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Abstract

This thesis provides an up-to-date insight into securitisation in general and residential mortgage-backed securities in particular. In order to reach a conclusion about the contribution of residential mortgage-backed securities to the current financial crisis tensions in the securitisation process are discussed. It addresses issues as predatory lending and borrowing as well as moral hazard and asymmetric information. It presents a brief introduction to the causes and fuel that fed the crisis and point out the problem of economic bubbles. Concluded will be that securitisation might have failed to some extent but that other factors had far more influence on creating the credit turmoil rather than securitisation alone. An amalgamation of reasons that led to the spread of the US housing crisis all over the developed world is presented.

Preface

I would like thank first of all my mother for the patience during the hard time writing this thesis and all the support during the sleepless nights. My appreciation also goes to my supervisor Prof. John Struthers for his guidance and important points of view. Finally, I want to thank a very special friend that made it possible for me to write this thesis and supported me throughout the whole Master programme.

Paisley, August 20th 2008

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1 Introduction

Since one year the markets are shaken by the woes of the subprime crisis and its effects on the real economy since early 2008. This resulted in frantic reactions by the economic press, market analysts and even political interventions. No other topic was as often quoted in the Financial Times than the effects of the subprime turmoil. The central banks in Europe and the USA intervened with rate cuts and liquidity injections to restore market confidence. In the US the Federal Reserve even introduced a new funding device for banks to swap illiquid mortgage related securities to highly liquid government securities.

The high number and frequency of the events and political reactions calls for an objective overview and analysis to provide deep insight of the current situation and how it was created. The globalisation particularly of the financial markets, through new communication systems and the highly sophisticated process of financial innovation, led to a global credit and liquidity crisis that had its origins in the US housing market. Blame has been more than forthcoming with Alan Greenspan, regulatory bodies, mortgage lenders, banks, rating agencies and the market itself all coming in for criticism. The main question arises:

“Who is to blame for the credit crunch, a financial crisis that Alan Greenspan himself says is the most wrenching since the end of WW2?” (World Finance, 2008, p. 226)

This research attempts to address some of the major issues and problems that created and shaped this crisis in order to provide a clear and objective insight of the mechanisms that are at work in the present financial markets. The study focuses on the US subprime securitisation market because this is where it all started. An amalgamation of practice and theory will be used to assess the actions and reactions of the market participants.

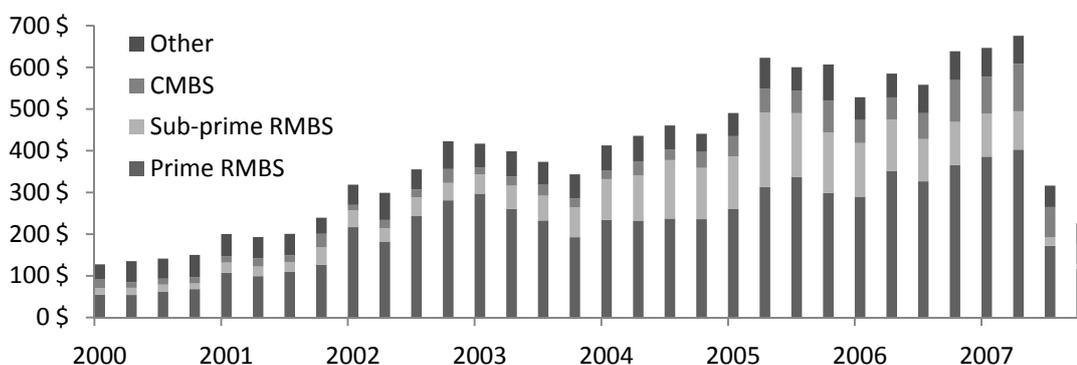
1.1 The Research Problem

The sale of receivables as such is relatively old and can be traced back 150 years; also the concept of mortgage sales was existent in European countries like Germany and Denmark. The popular German “Pfandbrief” is still in use today. The process of securitization and all the mechanisms related to it are relatively new and date back to the US of the 1970s.

In a classical Securitisation transaction a company sells homogenous assets to a special purpose vehicle (SPV) or conduit that is only created to for the sake of the transaction. The SPV finances these assets by issuing securities on the capital markets, which are backed by the assets the SPV holds. The securities are amortised like plain vanilla bonds through the cash flows derived from the assets. The concept of Asset-Securitisation was first mentioned in the 1970s in the secondary mortgage market in the USA where the first mortgage backed securities were created to provide liquidity for mortgage banks to create funds for the booming housing market. Intentionally created as an adjunct to the old thrift industry that was providing housing finance until then in the USA it evolved to a replacement over time.

The involvement of government-sponsored entities like Fannie Mae and Freddie Mac accelerated the growth and made it to the major financing tool for companies. In Europe, the first structured deal was created in the mid 1980s. The importance of research on that topic arises from the fast paced growth of the industry that is illustrated by an increase of the global issuance of asset-backed securities from \$126bn in March 2000 to \$676bn in June 2007, a growth of 530% in 7 years (Figure 1).

Figure 1: Global Issuance of Asset-backed Securities (in billions)



Source: Dealogic

The securitization process started with the transformation of mortgages and spread to credit card loans, automobile loans, business revenues and whole businesses. Nowadays, such exotic structures include life insurance, intellectual property rights and derivatives that create synthetic underlying assets. Also repackaging of these structures took place, where parts of these pools are sold on to be assembled in new structures called collateral debt obligation (CDO). The size of the issuance and the coverage of underlyings make Securitisation an important part of the financial market instruments and change the traditional way of banking in a way that cannot be restored.

Biased criticism tries to blame Securitization or the wider field of structured finance for the current financial crisis without considering the advantages and other factors that supported the turmoil. Therefore, this study will assess the process of securitisation and analyse other factors that influenced the liquidity problems such as monetary policy, industry practice, leverage, risk management, moral hazard, information asymmetries and contagion effects that led to a spill over of a US housing crisis to a global credit crisis. No single process, individual or organisation can be held responsible for the current market turmoil rather an aggregation of various influences created an unstoppable chain reaction to adjust the market to a new equilibrium. For how long this market clearing process, the elimination of assets that are not conform with the former expectations and the elimination of organisations that cannot meet the new expectations, is hard to predict, latest predictions based on new bets of money market traders see an end no earlier than at the end of 2010 (Mackintosh, 2008).

So called butterfly trades in the money markets allow traders to bet on increased stress at the end of year, when banks typically try to borrow more money to clean up their balance sheets. The trader takes long positions in the money market futures before and after the year end and shorts the December contract. This is a bet that higher demand for money in December will push interest rates higher and prices lower relative to the earlier and later contracts. Usually there is a small premium at the end of year on the cost of money, but in the past three months the premium for the end of this year has tripled and the 2010 premium has risen by half (Mackintosh, 2008).

1.2 Purpose & Objective

The focus of this thesis is to provide a deep insight into residential mortgage-backed securitisation in the US in order to understand the importance of this financial innovation and to be able to draw conclusions on the role of securitisation in the current crisis.

Hence, the main objectives of this research work are:

1. Give an overview of securitisation in general and residential mortgage-backed securities in particular. This is providing the rationale for and a classification of securitisation followed by an in depth assessment of the US residential mortgage-backed market, consisting of both the agency and non-agency market.
2. Outlining current issues in the securitisation of residential mortgage-backed securities by covering the tensions arising in the process of securitising subprime mortgages due to moral hazard, asymmetric information and adverse selection.
3. Presenting a brief overview of the credit crisis in a chronological form and pointing out current spill over effects on other markets than the housing market. Additional, the theory of price bubbles is introduced.
4. Finally, a conclusion will be drawn on the role of securitisation and on the future development of the process of securitisation.

1.3 Research Methodology

The research approach can be described as Applied Science or Application-oriented Science. New knowledge and solutions for practice is generated with the aid of knowledge from fundamental or theoretical sciences as well as practical experiences.

This strategy is applied because in the current financial world facing the crisis people are unlikely willing to participate in any primary research either for time reasons or for confidentiality reasons. However, it was tried to include data collections of firms that have access to such confidential data try to make good use of it. During the collection of the data it had to be encountered that it can be very expensive to get access to such data and highly sophisticated and time consuming internet research was used to overcome these problems. Many data had to be collected and assembled to get to the results presented.

Helpful was the Bank of England statistical release site that provided data that normally just can be accessed through licenses. Also the Bank of International Settlements and the International Monetary Fund provide useful data. Despite, no primary research was conducted the data collection is very comprehensive and highly up-to-date. Due to that the crisis is still going on and that academic research takes time to conduct relatively few papers are available that analyse the topic. However, to the end of the writing of this thesis more and more very useful literature could be included.

1.4 Outline of Research

The research is structured as follows. First the topic is introduced followed by the outline of the methodology and the objectives of this thesis. The main body of the thesis consist of a literature review which covers the fundamentals of securitisation and residential mortgage-backed securities. This is followed by an analysis of the US residential mortgage-backed securities market consistent of the agency and non-agency market. Tensions in the securitisation process of subprime residential mortgages is discussed and analysed. Next the crisis is outlined and the house price bubble theory is introduced. The effects of the crisis on other markets is illustrated and assessed. Finally, a conclusion is drawn and recommendations are made.

2 Fundamentals of Securitisation

This chapter is designed to lay the foundation for the analysis in the later chapters of this dissertation. It will provide an overview of the fundamentals of Securitisation in general and residential mortgage-backed securities in particular. First a definition of securitisation is attempted followed by the rationale for securitisation. Second, participants and mechanisms of securitisation are presented. Third, general asset classes are outlined and fourth, mortgage-backed securities are assessed and typical agency and non-agency issues are explained. This is completed by an overview of the history of mortgage-backed securitisation.

2.1 Structured Finance vs. Securitisation

Standard & Poors (2003) defined structured finance as “A type of financing in which the credit quality of the debt is assumed to be based on a direct guarantee from a creditworthy entity or on the credit quality of the debtor’s assets, with or without credit enhancement, rather than on financial strength of the debtor itself.” Securitisation or asset-securitisation is a form of structured finance. Structured finance also includes syndicated loans, project finance, equipment and cross-border finance. So that it can be defined as “A service offered by many large financial institutions for companies with very unique financing needs. These financing needs usually do not match conventional financial products such as a loan. Structured finance generally involves highly complex financial transactions” (Investopedia, 2008).

The Committee on the Global Financial System (2005) defines structured finance more narrowly based on three characteristics that tend to be associated more specifically with asset securitization (rather than the entire universe of structured finance:

“(i) pooling of assets (either cash-based or synthetically created), (ii) tranching of liabilities that are backed by the asset pool [...], (iii) de-linking of the credit risk of the collateral asset pool from the credit risk of the originator, usually through the use of a finite-lived standalone special purpose vehicle (SPV).”

“Securitisation in its widest sense implies every process that converts a financial relation into a transaction” (Kothari, 2006). The ownership of a company is a relation and the ordinary share is this relation converted into a transaction. In other words every process that makes a contract between different parties tradable on the market or over the counter is securitization and the traded asset is the security.

The word also has found its way into the Concise Oxford Dictionary “securitize” “v. Convert (an asset, specially a loan) into a marketable securities, typically for the purpose of raising cash.” This definition points to the ability of securitisation to be employed as funding device for corporations and financial institutions to finance receivables. A universal definition of securitisation is difficult due to the various forms and structures it can take. The many different asset classes and the continuous financial innovation in this area lead to the need for an ever changing definition of securitisation to cover all aspects that are associated with it.

2.2 Economic Rationale

The above definitions already described and outlined some of the rationale why securitisation is employed in finance. The following paragraph provides the most frequent mentioned reasons mentioned in the literature for undertaking securitisation.

Return on capital – A regulated entity can release capital that would have otherwise been locked up for the risk of default on the assets. The essence of this transaction is to replace receivables with cash, which carries a zero risk weighting for capital adequacy purposes. The new Basel 2 capital adequacy framework makes this rationale of securitisation even more important because securitisation can decrease the percentage of capital that needs to be held for cases of default (Breidenbach, 2005). Also non-regulated entities can boost their return on capital resulting from a reduced equity requirement.

Balance Sheet Management – Securitisation can be used to monetise assets without being forced to sell them outright. The original form of the receivable, such as mortgages, maybe very illiquid and cannot be marketed right away. Securitisation enables the holder of these receivables to create more liquid Asset-Backed Securities that can be sold on to investors on the capital markets and help to survive a short-term liquidity crisis or to avoid to sell assets outright to the market at the wrong point of the economic cycle (Deacon, 2004).

Off-balance-sheet funding – Securitisation can be used to extend the balance sheet of the originator as the finance obtained in the capital markets through origination of the ABS will not appear on the balance sheet and the assets securitised will be removed from the balance sheet. This can also be used to reduce gearing or leverage in order to raise future bank finance on better terms.

Funding diversification – ABS markets have their own investor base, some or all of them may not be current counterparties to the business of the originator. Issuing in the ABS market can provide access to new investors and counterparties that would have otherwise been denied (Deacon, 2004). This helps to expand and diversify the funding resources of the issuer.

Bank Liquidity – A new and recently of the Federal Reserve Bank renewed use of securitised loans is the increase of the liquidity of assets on the balance sheet of the financial institution originator due to the acceptance as repo collateral. A repo, or repurchase agreement, is a money market instrument that allows banks, mainly prime brokers, to sell securities to the central bank against cash under the agreement of a later buy-back (Stigum, 1989). Thereby the bank can enhance liquidity and increase its cash stock on a short-term period.

Cost of funds – The separation of the receivables that are securitised from the originators credit risk can improve the overall cost of funding for originators that perceive a bad credit risk. This can lead to cheaper funding and an increase of the overall amount of possible funding for the originator.

Strategic profile – An originator that has not previously issued on the capital markets might be unknown to the capital markets investors. A high profile credit rating issue can have positive effects on non-ABS issuance in the future by achieving good reputation through the successful ABS issuance.

Matched funding – The issuance of ABS backed by the receivables easily matches the tenor of the receivables and thereby decreases the maturity gap and improves asset liability management although prepayments on the underlying loans lead to a lower weighted average life of the instruments than the tenor (Kendall, 2000).

Tenor – The use of matched funding through the issuance of ABS, especially in the case of mortgage-backed securities leads to 20- to 25-year committed finance. This is significant longer than the usual bank finance available.

Transfer of risk – By transferring the receivables to an special purpose vehicle the originator also transfers the risk of losses due to default or delinquencies leaving the originator just with the risk that it want to perceive for example the credit enhancement for the issued instrument (Barbour & Hostalier, 2004).

Systems – Some also argue that the systems of the originator, underwriting procedures and day-to-day administration that are required for such a transaction prove to be supportive in terms of ongoing business efficiency.

Overall the benefits of securitisation strongly depend on the form of the receivables to be securitised, the legal and regulatory system and the type of originator as well as the goals of the origination.

2.3 Modus Operandi

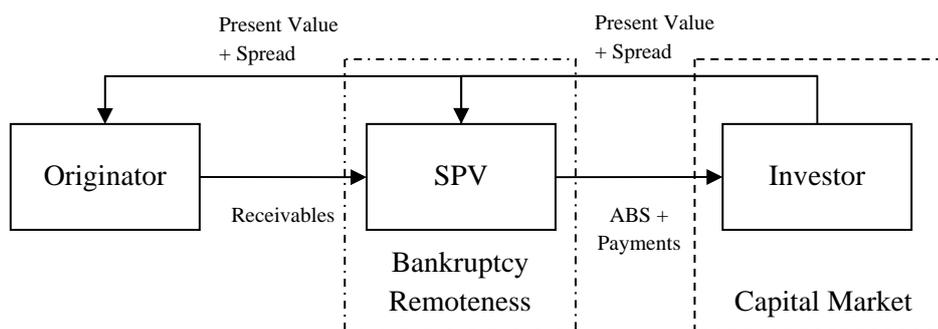
This chapter will briefly introduce the modus operandi of securitisation by outlining the main principles. The starting point is an entity that has created receivables accompanied by the right to collect them. In other words, the working capital is tied up in this receivables and the entity wishes to free the capital for further business.

The entity, also called the originator, will select receivables regarding a certain criteria and transfer them to a special purpose vehicle (SPV). The SPV is either created by the firm or by a specialised firm that offer this service. The sole purpose of the SPV is to hold the receivables and safeguard them for the investors (Kothari, 2006). Once the SPV becomes the owner of the receivables, investors will acquire a beneficial right therein by paying for the present value of the receivables.

The SPV will issue debt instruments to the investors that pay off at predetermined rates and dates. These instruments are called asset-backed securities (ABS) and can be traded freely on the capital markets. The originator also usually acts as servicer, which is collecting the payments from the receivables and taking action in the case of delinquency or default (Kothari, 2006). The debtors, depending on the legal system, are usually not notified about this transaction.

Near to the end of the process when the outstanding amount of the receivables is small the originator buys back the outstanding receivables and closes the transaction. However, this is just a very simplified illustration of the complex process but it outlines the major advantage of securitisation which is to create capital market instruments backed by bankruptcy remote assets.

Figure 2: Simple Modus Operandi



Source: Kothari

2.4 Asset Classes

Defining asset classes is as difficult as finding a perfect suitable definition of securitisation. Due to the broad nature of securitisation several securities could be included under certain criteria. The focus here lies on mortgage-backed securities and in particular residential mortgage-backed securities. There is a distinction between the European and the U.S. market. The U.S. market is unique in a sense that the government sponsored enterprises (Ginnie Mae, Fannie Mae, Freddy Mac) developed the mortgage-backed securities market. This results in a differentiation between asset-backed securities and mortgage-backed securities while in Europe and the rest of the world the term asset-backed security covers all types of asset-backed products. Here an amalgamated view will be adopted in order to focus on residential mortgage-backed securities. Depending on the underlying pool of assets securitization can be divided into three broad categories (Kothari, 2006).

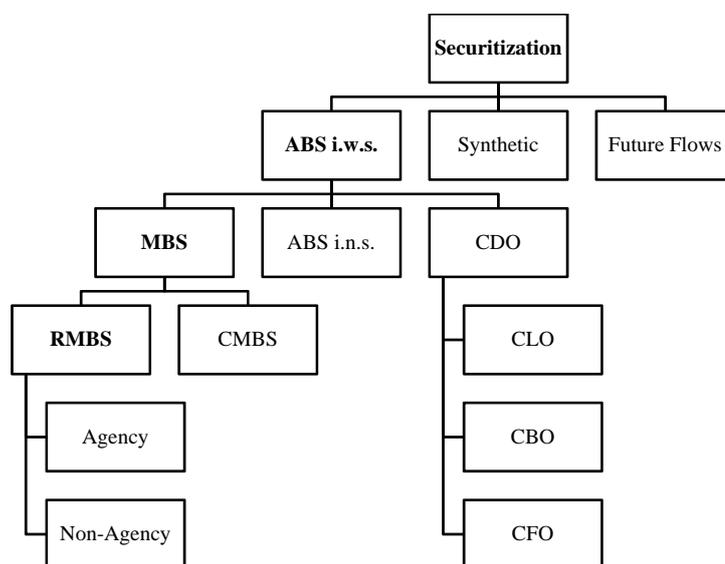
First, Asset-backed Securities in a wider sense that consist of Mortgage-Backed Securities, Asset-Backed Securities in the narrower sense and Collateral Debt Obligations. Second, the securitisation of future flows which is the generation of marketable securities based on future cash flow streams. Third, the securitisation of synthetic assets which is based on a pool of underlying credit default swaps that replicate the cash flow structure of for example corporate bonds without the need to own these bonds. In this case the pool is a pool of credit derivatives called credit default swaps that transfer the credit risk of the underlying to the buyer of the swap (Tavakoli, 2003).

The forms of securitisation vary widely and ever new asset classes are invented to meet investor needs and provide advantages for originators. It began with long-term consumer finance contracts such as mortgages and spread to shorter-term consumer-finance like credit card receivables and auto-loans (Deacon, 2004). The original securitisation as developed in the U.S.A. in the 1970s is at the core of this research. Synthetic securitisation and the securitisation of future flows are not in the scope of this study and will not be explained further. The focus here lies on asset-backed securities in general and mortgage-backed securities in particular.

2.4.1 Asset-Backed Securities

“The term Asset-Backed Securities (ABS) comprises securities and certificates of indebtedness representing payment claims against a special purpose vehicle (SPV) established solely for the purpose of the ABS-transaction” (Breidenbach, 2005). These claims are backed by a pool of assets, which are transferred to the special purpose vehicle and serve as security, largely for the benefit of the ABS investors (Gehring, 1999). The US market distinguishes Asset-Backed Securities from Mortgage-Backed Securities whereas in Europe the term covers both asset classes. In this thesis the European classification is used as is illustrated in Figure 3. Securitisation can be classified as mentioned above into three main categories.

Figure 3: Securitisation Categorisation



Source: Breidenbach

Furthermore, asset-backed securities are classified in mortgage-backed securities (MBS), asset-backed securities in a narrower sense (ABS i.n.s.) and collateralised debt obligations (CDO). Asset-backed securities in a narrower sense include credit card receivables, auto-loans and other consumer loans whereas collateralised debt obligations can be further divided into collateralised loan obligations (CLO) backed by loans for various purposes and collateralised bond obligations (CBO) backed by debt securities of corporations and a new product called collateralised fund obligation (CFO) that includes the participation of a hedge fund or private equity fund (Nachtwey & Wörner, 2005).

2.4.2 Mortgage-Backed Securities

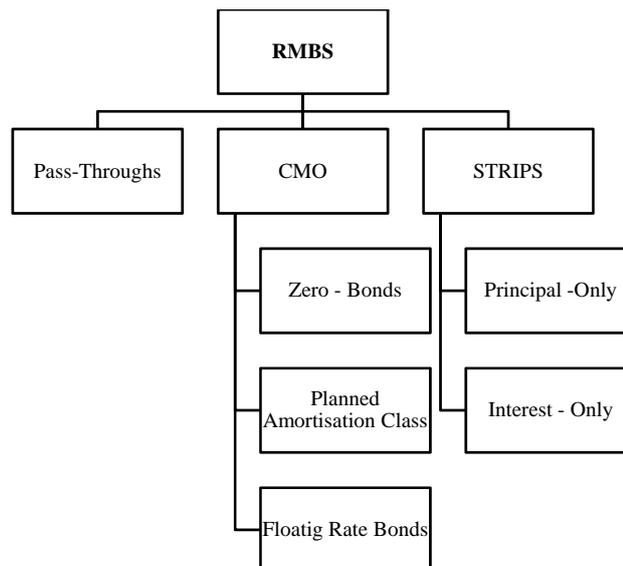
The Securities and Exchange Commission (2007) defines Mortgage-backed securities (MBS) as “debt obligations that represent claims to the cash flows from pools of mortgage loans, most commonly on residential property. Mortgage loans are purchased from banks, mortgage companies, and other originators and then assembled into pools by a governmental, quasi-governmental, or private entity.” In short these securities are derivative real estate cash flows of residential or commercial real estates.

3 Residential Mortgage-Backed Securities

A type of security that derives cash flows from residential debt such as mortgages, home equity loans and subprime mortgages which are then pooled and sold on to a special purpose vehicle (Investopedia, 2008). In a global context this asset class can be divided into agency and non-agency securities. In Europe just non-agency securities are issued because the agencies like the government sponsored entities located in the USA are non-existent. Because of the importance of the government-sponsored entities in the development of mortgage-backed securities in the US and worldwide, a brief historical overview is provided in the next chapter.

The most basic mortgage-backed security structure is the pass-through. It passes, on a monthly basis, the principal and interest payments less the servicing fees received from the pool of mortgage loans through to investors which are the holder of the security. Thus, effectively investors are buying a share of the cash flows from the underlying pool of loans. This structure is opposed to structured mortgage-backed securities, such as collateralized mortgage obligations (CMOs) and interest-only (IO) and principal-only (PO) stripped mortgage-backed securities (or STRIPs), that modify the cash flows in a variety of ways to create securities with given prepayment and maturity profiles (Kane, 2001).

Figure 4: RMBS Classification



Source: Investopedia

3.1 History

The history of securitization depends on the meaning of securitization adopted. “In a paper titled *The Capital Market Before 1600*, it says that sale of rentals out of land emanated in Northern France in the 12th Century, as an escape from increasing assaults on mortgage loans on account of usurious lending” (Kothari, 2006). In Denmark securitization has a history of about 200 years much longer than the mortgage-backed securities from the U.S., another traditional mortgage financing instrument is the German “Pfandbrief” that is even alive today. However, here securitization is used as means of asset securitization in general and mortgage securitization in particular. This is why the focus of this study is on the history of the U.S. market and specifically on the mortgage-backed securities market that is divided into agencies and non-agencies.

The developments in the U.S. market are due to experience during the Depression in the 1930s. As deposit markets collapsed the Congress enacted the National Housing Act to create a secondary market in mortgages to allow originators to fund mortgages. Therefore it created the Federal Housing Administration (FHA) that insures housing loans made by private lenders and thus absorbs the inherent risk in housing finance. In 1938 the Federal National Mortgage Association (FNMA, Fannie Mae) was founded to buy and sell federally-insured mortgages and insure sufficient liquidity in the market. It was split in 1968 in the Government National Mortgage Association (GNMA, Ginnie Mae) that is a state owned entity and the new Fannie Mae that is listed on the New York stock exchange but operates under government charter.

In 1970, GNMA was the first of the government sponsored enterprise (GSE) to create a securitization transaction on a “pass-through” structure. These pass-throughs are securities, that pass the principal and interest payments on mortgages through to investors, insured by the Federal Housing Administration and had the full credit and the backing of the U.S. government, as GNMA guaranteed both the repayment of the principal and the timely payment of interest. The program launched in 1970 called GNMA-1 is still in operation, while in 1983 another pass-through program GNMA-2 was launched. While GNMA-1 was designed for a single seller and

a single rate of interest, GNMA-2 had a range of interest rates and sellers. These programs can be further classified based on the type of mortgage pooled therein, for example single family or multifamily loans. The other two government sponsored enterprises Fannie Mae and the in 1970 founded Federal Home Loan Mortgage Corporation (FHLMC, Freddie Mac) soon followed with issuance of MBS. However, Fannie Mae was the agency that played a crucial role in promoting securitization of adjustable-rate mortgages and variable-rate mortgages. The securitization market in the United States of America is the largest in the world. In terms of depth, it is the only market in the world where both institutional and individual investors participate and in terms of width, the issuance is significantly higher than in the rest of the world.

3.2 Agency Market

The following chapter gives an overview of the main forms of residential mortgage-backed securities that are issued through the government-sponsored entities Fanny Mae, Freddie Mac and Ginnie Mae. Pass-through securities are the first and most common issues and laid the foundation for the growth and success of the following structured mortgage-backed securities or collateralised mortgage obligations and the later developed STRIPS. Despite the fact that the GSE were the first to develop MBS the non-agency market contributed significantly to growth of the market. This is why later the non-agency also non-conforming market will be introduced. The main differences between both markets are the pools of underlyings and the regulation each of the markets face.

3.2.1 Pass-Through Securities

The type of the pass-through collateral is a very important factor to qualify as agency conforming loan. The agencies differentiate by the following categories (Kane, 2001):

- Type of property (single-family or multi-family);
- Payment schedule (level, adjustable, other);
- Original maturity, and
- Loan coupon rate.

Single-family loans, defined as loans on one- to four-family homes, provide the collateral for the great majority of agency pass-throughs. These loans can be classified in government loans, insured by the Federal Housing Association (FHA) and the U.S. Department for Veteran Affairs (VA), and conventional loans. Ginnie Mae pools are collateralized by these government insured loans and the conventional loans back almost all Fannie Mae and Freddie Mac pools also they have issued pools backed by the FHA and VA. There tends to be a main difference in wealth between borrowers of the government loans and the borrowers of conventional loans that is due to the loan size and lower down payment requirements for the FHA and VA loans. This leads to lower prepayment rates of Ginnie Mae pools (Stone & Zissu, 2005).

Conventional loans can be further divided into conforming loans, which are loans eligible for securitization by the GSEs, and non-conforming loans which form collateral for private-label mortgage-backed securities. To qualify as conforming loan requirements set out by the GSEs need to be met. For 2008 the GSEs state the following loan size limits for first mortgage of \$417,000 for One-family loans (Fannie Mae, 2008). Furthermore, specific underwriting guidelines in terms of required documentation, borrower debt-to-income ratios, loan-to-value (LTV) ratios need to be met to be included in GSEs pools. The non-conforming loans do not qualify due to their size but also because of relaxed underwriting standards.

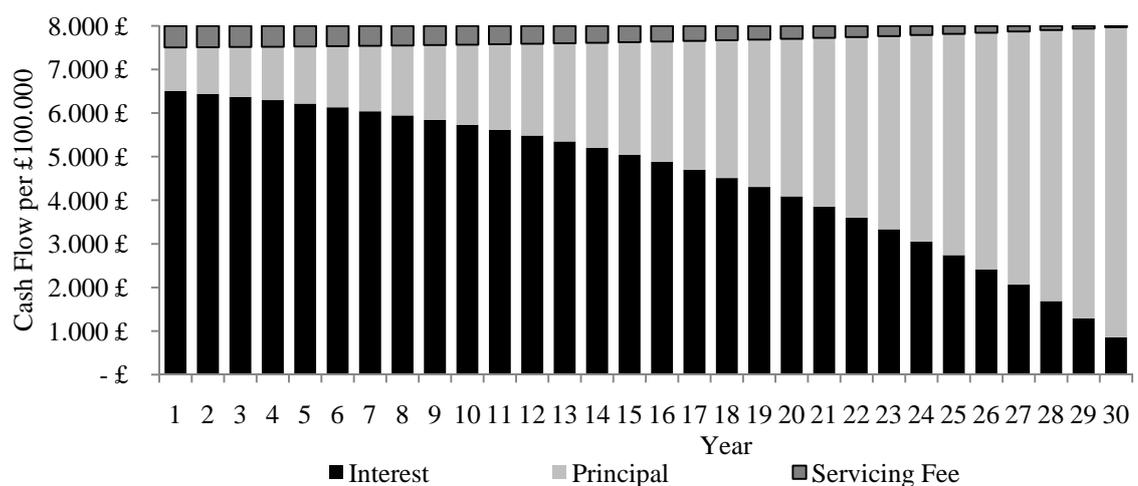
Within these loan categories a further classification is made by payment type and term. The basic collateral for pass-throughs are fixed-rate loans or level-pay loans (Kane, 2001). They are fully amortizing loans with fixed coupons and hence fixed monthly payments with loan terms of

usually 30 years. Also shorter loan terms are common today due to the recent refinancing waves. During the high interest-rate period of the 1980s adjustable-rate mortgages (ARMs) became popular. But the adjustable-rate mortgages also attract borrowers in low interest rate environments due to their low initial coupon or teaser rate in the first years. After the low teaser rate expires the coupon sets off to a specified index such as the 3-month LIBOR. These resets are limited by so called periodic caps, the maximum amount the coupon can change each reset date, and life caps, the upper limit on the adjustable-rate mortgage coupon (Banks, 2006).

A recent development is the hybrid adjustable-rate mortgage that is a mix between a fixed and an adjustable rate mortgage. The last payment type is balloon loans that are securitized by Freddie Mac and Fannie Mae. These loans amortize according a 30-year schedule with a following balloon payment after five or seven years.

Figure 5 illustrates the cash flow of a typical Ginnie Mae pass-through security with a 6.5% coupon payment. The yearly payment consists of interest, principal and servicing fees. The mortgagor pays a 7% coupon and the investor receives the 7% coupon minus the 50bp for the originators servicing fees resulting in a 6.5% coupon. The servicing amount declines as the outstanding mortgage amount declines. The illustration is under the assumption of no prepayments, however on practice prepayments will occur.

Figure 5: Cash Flow of Pass-through with 6.5% Coupon



Source: Stone & Zissu

3.2.2 Structured Mortgage-Backed Securities - CMOs

Although the mortgage pass-through market experienced dramatic growth, the cash flow characteristics did not meet all the investor's needs and expectations. Financial innovation came up with a far more sophisticated instrument with a variety of maturity and prepayment profiles to fulfil the expectations. In 1983, Freddie Mac issued the first collateralized mortgage obligation and since then the market has increased rapidly (Stone & Zissu, 2005).

The first structure that was issued was the sequential pay CMO where the different tranches in a sequential pay structure are amortised in sequence. This pay structure divides the underlying pool into bonds of varying maturities and durations. The collateral can be agency pass-through pools, non-conforming loans, or classes from other CMO deals.

The earliest CMO structures, consistent of typically three or four classes illustrate well the sequential retirement of each class. The process is as follows all principal payments are directed to the class with the shortest maturity, the class A bonds. Just when all class A bonds are retired the principal payments are directed towards the next shortest maturity, the class B bonds. This continues until all classes have been paid off.

Figure 6: Principal Payments to CMO Bonds with a Four-Class 300% PSA

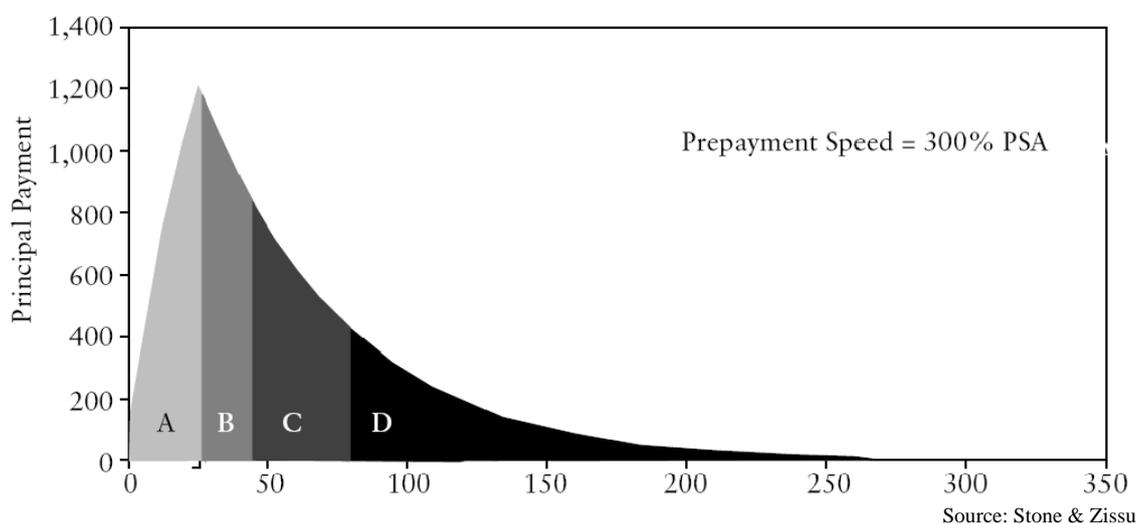
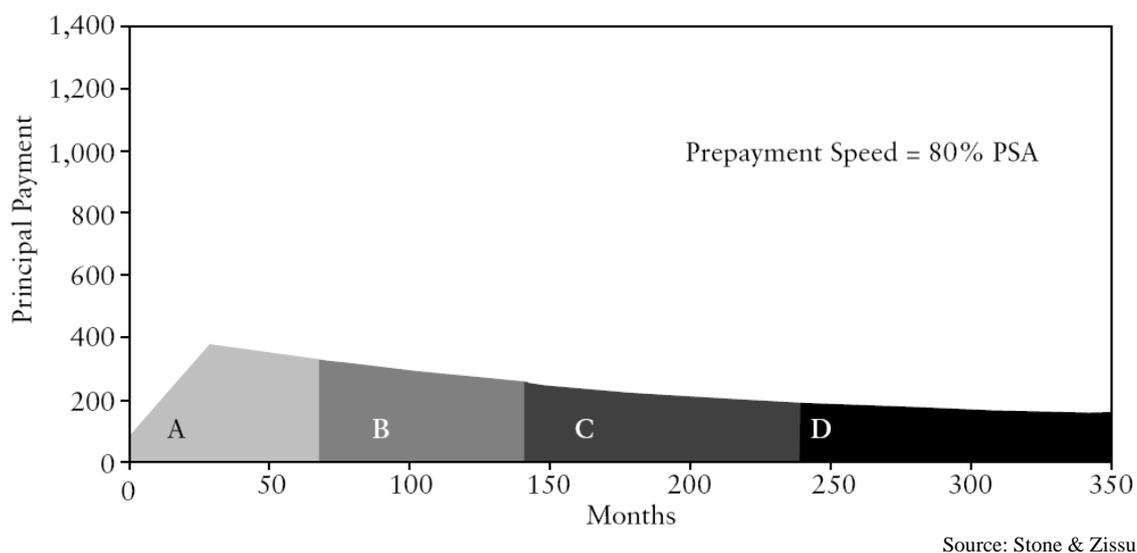


Figure 6 illustrates a typical CMO structure under the assumption of a 300% PSA prepayment speed. The four tranches A, B, C and D are outlined by the different colours. Tranche A is repaying first followed by the other tranches with D at last. Figure 7 shows the CMO structure

but under the assumption of 80% PSA prepayment speed. As can be seen the curve of the principal cash flow is flatter and also more stretched.

Figure 7: Principal Payments to CMO Bonds with a Four-Class 80% PSA



The speed of the repayment is depending on the prepayment speed of the underlying mortgage pool. The advantage is that the structure gives the investor the choice between different maturities to meet his funding needs. Class A must have the shortest maturity and the last class the longest maturity, whereas the class A has a lower interest payment compared to the later classes that bear higher risk and reward with higher return.

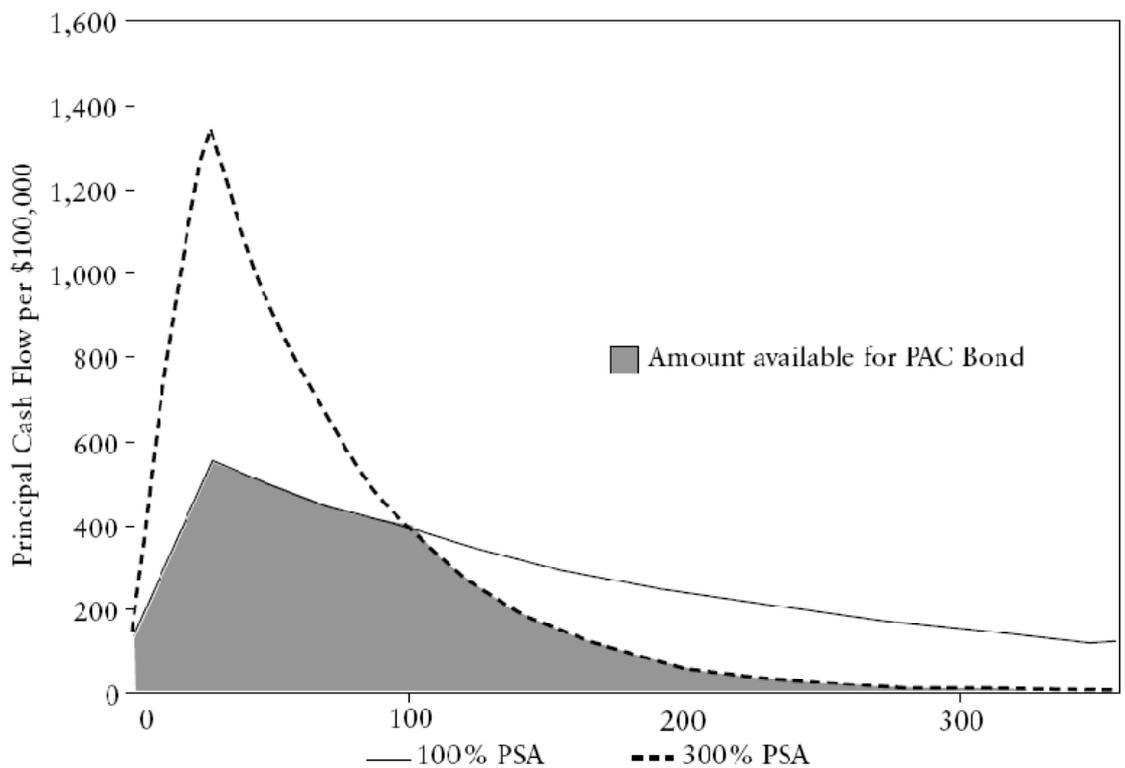
There are several other characteristics that lead to the rapid growth of collateralized mortgage obligations. The size of typical CMO deals mean that the monthly payment speeds are steadier and because they are backed by several pools a geographical diversification can be achieved. CMO classes often offer higher yields compared to other credit quality fixed-income instruments (Stone & Zissu, 2005). The main factor is that customized CMO classes meet the needs of investors better than conventional pass-through certificates. Various bond classes can be found and ever new are invented to meet funding needs of clients; in the following paragraph the most common are outlined.

Accrual or Z-bonds were the first derivation from the plain sequential bonds. Z-bonds do not receive any interest payment until their principal payment window starts. However, the interest due is accrued and added to the Z-bond's principal balance what results in an increase until the

earlier classes have retired. In short it is a plain Zero-bond included in a CMO structure. Typically the Z-bond is the last class in the structure and stabilizes the cash flow of the earlier classes because the interest payments are redirected to these classes.

The most important innovation in the CMO market was perhaps the *planned amortization class* (PAC). Opposed to the basic rationale behind CMO bonds, to offer investors better defined maturity profiles through sequential segmentation of principal, PAC bonds remove maturity uncertainty provided prepayments stay in predetermined range (Kane, 2001). PAC bonds are characterized by a determined principal payment schedule. This is achieved by allocating principal payments from the collateral to the CMO bonds, where priority is given to meet the PAC principal schedule. Therefore other bonds in the structure termed support or companion bonds absorb prepayment variations as much as possible. This results in higher weighted average life sensitivity to prepayment changes of these companion bonds so that they are priced at higher yields (Kothari, 2006). The degree of prepayment protection is characterized by a band of prepayment speeds.

Figure 8: PAC Principal Payment Schedule with a PAC Band



Source: Stone & Zissu

A last bond class to be mentioned is the *floating-rate bond* that is popular to many European and Japanese investors. The coupon resets monthly at a stated spread over an index, most commonly the LIBOR, subject to a cap on the coupon. The cap is typically higher than the coupon of the underlying fixed-rate collateral what makes it more attractive to investors. When structuring these bonds it is necessary to ensure that the income from the collateral is sufficient to pay out the coupon to the investors on any combination of the index and prepayment speed (Barbour & Hostalier, 2004)

3.2.3 Stripped Mortgage-Backed Securities

STRIPs are created by separating cash flows from underlying pools of mortgages and allocating specified percentages of principal and interest to each new STRIP. A Fannie Mae 9% pass-through can be stripped to produce two new securities one with a 6% coupon and one with a 12% coupon by simply allocating more interest from the underlying collateral to the 12% coupon and less interest to the 6% coupon, while the principal is split equally (Fabozzi & Choudry, 2004). By varying the ratio of interest and principal a wide range of securities can be created. The most dominant types and most elementary forms are the interest-only (IO) and the principal-only (PO) STRIPs. IO STRIPs receive all of the interest payments from the pool of underlying collateral and none of the principal (Lambert, 2008). PO STRIPs function in the opposite way.

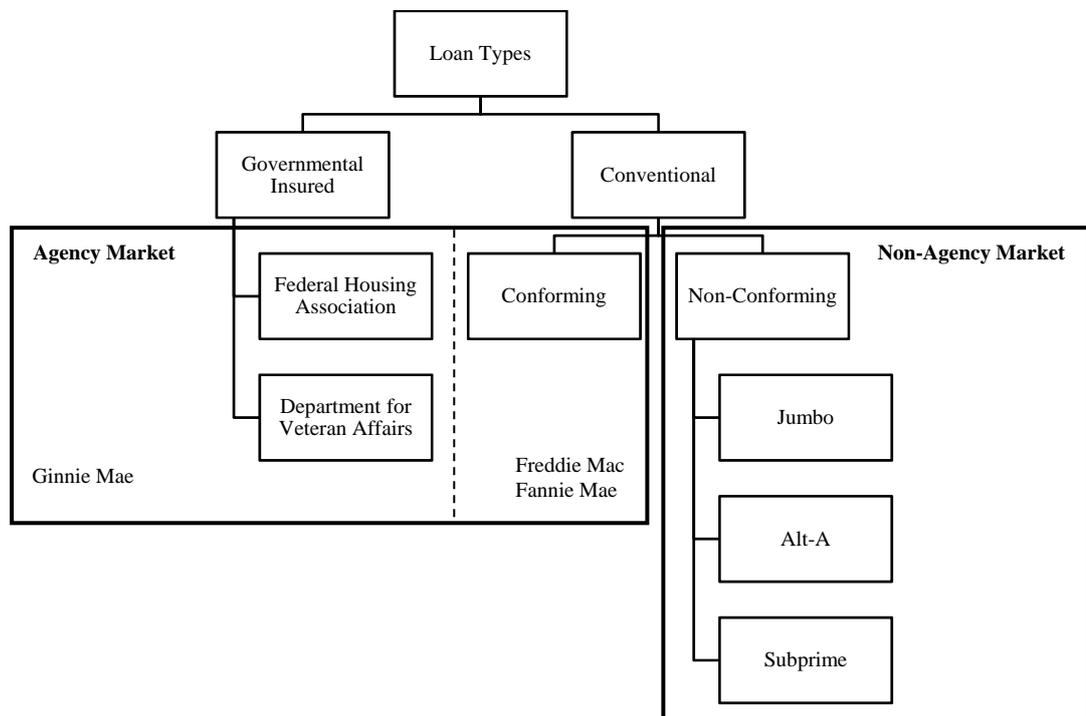
3.3 Non-Agency Market

The non-agency market is by far more diverse sector covering different credit characteristics as well as loan size and types (Kane, 2001). Despite the diversity of collateral backing non-agency issues the pay-out structures tend to be similar to the agency issues. In an agency issue the agency guarantees the timely and correct payment of the cash flow regardless of the delinquency or default of the underlying pool of loans. Whereas non-agency issues need some other forms of guarantees to secure the payment of principal and interest in case of delinquency or default. This is achieved by so called credit enhancement either internal, the more commonly used form, or external. External credit enhancement means insurance from an external source covers shortfalls in case of delinquency and defaults of the underlying loan pool. Internal credit enhancement is achieved by structuring the mortgage-backed security in senior and subordinated tranches.

The most basic form consists of a senior and subordinated or junior class; the latter absorbs possible principal shortfalls, but typically, for the senior class to be rated AAA, 4% to 20% of the deal tend to be in the junior classes (Kane, 2001). The AAA rated senior class is typically structures as a CMO with PACs, sequential bonds, and the other before mentioned classes. The junior class is often tranching along with credit lines, from AA to A, sometimes is referred to as mezzanine class, down to an unrated piece. According to the ratings the lower rated classes absorb losses first where the unrated class is the first loss piece. Non-agency MBSs, especially the lower rated BBB instruments trade at far wider spreads compared to similar rated corporate bonds (Tavakoli, 2003). This is opposed to the higher diversification in the underlying pool compared to the credit risk of a single corporation, so effectively they should trade at tighter spreads according to lower risk perception.

The non agency market mainly differentiates itself from the agency market through the underlying loan pools (Figure 9). Consequently the three main types of loans included in non-agency originations are outlined. The largest sector is the *traditional jumbo loans* also termed whole loans from affluent and financially sophisticated borrowers. The average loan size exceeds the agency conforming loans by more than double but still the borrowers have high credit ratings and loan-to-value ratios of below 80% (Stone & Zissu, 2005). The underwriting standards are the same as in the conforming sector.

Figure 9: Loan Types by Market



Source: Stone & Zissu

The second class are the *Alternative-A loans* or Alt-A. The credit quality here is more moderate and the average loan balance is not much higher than in the conforming sector (Stone & Zissu, 2005). Some reasons why these loans are non-conforming is that they are for investor properties, underwritten by using limited or alternative documentation for example a borrower that is self-employed and does not have a history of regular income. There are also cases that these loans could qualify but the borrower obtains a better rate through a non-agency program. These loans are characterized by unforeseeable refinancing if the borrower achieves a better standard of living even when mortgage rates do not change (Fabozzi & Choudry, 2004). The

high refinancing rate leads to shorter maturity in the pool of mortgages. However, sensitivity to interest rate moves tends to be lower for Alt-A loans because borrowers face extra hurdles in refinancing.

Loans to borrowers with imperfect credit histories and higher debt-to-income ratios are termed *subprime loans*. The 2001 Interagency Expanded Guidance for Subprime Lending Programs defines the borrower as one who generally displays a range of credit risk characteristics, including one or more of the following (Ashcraft & Schuermann, 2008):

- Two or more 30-day delinquencies in the last 12 months, or one or more 60-day delinquencies in the last 24 months;
- Judgment, foreclosure, repossession, or charge-off in the prior 24 months;
- Bankruptcy in the last 5 years;
- Relatively high default probability as evidenced by, for example, a credit bureau risk score (FICO) of 660 or below (depending on the product/collateral), or other bureau or proprietary scores with an equivalent default probability likelihood; and/or,
- Debt service-to-income ratio of 50 percent or greater; or, otherwise limited ability to cover family living expenses after deducting total debt-service requirements from monthly income.

Furthermore, subprime loans are sometimes associated with predatory lending and borrowing, despite this is not the case for every subprime loan originated. *Predatory lending* is defined as the welfare-reducing provision of credit (Morgan, 2007). What in other means nothing else than the borrower would have been better off without the loan. A far more broad definition is given by the New Jersey Division of Banking and Insurance (2007) which define it as an activity that involves at least one of the following elements:

- Making unaffordable loans based on the assets of the borrower rather than on the borrower's ability to repay an obligation;

- Inducing a borrower to refinance a loan repeatedly in order to charge high points and fees each time the loan is refinanced (“loan flipping”); or
- Engaging in fraud or deception to conceal the true nature of the loan obligation, or ancillary products, from an unsuspecting or unsophisticated borrower.

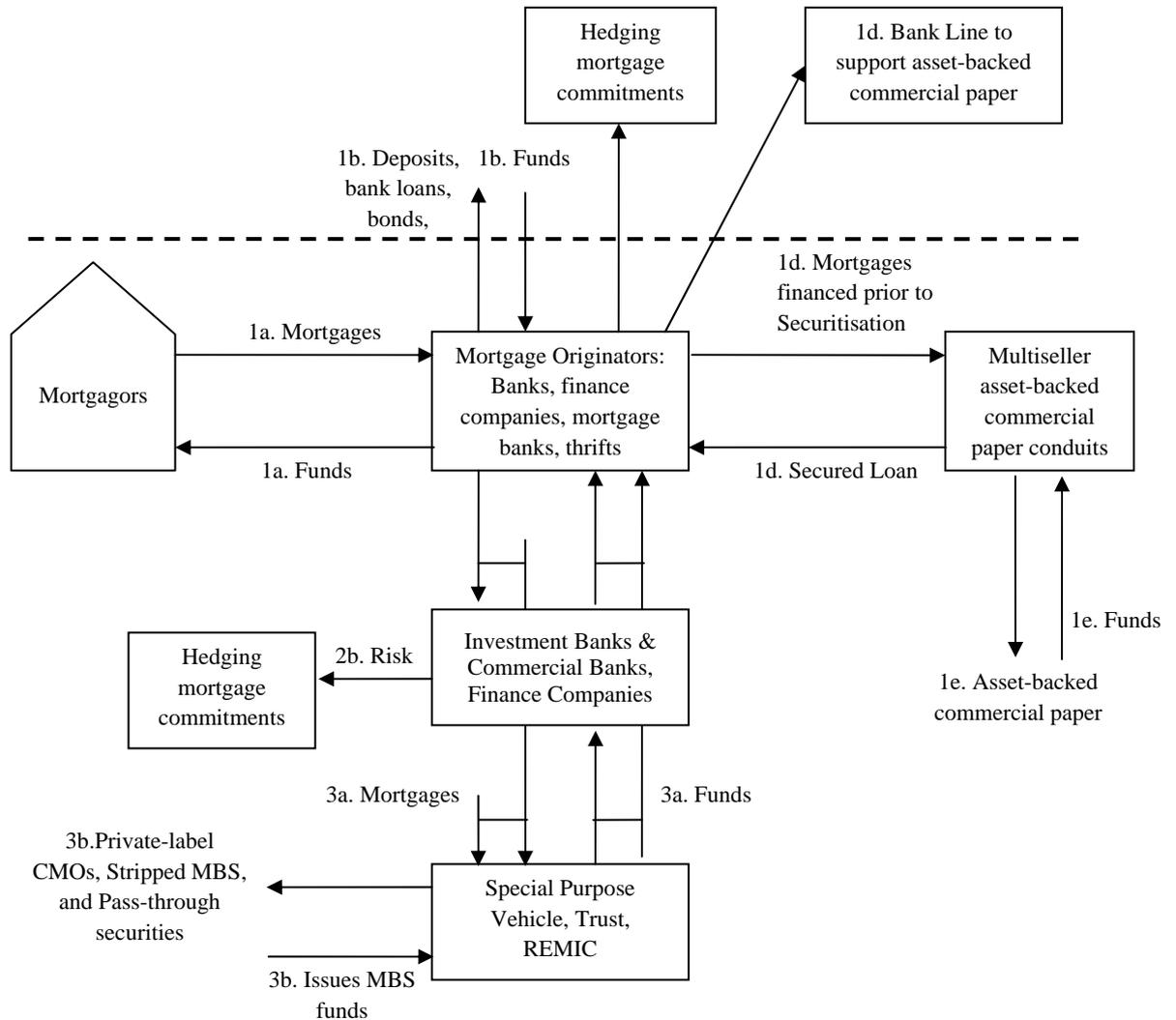
Predatory lending is conducted by professionals of the industry that are motivated by fee income to wilful misrepresent material facts about the real estate transaction without the knowledge of the borrower (Smyth & David, 1991). Opposed to this there is *predatory borrowing*, more commonly known as mortgage fraud, which becomes more prevalent in an environment of high and increasing house prices. Here the borrower wilful misstates material facts in order to obtain a higher standard of living.

The increasing house prices motivate the borrower to take on loans with an unrealistic high debt-to-income ratio guided by the hope that the house price will rise faster in order to pay off the loan with a sale of the property (Morgan, 2007). It can be divided into two forms of fraud, fraud for housing and fraud for profit. The former is the illegal action of the borrower in order to acquire and maintain ownership of a home, the latter is a jointly action by the borrower and insiders to inflate the price of a property with no motivation to maintain ownership.

3.3.1 A typical non-agency structure

Figure 10 illustrates a typical non-agency mortgage-backed structure. It is divided into three phases each phase encompasses multiple flows of mortgage assets and funds. The dotted line represents off-balance sheet funding and on-balance sheet funding.

Figure 10: Non-Agency Market



Source: Stone & Zissu

Phase 1 starts with the mortgagor that receives funds from the mortgage originator in exchange for the mortgage (1a). The mortgage originator needs to fund this transaction either on-balance or off-balance sheet. Usually the mortgage originator will fund it the on-balance sheet with deposits made from other customers in exchange for the interest paid on these deposits (1b). The mortgage commitment and other risks that are inherent in such a transaction will be hedged by using the market for futures, options and other derivatives (1c).

The originator also has the opportunity to tap an asset-backed commercial paper program to fund the accumulation of mortgages before the securitization of the pool by selling them to an asset-backed commercial paper conduit (1d). This conduit will issue asset-backed commercial paper and retrieve funds to pay the mortgages (1e).

Phase 2 the sale of the mortgages to a financial institution that will securitize the mortgages or directly to a SPV or trust. As illustrated, one mortgage pool passes first through the financial institution the other is transferred directly to the SPV (2a). The financial institution will hedge its commitment between the purchase of the assets and the sale to a securitization trust in the derivatives markets (2b).

Phase 3 is the final sale of the mortgages to the securitization vehicle (3a). The SPV or trust issues CMOs, STRIPS and pass-throughs to investors and receives funds in return (3b).

3.4 Tensions in Mortgage Securitization

In the following chapter the focus lies on the before illustrated securitization process and tries to identify possible tensions in this process and how they are dealt with. This is done by outlining the key players and their connections to each other in this process.

A significant change in the composition of issued and originated mortgages happened in the US as a consequence of the before mentioned long-term interest rate reduction. The issuance and origination of all mortgage asset classes experienced a significant increase. However, the non-conforming asset classes, mortgages that cannot be bought by the government sponsored entities (GSE), like jumbo loans, Alt-A and Subprime increased more relative to the agency asset class. The Jumbo asset class includes loans to prime borrowers with an original principal balance too big to be bought by the GSEs, while the Alt-A asset class consists of borrowers with good credit rating but with a more aggressive underwriting practice, i.e. poor documentation of income or high leverage; the Subprime asset class involves loans to borrowers with poor credit history.

Table 1: MBS Issuance & Origination

Year	Subprime		Alt-A		Jumbo		Agency	
	Origination	Issuance	Origination	Issuance	Origination	Issuance	Origination	Issuance
2001	\$ 190,00	\$ 87,10	\$ 60,00	\$ 11,40	\$ 430,00	\$ 142,20	\$ 1.433,00	\$ 1.087,60
2002	\$ 231,00	\$ 122,70	\$ 68,00	\$ 53,50	\$ 576,00	\$ 171,50	\$ 1.898,00	\$ 1.442,60
2003	\$ 335,00	\$ 195,00	\$ 85,00	\$ 74,10	\$ 655,00	\$ 237,50	\$ 2.690,00	\$ 2.130,90
2004	\$ 540,00	\$ 362,63	\$ 200,00	\$ 158,60	\$ 515,00	\$ 233,40	\$ 1.345,00	\$ 1.018,60
2005	\$ 625,00	\$ 465,00	\$ 380,00	\$ 332,30	\$ 570,00	\$ 280,70	\$ 1.180,00	\$ 964,80
2006	\$ 600,00	\$ 448,60	\$ 400,00	\$ 365,70	\$ 480,00	\$ 219,00	\$ 1.040,00	\$ 904,60

Source: Ashcraft and Schuermann (2008)

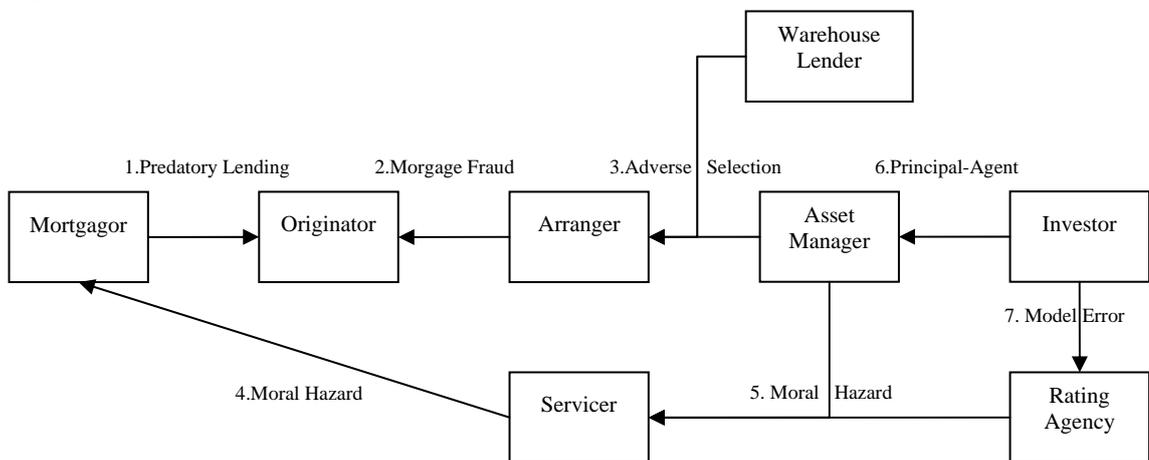
Table 1 illustrates the shift from quality to quantity and outlines one of the causes of the credit crunch. Riskier mortgages promise higher returns to investors but also increase the uncertainty and severity of delinquency and default. The shift was due to the higher demand from investors for higher return, and the new “originate and distribute” model of banking. An issuer that knows it does not need to keep the bad loans on its balance sheet is more likely to underwrite bad loans than one that would need to keep the “lemons” until maturity on the balance sheet and face the

possible losses through default. This is a first flaw or tension associated with the subprime mortgage securitization and is called moral hazard.

By the end of 2006 the non-agency production was 45% higher than agency production compared to 2001 where the non-agency production was 40% of the agency production. This fraction is also illustrated by the increase of the ratio between origination and issuance of the Subprime and Alt-A asset classes. The increase of this ratio underpins the assumption of a shift in the banking model to originate and distribute and causes also possible tensions.

Ashcraft and Schuermann (2008) identified seven tensions in the process of securitising residential mortgages.

Figure 11: Tensions between Key Players



Source: Ashcraft and Schuermann (2008)

3.4.1 Between the mortgagor and originator

The mortgagor needs a loan to either purchase a property or refinance an existing mortgage and the originator underwrites, initially funds and services this loan. Often a mortgage broker serves as intermediary in this process between mortgagor and originator. The originator is motivated to provide the loan by fee income and by the proceeds of a sale of the mortgages (Ashcraft & Schuermann, 2008). In a sale the originator receives an amount that is larger than the principal balance of the mortgage pool because the buyer anticipates interest payments on the principal. The financially unsophisticated borrower is often not aware of all the options available to him and if aware he is often not able to make the best choice.

Here arises the possible tension of predatory lending practice on the side of the originator or broker which leads to a welfare-reducing provision of credit (Morgan, 2007). The originator or broker has an incentive, the fee income, to offer the borrower the credit product with the most income for him even if the borrower would be better off with another financial option.

3.4.2 Between the originator and the arranger

As explained earlier the arranger purchases the pool of mortgages from the originator and needs to conduct due diligence on him. This will include, between other tasks, financial statements, underwriting guidelines, discussions with senior management, and background checks (Ashcraft & Schuermann, 2008). The arranger will then perform all tasks necessary to finalize the deal that is creating the special-purpose vehicle, consult rating agencies, file with the SEC, and underwrite the issuance of the securities by the SPV to the investors. The compensation of the arranger consists of fees charged to investors and the premium paid by the investor over the par value of the issued securities.

The main problem here is that the originator has an information advantage over the arranger regarding the quality of the underlying loan pool (Ashcraft & Schuermann, 2008). The originator could be motivated to work together with the borrower in order to construct misrepresentations in the loan application which is termed either predatory lending as described above or predatory borrowing when the “borrower convinces the lender to lend too much” (Morgan, 2007). In both cases the arranger would have bought mortgages under false

assumption of their quality. There are some safeguards in place to protect the arranger, as mentioned the due diligence and second representations and warranties included in the SEC filing. If these are violated the originator has to buy back the mortgages requiring the originator to have enough liquid funds to do so. Rucker (2007) suggested if the arranger does not conduct or routinely ignores due diligence there is little to stop mortgage fraud.

3.4.3 Between the arranger and third-parties

The information advantage continues throughout the securitisation. The information asymmetry between the arranger and third parties like, warehouse lender, asset manager and rating agencies can lead to adverse selection. The arranger can securitize the bad loans and either keep the good loans or securitize them elsewhere (Ashcraft & Schuermann, 2008). The classic lemons problem was defined by George Akerlof in 1970. The main idea is that the buyer of the mortgage, based on asymmetric information, assumes an average quality of the underlying pool and is just willing to pay an average price which will keep the arranger away from securitizing the better quality mortgages (Akerlof, 1970). This will happen to the point until all underlying mortgages are from bad quality. When the lender a mono-line arranger he requires funding from a third-party lender for loans kept in the “warehouse” until they can be securitized (Rosen, 2007).

One of the protections the warehouse lender will use is a so-called haircut. The lender will provide an over-collateralised loan against the underlying pool forcing the lender to take a funded equity position while they remain on its balance sheet (Ashcraft & Schuermann, 2008). One could see the results of this tension in the first half of 2007 as dozens of mono-line lenders failed due to the increased demand of collateral by the warehouse lenders (Wei, 2007). As the arranger sells the underlying pool to the special-purpose which is managed by an independent asset manager who faces the same information disadvantage as the warehouse lender. The asset manager needs to conduct due diligence and needs to rely on the reputation of the arranger as well as the provided credit enhancement to the securities.

On the other hand, credit rating agencies just conduct limited due diligence on the arranger but calculate the amount of credit enhancement need for the transaction. As the arranger is likely to

still know more than the credit agencies he will has an incentive not to disclose his information in order to lower the needed credit enhancement that needs to be provided by him (Ashcraft & Schuermann, 2008).

3.4.4 Between the servicer and the mortgagor

The special-purpose vehicle or the arranger appoints a servicer that is “responsible for collections and remittance of loan payments, making advances of unpaid interest by borrowers, accounting for principal and interest, customer service to the mortgagor, holding escrow or impounding funds related to payments of taxes and insurance, contacting delinquent borrowers, and supervising foreclosures and property dispositions” (Ashcraft & Schuermann, 2008). The servicer in return is rewarded with a periodic fee payment by the SPV.

The moral hazard arises when the borrower starts struggling to make mortgage payments. Then a mortgagor is less likely to pay hazard insurance and property tax bills as well as conducting adequate maintenance. This is because the mortgagor does not share the same downside risk as the servicer and the investors. Failure to pay hazard insurance exposes the investors to a significant risk of high losses due to a lack of coverage. Failure to maintenance increases the costs for investors in marketing the property after foreclosure or in the worst case even reduce the sale price. Therefore, borrowers need to pay regularly escrow funds for insurance and property tax if the borrower fails to pay usually the servicer needs to advance these funds. The maintenance problem is tried to be solved by promptly foreclose the property as the payments are deemed uncollectible (Gehring, 1999).

3.4.5 Between the servicer and third parties

Losses realized from the mortgage pool are significantly affected by the servicer and its ability and will to manage the delinquencies. Similar to the above mentioned problem the servicer does not share the downside risk with investor but his fees increase the longer he holds the deal on his books. The servicer incurs costs to manage the delinquencies and foreclosures in the interest of the investor but he will not incur losses like the investors in case of badly managed delinquencies. The fees the servicer receives are paid on a monthly basis, normally on the beginning of the month, and the payments to the investors are distributed at the end of the month so that the servicer can earn interest on the funds (Ashcraft & Schuermann, 2008).

Additionally, the servicer also gets to keep late fees what provides an incentive for him to not make collection calls until late fees are assessed. There are two other tensions between servicer and investors observable. On the one hand the servicer has an incentive to inflate expenses, especially in good times when recovery rates on foreclosed property are high and on the other hand he is willing to modify the loan terms of a delinquent loan to delay foreclosure in order to receive the fee payment (CalculatedRisk, 2007). One possible solution is to employ a master servicer that monitors the servicer and to choose the servicer after its reputation. In relation to the credit rating agencies the servicer quality has influence on the credit rating of the ABS issue so the agencies will conduct due diligence and release their findings to the public.

3.4.6 Between the asset manager and the investor

As the typical investor is financially unsophisticated he will employ an asset manager to overcome this. This difference in the information and knowledge between investors and manager leads to the principal-agent problem. The investor will not fully understand the investment strategy of the asset manager, has uncertainty about the manager's ability, and does not observe any efforts made by the manager to conduct due diligence. The investor will try to mitigate this problem by evaluating the manager's performance relative to a peer benchmark (Ashcraft & Schuermann, 2008). A problem arises when the asset manager does not invest sufficient effort on behalf of the investor.

3.4.7 Between the investor and the credit rating agencies

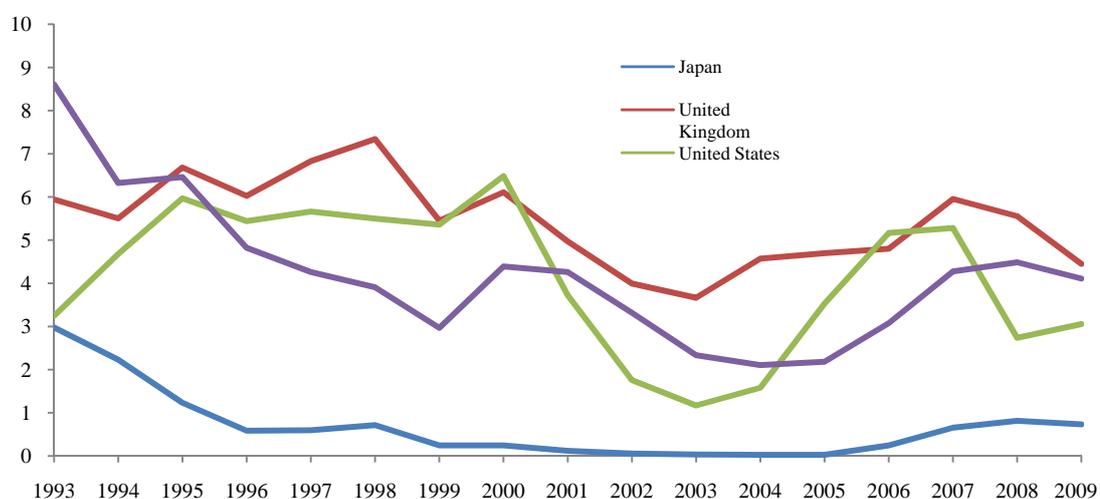
There are two major concerns that need to be addressed here. First, rating agencies are paid by the arranger of the deal which creates a conflict of interest and second rating agencies use models to quantify and qualify ABS deals. The conflict of interest arises because the rating agency is paid by the arranger rather than the investor who heavily relies on their judgement. For example, Moody's 2007 revenue consisted to 44% of structured finance deals (Beales, Scholtes, & Tett, 2007). As the rating agencies also rate other financial products for the arranger they are more likely to give a good rating in line with the arranger's expectations. Furthermore, the investor is not able to differentiate later if the possible problems with his investment are due to honest errors caused by model errors or if they were caused by unprofessional behaviour of the rating agencies (The Economist, 2007).

4 Liquidity Crisis

4.1 From the Causes to the Fuel that Fed the Crisis

George Soros (2008) identified August 2007 as the outbreak of the current financial as first interventions by central banks took place. However, the roots and causes are to be found further in the past. The economic environment of the first half decade of the 2000s was fruitful for the development of a housing price bubble and the following “subprime turmoil” that triggered the current financial events of the so called “credit crunch” (Economist, 2007).

Figure 12: Global 3-Month Money Market Rates



Source: Bank of England

In 2000 the Federal Reserve cut the base rate by three percent after the Internet bubble bust. Consequently, the 2001 attack on the World Trade Centre resulted in further rate cuts ending up with one percent on 31st July 2003 where it stayed for a full year. The goal of the Federal Reserve Bank was to expand the monetary base by stimulating borrowing to increase investment activity. Cheap money engendered excessive lending. With increasing liquidity and low interest rates the real estate market became more attractive. Investors were trying to take advantage of the house price appreciation since 1996.

The house price bubble ended abruptly in the 2nd quarter of 2006 as the S&P/Case-Shiller U.S. National Home Price Index reached 189.6 % up from 100% in 2000. Low interest rates and

rapidly rising house prices make real estate attractive as investment not only to professional investors. Individuals were driven by two new features of the mortgage market.

First, newly introduced adjustable rate mortgages had a low short-term teaser interest rate called 2/28 or 3/27. The “teaser”-rate a very low interest rate for the first period of the mortgage maturity is followed by an adjustable market rate plus a borrower specific spread. If the low rate resets to a higher market rate the borrower can face a payment shock especially if the base rate increased causing the benchmark market rate to increase (Ashcraft & Schuermann, 2008). This leads inevitably to a delay in payment and can trigger foreclosure.

Second, continuously rising house prices offered the chance to borrowers that the property value would rise over the mortgage value so that an early repayment with a profit is possible through a house sale. This opportunity vanished as house prices began to stagnate and later started to fall. As house prices began to fall loan-to-value ratios of mortgages began to erode and left home owners paying for a mortgage debt higher than the value of their property (Whalen, 2008).

Institutional investors saw their opportunity for yield enhancement in the secondary mortgage market. Most exciting and interesting to them was the subprime mortgage market with returns of up to 300bps higher than traditional instruments. Table 2 illustrates the share per loan type of all originated and issued mortgages and indicates a significant change in the composition.

Table 2: Share per Loan Type of Total Origination & Issuance

Year	Subprime		Alt-A		Jumbo		Agency	
	Origination	Issuance	Origination	Issuance	Origination	Issuance	Origination	Issuance
2001	9%	7%	3%	1%	20%	11%	68%	82%
2002	8%	7%	2%	3%	21%	10%	68%	81%
2003	9%	7%	2%	3%	17%	9%	71%	81%
2004	21%	20%	8%	9%	20%	13%	52%	57%
2005	23%	23%	14%	16%	21%	14%	43%	47%
2006	24%	23%	16%	19%	19%	11%	41%	47%

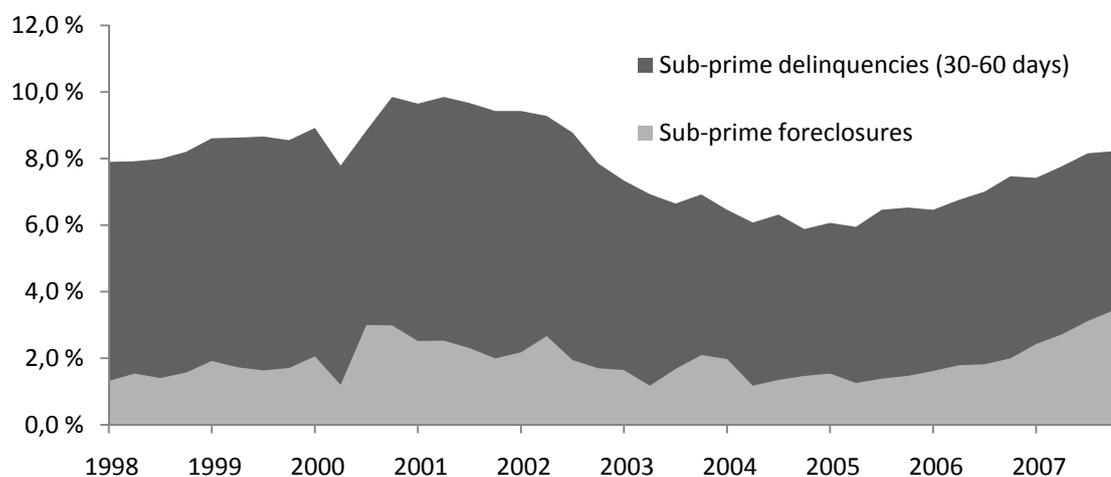
Source: Bank of New York

Prior 2004, the share of subprime mortgages was about 9% of outstanding mortgages. By 2004 subprime mortgages increased to 21% of all outstanding mortgages while 20% of all issued mortgages to investors were subprime opposed to an historical average of 7%. The

exceptionally liquid markets and improvements in risk management techniques gave incentives for higher leverage and increased risk taking. This laid the foundation for the fast paced growth of mortgage related securities.

The shift to an “originate and distribute” culture in the financial services industry led to the immense growth of the market for credit transfer instruments. The issuance of mortgage related securities increased significant due to demand for extra spread points, the CDO market alone ballooned to an issuance of \$600 billion in 2006 (Lambert, 2008). The “originate and distribute” model bears moral hazard as the originator transfers the credit risk to the investor, which is transferring it to the special purpose vehicle. The demand of the capital market for new securities with enhanced yield and the continuous origination of mortgage pools in the form of residential mortgage-backed securities and collateral mortgage obligations led to a bottleneck in the supply of mortgages. As a result the standards of underwriting and due diligence declined in the subprime market and thereby supporting higher delinquency rates than expected.

Figure 13: US sub-prime delinquency rates vs. foreclosure rates



Source: Bank of England

Borrowers were able to finance houses to 100% with the help of so called 80/20 mortgage. Where the borrower takes out a mortgage for the first 80% of the total amount and then finances the outstanding 20% with a second mortgage. There was no upfront payment to increase the borrowers’ loss participation. Also 2/28 and 3/27 adjustable rate mortgages were offered to feed the demand by investors and “tease” borrowers.

On 5th August 2007 American Home Mortgage (AHM) filed for bankruptcy after the subprime housing turmoil. This was caused by increased delinquency rates and the new types of mortgages such as 2/28 or 3/27 mortgages that reached the end of the “teaser” rate and reset to the market benchmark plus a risk related spread specific to the mortgagee. The new far higher rate caused shocks to the borrowers and they had to realize that they face payments they cannot afford. With delinquency rates increasing mortgage originators, such as AHM, were forced to buy back loans they had sold on to the secondary market for securitization. The forced repurchase increased the amount of distressed mortgage loans for sale in the market which had a negative effect on prices.

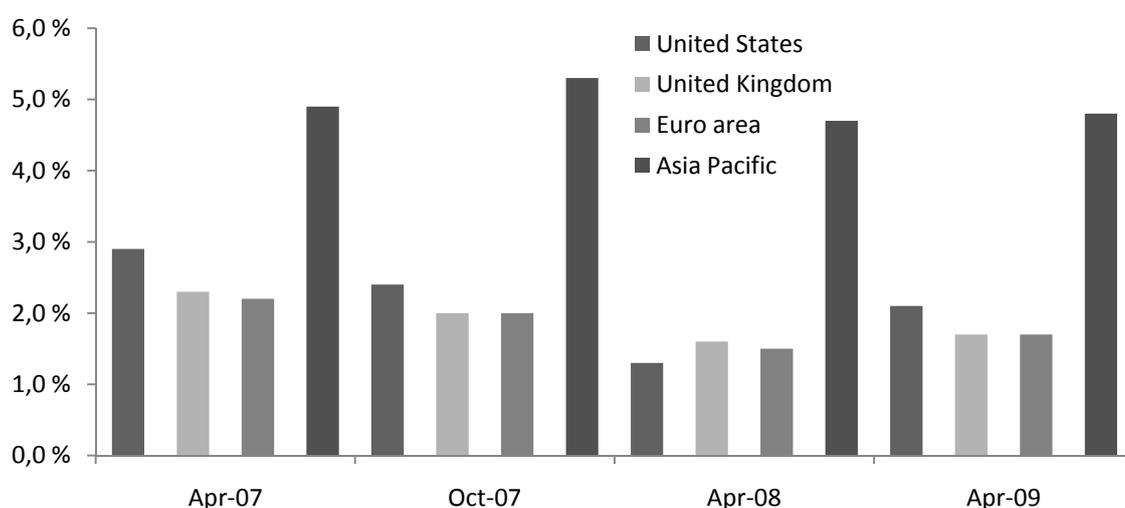
Mark-to-market assets needed to be written down in value what caused margin calls and demands for more cash or collateral to back the loans. The debtor would pay off the margin calls or increase the collateral but mortgage banks do not have anything else to cash in then mortgages. So the vicious circle caused AHM being unable to pay its liabilities. Furthermore, the special purpose vehicles and conduits relying heavily on funding in the short-term capital market faced the problem that no one would buy their asset-backed commercial paper due to the drop in ratings of the assets and the increasing mistrust and uncertainty on the amount of the subprime assets.

The next chapter will outline some of the main effects the crisis had on the markets worldwide by using particular indices and forecasts to illustrate the severity of the situation.

4.2 Aftermath of the Crisis

Since the outbreak of the crisis in the summer 2007 it has spread all over the globalised world and affected various markets and countries. So far the worst hit are the US, followed by the UK and Spain in Europe and Australia. However, also countries that have different housing markets compared to the US and UK are affected and fear recession such as Germany and France. The following chapter illustrates the spill over effects of the former US subprime housing crisis on to the world markets evolving to a worldwide credit crunch.

Figure 14: International GDP growth forecasts

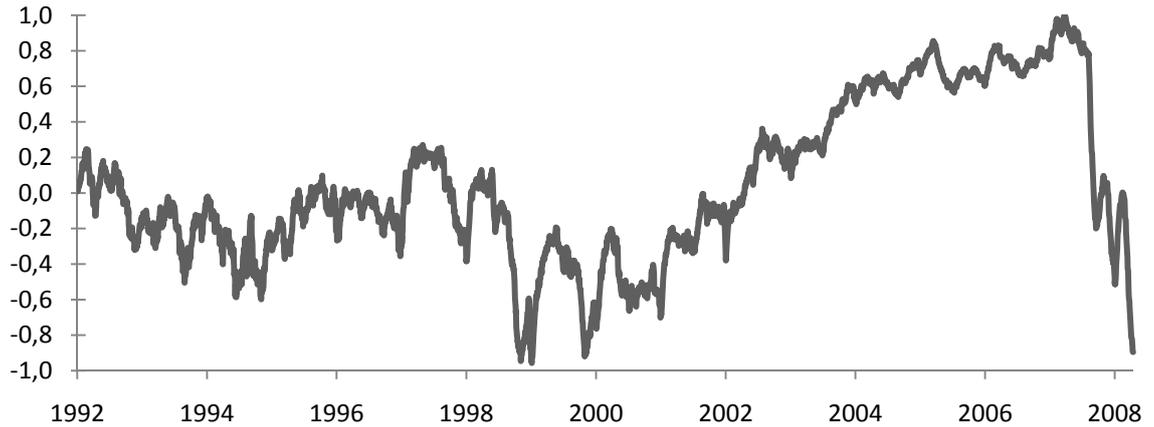


Source: Concensus Economics Inc.

As credit conditions have tightened the international gross-domestic product forecasts have been cut, in particularly in the US. Fears about recession and further deterioration of the markets are headlining the news. This compared with the rising commodity prices does not provide hints for a near end of the crisis.

The Bank of England published in its Financial Stability Report 2008 an indicator for the liquidity in the markets based on liquidity indices of 9 major banks. As illustrated in Figure 15 the markets are dried up which causes less investment and limits the growth of the economies worldwide.

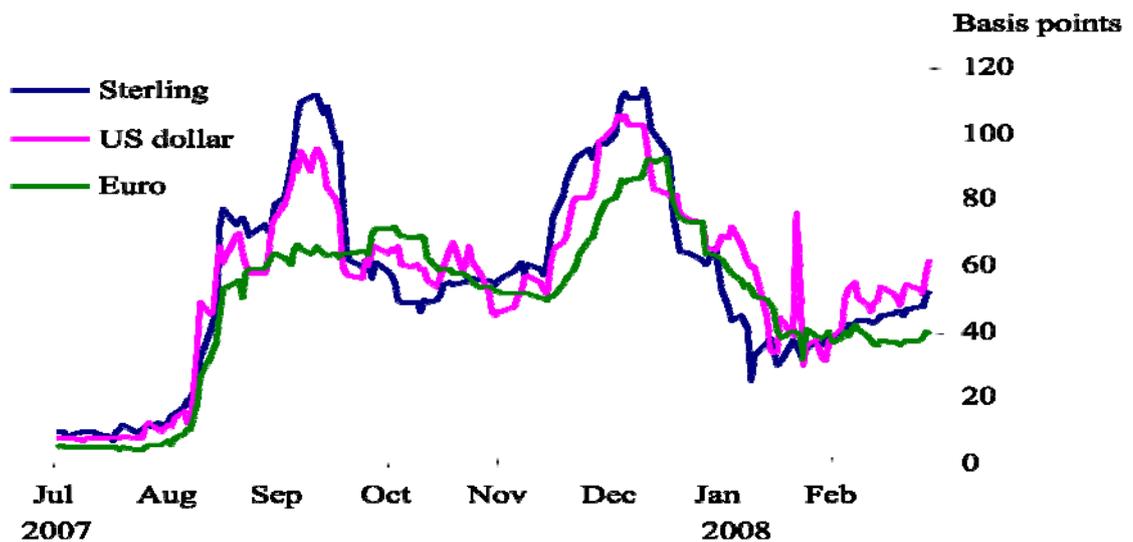
Figure 15: Financial Market Liquidity



Source: Bank of England

Furthermore, the important spread between Libor and the overnight index swap is not narrowing to its historical levels. The Libor-OIS spread is the difference between the rate banks charge for loans in London relative to the overnight index swap rate charged by the central bank. The three-month Libor OIS spread is viewed as an indirect measure of the funds availability in the money market (McCormick, 2008). An increase or widening of the spread typically signals a decreased willingness to lend to each other by the banks. The historical spread was about 10 basis points and at the outbreak of the crisis it widened to record highs of over 100 basis points. However, one year after that it still trades at about 60 basis points what indicates that the woes are not over yet.

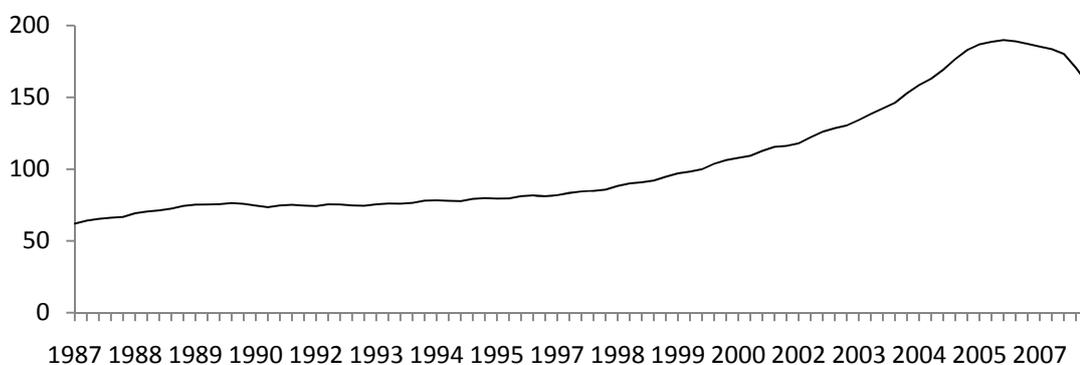
Figure 16: International 3-month Libor-OIS spreads



Source: Bank of England

The US real estate market still not sees the end of the crisis. The Case-Shiller house price index is still declining due to the high supply and further foreclosures. The delinquency rate is currently on the highest point since 1980. For the subprime mortgages it is above 20.5% and the foreclosure rate is at 2% the highest since 1980. The foreclosures lead to a further price deterioration of the neighbouring houses and trigger thereby new delinquencies and give incentives for defaults on mortgage payments because the US mortgagor just loses the value of the house in case of default. Forecasts suggest that the end of falling house prices will be reached when the house price reaches the rent equivalent which could happen in the end of this or year early next year (Levy, 2008).

Figure 17: S&P/Case-Shiller U.S. National Home Price Index



Source: S&P/ Case-Shiller

The problem of declining house prices also affects the broader US economy as the building industry is expected to cut its output by half due to the high over supply with property which will cause thousands of job losses over time (BBC News, 2007). The building industry makes up about 15% of the US economy and thereby affecting other industries that are linked to the housing market such as the durable goods and DIY industry.

Large bank losses of an estimated 1 trillion US\$ are mainly due to subprime related write-down's. As the mortgage-backed instruments lost their value due to the rating agencies downgrades the book value of these instruments had to be marked to market which caused these write downs. As can be seen in the in the ABX index the large scale rating actions on subprime residential mortgage-backed securities took place in June 2007. The ABX index spread is the price one would pay to insure a residential mortgage-backed bond through the use of credit

default swaps. It is an ideal measurement of the credit risk expectations of the market towards residential mortgage-backed securities.

Figure 18: Markit ABX.HE Spreads



Source: European Securitisation Forum

Figure 18 illustrates that in June / July the index for BBB-rated RMBS more than doubled and later that year until early 2008 skyrocketed to nearly 14000 basis points. In other words one would need to pay 140% of the face value of the to-be insured bond to buy protection against default. However, the AAA-rated tranche of the index changed from 100 basis points to about 650basis points that is equal to 6.5% of the face value of the to-be insure bond. The unsatisfying transparency of the credit structures and the uncertainty of the allocation of the risks involved led to a dry up in the market for securitised products and a general spread widening. Three markets can be identified that were effected the most, the money market, real estate market and the credit market. Furthermore, effects on the real economy are increasing too.

4.3 The Housing Bubble

The dominant theory of asset pricing is that stock prices are equal to the sum of expected discounted dividends and when market prices deviate from such fundamental value then a 'bubble' may exist. Three main characterisations of bubbles have been discussed in the literature (momentum, explosive and intrinsic) and they form the theoretical underpinning of this research.

Momentum investor behaviour is driven by price alone, whereby agents buy after price increases and sell after price decreases (DeLong, Schleifer, Summers, & Waldmann, 1990). Such momentum occurs when a price rise (fall) is expected to continue to rise (fall). This type of bubble is usually taken as evidence against rationality of the marketplace.

In contrast, the two other types of bubbles constitute evidence of rationality. With an explosive rational bubble, prices deviate from fundamentals due to factors extraneous to asset value. Such bubbles continuously diverge and cannot be negative since this would imply a negative asset value (Diba and Grossman, 1988). Intrinsic rational bubbles derive all of their variability from exogenous fundamentals rather than from extraneous factors (Froot & Obstfeld, 1991). Unlike explosive bubbles, intrinsic bubbles do not continuously diverge but periodically revert toward their fundamental value.

A real estate, property or housing bubble is a type of economic bubble. It is characterized by a fast paced increase in the value of property up to a level where the market corrects itself and adjusts to the new fair value. The price is driven up by believes of investors and expectations about the real value of the asset the purchase (Black, Fraser, & Hoesli, 2006). The expectations that real estate is currently undervalued leads to the increased investment activity. As this was supported by cheap money through low interest rates during 2005 the number of real estate purchases increased. The buyer expected the house value to rise over the mortgage value so he could sell the house and repay the mortgage with profit. As more and more individuals follow the herd and invest heavily in real estate the supply of houses is tightened and prices will increase. This will go on as long as people will find reasons to justify the prices. As soon as first investors change their opinion about the fair value of the asset prices will adjust to the new

expectations and prices will decrease. This can be followed by an abrupt and immense price drop or a slow adjustment over time depending on the speed of change and the extent of change of the expectations. The housing bubble was not only present in the U.S. also the U.K. and other developed and developing countries experienced house price appreciation.

Shiller (2000) presents “the Feedback Theories of Bubbles” as an explanation for the development of price bubbles in the stock market. “In feedback loop theory, initial price increases lead to more price increases as the effects of the initial price increases feedback into yet higher prices through increased demand.” (Shiller, 2000). The second round of price increases stimulates another round and so on. Thus, the initial price increase is leveraged into a much higher revolving process of price increases. An important role in the process of price increases through feedback play adaptive expectations (Muth, 1961).

Expectations based on past price increases lead to further price increases while expectations adjust to the new higher price environment and the process begins again. Another feature described is increased investor confidence based on past price increases (Shiller, 2000). This confidence is built up not through sudden price jumps rather than a consistent price increase over time. The feedback can also be caused by emotional factors, reasons unrelated to confidence or expectations.

The economists John Campbell and John Chochrane (1995) constructed a theory of habit formation that supports feedbacks of price changes. They assume that people become slowly habituated to new levels of consumption caused by higher stock price levels. This results in investors experimenting with the new possible level of consumption without getting habituated to it so that they are likely to take on more risk with the knowledge that they could give up some of the new consumption if losses would force them to do so. In the housing market, the investor would hold the house that previously increased in value, rather than selling it and taking the profit. By holding the house the investor takes the risk of losing out if the price drops justifying it that he would not be better off than before the price jump increase. No matter which of the presented features accelerate the bubble to grow it cannot grow forever.

At some point investors will not expect prices to grow anymore and the real value of the asset will adjust to the new expectations and investors will start to sell. This can cause another negative bubble with a downward price slope where prices decline until further decreases seem to be unlikely and investors will start to buy the asset. At that point the negative bubble bursts back up.

In the subprime crisis two bubbles can be identified that supported each other and led to the fatal outcomes that affect nearly all markets. First, a house price bubble mainly in the US but also in European countries as the UK and Spain and second a securitisation bubble in the global financial market (Whalen, 2008).

The house price bubble as outlined above caused the securitisation business to flourish and grow to enormous numbers. The availability of cheap money to originate new mortgages and to distribute them to the capital markets created a vicious circle of never ending growth as long as the trust is not harmed between the counterparties. The created moral hazard on the side of the originator and mortgage agents motivated by fees and no downside risk promised ever new supply with mortgages (Black, Fraser, & Hoesli, 2006). The return hungry investor was likely to accept any securitised instrument as long as it was approved by the rating agencies with AAA ratings.

However, as the first trust between the participants of the securitisation chain was harmed through increased delinquency and foreclosure rates combined with stagnating house prices the securitisation bubbles reversed.

5 Conclusion

This thesis is designed to give an insight to the world of securitisation and its role in the current financial crisis. After having outlined the basics of securitisation and having assessed the crisis with all its effects and mechanism one should ask:

Did the securitisation process fail so badly?

The answer is not a straight forward if one considers all the influences and spill over effects of the credit turmoil. However, it is obvious that securitisation initially designed to provide better housing finance in the USA was successful for more than thirty years. It supported the development of the US housing sector and even over came the thrift industry that was prevalent at the time of its market introduction. It enhanced liquidity for the mortgage banks and provided loans to people with lower incomes. Banks were able to free capital by passing on the securities to investors that were willing to hold the securities and the risks associated with them. This time was dominated by the government sponsored entities like Fannie Mae, Freddie Mac and Ginnie Mae. The investors were insured by implicit or explicit government guarantees and faced nearly no risk by investing in mortgage-backed securities.

Nevertheless, investors demanded for higher returns and the process of financial innovation came up with a new sort of securitisation, labelled non-agency or private securitisation. The government guarantees were replaced by three substitutes. This included, rating agencies, new business models and monocline insurance. Investors should have been aware of that higher return, which was associated with these private issues, means higher risk even if they were insured and rated AAA. But in an environment of low interest rates and rising house prices they had a fourth pillar they could rely on. That was the fact that they could still recover losses by foreclosing and then selling the house.

This positive experience with private securitisation led to further financial innovation that modified and re-securitised tranches of MBS to create ever new instruments with even higher returns. The ever growing demand and the following supply led to a securitisation bubble where investors did not actually know what they were buying and putting on their books. As explained

earlier the bubble just continues to grow as long as the expectations of the market player are conform to the market.

This rapidly changed as house prices started to stagnate and later fall. Due to weakened underwriting standards the delinquency and foreclosure rates rose and rating agencies had to revise their ratings on RMBS. This was the initial trigger that was followed by numerous events and actions from all market players and led to the final mistrust against securitisation. But one remarkable fact is that there are still banks, especially in Europe, that issue successfully MBS.

The problem and the major flaw of securitisation is that the final investor was too far away from the mortgage originator. This causes information asymmetry that is prevalent in the whole banking industry and needs to be contained. A too high information asymmetry gives incentives for moral hazard and causes adverse selection as was outlined in an earlier chapter. However, it is this competition that makes the financial sector so successful and expanding. Though, a certain degree of working together and on the same side for the same target can improve conditions and prevent major damages to the system as a whole.

Securitisation relies on the evaluation of loans based on easily to measure data, but this data might not be the best indicator for credit risk. Research suggest that loans which were not securitised due to lower credit scores performed better because banks conducted monitoring and screening on “softer” data (Keys, Mukherjee, Seru, & Vig, 2008). This problem can be overcome by relationship banking as prevalent in Germany and Japan. For example recent MBS and ABS issues in Germany by the Hypovereinsbank (part of Unicredit Group) are distinguishable from common issues because loans included in them are from selected customers of the above bank and are regarded as highly qualitative. However, this also has an effect on the diversification of the portfolio and on the return this portfolio will produce so that the trade off between risk and return is again decisive.

By cutting out fee motivated mortgage agents from the securitisation chain moral hazard can be reduced. By choosing long-term customers screening is improved and soft data can be retrieved

easier. The rating agencies already improved their rating models but until the confidence into structured finance is restored it will take more industry-generated reforms.

One solution and major step toward new trust could be to include the four major auditing firms in the securitisation process (Coffee, 2008). They could check if the loans are conforming to the standards disclosed and with their access as accounting firm ensure that valuable information is passed on to investors. Over time they could even get into the rating business and improve the competition to ensure better information transfer and more reliable ratings based on their access to the firms involved rather than relying on information passed on by the originator.

Securitisation, if it can be blamed at all, should be blamed for the transfer of the US credit crunch to the rest of the world because it made risky mortgages originated in the US available for overseas investors by transferring the risk to them. Nonetheless, these investors were willing to take the risk and by investing in highly complex structures that pay up to 300 basis points more than treasury bonds they should have been aware of the risks involved. Furthermore, if securitisation would not have spread the risk, in today's globalised world financial players are so highly interwoven with each other, the network effect; any other instrument would have spread the risk.

Finally, residential mortgage backed securitisation might be sleeping at the time but the concept will last and new and improved structures will emerge. It will be more resistant against moral hazard, information asymmetry and adverse selection. Structures will be easier to understand for investors and new watchdogs will guard investors' interests. New regulation will be in place to overcome the misconceptions of the past and prosper a new world of securitisation. Every major financial innovation had its big crisis, and in the relative short history of securitisation compared to equity or bonds it survived for a long time without. The market clearing process will abandon players that play against the rules and reward the innovative ones. As soon as market confidence is restored the time for securitisation will come.

6 Recommendations

One major field in improving the system of securitisation is to improve the information structure of the particular loans involved in the transaction. Research should be conducted in the field of how relationship banking can improve the information transfer in securitisation. Is there any evidence that improved screening and monitoring can lead to lower delinquency rates and earlier foreclosure to prevent the decline of the house value.

Second, the strategic behaviour of the originator and servicer should be included in models determining default rates rather than primarily relying on credit scores. Models in general need to be more complex and incorporate various variables to determine the default rates of borrowers.

Last, is there any evidence those investors who invested in highly secure agency issues regarded non-agency or private issues as the same secure investment based on wrong assumptions and misleading issued information and ratings.

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