us/page.topic/indices_csmahp/0,0,0,0,0,0,0,0,0,0,1,1,0,0,0,0,0,0.html

[38] Andrew, Oswald, "A Conjecture on the Explanation for High Unemployment in the Industrialized Nations : Part I." in University of Warwick, Department of Economics / The Warwick Economics Research Paper Series (TWERPS). *RePEc:wrk:warwec:475*., 1996

[39] U.S. Department of Labor, "Labor Force Statistics from the Current Population Survey" source: http://data.bls.gov/PDQ/servlet/SurveyOutputServlet?data_tool=latest_numbers&series_id=LNS14000000 checked December 2008

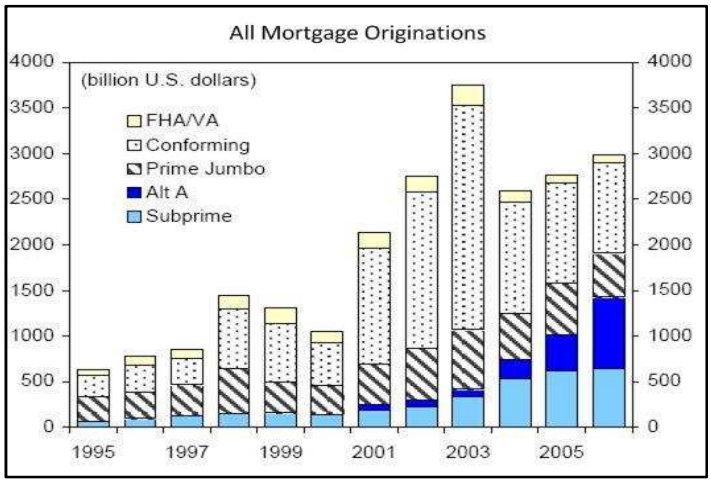


Graph 3- Unemployment rate in America from 1998-2008

There also is a correlation between the interest rate and the unemployment rate. The decrease in interest rate is stimulating for the economy and is encouraging businesses to hire more people. The effect of a decrease in interest rate can usually be seen later in the unemployment rate due to the businesses' need to adjust their production. It is clear that the increased interest rate affected the unemployment in the beginning of 2007 which seems to have worked as a generator for the declining house prices present in that period. It is of course an effect that people have difficulty paying their mortgage payments when losing their jobs. Other factors may surely also contribute to the development in interest rates, these will not be discussed here though.

3.2. Development in the mortgage market

Many of the problems with sub-prime mortgages are related to the development of the interest rate. The very low interest rate strongly stimulated the housing market and thus also the mortgage market. Generally speaking, housing market will rise in times of low interest rates, mainly because of the accessibility of cheaper mortgages. This development can be seen in graph 4[40] that shows all mortgage originations from 1995 to 2006. It is noticeable to look at the



Graph 4- All mortgage originations from 1995-2006

[40] "Inside Mortgage Finance" in *John Kiff and Paul Mills*, "Money for nothing and checks for free: Recent development in U.S. Subprime" an IMF Working Paper No. 07/188 July 2007, p 1-18

volume of the mortgage originations from 2000 to 2006 which shows remarkable high volume levels in comparison to the former years. Observing the situation of the mortgage market during the period from 2000 and forward, we see a development that is congruent with the argument of a more volatile mortgage market in times of low interest rate. Another important thing to notice from graph 4 is the development of non-conforming loans from 2000 onwards. Borrowers were able to finance house purchases cheaply which also made it possible for lower income groups to buy property. The reason for this may be deducted from the originations of sub-prime loans which became very popular during the period of low interest rates. Sub-prime loans were of course booming in this period, but Alt-A and Prime Jumbo loans also experienced a boost then. There may be several reasons behind the raise in those two types of loans, the increasing prices and low interest rate are its main drivers though.

The increasing house prices meant a shift from prime loans to especially Alt-A loans because borrowers no longer were eligible to conforming loans. The main reason behind the large number of Alt-A loans is the maximum borrowing limit on conforming loans. Due to the dramatic rise in housing prices borrowers had to apply for loans with a higher value than the one accepted by the GSEs. Steeper house prices also meant that it was harder for the borrowers to satisfy the other GSE criteria which resulted in the more elevated increase in Alt-A in comparison to prime-jumbo.

3.2.1. Sub-prime borrowers

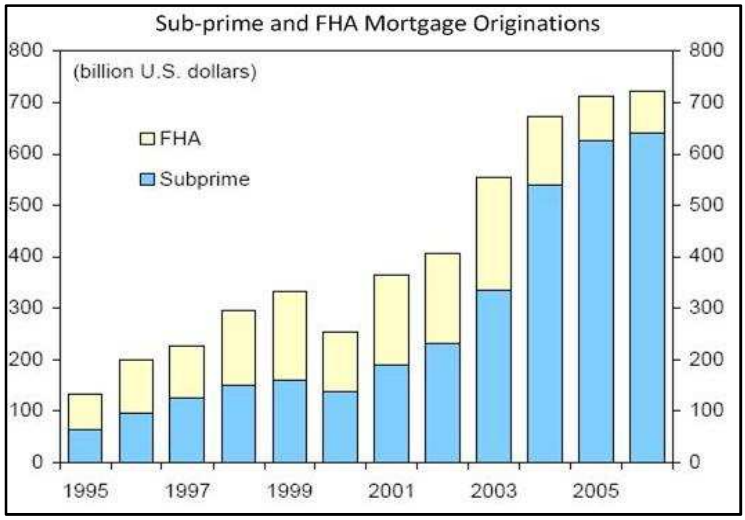
FHA/VA loans used to be the primary source of loans to sub-prime borrowers but during the last 10-12 years this has changed. Graph 5[41] shows that the ratio between FHA loans and sub-prime loans changed from app. 50% FHA loans in 1995 to app 15% in 2006. The reason for the rise in sub-prime mortgages in comparison to FHA loans can primarily be explained by the following.

- Subprime loans were marketed much more offensively in that period which meant that borrowers had more options to choose from. The increasing housing prices and the low interest rate made it possible for private label companies to design loans that appealed to sub-prime borrowers.
- The FHA was not willing to lend as much as the borrower could through the private-label sub-prime loans.

[41] "Inside Mortgage Finance" in *John Kiff and Paul Mills*, "Money for nothing and checks for free: Recent development in U.S. Subprime" an IMF Working Paper No. 07/188 July 2007, p 1-18

- The originators also complained about the low profitability in originating FHA loans. Thus, this created an incentive for the originators to sell private label sub-prime loans instead of FHA loans.

The other interesting thing to learn from graph 5 is the volume of the lending to sub-prime borrowers which has increased app. 600% in that period.



Graph 5 Sub-prime and FHA Mortgage Originations from 1995-2006

There is still a demand for FHA loans because it holds some advantages in comparison to private-label mortgages. The advantage lies primarily in the non-existing prepayment penalty on loans. This is a big plus for sub-prime borrowers if e.g. the borrower's income is very volatile. The fact that FHA is a government institution will give a feeling of safety to the customers, assuring that they will not be subject of predatory borrowing. Despite these advantages, the 1.5% insurance premium and the ongoing fee with each monthly payment might make the FHA loan more expensive than the private label.[42]

3.3. Composition of loans

The need for cheap financing has been resolved in the creation of ARM hybrids. Their structure has given them the name "teaser loans" since they provide a lower payment in the beginning of the loan period. The characteristics of these loans are a combination of a FRM and an ARM mortgage. The most common of the sub-prime loans is the so called "2/28 ARM hybrid". It starts out with a FRM which usually is below market rate. After two years the loan is transformed into a 28 years ARM. The 28 year ARM has a premium on the rate which should cover the missing payment the first two years.

Within the sub-prime mortgage market there is a variety of options to the borrower, all with the purpose of providing the borrower low cost at the beginning of the loan period. As said, the 2/28 is the most common but it is also possible to get 3/27 and 5/25 ARM hybrids. Other popular options

[42] Justin Pritchard, "Pros and Cons of the FHA loans" direct link: http://banking.about.com/od/mortgages/a/FHALoans.htm

are IO-mortgages and options ARM. Interest-only is constructed like the loans offered in the GSE where the borrower, in the beginning of the loan period, only pays interest on the mortgage. After the interest-only period the loan is converted into a regular mortgage that pays both interest and principal. Because of the postponing of principal payment the interest-only mortgage is more sensitive towards fluctuations on the interest rate. Another option to keep mortgage cost low in the beginning of the loan period presents the negative amortization loan. Its structure is quite similar to the interest only mortgage with a difference in the initial rate on the mortgage. The negative amortization loan allows the borrower to pay a lower interest rate than intended. This structure causes the loan to give a negative amortization, making the principal higher each month.

One of the newer options regarding sub-prime loans is the option ARM. The option ARM provides the borrower with different alternatives of payment every month. These selection possibilities cover both the interest only and the negative amortization. After 5 years or when the balance reaches 110 percent of the original loan principal, the loan will reset and transform into a full interest and principal loan.

The ARM hybrids are quite complex financial securities. The mortgages are connected to a market index which in terms of the sub-prime mortgages usually is the six-month LIBOR. Besides the fluctuations on the interest payments the payout structure is also affected by interest rate derivatives. The ARMs that are connected to the LIBOR are usually subject to collars in the interest payment. The collars represent a high and low limit in which the interest rate on the mortgage can vary.

Along with the innovations on the lending market the overall compositions of loans also shifted in the last years. ARM loans have become increasingly popular among borrowers in the American mortgage market and have grown from app 18% in 2003 to 25% of all outstanding mortgages in 2006[43]. If we look at the originations of ARMs in 2006, it shows the same pattern. Among all originated loans 53% were ARM or variations of these. In the sub-prime sector 67 % of loans were ARMs. These numbers are matching well the statistics about the increase of non-prime mortgage originations.

[43] Michael Fratantoni, "The Residential Mortgage Market and Its Economic Context in 2007" in Mortgage Bankers Association, January 2007

4. Analysis of the American mortgage market

The following analysis will go through the structure of mortgage backed securities in the American market. In general, there are two different kinds of them in America; one is the mortgage backed securities issued through private label mortgages that are backed by non-prime loans. The other is the mortgage backed securities issued by the GSEs backed by conforming loans.

4.1. Private label backed securities

For the rest of this report I will use the term sub-prime for private label sub-prime mortgages. Sub-prime loans are relatively new on the American mortgage market. These securities spring from the world of structured finance where securities are bundled and sold. The credit crisis has by many been considered a consequence of the sub-prime loans which is why I will analyze their structure which is somewhat similar to the conforming loan structure, nonetheless different in several ways. One of the similarities is that sub-prime loans are being originated by banks, thrifts or other financial institutions. Sub-prime loans are, like the conforming loans, securitized and sold to investors but the securization structure of the sub-prime loans is far more complicated than the one of the GSEs. It should be emphasized, that the way sub-prime loans are securitized is the same as for the other non-conforming loans.

Figure 3, in the end of section 4.1., is an overview of the different processes in the sub-prime securitization structure. Also in this section, the single elements and explain the relations. Often, some of the processes can be handled by the same unit, e.g. the originator and arranger are quite likely to be the same unit which is illustrated in table 2 and 3.

4.1.1.1. Originators

The securization process starts with a borrower that applies for a mortgage in order to buy a property or refinance an existing mortgage. This process can easily be handled by a mortgage broker who specializes in sub-prime mortgages and acts as agent for mortgage bankers and banks. Often they work for a number of different financial institutions. Through standardized underwriting these mortgage brokers can carry out most of the lending activities. Many years of improving the information processes has been one of the main drivers behind this standardization. Mortgage brokers can now put in the lenders information and learn whether it satisfies the loan standards. The increased use of automatic underwriting has lowered the cost for brokers which, undeniably, have been a contributor to its expansion. By employing the automated underwriting the broker is applying standardizing models that should give a picture of the default possibility of this type of lender. It has been argued that these new models allow looser underwriting standards here. An

example of this is that the automatic underwriting models can allow for lower down payments in return for a good credit score.[44] Most mortgage originators have developed their own models and the GSEs have their own model to determine whether the loan is conforming. Common for both GSE and non-prime mortgages is that borrowers are not personal liable for the debt in the mortgage. This has the consequence that originators have to file a suit against the borrower if he does not fulfill his debt commitment.

Another key issue in mortgage application lies in the appraisal process that determines the value of a home. Originators need the information to determine the amount that enables the borrower to purchase the desired property. It is also important since it is the value of the collateral to the mortgage and thus the safety in case the borrower is unable to pay the expenses on the mortgage. During the latest years standards have been loosened in this process. The lending industry has, like the underwriting process, increasingly relied on automatic value models. It used to be normal practice to randomly assign an appraiser. This practice has changed, so that today it is the broker who selects the appraiser[45].

As a consequence of these easy accessible pre-approval systems the mortgage broker business has been growing over the last years and has also have resulted in more aggressive marketing measures. Many of the brokers utilize marketing channels as the internet and/or telemarketing to sell mortgages[46]. With about 25% of the prime mortgages and 60% of the sub-prime mortgages originating from mortgages brokers in 2005[47] it is proven that they play a significant role in the development of the mortgage industry.

When the originator has collected a portfolio of mortgages, he sells the mortgage portfolio and collects proceeds on the sale. The originating institution is thus compensated with an origination fee (closing costs etc.) and proceeds from the sale. The originator is removing the loans from its own balance and is therefore separated from the income and risk connected with the mortgages. The originators are commercial banks and mortgage institutions. If there is a mortgage broker involved,

[44] Reality Times staff, **"**Fannie Mae Urges Lenders To Explain Rejections" in Reality Times, January 17, 2000
[45] Joseph R. Mason and Joshus Rosner, "How Resilient Are Mortgage Backed Securities to Collateralized Debt Obligation Market Disruptions?" February 13, 2007, source: http://ssrn.com/abstract=1027472
[46] Dennis E. Gale, "Subprime and Predatory Mortgage Refinancing: Information Technology, Credit Scoring, and Vulnerable Borrowers" May 31, 2001, Berkeley Program on Housing and Urban Policy. Seminar and Conference Papers: Paper C01-001.
[47] Kevin Drawbaugh, "Mortgage brokers faces industry upheaval" in Reuters.com, June 4, 2008

he is compensated with a fee from the originator. Table 2[48] shows the origination companies in 2006 which include some of the largest banks in America.

Top Sub-prime Mortgage Originators

		2006		2005	
Rank	Lender	Volume ($b)	Share (%)	Volume ($b)	%Change
1	HSBC	$52.8	8.8%	$58.6	-9.9%
2	New Century Financial	$51.6	8.6%	$52.7	-2.1%
3	Countrywide	$40.6	6.8%	$44.6	-9.1%
4	CitiGroup	$38.0	6.3%	$20.5	85.5%
5	WMC Mortgage	$33.2	5.5%	$31.8	4.3%
6	Fremont	$32.3	5.4%	$36.2	-10.9%
7	Ameriquest Mortgage	$29.5	4.9%	$75.6	-61.0%
8	Option One	$28.8	4.8%	$40.3	-28.6%
9	Wells Fargo	$27.9	4.6%	$30.3	-8.1%
10	First Franklin	$27.7	4.6%	$29.3	-5.7%
	Top 25	$543.2	90.5%	$604.9	-10.2%
	Total	$600.0	100.0%	$664.0	-9.8%

Table 2 - Top Sub-prime Mortgage Originators in volume and market share in 2005-2006

4.1.1.2. Arranger

The next link in the securization chain is called the issuer or arranger. The arranger buys the pool of mortgages from the originator with the intent to transform and re-sell the mortgages to investors. This arranger is responsible for conducting due diligence on the originator and is also responsible for all his background issues, including review of the income statement, interview with senior management etc.[49]. One of the most important tasks for the arranger is the creation of a SPV to hold the mortgages, thus removing them from the arrangers balance. When the mortgages have been transferred to the SPV, the issuer is responsible for the bundling the mortgages, this which involves credit enhancement on the mortgages and establishing contact with the credit rating agencies. Credit agencies are responsible for the rating on practically all bonds issued. This is primarily due to the regulation of the S.E.C and bank regulators who, through regulatory measures, limit institutional investors to only invest in bonds with an investment grade (Moodys corporation 10 top grades)[50]. From analyzing the statistical data, the rating agency is able to provide tranches with the proper rating. Most liquid is the AAA rated bond, for this reason the arranger will improve the quality of the mortgage pool by adding credit enhancement to it.

The rating agencies are not conducting the rating on the mortgages but on the bonds that are issued by the SPVs. In order for the credit rating agencies to give a rating on the mortgages they are provided with statistical data on the loans. All of the data is collected by the arranger and is

[48] Inside Mortgage Finance in Adam B. Ashcraft and Til Schuermann, "Understanding the Securitization of Subprime Mortgage Credit", a Federal Reserve Bank of New York Staff Reports, March 2008, source: http://www.newyorkfed.org/research/staff_reports/sr318.html

[49] Adam B. Ashcraft and Til Schuermann, "Understanding the Securitization of Subprime Mortgage Credit", a Federal Reserve Bank of New York Staff Reports, March 2008

[50] Roger Lowenstein, "Triple-A Failure" in The New York Times, April 27, 2008

presented to the credit agencies. Not all of the securities are sold as AAA bonds which means that the SPV has to offer a premium on the lower ranking tranches. The lowest ranking tranche, the equity tranche, is within securization of sub-prime mortgages, often being purchased by the arranger as a form of over collateralizing credit enhancement. AAA grade investment papers are liquid papers that have a broad range of investors. The contrast is the mezzanine tranches that have few natural investors[51]. Driven by this lack of investors, investment banks invented a new way to sell the mezzanine tranches. By re-bundling lower ranking tranches investment banks are able to create Credit Default Obligations (CDOs.).

CDOs may be compared with pay-through mortgage backed securities, the difference lies in the kind of assets backing them. A CDO is an investment grade security, bundled by different kind of loans and other assets. Thus, it is not limited to hold a specific kind of collateral.
When the arranger is bundling lower ranking tranches into securities, he is able to create new investment tranches. The process is also known as resecurization and is widely used in connection with mezzanine tranches in sub-prime mortgage backed securities. The new investment paper is a derivative on the pool of mortgages. Like the asset backed securization the senior of the tranches is the AAA and the process is structured very like bundling mortgages. This process is possible due to two reasons. First, the CDOs are based on multiple pools of mortgage backed securities in which not all subsequent tranches are experiencing complete losses. Another argument is that CDOs are holding a diverse pool of securities which means that the diversification effect secures that the safest tranche is protected against losses in a security. Both these arguments turned out not to be valid on sub-prime mortgages. The depreciation in housing prices affected largely all of the sub-prime mortgage pools, meaning that even the most senior tranche lost its value[52]. Table 3 shows the issuing companies.

[51]John Kiff and Paul Mills, "Money for nothing and checks for free: Recent development in U.S. Subprime" an IMF Working Paper No. 07/188 July 2007, p 1-18
[52] David Robson, "Fair value Issus and the Sub Prime Crisis" Used in the 13th Melbourne Money and Finance Conference, June 2008, direct link:
http://www.melbournecentre.com.au/mmfc/2008/Fair_Value_Issues_and_Sub_Prime_Crisis.pdf

Top Sub-prime Arrangers					
		2006		2005	
Rank	Lender	Volume ($b)	Share (%)	Volume ($b)	%Change
1	Countrywide	$38.5	8.6%	$38.1	1.1%
2	New Century	$33.9	7.6%	$32.4	4.8%
3	Option One	$31.3	7.0%	$27.2	15.1%
4	Fremont	$29.8	6.6%	$19.4	53.9%
5	Washington Mutual	$28.8	6.4%	$18.5	65.1%
6	First Franklin	$28.3	6.3%	$19.4	45.7%
7	Residential Funding Corp	$25.9	5.8%	$28.7	-9.5%
8	Lehman Brothers	$24.4	5.4%	$35.3	-30.7%
9	WMC Mortgage	$21.6	4.8%	$19.6	10.5%
10	Ameriquest	$21.4	4.8%	$54.2	-60.5%
	Top 25	$427.6	95.3%	$417.6	2.4%
	Total	$448.6	100.0%	$508.0	-11.7%

Table 3- Top Sub-prime Arrangers in volume and market share in 2005-2006

4.1.1.3. Connectors with Arranger

As the above should indicate, the arranger is responsible for many of the processes along the securization. This results in relationships also with many of the entities that are involved in the process. Especially three relations are important in this connection: the one with the warehouse lender, the credit rating agency and the investors.

Warehouse lenders

Arrangers use warehouse lenders primarily when they are non-depository and thus need short term funding for the loans. The warehouse lender is a commercial bank or another financial institution that individually or collectively provides short term cash to these so called mono-line arrangers. The term warehouse lender is used because they use the pool of mortgages as collateral. The short term financing puts the warehouse lenders in a position where they are the first to occur losses if the mortgages are not purchased by investors. This results in demands from the warehouse lender for the arranger to add additional safety, usually by overcollateralizing the pool of loans[53]. It usually means that the mono-line arranger will have to provide equity to receive the funding. How the warehouse lenders value the mortgages is therefore essential for the level of overcollateralization that needs to be added.

Credit rating agencies

The credit rating agencies are responsible for the ratings on the investment tranches and are therefore an important part of the securization process. The role of the credit rating agency is to evaluate the bonds issued by the SVP and give default possibility on these. Much of the innovation within structured finance is only possible because the rating agencies are providing investment

[53] Morgan Brown, "Who's Next? Do the Warehouse Lenders Hold the Answer?" in Blownmortgage.com, 8 August, 2007

grade on the securities. To get a better understanding of why they have this position it is natural to look at their historical development.

Since 1909 when John Moody created the first credit rating agency, ratings were offered to investors that wanted to learn more about institutions ability to meet their obligations. In the beginning, they were given to subscribers who received ratings and research on the creditworthiness of ongoing companies. The Poors Company who later become Standard and Poors was founded in 1916. Fitch Publishing Company was founded in 1914 and was later in 1924 the inventor of the rating scales from AAA to D[54].

The great importance of these credit rating agencies is found in the historical regulation made by the US government. In 1970 the US government regulated the brokers only to hold investment graded bonds. This act created a high need for the credit rating agencies as they were responsible for making the grading on the securities. Who was allowed to make ratings on investment papers was decided by the SEC who created a new category of official rating agencies including Moodys, Fitch and the Standard & Poors[55].

During the next decades the credit rating agencies grew in importance, driven by institutional investors who became subject to the same rules as brokers. Bankers, mutual funds and pension funds became restricted only to invest in rated bonds. In the end, almost all classes of investors were under these regulations. Another factor that increased the importance of the rating agencies was the evolution on the corporate bonds market which all needed an investment grade from one of the three agencies. These used statistical material from the companies as a basis for their ratings. The whole meaning of the rating was to give a probability of default and not investment advice[56].

Today, the rating agencies are still central in the financial markets and all three of them are accountable for most ratings on bonds issued in the market. They play an equally essential role in rating the mortgage backed securities and CDOs within the sub-prime securitization. With relatively few arrangers of private-label mortgage backed securities the credit rating agencies has close collaboration. In the rating process, they employ relative static models to rate mortgage backed securities. This has the effect that arrangers can use the agencies' publicly available models designing the pool to acquire the desired ratings in the different tranches. On top of this, the

[54] Ruth Rudden , "Evolution of Credit rating, part 1" Caribbean Information and Credit Rating Services Limited, direct link: http://www.caricris.com/pdfs/article/evolutionpart1.pdf
[55] Roger Lowenstein, "Triple-A Failure" in The New York Times, April 27, 2008
[56] ibid.

arranger engages in conversations with rating agencies' officers who will indicate if the securitization structure can achieve the desired ratings[57]. The statistics on mortgages in the pool are provided by the arranger. The list covers a long range of issues about loans, lenders and the backing property. It is on grounds of these data that the agency is able to provide rating.

One of the main differences between ratings of structured finance and the regular bond market is the concentration in structured finance. A study showed that 12 banks stand for more than 70% of all deals made in Europe and these were all rated by one of the three agencies[58]. This is congruent with the American market where top 10 accounts for 63.3% in 2006[59]. Structured finance does not only cover mortgage backed securities but also the securization of other types of assets. Among these assets are the CDOs which are widely used to bundle mezzanine tranches from sub-prime mortgages. The market for CDOs is vital in respect to sub-prime mortgage backed securities. It is a necessity for these securities that there is a well functioning market for CDOs. The logic is that you are only able to sell AAA tranches if there are buyers for the remaining tranches. The rating agencies are therefore involved in the rating of these securities as well.

During the last years the market for CDOs has evolved driven by the increase in sub-prime mortgages. Despite the large market there is a large uncertainty as to the quality of the ratings on structured finance. This problem may be looked at in two ways; one is the spread between corporate bonds and some CDOs. On June 19 2006 the 5-year default probability of an AAA was 0.043 for an ABS, 0.061 for a corporate bond and 0.118 for a CDO[60]. It is not transparent why the default probability should be different for the different asset classes. The other way to see uncertainty is by considering the many changes which are made in the rating models. In 2004 alone two of the three largest rating agencies published 57 releases with changes in their rating model. 45 of these were related to ABSs and the remaining to CDOs. .

Investors

The arranger underwrites the deal for one or more portfolio managers in order to sell the investment papers to the investors. An investor who is interested in mortgage backed securities is most likely to be institutional investors such as a hedge fund or an investment bank which rely on the portfolio

[57] Securities and Exchange Commission - Comments on Proposed Rules on Rating Agencies: File Number S7-04-07 – March 2008, direct link: http://www.sec.gov/comments/s7-04-07/s70407-33.pdf
[58] "Is Rating an Efficient Response to the Challenges of the Structured Finance Market?", Authorite des Marches Financiers, Research Department, March 2007
[59] Based on figure 5
[60] Mark Adelson, "Bond Rating Confusion" Nomura Fixed Income Research, June 2006, direct link: http://www.adelsonandjacob.com/pubs/Bond_Rating_Confusion.pdf

manager to examine and buy securities. The manager usually holds a wide range of different fixed income investment papers which covers government bonds, corporate bonds and ABS.

Investors have been criticized by many for relying too much on the rating made by the agencies. This reliance has triggered a shift towards sub-prime mortgage backed securities and CDO that together with the AAA rating should have the same default risk as similar papers. I will use an example to illustrate how this shift has happened. The example of an investor in mortgage backed securities is The Ohio Police & Fire Pension Fund[61], a fund that provides pension and disability benefits to qualified participants. In 2006 the fund had $11,832.3 million in its investment portfolio. From that pool app 18% is invested in fixed income which includes the investment papers described earlier. The pension fund has its fixed income investment managed by 8 different portfolio managers. These are given conditions under which they can invest accordingly. These conditions are:

1. The main focus of investing will be on dollar denominated fixed income securities. Non-US dollar denominated securities are prohibited.
2. The composite portfolio as well as each manager's portfolio shall have similar portfolio characteristics as that of the Lehman Aggregate Index[62].
3. Issues must have a minimum credit rating of BBB- or equivalent at the time of purchase.
4. Each manager's portfolio has a specified effective duration band.
5. For diversification purposes, sector exposure limits exist for each manager's portfolio. In addition, each manager's portfolio will have a minimum number of issues.
6. Each manager's portfolio has a maximum threshold for the amount of cash that may be held at any one time.
7. Each manager's portfolio must have a dollar-weighted average quality of A or above.

During 2005 and 2006 the composition of the fixed income portfolio changed significantly. The largest shift was from guaranteed mortgage backed securities into mortgage backed securities that did not have the full faith and credit of either the US government or the GSEs. In fact, the portfolio experienced an increase in mortgage backed securities from 12% to 34% between 2005 and 2006. The shift resulted in an out-performance of the benchmark on 26 bp. It should be noted that, with this shift away from guaranteed mortgage backed securities, the characteristics of the portfolio is not similar with the Lehman Aggregate Index.

[61] Adam B. Ashcraft and Til Schuermann, "Understanding the Securitization of Subprime Mortgage Credit", a Federal Reserve Bank of New York Staff Reports, March 2008 source: check footnote 29

[62] The Lehman Aggregate Index has a weight of less than one percent on non-agency mortgage backed securities.

4.1.1.4. Servicer

One of the concerns in financial literature is the free rider problem. If the pool of investors is too wide-spread, it can result in the situation that no individual investors would have the incentive to collect the payments on the mortgages. This issue is being taken care of when employing a servicer. His objective is to ensure the collection of interest and principal of the outstanding mortgages. It is also the servicers' responsibility to be in contact with the borrowers in case of concerns regarding the mortgage. The servicer usually collects 50 bp of the outstanding principal balance as an ongoing fee. As an extra payment, the servicer collects payments in the beginning of the month and ships on the payments at the end of the month. In the interim period the servicer is able to earn interest on payments.

In times of delinquencies there is a high need for these services. A delinquency is when the borrower fails to make his payments on the mortgagee. In that case the servicer must provide the payment as long as it is deemed collectable. In this phase he is also responsible for the correct payments of property tax and property insurance. The limit for when a loan is deemed collectable is usually 90 days delinquent. After this period the mortgage will be foreclosed and the servicer has to pay all expenses connected with that. The expenses of the servicer are subtracted from the sale of the property. Another of the servicer's option is to restructure the loan as long as the changes are in the best interest of the investors. A restructuring comprises all from changing the interest rate, the principal amount of the loan and the maturity of the loan. This option is available if the loan is in default or if it is in the servicer's judgment, default is reasonably foreseeable or if the borrower is delinquent for twenty days[63].

Within a pool of mortgages the trust can have several servicers that provide these obligations. Because of this, the trust will hire a master servicer to overlook all the primary ones. The main purpose behind this supervising position is to ensure that all the borrowers are given the same conditions and report concerning all the mortgages to the SPV[64].

4.1.2. Moral hazard and adverse selection in Sub-prime mortgage backed securities

Both adverse selection and moral hazard create instability in the process and contribute to the mispricing of mortgage backed securities. In times of high demands for sub-prime mortgage bonds and easy access to short term capital the participants may have both the incentive and the possibility to conduct both moral hazard and the adverse selection problem increases. The impact of the crisis

[63] Steven L. Schwarcz, "Protecting Financial Markets: Lessons from the Subprime Mortgage Meltdown" in Minnesota Law Review, Vol. 93, No. 2, 2008; Duke Law School Legal Studies Paper No. 175, 19. February, 2008

[64] Erin Stafford, "Is the master Servicer's role diminishing?" in Global CMBS newsletter Issue 113, April 6, 2006

may not yet have been completely exposed and the reason why it is so complicated is in part due to the complex securization process. Section 4.1.2. analyzes moral hazard and adverse selection in the securization process.

4.1.2.1. Link between the broker and originator

Every time the broker sells a loan to an origination bank, he receives a fee and is released from risk and proceedings from the loan. This fact is in itself a problematic issue since the risk of originating a "bad loan" is not removed. During the last years the level of automatic underwriting has raised which has been a contributor to the boom in the mortgage broker business. The increase has lowered the cost for the underwriters, but it has also made it easier to conduct fraud and moral hazard behavior.

The appraisal value of property is important in connection with mortgages, since it is the investor's safety in case of foreclosure. Also, much of the data collected is sensitive towards it. The increase in automatic appraisal has the consequence that the appraiser now is selected by the broker who has an interest in getting a high appraised value. Mortgage brokers want such values because they will generate larger loans. This serves as a conflict of interest as it might be overestimated, leaving higher risk to the investors. To underline the problem there have been numerous of complaints from the players in the appraisal business putting forward that brokers pressured them to provide a, from the brokers' point of view, good appraisal value[65].

Other problems with the originator/broker relationship are hinting towards fraud in the application process. Mortgage brokers are responsible for the correct filling of the mortgage application. The sub-prime loans are not without limits and the amount that the borrowers are allowed to loan are dependent on the application. The information gap between the broker and the origination bank is a troublesome aspect. In the event of the applicant conducting fraud, this can be a sign of moral hazard. The broker is conducting moral hazard if he deliberately avoids making the proper background check because he is able to sell the mortgage to an originator. When the risk is sold off to an originator, the broker is no longer responsible for his actions and thus the conditions for moral hazard are present. The dilemma may be applied to the actions of the originator as well who has the same option to sell the loan and credit risk to another. This means, that if there is an uncritical market for the mortgages, there are less incentives to conduct due diligence. If the originators fail to conduct proper due diligence concerning their mortgage brokers, they will avoid to discover

[65] Mason et. Al, "How Resilient Are Mortgage Backed Securities to Collateralized Debt Obligation Market Disruptions?" seminar paper, February 2007, direct link: http://ssrn.com/abstract=1027472

systematic fraud. This has an amplifying effect on the broker's incentive to conduct moral hazard since the risk of his moral hazard behaviors being discovered is reduced.

Mortgage fraud has increased in the recent years; the cost is believed to lie between $946 million and $4.3 billion in 2006 alone[66]. To set those numbers in perspective, it is 70 % of the early default loans that are afflicted by fraud[67]. By looking at these numbers it becomes obvious that fraud in the underwriting procedure presents a factor behind the sub-prime crisis – a finding that Fitch Ratings confirms in a research paper[68]. They believe that app. a quarter of the underperformance sub-prime mortgages can be explained by poor underwriting and fraud. At this, much focus is on the so called broker originated loans because he is the only person in contact with the borrower. As he therefore is the only link between the borrower and the lending bank, it puts him in a position where he may alter numbers so the data fit with the lenders guidelines. If the level of fraud is high enough, it presents a disturbing factor to the rating agencies which use these data to rate the mortgage backed securities later in the process. An example given in the Fitch report is the level of occupancy fraud which is at 66% of their sample. Occupancy fraud means the situation when the borrower states in his application that he aims at occupy property, but in reality uses the property for speculative investment. The level of occupancy is one of the essential data in the securization process. The rating agencies put a high emphasis on the level of occupancy when making ratings on a pool of mortgages. Historically, there is a high negative correlation between the level of occupation and the rate of default. Said in another way, in a pool of mortgages with a high amount of them being used for primary residence have a good chance of receiving a high rating. Occupancy is just one of many data that can be altered to improve the loan application and many things point towards the suspicion that there has been fraud involved.

All together there is a high risk of moral hazard behavior between the broker and the originator. Especially the extended use of automatic underwriting and appraisal has exposed the securization process here. This, hold together with the fee based system that encourages brokers to conduct moral hazard behavior, sums up to a bad mixture. The effect is even amplified by the originators lacking incentive to conduct proper due diligence on the broker.

[66] Federal Bureau of Investigation, "Mortgage Fraud: New Partnership to Combat Problem" in fbi.com, March 2007
[67] BasePoint Analytics LLC - "Early Payment Default – Links to Fraud and Impact on Mortgage Lenders and Investment Banks,"2007 in Adam B. Ashcraft and Til Schuermann, "Understanding the Securitization of Subprime Mortgage Credit", a Federal Reserve Bank of New York Staff Reports, March 2008 source: check footnote 29
[68] Pendley et al "The Impact of Poor Underwriting Practices and Fraud in Subprime RMBS Performance" in Fitch Ratings, November 2007

4.1.2.2. Link between the originator and borrower

The mortgage originators have an obligation towards the borrower to provide the correct guidance in connection with the loan options. In particular when dealing with sub-prime loans, there is a chance that the borrower does not have the right financial understanding and thus needs more guidance. This information gap creates a chance to conduct moral hazard. If the borrower does not fully understand the mortgages that he receives, likelihood for predatory lending exists. Predatory lending is defined as welfare-reducing provision of credit[69]. Examples are manifold and include some of the following[70]:

- Excessive fees, defined as points and other fees of five percent or more of the loan,
- Abusive prepayment penalties, defined as a penalty for more than three years or in an amount larger than six months interest,
- Kickbacks to brokers, defined as compensation to a broker for selling a loan to a borrower at a higher interest rate than the minimum rate that the lender would be willing to charge,
- Loan flipping, defined as the repeated refinancing of loans in order to generate fee income without any tangible benefit to the borrower,
- Unnecessary products,
- Mandatory arbitration that requires a borrower to waive legal remedies in the event that loan terms are later determined to be abusive and
- Steering and targeting borrowers into subprime products when they would qualify for prime products.

Fannie Mae has estimated that up to half of the borrowers with subprime mortgages could have qualified for loans with better terms. Predatory borrowing is hurting, especially for borrowers as they are paying more on their loans than necessary in a possibly tight economy, but also for the investors as there is a higher risk that the borrower cannot afford the mortgage payments. In this area there is an urgent need for protective measures regarding borrowers. The problem with predatory borrowing is in a way similar to the problem with the originator and broker relation. The problem lies in moral hazard; the one that originates the loan is not the one with the risk connected to the loan. Especially brokers are getting a fee for every mortgage originated, but the employees in the originating institutions are also on a bonus scheme. If the banks use a compensation system that

[69] Don Morgan, "Defining and Detecting Predatory Lending" Staff Report #273, Federal Reserve Bank of New York, 2007

[70] Center of responsible lending in Adam B. Ashcraft and Til Schuermann, "Understanding the Securitization of Subprime Mortgage Credit", a Federal Reserve Bank of New York Staff Reports, March 2008 source: check footnote 29

rewards the employee for loans originated without accounting for the risk, then the individual banker will have the incentive to conduct predatory lending. The trouble with this is that the goal of profit maximization and good guidance are in many cases are not congruent. To protect against predatory lending, the financial institutions has to rely on federal and local law enforcement. This approach has its setbacks too, in relying on the law enforcing measures, the problem with bonus schemes in banks is not addressed. In order to reduce moral hazard between originators and borrowers, there has to be more control applied on the originated mortgages.

Like the originator that may conduct predatory lending, also the borrower can conduct predatory borrowing. This phenomenon might be defined as the willful misrepresentation of material facts on a real estate transaction by a borrower to the ultimate purchaser of the loan.[71] Borrowers are conducting predatory borrowing to either loan more money or to get better loan conditions than they are eligible with the current status. They are primarily driven by increasing house prices since these create equity that both generates positive outcome for the borrower but also decreases the chance of default by the very same reason. Because of this, predatory borrowing is discovered in times of stagnating and falling market. The lack of opportunity to quickly sell property for profits, gives a high level of defaults on mortgages. This kind of fraud may occur on different levels, it can be everything from false documentation of income to applying for a mortgage by using another person's data.

The originating institution is held accountable for loans that are originated by predatory lending. This is done through warrants to the arranger so that the originator is required to buy back mortgages that have been originated under predatory lending. Many originating units have been squished because of these warrants. What happened is that originators have been forced to buy back whole pools of mortgages. Since many originators did not have the required capital to buy back the mortgages, they had to file for bankruptcy. Originators, who could not buy back, became a counterparty risk due to the extended moral hazard behavior. An interesting aspect of the originators filing for bankruptcy protection is the extra risk on mortgage backed securities. As the warrants made by the originators turned out to be inadequate, the mortgage backed securities became more risky. When investors are considering investments in a sub-prime mortgage backed security, they are presented with a prospect that, among other, describes the warrants made on the mortgages from the originator. Once these are inadequate, it diminishes some of the safety in the pool of mortgages.

[71] Federal Reserve Bank of New York Staff Reports - Understanding the Securitization of Subprime Mortgage Credit Adam B. Ashcraft and Til Schuermann – March 2008

Management in the predatory lending business has not been affected by the predatory lending activity in their company. There has been evidence that top management in sub-prime lending companies did not get a pay cut as their profit dropped. Even with the company filing for bankruptcy protection, management is protected[72]. The lack of consequences for the management has also been an incentive to moral hazard behavior in this business

4.1.2.3. Link between originator and arranger

The arranger's role is vital in the securization process because it is the last link before the mortgages are removed from the originator's balance sheet. The problematic issue between the originator and the arranger is the information gap. If the arranger does not conduct proper due diligence, it creates an incentive to the originator to behave more aggressively in the underwriting process or even to commit fraud.

There are two ways the arranger can safeguard himself against the originator's potential moral hazard behaviors. One way is to carry out due diligence on the originating company which should reveal potential issues within the origination company that would drive them into systematic fraud. It also assures the arranger that the originator has the adequate capital to buy back the mortgages in that event. The second option entails making the originator create warrants and representations about the borrowers and underwriting process. These warrants are committing him to buy back the mortgages if the conditions are violated. These two safeguard opportunities should in theory be enough for the arranger to be immune towards moral hazard behavior from the originator. Nevertheless, we have seen that the commitments from some origination companies were not credible since they did not have the adequate capital to buy back the pool of mortgages which resulted in bankrupts. This might also be an indication that the arranger did not conduct proper due diligence on the originator, as this could have warned the arranger about irregularities.

The lack of due diligence on the originator is moral hazard behavior by the arranger. An explanation why an arranger would commit moral hazard behavior is the easy access to investors which have not pressured him to conduct proper due diligence. If investors are uncritical towards this process, it diminishes the incentive to make an in depth analysis of originator and even brokers. In times where the house market is raising this problem is most aggravated because lower underwriting standards are not being punished.

[72] Christopher L. Peterson, "Subprime Mortgage Market Turmoil: Examining the Role of Securitization ", A hearing before the U.S. Senate Committee on Banking, Housing, and Urban Affairs Subcommittee on Securities, Insurance, and Investment, April 2007

4.1.2.4. Adverse selection behavior by the arranger

The arranger has the contact to many of the institutions in the securization process and thus has the obligation to ensure the quality of the mortgage pool. This obligation may create a problem in the securization process since there is a clear gap of information between the arranger and the other institutions. This means that the arranger has different ways in which he can use this information to his own advantage. The most obvious method is keeping the best loans in the portfolio and selling off the rest. This is an example of adverse selection in the process and the institutions around the arranger have to safeguard themselves against this behavior.

Warehouse lenders

Mono-line arrangers are very alert on the adverse selection problem because they are in need of short-term credit from a warehouse lender. The warehouse-lender has to safeguard against losses caused by poor pools of mortgages. To reduce their risk in the transaction they demand the mono-line arranger to provide equity as a safety towards the pool of mortgages. The equity requirement is a direct consequence of the information asymmetry between the arranger and the warehouse-lender. Not only should the equity-requirement safeguard against the arranger only selling off the poor mortgages, but also it gives the arranger an incentive to conduct proper due diligence on the originator.

Some mono-line line arrangers have been bankrupt as a consequence of higher equity requirements from warehouse lenders. When the delinquencies started to evolve in the sub-prime loans especially in the fall of 2007 arrangers and originators were faced with higher demand for overcapitalization in the pool of mortgages. This was due to the warehouse lenders' view on the mortgages that arrangers used as collateral on short term capital. Because of their perception regarding the value of the mortgages' pool, the arrangers had to overcollaterize the loans more than they used to. This happened in times where the cost of money had increased which made it even harder for the arrangers to provide the required capital.

An example of this problem's effect is New Century, the number two arranger of sub-prime mortgages in 2006. New Century filed for bankruptcy in April 2007 as it could no longer raise the necessary capital. Warehouse lenders included some of the major banks, Lehman Brothers, Credit Suisse, Morgan Stanley etc. After having originated mortgages for around $225 billion since it was founded in the mid 90s it could no longer meet credit demands from warehouse lenders[73].

[73] Alistair Barr, "New Century files for bankruptcy, is selling units" in Marketwatch,com, April 2, 2007

4.1.2.5. Credit rating agencies

Moral hazard

Basically, the business of credit rating agencies is selling credibility, so their main concern is to make ratings that fairly represent the risk of the respective securities. In order for them to make such true ratings they need full information about quality and underwriting criteria. The credit rating agencies' way of diminishing the information gap is to conduct proper due diligence on the arranger and in some cases also the originator. However, there is evidence pointing towards the finding that credit agencies are not finding this necessary. In a report published by the European Commission of Security Regulators, Fitch submitted:

"Fitch shall have no obligation to verify or audit any information provided to it from any source or to conduct any investigation or review, or to take any other action, to obtain any information that the issuer has not otherwise provided to Fitch"[74].

Moody are also of the opinion:

"Moody's has no obligation to perform, and does not perform, due diligence with respect to the accuracy of information it receives or obtains in connection with the rating process"[75].

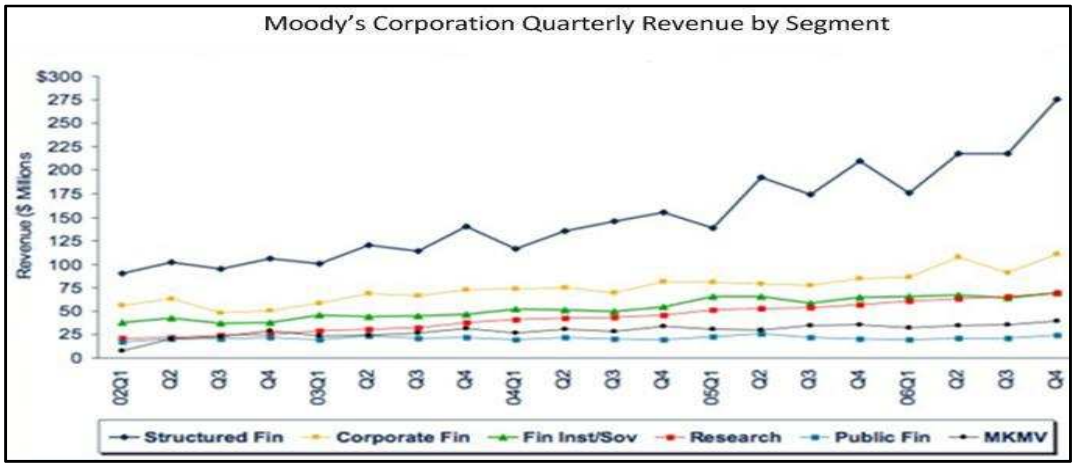
The two quotes indicate that the rating agencies are not actively taking a role to ensure that the information from arrangers and thus from earlier links in the securization chain is correct. The lack of due diligence is one of many places where I find moral hazard behavior on the part of credit rating agencies. Much of the criticism towards the rating agencies is on the inability to predict the losses on mortgage backed securities.

Due to the historic development rating agencies have become a vital part of the development of structured finance which also includes asset backed securities. Without their ratings most investors would not be allowed to invest in these bonds. Still the ratings also work as a reassurance for them that the quality of the security corresponds to the rating. It is highly unlikely that investors would have the same trust in the respective securities if the arrangers carried out the rating. This development puts a lot of power in the hands of the credit rating agencies, which makes it very interesting in connection with the sub-prime mortgages backed securities.

[74] The Committee of European Securities Regulatos, "CERS's Report to the European Commission on the compliance of credit rating agencies with the IOSCO Code - Ref: CESR/06-545", December 2006, direct link: http://ec.europa.eu/internal_market/securities/docs/agencies/report_en.pdf

[75] Moody's Investor Service, "Code of Professional Conduct ", June 2005 direct link: http://v2.moodys.com/cust/research/MDCdocs/01/2003400000425277.pdf

The overall moral hazard problem is the fee based system in connection with ratings on mortgages. With every rating the rating agency is compensated with a fee; this has the potential of creating conflicts of interest that may result in moral hazard. The conditions for moral hazard are that the action of the credit rating agency would be different if it carried the risk of the action. The expansion of structured credits has turned out to be a very lucrative business for the agencies. But it is not only the credit rating agencies that are making money out of the corresponding deals, also the arranger that securitizes the mortgages has a big monetary interest in the rating provided by the agencies. The technique arrangers apply to make profits is to bundle a pool of mortgages in a way that increases its value. This is basically done to get a higher stream of interest and principal than they are paying on the mortgage bonds. It should be clear that the conditions for moral hazard are in place in this bilateral transaction because if the rating agency accepts lower quality in the mortgage pool it will increase the arranger's profit while not carrying any risk itself at the same time. The incentive is increased by the repeated transactions the credit rating agency has with the arranging companies and the concentration of the arrangers. These repeated dealings are making the arrangers very important clients for the rating agencies, thus leaving them more powerful. The danger is that the fear of losing these large clients which may result in ratings that provide a bigger AAA tranche. It is possible for the rating agencies to act in such a fraudulent manner as they hold little risk in the transaction. Graph 6 below illustrates the importance of structured finance to Moody since 2002[76], showing that it has developed into being the segment that produces most revenue. Also interesting is the growth that is illustrated in the structured finance segment in comparison to the other segments.



Graph 6 - Moody's Corporation Quarterly Revenue by Segment from 2002-2007

[76] Moody's Corporation, "Investor Presentation" direct link: http://library.corporate-ir.net/library/12/123/123831/items/236937/MCO%20March%20Long%20FINAL.pdf, March 2007

As noted, credit rating agencies may face the fear to lose their important clients, the arrangers. If the arrangers are not getting the desired rating from one of them, there is nothing that prevents them to try one of the competitors. It is important to mention that until now there has been no evidence of fraud in the transactions between agencies and arrangers[77].

Another issue to consider is the discretion related to rating models. The arrangers' profit-level is determined by how well they are able to bundle the mortgages with the thinnest layer of credit enhancement. This causes them to design the credit enhancement to just reach the desired rating. In order for the arrangers to optimize the structure they need the models used by credit rating agencies. A former Moody securization expert says:

"Every agency has a model available to bankers that allows them to run the numbers until they get something they like and send it in for a rating,"78

Even if the arrangers did not have access to the rating models, it would not be hard for them to figure out these. This is related to the repeated business they have with each other; the more ratings they get on their SPVs, the easier it is to look through the system as which they rate. The process of designing credit enhancement is not illegal but the close collaboration between the credit rating agencies and arrangers can cause problems, because both have an interest in the expansion of the structured financing market[79].

Rating model

Another much discussed issue regarding credit rating agencies is the models used to value the sub-prime mortgages backed securities. There should be no doubt that the ratings on mortgage securities were priced falsely. Basically two things may be wrong with the ratings. One reason is that the information provided by arrangers and originators is false which has caused wrong prices on the securities. Secondly, rating agencies have made wrong pricings on bonds because they have used the wrong models when pricing sub-prime mortgage backed securities. Much of the discussion in this thesis this far has been directed to the first concern that there have been elements in the securization structure that created fraud and thus that the information given to rating agencies has been false. Because of this the focus on the above mentioned second aspect

As a consequence of the losses and downgrading in connection with mortgage backed securities rating agencies have been accused of not providing the right rating or using the wrong model. Some

[77] Roger Lowenstein "Triple-A Failure" The New York Times, April 27, 2008
[78] ibid
[79] ibid

of the problems in the securization structure might have contributed to the use of wrong rating models. Surprisingly enough the agencies have left out some information in their models that historically has been considered significant. In 2007 Moody released a report saying they would increase the level of loan information in their models. There was a need to reevaluate the model first introduced in 2002 due to many new products and the expansion of risk associated with them.[80] Among the new data requested was DTI ratio and information about which lender originated the loan. In times where the housing market is raising the DTI ratio is less important as the appreciation of houses generates equity to the borrower. In contrast to that, the DTI ratio is one of the key aspects in declining markets, being an indicator on how capable the borrower is to pay the down payments on the mortgage. Increasingly important is furthermore the effect of the increase of automatic underwriting and automated appraisal. The models utilized are based on statistical data concerning mortgage performance. It is likely that rating models do not account for the fundamental changes seen in the structure of the market[81]. As described earlier the introduction of automated underwriting has been one of the drivers behind fraud in the origination process. Another pressing issue is how well the model works to evaluate risks. Studies have shown that they have been designed for greater efficiency in rising markets but there is less evidence as to their effectiveness in a slowing economy[82].

Concluding, it is obvious that credit rating agencies have had an inventive to conduct moral hazard behavior when rating mortgage backed securities and CDOs. Structured finance has become an increasingly important source of income which might have created some conflicts of interest. Because of this conflict some evidence maybe points towards flaws in the rating models. Nonetheless, the main problem has been investors' huge reliance on ratings which agencies could without having to deal with any consequences.

4.1.2.6. Investors

The investors in especially sub-prime mortgage backed securities and CDO are the ones that have suffered the losses in crisis. As we saw in the example with the pension fund, institutional investors are trading through portfolio managers. In the example, the portfolio managers shifted from guaranteed bonds to mortgage backed securities that did not offer the same protection against credit risk.

[80] Moody's Revised US Mortgage Loan-by-Loan Data Fields, Apr. 3, 2007 in Mason et al "Where Did the Risk Go? How Misapplied Bond Ratings Cause Mortgage Backed Securities and Collateralized Debt Obligation Market Disruptions" May, 2002, source: http://ssrn.com/abstract=1027475
[81] Mason et al "How Resilient Are Mortgage Backed Securities to Collateralized Debt Obligation Market Disruptions?" February 13, 2007, source: http://ssrn.com/abstract=1027472
[82] Ibid

Investors are looking at an adverse selection problem when investing in mortgage backed securities. The arranger has much more knowledge about the mortgages in the pool than they have, thus he has the incentive to hold the best of the mortgages in their own portfolio and resell the bad once to investors. This is the same problem that the arranger has in relationship with the originators. As an investor you want more information and thus to diminish the adverse selection problem. One way to do this is conducting due diligence on both the arranger and the originator. By doing this, there is a chance to detect possible systematic fraud. Another way is to depend on rating that the credit rating agencies are providing. At this, you are counting on a third party's opinion about the mortgages' credit risk. The last option is to get a credible commitment from the arranger that the pool of mortgage is of high quality. One method could be to make the arranger hold the credit risk. In the structure of the sub-prime mortgage backed securities this is not possible because the arranger is moving the pool of mortgages to an SPV that removes the credit risk away from his balance. Therefore, the investor is left with either conducting due diligence or counting on the credit rating agencies' opinion on the credit risk in order for the investors to conduct own due diligence.

The fact that most investors are trading through portfolio managers creates the first moral hazard in connection with sub-prime mortgages. During times when the interest rates are very low, investors are looking into securities that give high yields. In the example with the pension fund the portfolio managers shifted towards fixed income investments with higher yield but with the same credit rating. By doing this, they got a higher risk that originally was intended.

Being a portfolio manager involves a principal/agent relationship. It means that the portfolio manager does not carry the risk of the invested money and thus has a potential for moral hazard behavior. One of his responsibilities is to conduct due diligence on the arranger and possibly also the originator. If the investor does not provide the correct incentive to the portfolio managers, they are inclined to slack on the quality of the due diligence. Many of the investors in mortgage backed securities and CDOs are trading for a hedge fund, bank or investment bank. These investors are in the market for fixed income investments. In times of low market rates these types of investors are looking into markets that provides higher yield on fixed income. This interest may cause them to conduct moral hazard behavior, which eventually means that they will be inclined to trust blindly on the ratings of the rating agencies in the hunt for high returns.

4.1.2.7. Servicer

The role of the servicer is to ensure the timely payment of principal and interest. He is making money every time the borrowers are making the timely payment on the mortgage, aligning the

interest with the investors. It is therefore also in the servicers' best interest to keep borrowers in their house and paying their mortgages as long as possible.

There are two frictions that are especially important when it comes to moral hazard behavior of the servicer. In the event of the borrower having problems with the payment on the mortgages, he is very likely to have troubles covering other important expenditures such as insurances, taxes and maintenance on the property. The failure to fulfill all these financial obligations can reduce the value of the property. The problem then lies between the borrower and the servicer in the event of delinquent payments. If there is high risk for delinquencies, the incentive for the borrower is to pay those costs is low, thus making the servicer paying the expenses. The insurance and tax payments increase the costs to the servicer who is fist in line to get his expenses covered when the property is sold.

Another difficulty potentially occurring in the case of delinquencies is the servicer's moral hazard behavior. Since he is first in line to get his expenses covered, he is likely to inflate the costs in connection with the foreclosure. In many cases servicers are able to renegotiate the loan criteria and for that reason making the borrower staying in the house. The problematic issue here is that the servicer might have a higher interest in foreclose than in restructuring the mortgage. This happens because the servicer may be reluctant to engage in such activities if there is uncertainty that the transaction will generate sufficient excess cash flow to reimburse the servicer's costs. If he chooses to restructure the mortgage, costs amount to $750-$1000[83].

The relationship between investors and servicer may also suffer from the free rider problem. It is too costly for the individual investor to monitor the actions of the servicer. Due to this lack of monitoring, there is a higher chance of moral hazard behavior on his part. One of the servicer's purposes was to diminish this problem but as we saw, is his incentive not always fully aligned with the investors.

[83] Steven L. Schwarcz, "Protecting Financial Markets: Lessons from the Subprime Mortgage Meltdown" in Minnesota Law Review, Vol. 93, No. 2, 2008; Duke Law School Legal Studies Paper No. 175, 19. February, 2008

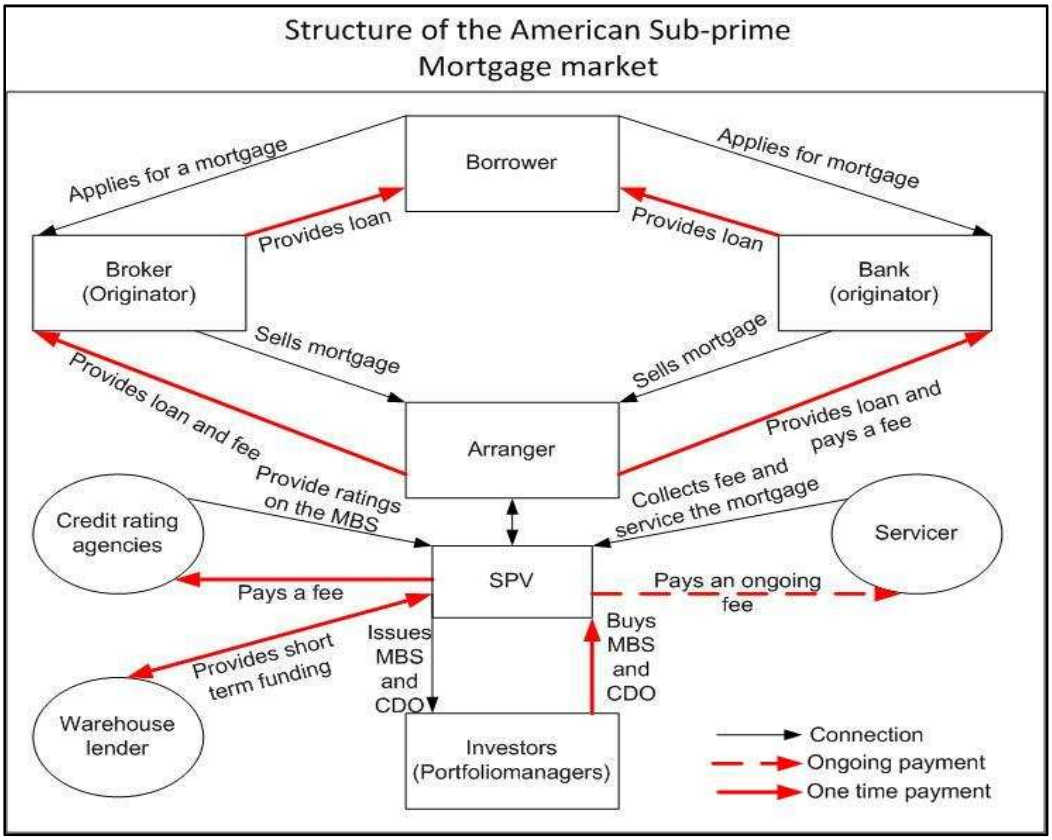


Figure 3- Illustration of the processes in the structure of the Sub-prime mortgage market, authors own illustration

4.2. GSE mortgage backed securities[84]

The GSE mortgages are historically one of the main drivers behind the expansion in mortgage backed securities in America. They have a special place in American economy due to their historic links to the government. This guarantee has given them advantages compared to other players in the mortgage market but also resulted in some restraints that have influenced the way they do business.

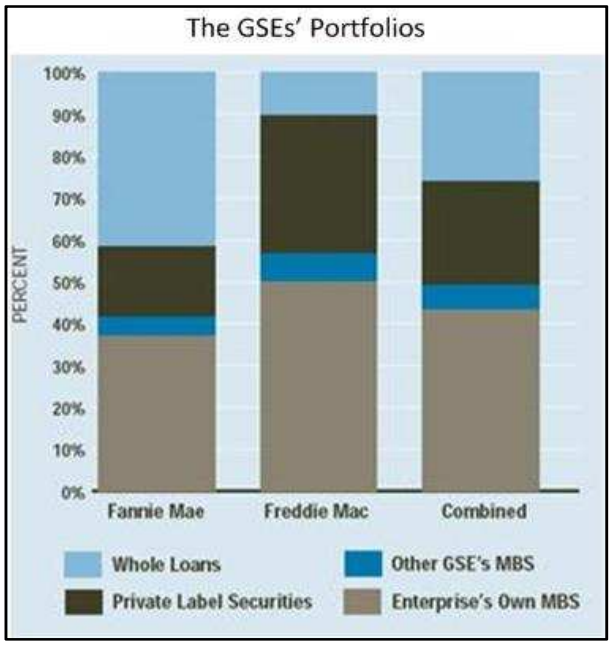
The first one of these only allows them to invest in residential mortgage finance which leaves them highly exposed to the mortgage market. Secondly, they are only allowed to operate on the secondary market, meaning that they are not permitted to originate loans. Thirdly, they may only trade conforming loans with the constraints described previously. And finally, they are subject to "mission oversight" by the Department of Housing and Urban Development (HUD) meaning that they should aim to providing mortgages to different income groups and different areas. In other words, they are supposed to aim at providing mortgages to mid and low income groups and underserved areas. In return there are a number of advantages which among other include exemption from state and local income taxes. Another advantage lies in the fact that they are able to

[84] Scott Frame and Lawrence White "Fussing and Fuming over Fannie and Freddie: How Much Smoke, How Much Fire?" in The Journal of Economic Perspective Vol. 19, Iss. 2, Spring, 2005

issue securities that are classified as “government securities” giving them a number of privileges, especially rendering them eligible for use as collateral for public deposits, for purchase by the Federal Reserve in open-market operations.

Both Freddie Mac and Fannie Mae are in the market of mortgages and mortgage backed securities only. Since they are not originating the loans themselves, they are operating solely in the secondary market for mortgage backed securities. They are doing business in two different areas. One is to swap pools of mortgages into securities issued by and guaranteed by one of the GSEs. The GSEs are assuring that the originator receives the timely payment less 20bp on the remaining principal. When the GSE are doing this they are providing a safety towards the investor in form of a default guarantee that the swap offers. As a consequence, the mortgages are staying on the originators balance and the GSEs are holding the credit risk.

The other business of GSEs is in mortgage investment which happens through purchases of mortgages directly from originators. As it is the case with the swap program they are only investing in mortgages that meet the conforming standards. Another investment opportunity is through investment in highly rated mortgage backed securities. This allows the GSE to also invest in pools of private label mortgages. Arrangers of sub-prime backed securities are often able to construct the most senior of the tranches so that it enables the GSE to invest in them. This tranche consists only of mortgages that have a lower principal balance than the conforming loan limit. Graph 7 shows the composition of the enterprises portfolio[85].



Graph 7- The GSEs' Portfolio in 2007

The GSE are issuing two types of mortgage backed securities in the market. One is the pass-through mortgage which is also known as Mortgage Participation Certificates (PCs). The other is pay-through mortgage backed securities that uses PCs as collateral in a CMO structure. This allows the GSEs to have a wide range of investors with different preferences. Because of the complexity in

[85] Office of Federal Housing Enterprices Oversight, “2007 Performance and Accountability Report”, direct link: http://www.ofheo.gov/media/pdf/OFHEOPARNovember2007508.pdf

prepayment and market risk the investors in mortgage backed securities are usually institutional investors[86]. Graph 7 illustrates how the enterprises are themselves large investors in GSE mortgage backed securities.

As an additional funding the agencies are issuing bonds without any mortgages as backing; these are known as agency bonds. Most of these are inconvertible benchmark bonds, with 2, 5, 10 and 30 years maturities. Their structures are like government bonds only with a premium on the rate. This permits the GSEs to sell the securities to a wider range of investors which also includes a large part of private investors. The demand for agency bonds has historically been high which also can be seen in the low bid/offer spread. On top of this there is the government guarantee which facilitates cheap funding on the GSEs' investments. Figure 4 illustrates the investment and funding process of the GSEs.

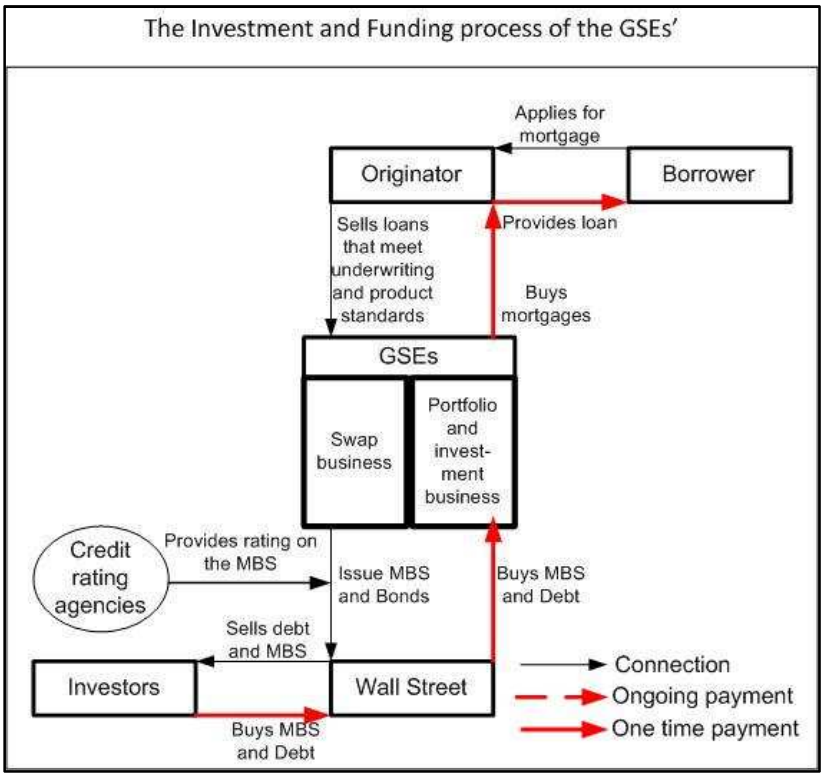


Figure 4- Investment and funding process of the GSE', authors own illustration

4.2.1. Moral hazard in GSE mortgages

The GSEs are subject to some of the same moral hazard issues as in the private label market. There exist two main differences between the private label market and the GSEs that affect moral hazard issues in the structure. One is the government involvement in the origination of mortgages and the

[86] Henrik Braun et al, "Amerikansk realkredit", Finans Invest nr. 8, August, 2000

other is the structure which is somewhat simpler than the one of private label. Section 4.2.1. will go through the moral hazard in the GSEs with special focus on these two differences.

Many mortgage banks are originating both private label loans and conforming loans. The originating process of conforming loans is therefore experiencing similar problems as seen in the private label market. The GSEs have played a role in this as they promoted the use of automated underwriting which presents a risk for moral hazard behavior as I have showed earlier. A consequence of the automatic underwriting is that borrowers with very high LTV are able to get a mortgage if they have credit score or otherwise have conditions that serve as counterweight to the high LTV. This has had the consequence that families with down payments as low as 3% were able to get a GSE mortgage[87].

During the latest years there has been evidence that GSEs have been involved in sub-prime lending. This connection is interesting; the conforming loan standards are in place to insure that the quality of the loans is high, though over the last years the lending standards have decreased. This decrease is a consequence of two separate issues. One lies in the underwriting standard which by introducing automatic underwriting has lowered the LTV ratio. This report will not judge whether the relaxation in relation to the LTV ratio is justified by good credit rating. Another factor that has pushed the GSE into sub-prime lending involves the pressure from both government and investors to provide loans to lower income groups. Both of the GSEs are under mission oversight by the HUD to increase lending to these groups. In 1999 they did lower their underwriting standards, among other due to pressure from both the HUD and the Clinton administration[88]. This lowering had the sole purpose of decreasing underwriting standards to low and mid-income groups. Looking back, the politicians' desire to promote cheaper mortgages to low and mid-income groups was too excessive because it pushed the GSEs to invest heavily in sub-prime mortgages although this was not their purpose of the GSEs[89]. The bailout of the GSE can be explained by their involvement in sub-prime investment. Examining their portfolio, a large part is invested in private-label mortgage backed securities. In mid-2008 the two companies had lost $45 billion due to decline in their mortgage backed securities. This number would have been even higher if they had not been able to label this decline as temporary[90]. Another issue includes the GSEs' development in risky mortgages such as ARM and hybrid ARMs. Along with the increasing exposure to sub-prime mortgages the GSE also

[87] Reality Times staff, **"**Fannie Mae Urges Lenders To Explain Rejections" in Reality Times, January 17, 2000
[88] Steven A. Holmes, "Fannie Mae Eases Credit To Aid Mortgage Lending", The New York Times, September 1999
[89] Arnold King "Freddie Mac and Fannie Mae - An Exit Strategy for the Taxpayer" Cato Institute Briefing Paper no. 106, September 8, 2008
[90] Fred Moseley "The Bailout of Fannie Mae and Freddie Mac" Dollars and Sense - The Magazine of Economic Justice, September 2008

started to invest in these types of mortgages. This investment strategy therefore marks another shift towards more risk exposure.

The development towards more risky mortgages is a moral hazard issue. When the government guaranteed all payments on Freddie Mac and Fanny Mae it was not a big surprise for investors. The implicit guarantee had given the GSEs very lucrative funding possibilities for many years and may easily have been a driver for moral hazard behavior because of the missing down side from the GSE management's point of view. A major problem regarding the GSE is related to this government's involvement in the GSEs business. It has given them an advantage compared to any other competitor on the market for conforming loans. As the crisis unfolded especially the GSEs semi-government structure has been a subject of critique. This is seen in the FBI investigation on irregularity in the GSEs' relationship with legislators. The allegations stress the use of lobbyists to prevent regulations on the two enterprises. This type of arrangement is common in American politics, however the FBI is investigating to find any irregularities[91]. The GSEs, on the other side, have been pleased with the implicit guarantee since it has enabled them to finance their mortgage business at a low cost. Holding the cheap financing up against higher income from sub-prime lenders has been a profitable business. The problem with moral hazard arose due to implicit government action that has enabled the GSEs involvement in the sub-prime mortgage market. The question is whether the shift towards investment in sub-prime is a result of too little regulations by government or by pressure from legislators to provide financing to low and mid-income groups.

None of the investors in GSE securities have suffered any losses in relation with the sub-prime mortgage crisis. The GSE have through the years moved more into investing in private label mortgages as well as the movement to automatic underwriting has also encouraged loans to sub-prime borrowers. Securities issued by the GSE have had the full faith and credit of the institutions. With the governmental takeover of the companies this guarantee is now government proofed. Thus, the losses in connection with sub-prime investments are being taken by the government.

4.3. Composition of loans

Another important issue is how the loans have been structured as it determines how much money the individual borrower must use to handle swings in the economy. As described in section 5.3. the American mortgage market introduced to new types of mortgages. It is found sensible to consider how the structures of the loans have contributed to the sub-prime crisis from the borrowers' point of

[91] Martin Burchart, "Politikere under mistanke for korruption" in Information, September 25, 2008

view. The motivation for examining the loans from the borrower's perspective is the rationale that if the borrower can pay his mortgage payments, there will be fewer foreclosures and thus fewer defaults in the mortgage backed securities. Thus, the thesis does not take into account possible commitments from the originators to repurchase the mortgage as a consequence of predatory lending or in other ways breaching the warranties and representations made.

Section 4.3, looks at how the structure of the loan exposes the borrower to payment shocks and the exposure to the risk of insolvency. The payment shock is a function of several issues. One is the payment schedule of the mortgage. Both FRM and the different types of ARM that are in the market is dealt with. Due to the increase in ARM in the last years it is important to examine the details of these loan types to see how they affect the borrower's economy. House prices and initial LTV ratio present further factors that contribute to the payment shock.

A driver for taking an ARM is to refinance towards a loan with better conditions after the initial period. In order to receive better conditions the borrower usually has to display better qualifications as lower LTV, higher income and better credit history. In an environment with increasing housing prices he will have built equity that could help qualifying for better loan conditions. On the contrary, if the initial LTV-ratio is high, he will have a harder time improving his situation in a declining housing market.

4.3.1. Traditional mortgages

Traditional mortgages are the FRM with pre-payment option at par which is the loan with the highest outstanding balance in America. The FRM are being securitized on a pay-through basis meaning that there is no direct connection between the lending and funding side. This has the effect that when interest rises, the level of prepayments will drop. The prepayments seen in this period will primarily be linked to movement.

Given that the borrower is holding the mortgage to maturity, the borrower will experience no payment shock in the mortgage payment. Thus, he is protected from interest rate risk in his mortgage payment. Concerning the FRM, the borrower is not completely protected against market risk though. Along with the increase in interest rate the borrower can experience loss of equity. This is because the loan does not fall in value as interest rates increase, assuming of course the assumption that increasing interest rates result in lower house prices.

4.3.2. ARM and ARM based loans

ARM is a type of loan where the borrower has different payments on his mortgage depending on the underlying interest rate. The main dissimilarity between the ARM and FRM is the increase in interest rate risk embedded in the ARM.

The nature of the ARM is connected with some amount of risk since the mortgage payment is determined by macro economic factors. Many of the ARMs on the American market are correlated with the LIBOR rate. From graph 1 we can see that the interest rate from 2004 to 2006 has more than doubled which can cause serious payment shocks on the ARM loans. The loan with the highest payment shock is the interest only ARM, the increase in the LIBOR is duplicated to the increase in the mortgage costs. Borrowers who have paid off some of the principle are not as affected but may experience high level in the mortgage payments. Ashcraft and Scheurmann (2008) made calculations on the payment shocks regarding different types of mortgages. Calculations show the pay shock under the assumption of an unchanged development in the LIBOR rate. They are made on a $225,000 loan and LIBOR on 5.31% throughout the loan cycle. Loan details are found in the table 4.

Loan details GSAMP Trust 2006-NC2

Loan Type	Gross Rate	Margin	Initial Cap	Periodic Cap	Lifetime Cap	Floor	IO Period
FIXED	8.18	X	X	X	X	X	X
FIXED 40-year Balloon	7.58	X	X	X	X	X	X
2/28 ARM	8.64	6.22	1.49	1.49	15.62	8.62	X
2/28 ARM 40-year Balloon	8.31	6.24	1.5	1.5	15.31	8.31	X
2/28 ARM IO	7.75	6.13	1.5	1.5	14.75	7.75	60
3/27 ARM	7.48	6.06	1.5	1.5	14.48	7.48	X
3/27 ARM 40-year Balloon	7.61	6.11	1.5	1.5	14.61	7.61	X

Table 4- Loan details for GSAMP Trust 2006-NC2

The information is taken from a prospector of a pool of 3,349 sub-prime loans[92]. The composition of loans is congruent with the overall composition in sub-prime market. Around 88% of the mortgages in dollar amount are ARM with the majority of these being 2/28. The amount of ARM is a bit over the average of 69% in 2006[93].

[92] SEC.gov, "Prospectus for GSAMP Trust 2006-NC2" Direct link: http://www.sec.gov/Archives/edgar/data/1366182/000112528206003776/0001125282-06-003776.txt

[93] LoanPerformance (2007) in Adam B. Ashcraft and Til Schuermann, "Understanding the Securitization of Subprime Mortgage Credit", a Federal Reserve Bank of New York Staff Reports, March 2008

Monthly Payment across Mortgage Loan Types							
Month	30-year fixed	30-year fixed	2/28 ARM	2/28 ARM	2/28 ARM IO	3/27 ARM	3/27 ARM
1	$ 1,633.87	$ 1,546.04	$ 1,701.37	$ 1,566.17	$ 1,404.01	$ 1,533.12	$ 1,437.35
24	1.00	1.00	1.00	1.00	1.00	1.00	1.00
25	1.00	1.00	1.14	1.18	1.19	1.00	1.00
30	1.00	1.00	1.14	1.18	1.19	1.00	1.00
31	1.00	1.00	1.26	1.32	1.45	1.00	1.00
36	1.00	1.00	1.26	1.32	1.45	1.00	1.00
37	1.00	1.00	1.26	1.32	1.45	1.13	1.18
42	1.00	1.00	1.26	1.32	1.45	1.13	1.18
43	1.00	1.00	1.26	1.32	1.45	1.27	1.34
48	1.00	1.00	1.26	1.32	1.45	1.27	1.34
49	1.00	1.00	1.26	1.32	1.45	1.27	1.43
60	1.00	1.00	1.26	1.32	1.45	1.27	1.43
61	1.00	1.00	1.26	1.32	1.56	1.27	1.43
359	1.00	1.00	1.26	1.32	1.56	1.27	1.43
360	1.00	83.81	1.26	100.72	1.56	1.27	105.60
Amortization	30 years	40 years	30 years	40 years	30 years	30 years	40 years

Table 5-Monthly payment across mortgage loan types from 1-360 months, increases in percentage.

Table 5 reveals that most exposed is the 2/28 ARM interest only mortgage. The payment shock is 45% after 30 months. More interesting is the 2/28 ARM with a 40-year amortization scheme. This type of mortgage accounts for 51% of this specific mortgage pool and experiences a payment shock at 32%.

Given the increase in interest rate we have seen from 2002 to 2006, this picture is far worse. The main problem with this payment shock lies in the fact that the main borrowers of these types of mortgages are sub-prime borrowers. This has the effect that if house prices depreciate, they cannot extract equity and thus are experiencing an increase in the debt-to-income ratio. Ashcraft and Scheurmann also make calculations on the DTI-ratio for the different loan types under the same conditions as mentioned before. These calculations assume no other debt than mortgage debt and a starting DIT ratio on 40%. With no change in the LIBOR rate the DIT-ratio is 50.45% for the 30-year ARM and 52.86% for the same mortgage with 40-year maturity. To set this in perspective, the DIT-ratio for a FHA mortgage is 29% when not accounting for any other debt[94].

The overall composition of the American market displays an overweight of FRM. With this high concentration it is somewhat protected against payment shocks due to increase in the interest rate. However, the group of borrowers who is the main recipient of the ARM consists of sub-prime borrowers. A study by Cagan (2007) displayed the impact on the foreclosure rate due to payment shocks for ARM in originations from 2004 to 2006. Among the findings Cagan showed that 22.4% of sub-prime borrowers are estimated to have no equity in their homes, about half have no more than 10% and two-thirds have less than 20%. This implicates that a 10% decline in the housing market would render over half of the sub-prime borrowers insolvent. The study shows how vulnerable the sub-prime market is to interest and the house price depreciation that followed it. A

[94] Justin Prichard, " Pros and Cons of FHA Loans" in about.com

small safety enclosed in ARM-hybrids is the embedded interest rate caps and periodic caps. The periodic caps make the borrowers immune against increases higher than a predetermined cap. In the previous example the periodic cap was 150 bp and interest rate cap at 15.62%. In comparison to the initial interest rate the lifetime cap seems very high and the borrower might be better off without it.

It follows the conclusion that even though the American market is dominated by FRM that has no payment shocks imbedded in it the market is vulnerable to increasing interest rates. This is due to the sub-prime borrowers who are the main recipient of the ARM based mortgages. None of the current mortgages in the market provides any protection against depreciating house markets. While the underwriting standards have fallen in relation to the LTV-ratio especially among sub-prime borrowers, the risk of insolvency on a larger scale is predominant.

4.4. Sub conclusion

This analysis of the American market for mortgage backed securities has shown the main problems in its structure. The examination's goal was to find the weaknesses in the system that have contributed to the losses within sub-prime. There are many issues that have proven to be troublesome within the system. The American market is, generally speaking, divided into two different segments. One is the GSE segment who invests in relative safe conforming mortgages and the other is the private label segment.

The GSEs are selling both pass-through PCs and pay-through mortgage backed securities. The GSEs have, in comparison to the private label market, underwriting standards determined by the treasury that should protect them against declining housing market. Those standards made by the GSE showed not to be sufficient and even though the underwriting standards were tightened in 2007, this was not enough to prevent a takeover by the government in 2008. The private label sector does not have the same underwriting standards as the GSE, in fact the legislation in this area is very liberal. This can be seen in the low documentation requirement there. Private label mortgages are using the pay-through method where the mortgages are securitized into different risk tranches.

The analysis included how the market for mortgage backed securities was affected by moral hazard and adverse selection and how this problem weakened the structure. The findings comprise that the sub-prime mortgages securization process has indeed several features that may encourage moral hazard behaviors. First of all the fee-based system is in general a driver for such behavior. The importance of fees is especially observed in two structural frictions; the brokers' fee for originating mortgage and the rating agency's fee in the ratings of structured financing products.

To start with, the underwriting standards were lowered which encouraged more loans granted to sub-prime borrowers. The lower underwriting standards were fueled by the fee-based system between mortgage brokers and originators that gave incentive to conduct moral hazard behavior. Especially when looking at the broker originated loans, there was evidence of a high fraud level. An important factor was the increase in the use of automatic underwriting and appraisal systems that enables the brokers to commit fraud. The automatic systems therefore ease fraud, nevertheless also the originators' moral hazard behavior removed the control mechanism that should prevent such situations. As the mortgage was easily sold to an arranger the originators' incentive to properly check the quality of the mortgage applications and conduct proper due diligence was decreased.

The safeguards in place to prevent originators selling mortgages that were originated with predatory lending or on false basis were the warranties and representations. These turned out not to be credible as mortgage brokers did not have adequate capital to buy back the mortgages. Also the arranger should be blamed since they should have conducted proper due diligence on the originators to detect moral hazard behavior by the originator. The second major problem with the fee-based system is present in the credit rating agencies that have gained increasing influence in the development of mortgage backed securities and structured products as a whole. The ratings are essential to making structured finance because it allows for different institutional investors to invest in the securities. Along the way, the agencies' ratings became a quality stamp that seemed to be sufficient for the investors. With rating of structured financing products as the main source of income and only few issuers of structured financing products it gave a high incentive for credit rating agencies to conduct moral hazard behavior and thus to ease the demand for credit enhancement.

As a consequence of the decrease in the federal fund rate after 2001 bond investors looked for investment opportunities that gave a high yield in a market where rates were very low. The answer was to invest in structured products such as sub-prime mortgage backed securities and CDOs. Considering the experience made in the sub-prime mortgage crisis, investors have not been critical enough about the rating. It seems like they blindly trusted them. When the spread on two AAA rated papers are between 5-6%, which was the case with CDO and government backed securities, it should be clear that there is a significant difference in risk. The investors' lack of criticism can be explained by an adverse selection problem. When evaluating a mortgage backed security investors have a hard time evaluating the quality of this pool. To do so, they use the credit rating agencies instead of getting credible commitments from the originators or to make due diligence. When investors trust the ratings the adverse selection problem is removed.

The payment structure of the mortgages in the American market was also analyzed. It focused on the risk of payment shocks and the protection of equity. During the last years the ARM and ARM-hybrids have become increasingly popular in mortgages market. Overall the predominant mortgage remains to be the FRM with app 75% of the outstanding mortgages in 2006. This means that the overall market is protected against payment shocks. The trouble remains though that sub-prime borrowers are accounting for most of the ARM and ARM hybrids on the market. With very high LTV ratios in this segment and high payment shocks on these mortgages it will result in very high DIT-ratios when the housing market is not rising. The existence of the ARM hybrids is a main contributor to the high numbers of foreclosures within sub-prime mortgages.

5. Analysis of the Danish Mortgage market

Section 5 goes through the Danish mortgage market to define its characteristics. The American system caused great losses to its investors, an issue that has not happened in more than 200 years. It is therefore interesting to analyze whether the Danish system has some of the same weaknesses as the American. The Danish mortgage market has been an inspiration to other countries when designing their mortgage market. This is best illustrated in the Mexican economy where the government in 2005 decided to introduce a mortgage system. They chose the Danish mortgage system to replace the current system where house purchases were financed through expensive bank loans[95].

In 2007 the Danish government altered the conditions of the mortgage market with changes in the legislation for mortgage backed securities in Denmark. The decision modified its structure and is therefore important when analyzing this. The new rules allow banks and mortgage institutions to issue covered bonds which are mortgage backed securities more aligned with other European countries. It has been discussed how the new covered bonds, also known as SDOs (Særligt dækkende obligationer / Covered Bonds), will affect the stability of the mortgage backed securities in Denmark. With their adoption the market is moving away from a pure pass-through system to a system where the balance between mortgage payment and bond payment is less tight.

The analysis will initially look at the Danish system before the SDO introduction in 2007. I find the Danish system pre 2007 particularly remarkable because it contains a very unique pure pass-through structure. Alongside the implementation of the SDOs many of the principles from the old system pass-through structure have been kept. Therefore, the analysis will look at the old system

[95] Realkreditrådet, ”Dansk realkredit i Mexico” in realkreditraadet.dk

first and subsequently look at how the mortgage backed securities market has changed after the introduction of SDO loans. Finally, section 6 look at whether the problems with mortgage backed securities in America can be found in the Danish system.

5.1. Structure of the mortgage backed securities before 2007

The Danish mortgage market has historically been a market dominated by using only the pass-through method in the mortgage bonds. Like in the American market borrowers have the option to buy back the mortgage at par meaning that the investors are subject to pre-payment risks. Unlike the American mortgage market though the regulations concerning the matching of cash-flow from borrower to investors are very strict. Mortgage banks in Denmark cannot retain the prepayment risk and are thus permitted from using the pay-through method. A consequence of this is that innovations in mortgage loans have to be reflected in the funding side[96]. During the last decade there have been introductions of several different types of mortgage loans. Examples of these are the 30-year ARM with a 10-years interest-only period and loans with caps on the interest payment, the so-called capped floaters. Both of these loans have series of bonds with the same features. Bonds issued and collateral must be assigned to specific capital centers within the mortgage credit institution[97].

The structure is moving all but the credit risk away from the mortgage credit institutes. All prepayment risk and market risk are taken by the investors and the role of the mortgage credit institute is to be an intermediate that assures a well functioning market. As compensation for carrying the credit risk and the servicing, the mortgage credit institute is charging a fee ranging between 30 and 80 bp from the outstanding principal, this rate varies with the LTV ratio[98]. The fee is added to the borrowers' interest and not the investors. The default risk on the Danish mortgage backed securities is thus dependent on the performance of the mortgage credit institution. In the event of the mortgage credit institution file for bankruptcy, the investors have priority to the assets in the capital center. The investors in the capital center has preferential claim against the assets of other capital centers before other ordinary creditors[99].

Due to the balance principle borrowers are able to buy the underlying bonds in the market releasing them from the loan commitment. This motivates them to buy-back the mortgage bonds in times of

[96] Allen Frankel et. Al., "The Danish mortgage market" in BIS Quarterly Review, March, 2004
[97] Realkredit Danmark, "Danish Mortgage Bonds", August 2007, direct link: http://www.danskebank.com/da-dk/ir/Documents/Other/DanishMortgageBondMarket2007.pdf
[98] Information found on www.Mybanker.dk
[99] Nykredit, "Danish covered bonds" September 2007, source: http://www.nykredit.dk/marketsdk/ressourcer/dokumenter/pdf/NYKR_DanishCoveredBonds_WWW.pdf

increasing interest rates. In this case the value of the loan falls and thus reduces the outstanding principal on the mortgage. Borrowers will often refinance with the effect of a mortgage with higher interest rate but lower outstanding balance. Although there is a possibility to buy back the bonds in times of rising interest rates, the predominant reason for refinancing remains to be motivated by borrowers who use their right to exercise at par.

To ensure the liquidity of the bonds they are listed on the stock exchange and the price is insured by a market marker arrangement. It is organized between nine Danish banks that act as brokers on behalf of related investors. Originally, the market maker arrangement was entered into in order to ensure liquidity on the bond market. In recent years there have been some irregularities in this arrangement which has resulted in relative large price differences between similar series of bonds. As an outcome of this there have been situations where the mortgage credit institutions have set a price on the bonds to reduce the price difference[100]. Regarding the ARM mortgage credit institutions are having an annual auction on one year bonds to finance it. The auction is usually taking place in December where investors are deciding on the interest rate on the one year bonds. The majority of the ARMs is priced this way, only the caped floaters are tied to index and are therefore not priced on this auction.

With the relative simple nature of the pass-through mortgage the system is very transparent. This is again advantageous in relation to its liquidity among mortgage investors. Among the rules of credit mortgage institutions it is set that they are only allowed to take a minimum market risk. A sub-limitation is very strict rule with regard to using options to hedge the market risk. In the traditional balance principle mortgage credit institutions are only allowed to hedge risk with derivatives in up to four years[101]. The lack of derivatives leaves investors with less complicated models to measure the risk and price on the bonds.

5.1.1. Underwriting and appraisal process

When a person in Denmark wants to finance a property or refinance his mortgage he will have to contact a mortgage credit institution or a commercial bank in order to receive the loan. Real estate agents are also providing the contact to mortgage credit institutions but will not participate in the lending process. Most banks are affiliated with one of the mortgage credit institutions. The two largest banks, have ownership in a mortgage credit institution; Danske Bank owns Realkredit Danmark and Nordea owns Nordea credit. The mortgage credit institutions are both originators and

[100] Mikkel Røgild, ”Særligt dækkende obligationer og investorerne” in Finans Invest nr. 5, May, 2007
[101] Finanstilsynet, ”Bekendtgørelse om obligationsudstedelse, balanceprincip og risikostyring”, in finanstilsynet.dk, June 2007

issuers in the Danish market. Banks originate, on behalf of the mortgage credit institutions, the mortgages. The largest real estate agents chains are subsidiaries of the mortgage credit institutions. Traditionally, the real estate agents business is structured as franchise organization, implicating that the individual agents are paying a franchising fee to be part of the chain. This means that real estate agents are individual businesses that have engaged in collaboration with the large chains.

The maximum LTV ratio for Danish mortgages is 80% for owner-occupied dwellings all year habitation. There is no limit on the maximum borrowing amount as long as the LTV ratio does not exceeds 80%. The mortgage credit institutions make an assessment on both the borrower's credit history and on the property. A combination of these two ensures that when lending concerning properties that are known to be at risk of declining in value there is a higher emphasis on the credit history of the borrower[102]. Other underwriting standards such as DTI-ratio are not determined by law but there is a common understanding within the industry that the lender must be able to pay a 30-year full amortized annuity loan in order to acquire a mortgage[103].

The mortgage credit institutions' close ties to intermediates allow the mortgage credit institutions in contact with borrowers both through refinancing which usually happens through banks and through new home financing. In connection with a new house financing the real estate agent will contact the mortgage credit institution who is in charge of the origination and underwriting of the mortgage. For banks the procedure is different as they also handle the underwriting linked with the mortgage. The banks are thus originating the loans but the mortgage credit institutions are holding the credit risk on the mortgages. To ensure that the originating banks are keeping a high underwriting quality the banks give the mortgage credit institutions a guarantee on the mortgages. The ones used by Nykredit are issued for an amount corresponding to the part of the loan that exceeds 60% of the property value at the time of granting and cover the first eight years of the term of the loans[104]. As compensation for the guarantees and for the servicing of the mortgages the originating bank receives a fee from the mortgage credit institutions. As of 2007, banks can choose to engage in a compensation model instead of the old guarantee model. Vestjyskbank, a bank affiliated with Total Kredit, is changing to the new system which means that banks can deduct losses on the banks originating loans on the future compensation fees[105].

[102] Realkredit Danmark, "Annual Report 2007" source: www.rd.dk
[103] ibid
[104] Nykredit, "Annual Report 2007" source: www.nykredit.dk
[105] Frank Kristensen, Bank executive in Vestjyskbank, "Letter to Finanstilsynet" March 2008, direct link: http://www.euroinvestor.dk/pdf/cse/138726-0.pdf

The appraisal value of the house is determined by an official appraiser in the area or in many cases, an appraiser within the mortgage credit institute. The mortgage credit institute will usually use their affiliated real estate agents for this procedure and this appraisal value is used to determine the financing need of the borrower. For certain types of property the appraisal may happen automatically. The mortgage credit institutions have different approaches to this, but as an example is automatic appraisal used on newly build property within Realkredit Danmark[106].

The borrower may freely choose between the different mortgage credit institutions in the market. Whether this is profitable, is questionable, in practice the price difference between the mortgage companies is fairly low. This is primarily due to the listed bond prices that keep the market uniform in regards to the bonds. The only price difference between the mortgage credit agencies is the ongoing service fee and other arrangement fees that will form a relative small part of the loan. All these prices are listed and are not affected by the credit worth of the borrower. Figure 5 is an illustration of the Danish mortgage market structure which also shows the engagements between the different intermediates in the market.

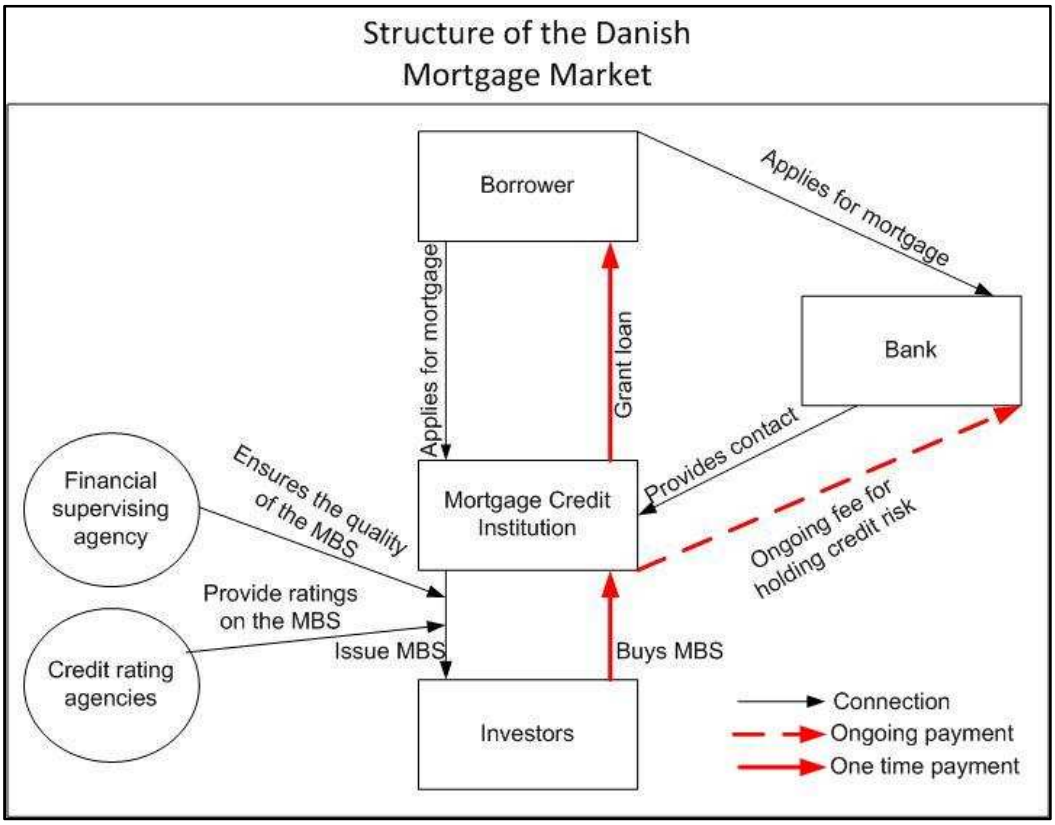


Figure 5- Illustration of the structure of the Danish mortgage market, authors own illustration

[106] Realkredit Danmark, "Annual Report 2007" source: rd.dk

5.2. Moral hazard in the Danish market for mortgage backed securities

In the Danish mortgage market, the structure is very simple when it comes to the securization of mortgages. In the middle of the structure is the mortgage credit institution that issues the mortgage bonds but also stands for many of the other processes.

5.2.1. Appraisal

An application for a mortgage goes through either intermediates or direct to the mortgage credit institution. Mortgage credit institutions use real estate agents from their affiliated real estate chain. The real estate agent's main source of income is to buy and sell houses which mean that they have an interest in seeing the house changing hands as often as possible. Because of this they might value the property too high to encourage speculative real estate investment.

In connection with refinancing the originator in turn will have an interest in seeing high appraisal from the appraiser as it releases more equity to be borrowed. This might create a conflict of interest as the real estate agent is not punished for too optimistic appraisal values.

5.2.2. Underwriting

Underwriting in the Danish market is characterized by being standardized; the underwriting criteria are relative uniform among the mortgage credit institution. In the American market we saw many of the problems being related to the broker/originator context. In Denmark there are only originators and issuer present, when the mortgage credit institutions are underwriting the mortgage originator and issuer are the same. In that case asymmetric information and moral hazard are thus out of question. When commercial banks are originating mortgages they do not carry the whole credit risk which could create moral hazard. This problem has been mitigated in the Danish system by different safeguards. The guarantee given by the banks holds them accountable for bad underwriting. It also encourages origination of good mortgage because they receive an ongoing fee as long as the borrowers fulfill their loan commitment.

On a micro level moral hazard behavior may exist in the form of predatory lending. A study made by Forbrugerrådet, a Danish consumer protection organization, showed that 90% of banking employees was under the influence of performance payment[107]. Such a scheme can present an incentive to the financial advisor to conduct predatory lending. The transparency of the system reduces the threat of this type of behavior. Looking at the examples of predatory lending in section 4.1.2.2., only few of these examples are relevant in the Danish system. The only situation where

[107] Forbrugerrådet, "Forbrugerne foretrækker fastlønnede bankrådgivere", at www.forbrugerraadet.dk, November 2008

such a problem could occur is the refinancing of a mortgage as this generates extra fees to the mortgage credit institution.

During the last years the mortgage credit institutions have developed the capped floater which in comparison to the traditional mortgages is less transparent. This development could give incentive to conduct predatory lending if consumers are not adequately informed about new loans. Thus a higher level of complexity in the structure of the mortgages can create more asymmetric information between the financial advisor and the borrower. A consequence of this could be higher incentive for moral hazard behavior. This problem is considered to be a minor one, mainly because the market is still highly standardized which reduces the level of asymmetric information.

As mentioned, there is a consensus between the mortgage credit institutions to maintain an underwriting criterion to only originate ARM to borrowers that can afford fully amortized annuity FRM. Whether this underwriting criterion is tight enough, is questionable when considering the development in the interest rate. Looking back to 2004/05, the interest rate was at a historic low level for both the long and short term interest rate. In those days, borrowers were given ARM with the underwriting criteria that they could afford a 4% 30-year FRM. Observing the rate at the auction in December 2008 only four years after, shows that the one year rate is between 5.15% and 5.20 %[108], higher than the limit at which they were approved.

5.2.3. Investors

Mortgage credit institutes in Denmark have good credit rating on their mortgage backed securities. The ones of the four largest institutions are AAA except BRF-kredit who has an Aa1 rating by Moody[109]. Because of the mortgage credit institutions' retaining of credit risk, the risk of default of the mortgage backed securities is considered to be small. The nature of the pass-through mortgage backed securities in the Danish system reduces the need for credit enhancements on them. The market' simplicity is also a factor that diminishes the importance of credit rating institutions. Investors are not depending on the credit rating agencies because they, facing the lack of rating agencies, can analyze the risk of the mortgage backed securities on their own. The access to due diligence is also easy due to the centralization of the market. Investors only have to conduct due diligence on the mortgage credit institution to evaluate the credit risk of their investment. Of course, due diligence on the originating banks could be on option for investors as they, too, carry some credit risk. Since mortgage credit institutions themselves are inclined to conduct proper due

[108] Mattias Grøndal, "Nykredits F1-rente blev lavest", in "Jyllandsposten" December 18, 2008
[109] Data found in the investor relations pages on the mortgage credit institutions homepages.

diligence on the originators - it relaxes the need for investors to do so. The Danish system is known to be highly supervised when it comes to mortgage backed securities. The supervising agency, finanstilsynet, thus keeps oversight on the mortgage credit institutions. This has the effect, that securities that are issued by the Danish mortgage credit institutions and carries the name realkreditobligation (mortgage backed security) are considered to have high quality[110].

Another example on the low dependency on credit rating agencies can be seen in the legislation on pension funds investments. These limit the investments to be composed of 70% in gilt-edged securities which among other are mortgage backed securities[111]. Within this legislation there is no requirement that these should have a credit rating.

The mortgage credit institutions work primarily as an intermediate in the mortgage market which reduces the adverse selection problem. By not being able to hold mortgages on their own balance, they have no possibility to retain the good loans and sell off the bad. Investors know this which is also why there are no premiums on the mortgage backed securities that should reflect this extra risk.

All together, there is very little moral hazard in the Danish market for mortgage backed securities. The main reason behind this is the mortgage credit institutions' central role in the overall structure. As they retain the credit risk, it gives them an incentive to insure solid underwriting standards. Whether the underwriting standards have been tight enough, is questionable as mentioned before, however this is not a moral hazard issue. The tight balance between the cash inflow with outflow is also a very important in this sense. The balance principle ensures transparency that eliminates the adverse selection problem.

5.3. Introduction of SDO

The SDO has been introduced in the Danish market in 2007 as an alternative to the traditional mortgage backed security system. The introduction has changed a lot of factors in the Danish mortgage market. The following section 5. runs through the changed that come with the SDO rules. The government's intention with the introduction of SDO was to increase the competition in the market house financing and to give the consumers more lending options[112]. The following chapters describe how the SDO rules affect the Danish mortgage market.

[110] Jeppe Ladekarl " Safeguarding Investment in Danish Mortgage Bonds" in "Journal of Financial Regulations and Compliance" Vol 06 Issue 1 pp. 59-69 1998.
[111] Retsinformation, "Bekendtgørelse af lov om finansiel virksomhed § 159-169" in www.restsinformation.dk
[112]Erhvervsministeriet (Bent Bentsen) "2006-07 - Fremsættelsestale: L 199 (som fremsat): Forslag til lov om ændring af lov om finansiel virksomhed og forskellige andre love. (Særligt dækkede obligationer), at www.folketinget.dk March 2008

5.3.1. Structure

SDOs are a form of covered bonds that can be used as funding to mortgages. SDO uses different types of collateral, property being one of them. On the Danish market there are two separate types of SDOs. One is the SDROs (Særligt dækkende realkreditobligationer/Covered bonds issued by mortgage credit institution) which are exclusively issued by the mortgage credit institutions and the other one the SDO which may be issued by both commercial banks and mortgage credit institutions. The difference between these two lies in the assets used for collateral and the level of overcollateralization applied. In section 5 SDO will be used as a general description, explicitly mentioning if there are special rules for SDROs.

One of the major modifications with the introduction of the SDO mortgages is the lending and funding structure. For many years the balance principle served as characteristic of the Danish mortgage market. With the new SDO rules there are changes in the balance principle. The traditional one remains as an option for the mortgage credit institutions but with the SDO funded mortgages the issuers also have the option to employ a new balance principle. The overall meaning of this new balance principle is still to remove all but the credit risk from the mortgage credit institution. The traditional principal insured that the mortgage credit institutes had a limit on their market risk, leaving them to only issue pass-through mortgages. The mortgage credit institutions make varies stress tests on the interest rate that insure that the institutions only maintain market risk within limits determined by law. The new rules have the same intention but are different in how this goal is reached[113]. The SDO-rules allow for a wider use of financial derivatives to cover the market risks. In the traditional system the mortgage credit institutions could have derivative risk up to four years. Under the new rules this constraint is removed and replaced by a demand for stress test concerning the volatility of the derivatives. The law states that option risk should occur in a limited extent; 5% of the over-absorption for banks and 0.5% of the solvency requirement plus 1% of the overabsorption for mortgage credit institutions[114]. After the introduction all mortgage credit institutions have chosen to follow the new balance principle on new series of mortgage bonds. A main reason behind this is due to the lower capital requirement on SDO with the new balance principle. Applying this, the capital requirement is 10% against 20% within the old principal.

Much of the discussion on the introduction of SDO bonds was the step away from the traditional balance principle. Whether the new one is less safe, is hard to determine, it exposes the system to some new risks though. Jesper Lund (2007) made in his article in Finans Invest a comparison of the

[113] Jesper Lund, ”Balanceprincipper i den nye SDO lovgivning”in Finansinvest nr. 5, 2007
[114] Finanstilsynet – Bekendtgørelse om obligationsudstedelse, balanceprincip og risikostyring in www.finanstilsynet.dk

new and the old balance principle[115]. One of the findings was that the new balance principle increased the exposure of option risk and model risk. Lund argues that it is fairly easy to determine the interest rate risk on bonds with linear pay-off, however when options are introduced it changes the picture. The use of separate models to determine the interest rate risk delivers different results. Lund argues that options that are affected by borrowers' behavior pattern will increase problematic issues regarding model risk. How big the problem with option and model risk is hard to determine, the borrowers right to pre-pay the mortgage in par might reduce the utilization of advanced options. In the end, it is the investor who decides whether he prefers the old or the new balance principle. A consequence of the increased use of derivatives is that innovations on the lending side do not have to be reflected on the funding side as it was the case with the old balance principle. This opens opportunities for mortgage products that are more complex than what is on the market today.

Another risk that follows from employing derivatives is the counterparty risk. Mortgage credit institutions will make option agreements with large financial institutions. During 2008 there have been examples that large financial institutions could not fulfill their commitments. An example is Lehman Brothers who was the fourth largest investment bank in America. In 2008 they had to file for bankruptcy protection. When there is trouble in the financial sector, there is also a risk that even large banks cannot fulfill their commitments on option agreements. It is hard to determine how large the counterparty risk is, but it is an extra risk in connection with the application of financial instruments.

There are also changes in respect to which assets can be used as collateral in the traditional pass-through mortgage backed securities and the SDOs. With the new rules property, loans to public debtors and ships can be used as collateral for SDOs. SDRO comprises only property and loan to public debtors as collateral. The traditional mortgage bonds have property and loan to public debtors' eligible as collateral. In both the new and old rules collateral in form of mortgage credit bonds is also eligible. The SDO-rules allow for up to 15% off the mortgage pool to be backed by other mortgage credit bonds from other issuers[116] against only 2% in the old system. This also has an effect on the buy-back option of the mortgage bonds. The change should in a larger extend enable borrowers to buy-back with bonds from other mortgage credit institutions. A borrower with e.g. a Nykredit loan now has an option to hand in a Nykredit bond or a comparable Nordea bond to release him from the loan commitment.

[115] Jesper Lund, "Balanceprincipper i den nye SDO lovgivning"in Finansinvest no. 5, 2007
[116] Retsinformation, "Lov om ændring af lov om finansiel virksomhed og forskellige andre love" in www.retsinformation.dk

Other issues that are important within the new SDO rules are the maturity and rules concerning the LTV ratio. Under them mortgage credit companies are able to issue mortgages with maturities over 30 years. This is done by adding a higher constraint on the LTV ratio on those loans. It continues to be 80 under the SDO rules on loans with maturities on 30 years or under. The new regulations open op for longer loan periods and IO periods. It is now possible to provide loans with an unlimited loan period and IO period. The condition for getting such loans is that the LTV-ratio is 70. In July 2009 when the ratio will change, the LTV restriction is going to amount to75%.

Along with the new LTV ratio comes also a demand that the mortgage credit institute must balance the mortgage pool so the LTV ratio never exceeds the maximum LTV on the originated loan. Thus on an owner-occupied dwellings all year habitation mortgage, the mortgage credit institution has to provide more capital if the LTV ratio exceeds 80% of the property's market value. Additional capital must be present in the form of government bonds or other safe securities that have to be added to the capital center. In order to fund the additional capital in the SDO issuers can issue junior covered bonds. These have secondary claim on assets in the case of insolvency. To insure the compliance of the LTV ratio the owner occupied dwellings must be valued every third year by a professional appraiser who is independent from the credit process.

One of the dissimilarities between SDO and SDRO lies in the level of overcollateralization needed to issue the different bonds. Issuance of SDRO requires mandatory overcollateralization corresponding to 8% of the risk-weighted assets. Commercial banks do not have this requirement on their SDO bonds but may provide it to enhance the pool on a voluntary basis. In terms of issuer's insolvency the investors have a claim in other capital centers before other creditors. This is different from the case of commercial banks where investors will rank on even terms with other creditors of the bank when all assets in the cover register have been distributed[117].

Under the new rules mortgage bonds do not have to be listed on the stock exchange, commercial banks and mortgage credit institutions may still choose to list the bonds. Mortgage bonds used to be listed on the stock exchange under the old rules. Since the new rules open up for international competition legislators believed that a demand for listing of bonds would result in an increased number of issues from other countries[118].

[117] Nykredit, "Danish covered bonds" September 2007, direct link: http://www.nykredit.dk/marketsdk/ressourcer/dokumenter/pdf/NYKR_DanishCoveredBonds_WWW.pdf

[118] Erhvervsudvalget, "Forslag til lov om ændring af lov om finansiel virksomhed og forskellige andre love (Særligt dækkede obligationer)" March 2007, direct link: http://www.folketinget.dk/samling/20061/Lovforslag/L199/Bilag/1/362009.PDF

Whether the new rules are making the market less resilient, is hard to judge from the present experiences. It comes down to whether the new balance principle can provide an equally secure mortgage backed securities market as the one that has protected investors against losses over 200 years. The capital requirement on the new covered bonds suggests that the new bonds are more secure than bonds issued under the old rules. New regulations will diminish the transparency that was inherent in the traditional balance principle and investors in mortgage backed securities issued under the new balance principle have to consider model risk and counterparty risk.

5.3.2. Competition

One of the intentions concerning the introduction of SDO loans was to improve the competition on the market for mortgage credit. The new legislation allows for financial institutions such as commercial banks to engage in the mortgage credit business. Until 2007 the mortgage credit institutes had the exclusive right to originate mortgage and issue bonds backed by these.

With the implementation of SDO the legislation opened up for more international competition in Denmark in this respect. The law has removed the obstacle for foreign banks to engage in mortgage lending on the Danish market. The legislation also allows for smaller banks to engage in collaborations and create a common covered bonds issue. Both of these liberalizations should have increased the competition on the market. From the legislators' point of view the removal of these barriers should lower the costs for mortgages as a consequence of an improved competition.

5.3.3. Underwriting and loan limits

The underwriting criteria are overall not changed, for a residential mortgage the LTV-ratio remains 80% with the SDO rules. According to the new rules the information level for borrowers was supposed to increase with the introduction of mortgages funded by SDOs. The originators have to use a developed information scheme which includes the annual mortgage cost in percentage of the outstanding principal and other relevant information. An increased legislation is a natural consequence because the structure will enable originators to charge different interest rates to customers with different economic status. Thus, there has to be a deeper information level as the cost of the mortgages is not as uniform as before the SDO-rules. An argument for the new regulations has been that the mortgage banks would be able to provide more fair mortgages to the consumers through segmentation. The consequence following is that people with high LTV ratio and poor credit history will have to pay higher interest rate than people with better credit rating.

5.3.4. Changes and future changes with SDO

The market for mortgage credit has been liberalized with the new rules. Much of the changes in the legislation were made to insure an increased competition both between national and international banks. It was also intended to expand the present selection of lending opportunities in the market. With regard to an increased competition modifications are considered to be rather minor ones. After the respective legislation was passed the product mix did not change from the mortgage credit institutions. We have not seen international banks enter the mortgage credit market and neither have smaller banks engaged in any collaboration to issue own covered bonds. The only new issue is Danske Bank and Nordea who have entered the market through the commercial bank. It is hard to know why there has not been more activity but an explanation is assumed to be the disturbance on the financial markets and declining house prices.

The system's resilience might also be affected by the new rules. The safety as to investing in mortgage backed securities relate to the Danish mortgage market should be increased with the new system. This can be seen in the capital requirement of traditional mortgage bonds and the covered bonds which amounts to 20 and 10% respectively on new issues. The increased security in the SDOs comes since the LTV ratio cannot rise above 80%.

A possible consequence of the new rules is the removal of the borrower's ability to buy back the underlying bonds in the market. The regulations in place now do not require that the bonds backing the mortgages are listed on the stock exchange. This means that borrowers will not necessarily have the possibility to go into the market and buy back the bonds that are corresponding with the mortgages. Thus, the new legislation does not necessarily carry a tight connection between funding and lending as we have seen before. The law states that the issuer has to inform about all the conditions relating to the mortgage, including the buy-back opportunity. After the introduction of the SDO bonds there have been no changes in this area. The competitors on the market are still listing the bonds on the market so that the buy-back opportunity is preserved. In fact, for the consumer nothing has changed as a consequence of the SDO mortgages, except the possibility to get mortgage backed by a SDO issued by the bank instead of the mortgage credit institution.

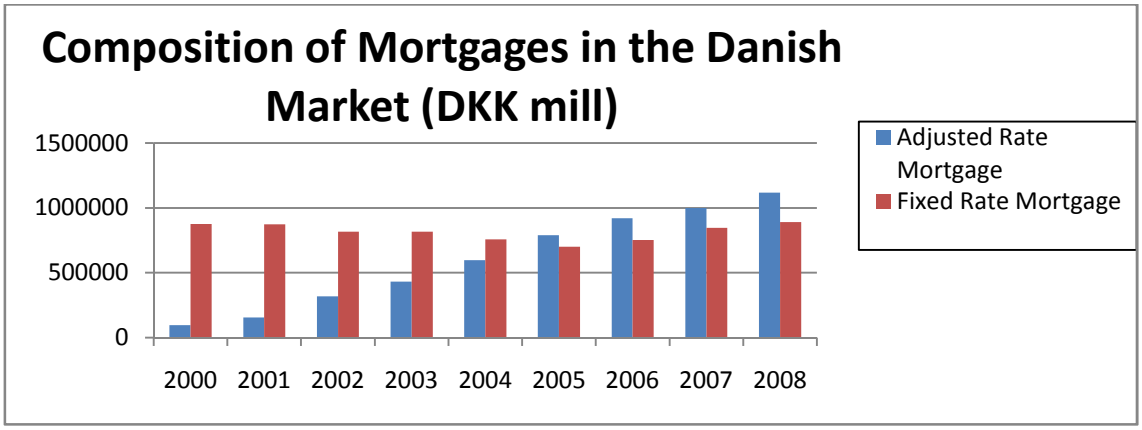
5.3.5. Changes in moral hazard with the introduction of SDO

The Danish market for mortgage backed securities has historically been very solid which is why one may question the need to change the structure. In this chapter is examined how the introduction of SDO loans will change the moral hazard problem in the Danish mortgage backed security structure.

From the borrowers' point of view, few things changes as a consequence of the SDO-rules. It is likely that mortgage banks will make several new developments in the product portfolio in the future, which also was the intention with the new regulations. More product development also requires more information to the borrowers because the complexity of the products creates a higher level of guidance from the mortgage bank. In order to mitigate this problem the government has required that mortgage banks, in their guidance with the borrowers, provide the complete list of costs associated with the loan. This measure should reduce predatory lending that could occur with more complex products.

5.4. Compositions of loans

Historically the market for mortgages has been dominated by the 30 year full amortisized annuity loan which offers prepayment at any time during the maturity of the loan. Since 1999 it has been possible to finance a house purchase with an ARM with adjusting periods between one, two, three, four, five and ten years. The maturity of the ARM varies; most popular is the 30-year option though. Graph 8 shows the composition of ARM and FRM in the Danish market since 2000[119].



Graph 8- Composition of Mortgages in the Danish Market from 2000-2008

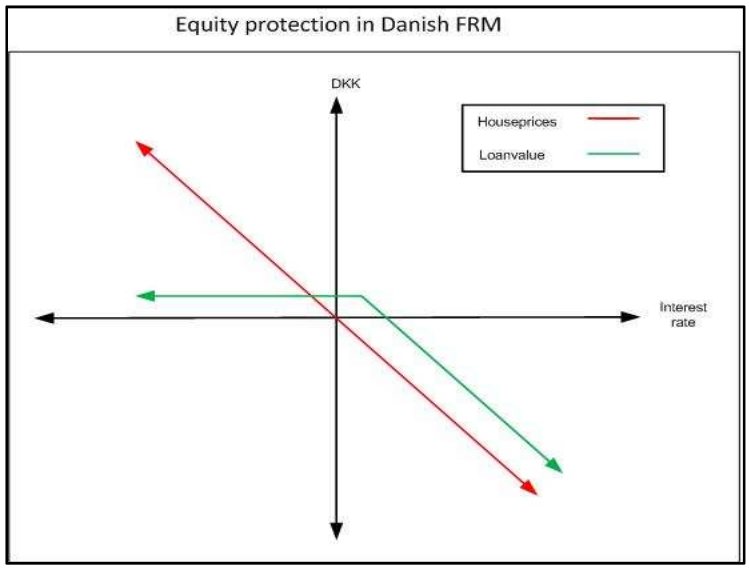
As you can see from the graph the ARM has been a popular alternative to the traditional FRM since its introduction in 1999. Among the ARM 73% of the mortgages were adjusted on an annual basis in 2007, this is a small decrease from 2006[120]. In 2003 the IO-option was established which can be used on most Danish mortgages up to 10 years. After the initial period the borrower must either refinance or repay the remaining principle over the remaining maturity of the mortgage. In the end of 2007 the ratio of mortgages outstanding that had interest only option was 39% of the outstanding mortgages to residential mortgages. In 2006 a new type of mortgage was introduced. This was the

[119] Nationalbanken (The Danish National Bank), "Average outstanding amount of ARM and FRM mortgages". Source: Nationalbanken.dk
[120] Finanstilsynet, "Markedsudviklingen i 2007 for realkreditinstitutter" May 14, 2008, Source: see footnote 77

ARM with build-in interest rate cap, the caped floater. These types of loans were introduced and offered a prepayment option like the 30-year FRM. In September 2008app. 15% of the outstanding mortgages were caped floaters[121]. These were marketed primarily towards borrowers who would refinance their FRM. A difference between the ARM and the caped floater is how these are being adjusted. Regarding the capped floater this is not done in the annual auction but semi annually to the Copenhagen Intra Bank Offer Rate (CIBOR).

5.4.1. Protection of equity

Both FRM and caped floaters have equity protection in rising interest rates. One of the advantages of having a pass-though system as the Danish is that the value of the debt is declining when interest rates are rising. As shown earlier there is a connection between rising interest rate and the value of houses. In the traditional annuity loan the borrower is protected against these fluctuations in interest rate. This is illustrated in graph 9.



Graph 9 - Illustration of equity protection in Danish FRM, authors own illustration

When interest rate goes up house prices are inclined to decrease, with the pass-through annuity bond with its prepayment option though this has the effect that equity is protected. Danish mortgages have traditionally had this option which is of course possible due to the close connection between funding and lending and the liquidity of the mortgage bonds.

It is not stated in the law that borrowers should be offered this option, however the structure facilitated this. Thus the pass-through annuity loan is protecting the borrower against market risk

[121] Authors own calculations based on data from Danmarks Nationalbank

both in the interest payment and also from an equity perspective. The downside risk is therefore reduced with this type of mortgage structure.

The overall composition of mortgages is dominated by ARM and the development over the years is pointing in the direction of more adjusted mortgages. When analyzing for payment shocks in mortgages, this becomes an important factor. The high amounts of outstanding ARM are making the market more vulnerable against increases in the interest rate. With the annual adjusted mortgage there is no protection against such rises. The capped floater provides more safety against payment shocks as the interest rate can only increase to a certain level before it becomes fixed.

5.5. Sub conclusion

The Danish mortgage market before 2007 is highly characterized by the balance principle that has been a corner stone in its structure. It ensures transparency in the system because of its easy pass-through structure. Most of the lending activities revolve around the issuer or the mortgage credit institution. The mortgage credit institution is responsible for the appraisal, underwriting and the funding of many of the originated mortgages. This central structure has removed much of the moral hazard issues in the Danish system. In mortgages that are not originated by a mortgage credit institution safeguards are in place to prevent moral hazard behavior. The commitment of the originators is believed to be valid as mortgage credit institutions have the incentive to conduct due diligence on them. Due to the system's transparency the reliance on credit rating agencies has been minimal. Another reason for this circumstance is the lacking ability of mortgage credit institutions to maintain the mortgages on their own balance. This has diminished the adverse selection problem.

The SDOs are permitting banks to issue mortgage backed securities which originally were reserved exclusively for mortgage credit institutions. With the new loans mortgage backed securities in Denmark do not have to be issued as a vanilla pass-through. From the borrowers' point of view few changes have occurred with the SDOs. All mortgage credit institutions have chosen to implement the new balance principle. According to the new regulations the possibility exists that the market will change in the future and some of the traditional system's transparency will be lost. There are no signs that the introduction of SDO will increase moral hazard problems. This is primarily because the issuer remains to be the holder of the credit risk and thus has the incentive to create adequate safeguards against such moral hazard behavior.

The traditional 30-year FRM has an embedded equity protection. Due to the listing on mortgage bonds the loan value is decreasing while interest rates rise. This protection of equity is unique and only possible in a strict pass-through structure. Danish borrowers with FRM mortgages are thus

well protected against market risk. When looking at the Danish market, we see an increase in ARM during the last years. A shift towards more ARM increases the exposure of the market as a response to increasing interest rates. The underwriting criteria of the ARMs have been the same as of the traditional mortgages. With the boost in interest rates during the last years the risk of payment shock has increased dramatically. With an increase in the interest rate on more than 200% since 2004 ARM borrowers have a much higher mortgage payment than with their initial one.

6. Comparison between the Danish and American market

Section 6 is a comparison between the two markets for mortgages backed securities to find if a similar crisis that we have seen in the American mortgage backed securities market could happen in Denmark. This is done by analyzing whether the factors that contributed to the sub-prime crisis could happen on the Danish market for mortgage backed securities. First if the factors could happen in the structure before the SDO rules and after look at how the SDO rules affect these findings.

6.1. Payment structure

Legislative differences must be considered to be quite vast comparing the two countries. Much of the difference lies in the strict legislation in Denmark on the tight connection between funding and lending, the balance principle. Such laws are not present in the American system which has contributed to a much more diverse mortgage backed securities market. Where the Danish issuers of mortgage backed securities have historically been constraint to only maintain the credit risk, the issuers of American mortgage backed securities have been able to construct CMOs to also retain the prepayment risk. The free link between funding and lending has also contributed to the creation of CMOs with separate risk tranches. Thus, issuers of Danish mortgage backed securities are not able to create CMOs. Other financial institutions have the possibility to create CMOs with securities issued by the Danish mortgage institutions. This has only happened in limit extend.

The nature of the Danish mortgage bonds require that mortgages are issued from a capital center on the issuers balance. In order for the bonds to maintain the status as SDO or SDRO, the issuer must uphold the capital requirement, overcollateralization and add capital in case the LTV-ratio rises over 80. If the issuer cannot fulfill this commitment, he is declared insolvent and loses his right to issue mortgage backed securities as well as the outstanding bond loses its SDO or SDRO status[122]. This limitation has centralized the market around few originators who also had to be the issuers of mortgage backed securities. This legislation regarding the payment structure is one of the reasons

[122] Nykredit, “Danish covered bonds” September 2007

why the crisis in the American mortgage backed securities market cannot happen in Denmark. The option to sell of the credit risk is inherent in American USA and is nursing a structure with many intermediates and thus a fee based system.

The losses in sub-prime mortgage backed securities hit the CDO first as they consisted of mezzanine tranches that absorbed the first losses in the sub-prime mortgages. This scenario could not occur in the Danish market for two reasons. For once, there is no market for CDO that contains mortgage backed securities. This is primarily due to the fact that mortgages backed securities have been issued with a high credit rating that would make them unfit to the CDO market. The other reason is the originators' retaining of credit risk which dramatically reduces the risk on mortgage backed securities. This means that before investors would suffer losses in the Danish mortgage backed security market, the respective credit institutions would have to become insolvent.

6.1.1. Moral hazard issues

The payment structure has a large influence on the moral hazard issues in the Danish market. Although there are intermediates in the Danish structure the problem is mitigated by the issuers' commitment to hold the credit risk. As experienced in the American mortgage market the structure observed in the sub-prime market has many weaknesses in relation to moral hazard aspects. In the moral hazard analysis concerning the Danish market we saw that its structure had, with the centralized structure, much smaller troubles with moral hazard.

One of the drivers behind moral hazard in the American market was the large broker market that sprung from the development in automatic underwriting and appraisal systems. The existence of automatic underwriting created a market for underwriting loans which were sold to banks. The brokers could do this and receive a onetime fee, giving them an incentive to conduct moral hazard behavior. Within the Danish mortgage banks there has also been a focus on creating automatic systems that would reduce the paperwork for the lending officers. The development of automated underwriting system in Denmark is not believed to increase moral hazard. This is also because of the centralization of mortgage backed securities issuers that have to keep the credit risk. When banks are originating the mortgages they receive an ongoing fee from the issuer. This difference in moral hazard in the originating of mortgages is a main reason that reduces the possibility of a similar crisis in Denmark. The ongoing fee increases the originating bank incentive to keep high underwriting standards.

6.2. Composition of loans

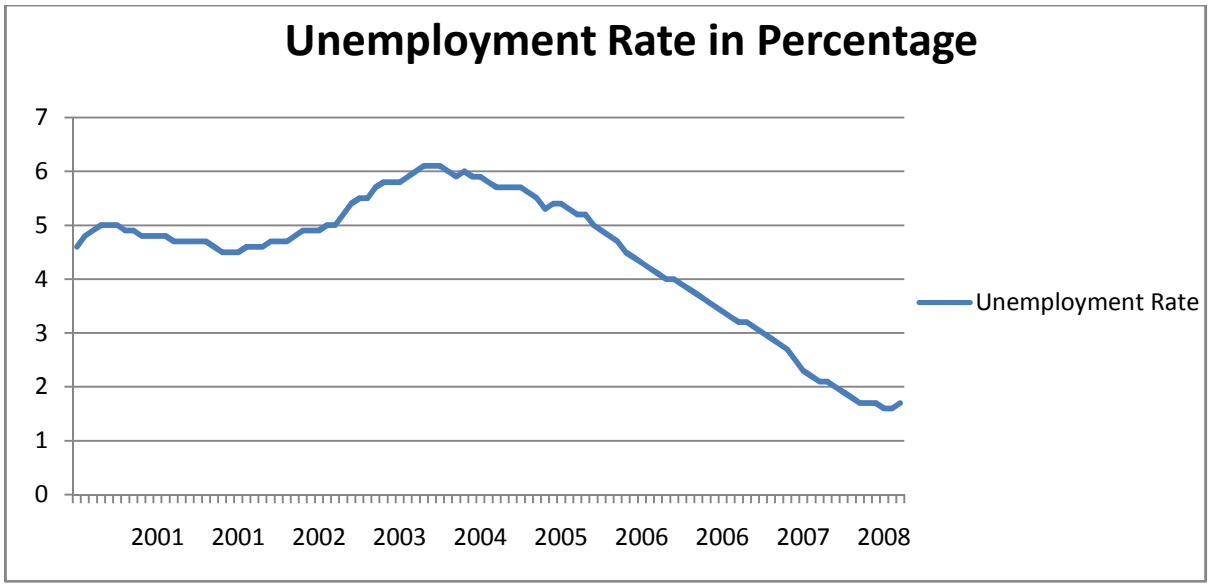
A big problem with the sub-prime mortgages was the payment shock that is inherent in many of the loans to this segment. The analysis of the overall composition of ARM and FRM between the two markets showed that there is a higher ratio of ARM in comparison to FRM in the Danish market. This should imply that they were more exposed to increases in the interest rate. There are two issues that make Danish borrowers more resilient than the American borrowers on fluctuation in the interest rate. One is the structure of the ARM where the payment structure is very different. The market in Denmark operates with generally two different kinds of ARM. One is the caped floater which is fluctuating with the CIBOR and fixed at the interest cap plus a small premium. The other is ARMs that are fixed over a period and then refinanced without a premium. In the American market and especially in the sub-prime market the most popular ARM is the 2/28. This type of loan has a much larger payment shock which means that even if interest rates have fallen within the two first years the premium on the interest rate will cause a payment increase. The existence of this 2/28 mortgage makes the American market much more exposed to fluctuation in interest rate. Another factor why the American market is more exposed to interest rate increases is the lack of equity protection. The Danish FRM have a buy back option that protects the equity. Due to the mismatch between funding and lending this option is not available in the American structure. This can have the effect that borrowers will easier become insolvent.

6.2.1. Macroeconomic factors' effect on the mortgage market

Macro-economic factors have also had an effect on the development of the sub-prime crisis. Graph 1 and graph 3 showed that the rising interest rates usually are followed by an increase in the unemployment rate. This renders equity protection even more essential. The high unemployment rate will make it harder for people to make their mortgage payment and leaves them insolvent if they have to sell the house. This will have an amplifying effect on house prices that drop as a consequence of higher supply and expensive mortgages.

Unemployment is also a risk embedded in the Danish market which has increased with the higher number of ARM in the market without equity protection. The interest rate in Denmark is highly correlated with the interest rate in the European Union, thus interest rates have also increased in Denmark. Interestingly, this did not have the same effect on the unemployment rate as in America. Graph 10 shows the Danish unemployment rate[123].

[123] Dansk statistik (Statistic Denmark)



Graph 10- Unemployment Rate in Denmark from 2000-2008

During the last years the unemployment rate has been low which has reduced the impact of the higher payment on ARM mortgages.

6.3. Segmentation in the mortgage market

The American market is also characterized by having different segments when issuing the mortgages to the borrowers. This diversion of borrowers has historically not existed in the Danish market where nearly the same conditions generally have been given to all borrowers independent of the credit quality. You might say that there only exists a prime market in Denmark. Much of the problem with sub-prime borrowers contained that they were given loans even though they had no or very small down payment. This option does not exist in the Danish market because it is determined on the part of government that the maximum LTV ratio lies at 80%. This limitation has kept the sub-prime borrowers away from the Danish mortgage market. The SDO-rules have opened up for the possibility of borrower's segmentation through independent credit valuation and thus give different conditions to borrowers.

6.3.1. Danish Mortgage credit institutions and the GSEs

The mortgage credit institutions in Denmark have more similarities with the GSEs both because of the investment in conforming loans and because they both hold the credit risk. The GSE mortgage backed securities would have caused investors losses if the American government had not given the guarantee. The question is whether the mortgage credit institutions in Denmark could have the same problems as the GSEs? The breakdown of Freddie Mac and Fannie Mae is mainly due to investments in sub-prime mortgage backed security market. Danish banks are not restricted from

investing in different securities, thus an aggressive investment strategy from commercial banks could expose the banks to similar risks as in the American market. The main difference is that the nature of the Danish mortgage credit institutions is not to invest in mortgages and mortgage backed securities but instead to be the link between investor and lender. The GSEs are holding many loans on their own portfolio and ensure a stable secondary market by being one of the large investors in the secondary market. The Danish mortgage banks do not have this kind of behavior and thus the problems with the GSEs are not likely to be transferred to the Danish mortgage credit institutions.

6.4. Future of the Danish mortgage backed securities market

How the future is going to develop in the Danish market is much dependent on the development of the future competition on the market. With the new regulations the financial institutions have the opportunity to create products that are more complex than the ones in place today. The question remains whether the progress we see in the Danish market will expose its structure to more of the weaknesses we found in the American market.

The loosening of the balance principle means that there is a transition from the tight pass-through to a pay-through structure. This is a shift towards a structure like the American. One of the problems that can occur within the new system is an increased dependence on credit rating institutions. With mortgage backed securities being less transparent the investors will increasingly look for the credit rating agencies' opinion on the quality of securities.

The other shift towards the American system is in relation to individual credit valuation on the mortgage borrowers. With the LTV-ratio on 80% as the only official underwriting standard it is possible that banks will target less creditworthy borrowers in the mortgage market by demanding higher interest rates. Though, as long as the issuers of mortgage backed securities are forced to maintain the credit risk on the securities the development in the sub-prime sector will be limited.

The 80% LTV ratio is also a factor that would keep the sub-prime segment away from the Danish mortgage market. Within the sub-prime market in America, the LTV-ratio averaged 85% in 2006[124]. The development of a sub-prime market would mean a relaxation of the underwriting standards which is not likely given the mortgage backed securities issuers have to maintain the credit risk.

[124] Loanperformance (2007) in Adam B. Ashcraft and Til Schuermann, "Understanding the Securitization of Subprime Mortgage Credit", a Federal Reserve Bank of New York Staff Reports, March 2008

7. Conclusion

Section 7 will conclude on the main research question put forward in the problem formulation: "What problems exist in the structure of the American mortgage backed security market and are the same elements present in the Danish mortgage backed security market?".

The financing of houses usually happens through a mortgage. A mortgage bank issues securities that are backed by a pool of mortgages which becomes a mortgage backed security. This way of financing houses is the predominant method in both the Danish and the American market. This thesis has focused on two kinds of payment-methods within mortgage backed securities, the pass-through and the pay-through method. It is important to distinct between these because they represent a difference between the Danish and the American market. The Danish market consists solely on pass-through mortgage backed securities while the American structure is diversified into both pass-through and pay-through. The reason why the Danish market does not use the pay-through method is because of a historical legislation that prevented mortgage credit institutions to issue other than pass-through mortgage backed securities.

The American market is divided into two segments, the loans to prime and to sub-prime borrowers. When applying for mortgages the individual credit rating and other key figures determine the loan conditions and whether the borrower is prime or sub-prime. Prime borrowers are eligible for mortgages that can be purchased by the GSEs. In contrast to that, sub-prime mortgages are issued by private label companies. The American market is dominated by FRM which accounts for app. 75% in 2006. During the last years though the ARM has become increasingly popular which has amplified its exposure to interest rate increase. Among sub-prime borrowers the most popular mortgage is the 2/28 ARM hybrid. In the Danish market, the ARM has, since it was allowed in 1999, become the most popular type of mortgage. Nevertheless, it was the FRM that has historically been the most popular mortgage in the Danish market.

During the beginning of the century the development of mortgage issues in the American economy has been expanding. Especially since 2001 the sub-prime segment has increased significantly. Some of the reasons for this increase are explained by macro-economical factors. A lowering of the interest rate resulted in both lower unemployment and especially house price increases in America. The house price increases attracted sub-prime borrowers who, with the low interest rate, were able to get a mortgage through the private label market. At the other end of the securitization chain were the fixed income investors who wanted higher yields on their investments and therefore found sub-prime mortgage backed securities attractive. When the economy started to turn and the FED raised

the interest rates, the mortgages that had been sold to sub-prime borrowers turned out to be based on a hope that the individual borrower had improved his economy or the houses prices had continued to increase. It is clear today that neither of these did happen, thus the house prices stagnated and the unemployment increased. Hence, macro-economical factors were one of the reasons behind the losses seen in mortgage backed securities in America.

Nonetheless, macro-economical factors do not alone explain the losses. During the expansion of the mortgage market there were several contracting problems that explain the unexpected losses in securities. As a result of the macro-economical factors the conditions for sub-prime lending were excellent. This also resulted in a wide range of businesses that benefitted from the expansion in the sub-prime segment. The ability to create pay-through structured mortgage backed securities resulted in a structure with many intermediates between the borrower and the final investor. The process in which sub-prime mortgages were securitized is characterized as fee based, hence many of the intermediates in the securization chain receive fees for the services they provide.

Moral hazard issues are found in many places in the securization chain of sub-prime mortgage backed securities. First, the broker business experienced a lift since 2000 which meant that many sub-prime mortgages were originated by a broker. When selling the mortgage to a mortgage bank, the broker is released of the risks associated with the mortgage. To mitigate the risk of poor underwriting of the broker, many of the mortgage brokers are committed to buy back the mortgages if it is originated badly. When house prices started to decrease and mortgages started to be delinquent the commitment of the mortgage brokers was found not credible and the brokers went into bankruptcy. Hence, the safeguard against poor underwriting was not sufficient. Other parts in the securitization chain are also affected by contraction problems, among them the rating agencies. The rating of structured finance products has become a main source of income for the credit rating agencies and with the relative few arrangers of structured finance products, the individual arrangers are an important source of revenue. This relationship creates a moral hazard problem as the agencies have an incentive to provide good ratings on potential bad products. The problem is amplified by the fact that they are not punished for being too optimistic in their rating.

Those that are punished for ratings that are too optimistic are the investors in fixed income investments. Investors in the private-label mortgage backed securities are likely to be institutional investors that trade through portfolio managers. As a consequence of the high rating on sub-prime mortgage backed securities, they were added into the fixed income portfolio of portfolio managers.

As sub-prime mortgages started to be delinquent the collateral for the sub-prime mortgage backed security lost its value.

Many of the elements that caused losses in the American market are not predominant in the Danish market. The macro-economic factors that created the foundation for the development of private label sub-prime loans were also present in the Danish economy. However, the Danish market does not have a specific sub-prime segment. Mortgages are only originated to borrowers that have a LTV-ratio on maximum 80%. More importantly, the credit risk, at least in part, is held by the issuing financial institution. This fact dramatically increases the issuing institution's incentive to maintain adequate underwriting standards. Since the issuer has a central position in the securitization structure, the problems with moral hazard are not as severe in the Danish system as in the American. Historically, the Danish system has been characterized by having a pass-through payment structure which has ensured its transparency and has thus reduced the need for credit rating agencies.

Since 2007 the legislation that prevented mortgage credit institutions from issuing has been removed and replaced by a system more align with the European standards. Until now, the changes in the system have not caused significant changes. Under the new laws the pass-through model is not preserved in its historic form. The elements in the new legislation do not in particular expose the Danish system to the factors that caused losses in the American market. Especially the issuers' commitment to maintain credit risk reduces the moral hazard problem.

8. List of references

C. Christiansen el al. "Denmark - A Chapter on the Danish Bond Market**"** Working Paper Series No. 146, 2003, direct link: http://www.cls.dk/caf/wp/wp-146.pdf

Rodney Yap and Dave Pierson in "Banks' Subprime Market-Related Losses Top $732 Billion" in Bloomberg.com December 15 2008

Kathleen M. Eisenhardt "Agency Theory: An Assessment and Review" in "The Academy of Management Review", Vol. 14, No. 1, January 1989

John Kiff and Paul Mills, "Money for nothing and checks for free: Recent development in U.S. Subprime" an IMF Working Paper No. 07/188 July 2007, p 1-18

Alchain and Demsetz, "Production, information costs, and economic organisation" in "American Economic Review" Vol. 62, No. 5, December 1972

Nicolae Gârleanu and Lasse Heje Pedersen "Adverse Selection and the Required Return" in "The review of Financial Studies", Vol. 17, No. 3 (Autumn, 2004), pp. 643-665

Allen Frankel et. al., "The Danish mortgage market" in BIS Quarterly Review, March, 2004

Judy Sheen "Alt A Loans `Disconcerting,' Jumbos Weaker, S&P Says" in Bloomberg.com, June 25, 2007

Michel Cruhy et.al. "The Subprime Credit Crisis of 2007" September 12, 2007

Andrew Oswald, "A Conjecture on the Explanation for High Unemployment in the Industrialized Nations : Part I." in University of Warwick, Department of Economics / The Warwick Economics Research Paper Series (TWERPS). RePEc:wrk:warwec:475., 1996

Michael Fratantoni, "The Residential Mortgage Market and Its Economic Context in 2007" in Mortgage Bankers Association, January 2007

Joseph R. Mason and Joshus Rosner, "How Resilient Are Mortgage Backed Securities to Collateralized Debt Obligation Market Disruptions?" February 13, 2007,

Dennis E. Gale, "Subprime and Predatory Mortgage Refinancing: Information Technology, Credit Scoring, and Vulnerable Borrowers" May 31, 2001, Berkeley Program on Housing and Urban Policy. Seminar and Conference Papers: Paper C01-001.

Kevin Drawbaugh, "Mortgage brokers faces industry upheaval" in Reuters.com, June 4, 2008

Adam B. Ashcraft and Til Schuermann, "Understanding the Securitization of Subprime Mortgage Credit", a Federal Reserve Bank of New York Staff Reports, March 2008

*Roger Lowenstein, "*Triple-A Failure" in The New York Times, April 27, 2008

David Robson, "Fair value Issus and the Sub Prime Crisis" Used in the 13th Melbourne Money and Finance Conference, June 2008

Morgan Brown, "Who's Next? Do the Warehouse Lenders Hold the Answer?" in Blownmortgage.com, 8 August, 2007

Ruth Rudden, "Evolution of Credit rating, part 1" Caribbean Information and Credit Rating Services Limited

Mark Adelson, "Bond Rating Confusion" Nomura Fixed Income Research, June 2006

Steven L. Schwarcz, "Protecting Financial Markets: Lessons from the Subprime Mortgage Meltdown" in Minnesota Law Review, Vol. 93, No. 2, 2008; Duke Law School Legal Studies Paper No. 175, 19. February, 2008

Erin Stafford, "Is the master Servicer's role diminishing?" in Global CMBS newsletter Issue 113, April 6, 2006

Monroe, Albert. "How the Federal Housing Administration Affects Homeownership." in Harvard University Department of Economics. Cambridge, MA. November 2001

Pendley et. al. "The Impact of Poor Underwriting Practices and Fraud in Subprime RMBS Performance" in Fitch Ratings, November 2007

Don Morgan, "Defining and Detecting Predatory Lending" Staff Report #273, Federal Reserve Bank of New York, 2007

Christopher L. Peterson, "Subprime Mortgage Market Turmoil: Examining the Role of Securitization ", A hearing before the U.S. Senate Committee on Banking, Housing, and Urban Affairs Subcommittee on Securities, Insurance, and Investment, April 2007

Alistair Barr, "New Century files for bankruptcy, is selling units" in Marketwatch,com, April 2, 2007

Scott Frame and Lawrence White, "Fussing and Fuming over Fannie and Freddie: How Much Smoke, How Much Fire?" in The Journal of Economic Perspective Vol. 19, Iss. 2, Spring, 2005

Henrik Braun et. al., "Amerikansk realkredit", Finans Invest nr. 8, August, 2000

Steven A. Holmes, "Fannie Mae Eases Credit To Aid Mortgage Lending", The New York Times, September 1999

Arnold King, "Freddie Mac and Fannie Mae - An Exit Strategy for the Taxpayer" Cato Institute Briefing Paper no. 106, September 8, 2008

Fred Moseley, "The Bailout of Fannie Mae and Freddie Mac" Dollars and Sense - The Magazine of Economic Justice, September 2008

Jeppe Ladekarl " Safeguarding Investment in Danish Mortgage Bonds" in "Journal of Financial Regulations and Compliance" Vol 06 Issue 1 pp. 59-69 1998.

Martin Burchart, "Politikere under mistanke for korruption" in Information, September 25, 2008

Mikkel Røgild, "Særligt dækkende obligationer og investorerne" in Finans Invest nr. 5, May, 2007

Mattias Grøndal, "Nykredits F1-rente blev lavest", in "Jyllandsposten" December 18, 2008

Jesper Lund, "Balanceprincipper i den nye SDO lovgivning"in Finansinvest nr. 5, 2007

Finanstilsynet, "Markedsudviklingen i 2007 for realkreditinstitutter" May 14, 2008, Source: **http://www.finanstilsynet.dk/sw36121.asp**

International Monetary Fund "Denmark: Financial Sector Assessment Program—Technical Note—The Danish Mortgage Market—A Comparative Analysis" an IMF Country Report No. 07/123, Source: **www.imf.com**, March 2007

United States Securities and Exchange Commission "SEC Release No. 33-8518, Asset-Backed Securities" December 22, 2004, direct link: **http://www.sec.gov/rules/final/33-8518.htm**

IMF "The Danish Mortgage Market A Comparative Analysis" an IMF Country Report No. 07/122, March 2007

Nationalbanken –" Kvartalsoversigt – 3. Quarter 2007"

Freddie Mac Mortgage Participation Certificates" March 17, 2008

Federal Reserve Board, “Federal Reserve press release”, January 3, 2001

Federal Reserve Board, “Federal Reserve press release” June 30, 2004

Federal Reserve Board, “Federal Reserve press release” September 18, 2007

Federal Reserve Board, “Open Market Operations”

U.S. Department of Labor, “Labor Force Statistics from the Current Population Survey”

Reality Times staff, “Fannie Mae Urges Lenders To Explain Rejections” in Reality Times, January 17, 2000

Securities and Exchange Commission - Comments on Proposed Rules on Rating Agencies: File Number S7-04-07 – March 2008

Authorite des Marches Financiers, Research Department, “Is Rating an Efficient Response to the Challenges of the Structured Finance Market?”, March 2007

Federal Bureau of Investigation, “Mortgage Fraud: New Partnership to Combat Problem” in fbi.com, March 2007

BasePoint Analytics LLC - “Early Payment Default – Links to Fraud and Impact on Mortgage Lenders and Investment Banks

The Committee of European Securities Regulatos, “CERS’s Report to the European Commission on the compliance of credit rating agencies with the IOSCO Code - Ref: CESR/06-545”, December 2006

Moody’s Investor Service, “Code of Professional Conduct “, June 2005

Moody’s Corporation, “Investor Presentation”, March 2007

Office of Federal Housing Enterprices Oversight, “2007 Performance and Accountability Report”

Securities and Exchange Commission “Prospectus for GSAMP Trust 2006-NC2

Realkreditrådet, ”Dansk realkredit i Mexico”

Realkredit Danmark, “Danish Mortgage Bonds”, August 2007

Nykredit, “Danish covered bonds” September 2007

Finanstilsynet, ”Bekendtgørelse om obligationsudstedelse, balanceprincip og risikostyring”, in finanstilsynet.dk, June 2007

Realkredit Danmark, “Annual Report 2007”

Nykredit, ”Annual Report 2007”

Frank Kristensen, Bank executive in Vestjyskbank, ”Letter to Finanstilsynet” March 2008

Forbrugerrådet, ”Forbrugerne foretrækker fastlønnede bankrådgivere”, at **www.forbrugerraadet.dk**, November 2008

Retsinformation, ”Bekendtgørelse af lov om finansiel virksomhed § 159-169”

Erhvervsministeriet (Bent Bentsen) ”2006-07 - Fremsættelsestale: L 199 (som fremsat): Forslag til lov om ændring af lov om finansiel virksomhed og forskellige andre love. (Særligt dækkede obligationer), at **www.folketinget.dk** March 2008

Retsinformation, ”Lov om ændring af lov om finansiel virksomhed og forskellige andre love”

Erhvervsudvalget, ”Forslag til lov om ændring af lov om finansiel virksomhed og forskellige andre love (Særligt dækkede obligationer)” March 2007

Finanstilsynet, ”Markedsudviklingen i 2007 for realkreditinstitutter” May 14, 2008

Books

Josehp Hu, “Basics of Mortgage-Backed Securities” Published by John Wiley and Sons Inc, 1997

G. Hendriksen ”Economics and Management of Organization” published by McGraw-Hill, 2003

F. Reilly, K Brown “Investment Analysis and Portfolio Management, seventh edition” published by Thomson, 2003

Philippe Jorion, “Value at Risk, third edition, international edition” Published by “McGraw-Hill”

Franco Modigliani and Frank Fabozzi, “Capital Markets, Second Edition” Published by “Prentice Hall”, 1996

Webpages

www.moodys.com

www.wikipedia.com

www.investopedia.com

www.tdcommercialbanking.com

www.valoans.com

www.banking.about.com

www.Mybanker.dk

www.folketinget.dk

www.Nationalbanken.dk

www.dst.dk

Appendix 1 - Historical overlook on the American market

Throughout the years, the American loan market has been stimulated by congress in order to provide a stable market for mortgages and of course to make sure that American citizens could finance a home purchase. This development started after the depression where there was an urgent need to stabilize the market. This was done by establishing government bureaus that could aid it. Especially two initiatives have had a large influence on the market as we know it today; The Federal Home Loan Banks (FHLBs) and the Government Sponsored Enterprises (GSEs) which are described in 3.1.1. and 3.1.2.

Federal Home Loan banks

One of these government initiatives was the FHLBs. The FHLBs were created to provide liquidity for the regular banks. The liquidity was created through a line of credit from the Treasury. The mission for the FHLBs is described as:

"…to provide cost-effective funding to members for use in housing, community, and economic development; to provide regional affordable housing programs, which create housing opportunities for low- and moderate-income families; to support housing finance through advances and mortgage programs; and to serve as a reliable source of liquidity for its membership." [125]

Today, as in 1932 when the FHLBs were established, there are 12 regional FHLBs spread over the country. These 12 provide liquidity to app 80% of the American financial institutions. The financial institutions have to apply for a membership in a regional bank in order to benefit from the FHLB. Due to the large size of the combined FHLB, they are able to raise money through the capital market in both bonds and papers at a favorable rate. The FHLB bonds are rated AAA on the stock exchange and can thereby provide competitive funding to its members.

Government sponsored enterprises

The other bureau that was established as a consequence of the depression was the Federal National Mortgage Association (FNMA or Fannie Mae). This agency was founded to create and support a strong secondary market for mortgages. Since then the congress has established two other agencies which serve somewhat the same purpose as Fannie Mae. These are the Federal Home Loan Mortgage Corporation (FMA or Freddie Mac) and the Government National Mortgage Association (GNMA or Ginnie Mae). They are usually named the GSEs. Fannie Mae is the oldest of the GSEs and was created in 1938 by Congress. Originally, it only traded government guaranteed mortgages

[125] fhlbanks.com: http://www.fhlbanks.com/html/fhlb_system.html - Checked 2008.12.23

but is now trading conforming loans and government sponsored loans. Freddie Mac is quite similar to Fannie Mae and is trading conforming loans[126].

The two enterprises, Freddie Mac and Fannie Mae were up until fall 2008 privately held organizations that were not officially guaranteed by the US government. In 2008 however the Treasury decided that it would guarantee the loans issued by Freddie Mac and Fannie Mae. This was a response to the crisis caused by the American mortgage market and the instability in the market. It was the Treasury's fear that a potential bankrupt by one of these two mortgage companies would dramatically worsen the situation on the financial markets[127].

Up until 2008 both Freddie Mac and Fannie Mae have had an implicit guarantee in the market which is proved by the rate that the market was willing to fund them with. The bonds were traded with interest that would categorize them as AAA bonds and they received this rating even though their stand-alone rating would be AA- or less. You might thus say that the implicit guarantee gave the 35-40 bp. debt funding advantage[128].

Ginnie Mae is a government backed agency and have been for a long time. This also means that the Ginnie Mae, and the US government, provide a guarantee for the timely payment of both interest and principal. The same guarantee is give to the Freddie Mac and Fannie Mae after the guarantee was provided to them.

The FHLBs and the GSEs are in a way representing the different ways for financial institutions to loan out money. These involve either direct lending or the use of secondary markets for funding. There are advantages to both of them, and while the main differences concerns the allocation of risk and the level of information.

[126] Franco Modigliani and Frank Fabozzi, "Capital Markets, Second Edition" Published by "Prentice Hall", 1996
[127] The Economist, "Freddie Mac and Fannie Mae - The muddle-through approach" in economist.com, July 14, 2008
[128] Scott Frame, Lawrence White, "Fussing and Fuming over Fannie and Freddie: How Much Smoke, How Much Fire?" in "The Journal of Economic Perspective" Vol. 19, Iss. 2, 2005

Appendix 2 - Historical overlook on the Danish market

The Danish mortgage market is one of the oldest in the world with the first mortgage institute founded in 1797 called "Kreditkassen af Husejere I Kjøbenhavn". As it was the case regarding the establishment of the American mortgage companies it was formed after a crisis. The Copenhagen fire of 1795 resulted in over 900 properties burned to the ground. The government covered the losses from the fire and made it mandatory to have fire insurance on houses. In those days, the maximum rate on loans to house purchases was 4%, which caused the banks to demand a high level of security. Being insured the houses were considered safe for collateral which stimulated the creation of a mortgage market[129]. It gained trust which resulted in a liquid and transparent market for mortgages[130]. From the beginning, it was intended to establish a system that could collect mortgages and issue bonds with the mortgages as collateral. One of the main explanations to the trust in the issued bonds was the "balance principal" which is the same as the pass-through method. The pass-through method has over the years been a ground pillar in the Danish mortgage market ever since it's beginning.

Throughout the years the mortgage market has been characterized as being highly regulated. The most important acts happened in the 1900 century. In 1970 it was significantly regulated: among the measures was the reduction of the loan maturity to 30 years, also loan limits was decreased and the act resulted in consolidations in the market[131]. In 1989 the mortgage institutes were able to convert into limited liability companies. This was primarily due to an EU regulative that the Danish government was implementing. The act of 1989 facilitated the creation of new mortgage companies which had been limited since 1970. Up until today the market has consolidated so that the Danish market now consists of seven companies (BRFkredit 9,5%, Realkredit 31,5% Danmark, Nykredit 41,3%, Nordea Kredit 12%, DLR 5,3%) and others (LFR and FIH0,5%)[132]. As DLR is only making credit for commercial properties and agriculture the market for residential mortgage is dominated by the four largest mortgage credit institutions.

2007 is an important year for the Danish mortgage market since there was a change in the financing of property. It was the introduction of SDOs which was implemented the first of July 2007. It allows commercial banks to finance homes and thus removes an exclusive right from the mortgage

[129] Realkreditrådet, "Realkredittens historie" in realkreditraadet.dk
[130] Anders Grosen "Traditionelle realkreditobligationer eller særligt dækkede obligationer – den svære balance" in Finans Invest nr. 3, 2007
[131] Konkurrencestyrelsen, "Realkreditmarkedets udvikling" Oktober 2003, direct link: http://www.ks.dk/service-menu/publikationer/publikationsarkiv/publikationer-2003/2003-10-14-fusionen-mellem-nykredit-og-totalkredit/11/
[132] Finanstilsynet, "Markedsudviklingen i 2007 for realkreditinstitutter" May 14, 2008, Source: http://www.finanstilsynet.dk/sw36121.asp

credit institutions to issue mortgage backed securities. Among the modifications with the new type of financing is an alteration in the balance principal and deregulations as to who may finance property.

Appendix 3 List of Abbreviation

ABS – Asset Backed Security

ARM – Adjusted Rate Mortgage

BP – Basis Points

CDO - Credit Default Obligations

CIBOR - Copenhagen Intra Bank Offer Rate

CMO - Collaterized Mortgage Obligation

DTI - Debt service-to-income

FRM – Fixed Rate Mortgage

FHA - Federal housing administration

GSE - Government sponsored enterprises

HUD - Housing and Urban Development

IO – Interest Only

LIBOR - London Intra Bank Offer Rate

LTV - loan-to-value

PCs - Mortgage Participation Certificates

SDRO - (Særligt dækkende realkreditobligationer/Covered bonds issued by mortgage credit institution)

SDO - (Særligt dækkende obligationer / Covered Bonds)

SEC - US Security and Exchange Commission

SPV - Special Purpose Vehicle

VA - Veteran's Administration