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ROLE OF CDOs IN THE FINANCIAL CRISIS 2007 – 2008

Ljubljana, September 2018 ANNA GRAPULIN

AUTHORSHIP STATEMENT

The undersigned ANNA GRAPULIN, a student at the University of Ljubljana, Faculty of Economics, (hereafter: FELU), author of this written final work of studies with the title ROLE OF CDOs IN THE FINANCIAL CRISIS 2007 – 2008, prepared under supervision of izr. prof. dr. Aleš Berk Skok.

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LIST OF ABBREVIATIONS

ABS – Asset-Backed Security
AIG – American Insurance Group
ARRA – the American Recovery and Reinvestment Act
BHC – Bank Holding Company
CBO – Collateralized Bond Obligation
CDO – Collateralized Debt Obligation
CDS – Credit Default Swap
CFTC – the Commodities Futures Trading Commission
CLO – Collateralized Loan Obligation
CMBS – Commercial Mortgage-Backed Security
CMO – Collateralized Mortgage Obligation
CRA – Credit Rating Agency
DIDMCA – the Depository Institutions Deregulation and Monetary Control Act
DJIA – Dow Jones Industrial Average
Dodd-Frank – Dodd-Frank Wall Street Reform and Consumer Protection
EESA – the Emergency Economic Stabilization Act
FDIC – the Federal Deposit Insurance Corporation
FDICIA – the Federal Deposit Insurance Corporation Improvement Act
Fed – the Federal Reserve System
FHA – the Federal Housing Administration
FHC – Financial Holding Company
FHFA – the Federal Housing Finance Agency
FHLMC – the Federal Home Loan Mortgage Corporation, Freddie Mac
FNMA – the Federal National Mortgage Association, Fannie Mae
FOMC – the Federal Open Market Committee
FSLIC – the Federal Savings and Loan Insurance Corporation
FSOC – the Financial Stability Oversight Committee
GLBA – the Gramm-Leach-Bliley Act

GNMA – the Governmental National Mortgage Association, Ginnie Mae
GSE – Government-Sponsored Entity
HEL – Home Equity Loan
HHI – Herfindahl-Hirschman Index
LIBOR – the London Interbank Offered Rate
MBS – Mortgage-Backed Security
MMIFF – the Money Market Investor Funding Facility
NRSRO – Nationally-Recognised Statistical Ratings Organization
NYSE – the New York Stock Exchange
Riegle-Neal – the Riegle-Neal Interstate Banking and Branching Efficiency Act
RMBS – Residential Mortgage-Backed Security
SEC – the Securities and Exchange Commission
SIFI – Systemically Important Financial Institution
SIFMA – the Securities Industry and Financial Markets Association
S&P – Standard & Poor's
SPE – Special Purpose Entity
SPV – Special Purpose Vehicle
TAF – the Term Auction Facility
TALF – the Term Asset-backed Loan Facility
TARP – Troubled Asset Relief Program

INTRODUCTION

"Many people argue that derivatives reduce systemic problems, in that participants who can't bear certain risks are able to transfer them to stronger hands. These people believe that derivatives act to stabilize the economy, facilitate trade, and eliminate bumps for individual participants. And, on a micro level, what they say is often true. […] however, […] the macro picture is dangerous".

Warren Buffett[1]

The market of structured financial products is vast and intense and it was the fastest growing market of the previous decade (Lucas, Goodman & Fabozzi, 2006, p. 3). Since the 1990s, when securitization started to take its hold and commercial banking slowly stepped aside making way for investment banking, the use of structured financial instruments grew exponentially (Tavakoli, 2008). The term "collateral debt obligation" (hereinafter: CDO) is not that publicly known as other names such instruments are often called: toxic securities, monstrosities and weapons of mass destruction. The names are disturbing, but unfortunately justified. CDO is a highly complex structured financial product, that is able to serve many noble purposes unless poorly understood, misused or manipulated. Numerous institutions used structured financial products on various occasions in multiple areas, but the leadership goes to asset-backed securities (hereinafter: ABS). Among all ABS CDOs, residential mortgage-backed securities (hereinafter: RMBS) are the most notorious.

CDOs were found in the centre of global attention during and after the worst financial crisis since the Great Depression in the US (The Financial Crisis Inquiry Commission, 2011) – 2007-2008 financial crisis. Financial institutions were toying with structured financial products massively without any visible concerns as to the quality of instruments they were creating, structuring, repackaging, selling and shorting against. Legislative framework cultivated this behaviour. Deregulation and government involvement into housing policy only added fuel to the fire.

Banking sector became uncontrollable and aggressive and seemed to disregard one of its primary roles as intermediary. On various occasions banks put its own profits before customer needs and credit rating agencies (hereinafter: CRAs), whose main goal is to assign ratings to separate financial instruments, companies and even countries, readily assisted. Having blind trust in these ratings we might have forgotten who rating agencies are paid by. News were flooded with announcements of brand new government loans and bailouts. Was

[1] Connors R. J., Warren Buffet on Business: Principles from the Sage of Omaha, p. 68

it that necessary or we could have done without? Was "too big to fail"[2] policy a disturbance and the government did the right by letting Lehman Brothers collapse or the policy should have been sustained all along?

Financial crisis of 2007 – 2008 was a turmoil of actions that affected various niches of economy, a chain of events that could have not be stopped once it started. Financial institutions seemed to have lost control and nobody but the government had the power to attempt to restore things back to normal. It brought countless bankruptcies, economic recession, billions in losses, instability and threat to the world financial system. Some Wall Street analysts believe that something that large could not have been foreseen, predicted or expected, however, the Financial Crisis Inquiry Commission figured otherwise. There were a lot of red flags in subprime lending, rapidly developing securitization practices, trading activities, rating agencies practices etc., hence the question: how did we miss it?

The topic of the thesis is controversial and complex, yet unavoidable. Financial crisis of such magnitude and consequences is ought to be examined in order to prevent any similar events from happening all over again. The purpose of this work is to study how such complex financial instruments as CDOs managed to influence the American economy in a way, that brought catastrophic consequences and exposed multiple vulnerabilities in the system.

This thesis presents an attempt, one of many, to establish the reasons of the financial crisis, its drivers, determinants and participants. The ultimate goal of this work is to analyze the environment prior to the crisis, describe events during the meltdown, consequences they brought and answer the following questions: what went wrong? Could the crisis have been avoided? Which role did collateralized debt obligations play? History often repeats itself and we have to be prepared for the next time.

The main approach that is used throughout this thesis is a qualitative research. The research is done amongst what I believe to be the credible sources of different kinds, which are further summarized, organized and told in a structured way. A case study in the first chapter of the thesis helps us further understand the problem in hand, while theoretical overview enables deeper knowledge of complex financial products. Moreover, various historical inquiries along with diverse quantitative data establish causal links to financial crisis events.

[2] I would like to clarify from the beginning how "too big to fail" policy is perceived in this thesis. Under "too big to fail" we understand the situation when a certain company or institution (the most often a financial one) grew to be a very large entity and in case of its poor financial performance or even bankruptcy, regulators tend to not let it fail, but bail it out instead or give it any other help. Hence, such company is not treated in a common manner, but special conditions apply.

The thesis is divided into six chapters. The first chapter will provide detailed information about the structure, characteristics and types of CDOs. The brief overview of the CDO market and its participants as well as some specifics about the ABS CDOs can be found in the second chapter of the thesis. Chapter three introduces the legal framework in force that may or may not have contributed to the financial crisis. Moreover, it emphasizes housing legislation since it seems to be of great significance. The next chapter of the thesis is dedicated to the brief overview of credit rating agencies, as well as their rating methodologies. It will contribute to the understanding of how CRAs found themselves in a spotlight during the financial crisis. The fifth chapter is dedicated to the financial crisis itself, the meltdown, the timeline of multiple turbulent events that happened and major consequences that they brought on. The last chapter closely follows the previous one. It is dedicated to changes in legal framework implemented after the financial crisis, namely to the American Recovery and Reinvestment Act of 2009 and to the Dodd-Frank Wall Street Reform and Consumer Protection Act. We learn key points of these two pieces of legislation, outline changes they are attempting to enforce and briefly look into what has actually changed since the financial crisis.

Summary of the whole paper will be drawn in conclusion.

1. WHAT IS A CDO?

What is the collateralized debt obligation? How is it built and for what purpose? These questions cannot be left unanswered before we set to discover the determinants of the financial crisis influenced so heavily by CDOs. The first part of this chapter is dedicated to the theoretical background of this powerful instrument. To be more tangible, later in the chapter we introduce a synthetic CDO named ABACUS 2007-AC1 that was traded by one of the leading investment banks – Goldman Sachs.

1.1. Securitization

The term "collateralized debt obligation" is a generic term and it includes a variety of instruments: collateralized mortgage obligations (hereinafter: CMOs), collateralized fund obligations (hereinafter: CFOs), collateralized loan obligations (hereinafter: CLOs), collateralized bond obligations (hereinafter: CBOs), asset-backed securities (hereinafter: ABSs), synthetic credit structures etc (Tavakoli, 2008). All these financial instruments are created by securitization. Securitization is a process known as a creation of new securities backed by a portfolio of assets. Pool of assets used for securitization performs as collateral, hence there is a "collateralized" in the "collateralized debt obligation" term. For instance, when the underlying portfolio of assets includes only bank loans, the CDO is referred to as a CLO. As we can see, a CDO is identified by its underlying assets, but in this paper, the generic term CDO will be used the most often.

Special purpose vehicles (hereinafter: SPVs) or special purpose entities (hereinafter: SPEs) are often mentioned in connection with CDOs. It is a powerful tool that is used in asset securitization. SPEs are special companies or trusts that house collateral assets and issue debt obligations. Special purpose entities can be structured in two ways: pass-through structure or pay-through structure (Brose, Flood, Krishna, Nichols, 2014b). In pass-through structure, all interest and principle payments are passed on to the investors. The structure represents a passive tax vehicle and the entity does not pay any tax, because it does not conduct any operations. Pay-through structure, on the contrary, reinvests and restructures cash flows on the entity level and is able to purchase new assets. Both structures are bankruptcy remote, therefore possible default or insolvency does not influence cash flows from collateral assets to the investors.

SPVs usually have a remote off-balance-sheet nature irrespective of the location (Brose, Flood, Krishna, Nichols, 2014a). They can be located offshore or onshore. When considering the location of a potential SPE, a variety of factors is taken into consideration the most significant of all being taxes: the less taxes a SPE pays – the better. We will not go in details into such broad and controversial topic as taxes in this paper, but there is just one thing to be remembered: tax evasion is illegal, while tax avoidance is not. The most popular offshore places to set a SPE are the Cayman Islands, the Bahamas and Gibraltar. As for onshore, Luxembourg, Ireland, the Netherlands, New York and Delaware are the leading tax-friendly locations (Tavakoli, 2008).

Due to the its often remote location, off-balance-sheet assets and frequently undisclosed ownership structure, SPEs are on more occasions believed to engage in illegitimate activities such as money laundering, embezzlement, accounting misconduct, concealment of losses and revenues etc.

For many years, securitization of financial assets was used by financial institutions as a way to reduce the size and risk of their balance sheets. This allowed investors to have access to a diversified pool of assets, while financial institutions were able to expand their business. Creating structured products can have a list of benefits (Tavakoli, 2008, p. 3):

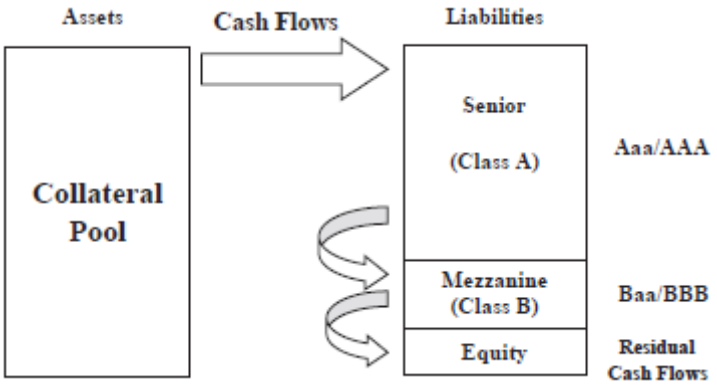
- it can provide additional funds by converting illiquid assets into cash,
- it may reduce borrowing costs,
- it may transfer the risk of assets and liabilities and allow companies to pursue additional business,
- it enables exploitation of capital arbitrage to different financial institutions (banks, insurance companies etc.),
- it may be used as a way to reduce a corporation’s potential operating liabilities,
- it can be used for tax management.

1.2. Basic CDO structure and characteristics

Figure 1 below conveniently shows the general CDO structure. The choice of collateral assets (underlying assets) for a CDO is very large and usually includes commercial loans, corporate bonds, asset backed securities, sovereign debt and more. The funds for purchase of assets are obtained from the issuance of debt obligations. These debt obligations are divided into the following **tranches** (Goodman and Fabozzi, 2002, p. 2):

- Senior tranches,
- Mezzanine tranches and
- Subordinate or equity tranche.

Figure 1: General CDO structure



Source: Tavakoli M. J. (2008), p. 4

Tranches are strictly ranked by seniority and represent portions of debt obligations that vary in maturity, default risk and interest rates. Senior tranches receive the highest level of protection, meaning that in case of default, senior debt holders are repaid first. Equity tranche is a so-called first-loss tranche. Credit rating of no lower than A should be fulfilled by senior debt. Opposite to senior tranches, equity tranche is the most levered tranche which ranks at the bottom and in case of financial distress it bears the loss first. Subordinate debt holders are the most exposed group and they are first to experience loss. No credit rating is needed for this tranche, since it receives residual cash flows. To compensate for high risks of loss, equity investors are paid most of the residual interest and can achieve quite high annual return. Subordinate or equity tranche can also be called preferred shares or residual or junior tranche. The middle tranche – the mezzanine tranche – typically receives a BBB rating, but no lower than B. Often in literature or in a balance sheet we can see debt obligations divided into classes (class A, class B, class C etc.) with class A being the senior debt, the last class is equity, while everything in between is ranked as mezzanine tranches.

CDOs are known to be "bankrupt remote" (Amadeo, 2016a). Despite the fact that these financial instruments include already existing debt, they are newly created entities without any business activities and therefore cannot be liable for any past misconducts. As we have already mentioned, CDO tranches are organised in absolute seniority. Even in case we are certain some debtholders will not receive full principal and interest or in case a CDO is insolvent, cash flow from asset pool is distributed strictly according to the seniority of their debt. Hence, since the payout distribution is already known and agreed upon in the beginning, the need of bankruptcy is eliminated.

Performance of the collateral assets dictates whether principal and interest payments to the debtholders will be made on time. The majority of CDOs has a floating interest rate based on LIBOR[3]. A floating interest rate allows to avoid an asset-liability mismatch and contributes to the employment of a short-term debt.

According to Goodman and Fabozzi (2002, p. 2-3) the whole CDO lifetime can be divided into three periods:

1. Ramp-up period – a short period (less than 1 year, usually 6 to 9 months) after the transaction closing date when an asset manager sells debt obligations and invests its proceeds;
2. Reinvestment or revolving period – a longer period of time (usually five or more years) when proceeds from the underlying assets are being reinvested;
3. Final period – a short period when the assets sold and debtholders are paid back.

A CDO transaction can be terminated early in case of poor performance or default of collateral assets.

1.3. CDO classification

Before we dive into different types and classes of CDOs, there is one more significant thing to be mentioned – purpose of CDO creation. If we know why a certain instrument is attractive to investors or other parties of the transaction, we can easier classify it.

According to Lucas, Goodman and Fabozzi (2006, p. 9) there are three main purposes of CDO creation, they are nicely summarized in the Table 1 below:

[3] LIBOR (the London Interbank Offered Rate) is benchmark rate, an average of interest rates of main London banks which is charged for short-term loans.

- Balance sheet – CDOs are created to reduce balance sheet (for example, by packaging assets as collateral or selling loans to a CDO), required regulatory and economic capital and to decrease funding costs.
- Arbitrage – purchase of CDOs allows an asset manager to receive new assets under management and to get extra management fees. Arbitrage CDOs are basically based on return on assets and cost of liabilities mismatch, which allows for higher compensations for investors. Besides, CDOs are uncomplicated to manage, because investors' payouts are predetermined due to the seniority of CDO tranches purchased.
- Origination – purchase of CDOs allows banks and insurance companies to increase equity capital.

Table 1: Purpose of CDO creation

	Balance sheet	**Arbitrage**	**Origination**
Provide asset sellers with cheap funding or regulatory capital relief or economic capital relief	**X**		
Provide asset managers with assets under management and CDO investors with asset management services		**X**	
Provide banks and insurance companies with cheap equity-like capital			**X**
Divide and distribute the risk of the CDO assets to parties with different appetites for risk	**X**	**X**	**X**
Provide equity investors with leveraged exposure to the CDO's assets with non-recourse term financing	**X**	**X**	**X**
Provide debt investors with high ratings-adjusted yields	**X**	**X**	**X**
Provide investors with a diversifies investment portfolio, perhaps of hard-to-access assets	**X**	**X**	**X**

Source: Lucas J. D., Goodman S. L., Fabozzi J. F. (2006), p. 11, adapted

Furthermore, despite either of the main purposes of CDO creation, it enables the risk distribution in accordance with different levels of risk-aversion, provides investors an exposure to the CDO's assets with non-recourse term financing[4], allows investors to have a

[4] Non-recourse term financing is a type of financing, when lender is repaid back from the profits of a project the loan was taken for, not from other assets.

well-diversified portfolio and provides CDO owners high ratings-adjusted yields (Lorenz, 2006).

CDO classification is relatively easy. We can divide CDOs into groups by the type of underlying asset or by the investor's motivation. By the type of the underlying asset we differentiate between cash CDOs and synthetic CDOs. The main difference between these two types of CDOs is

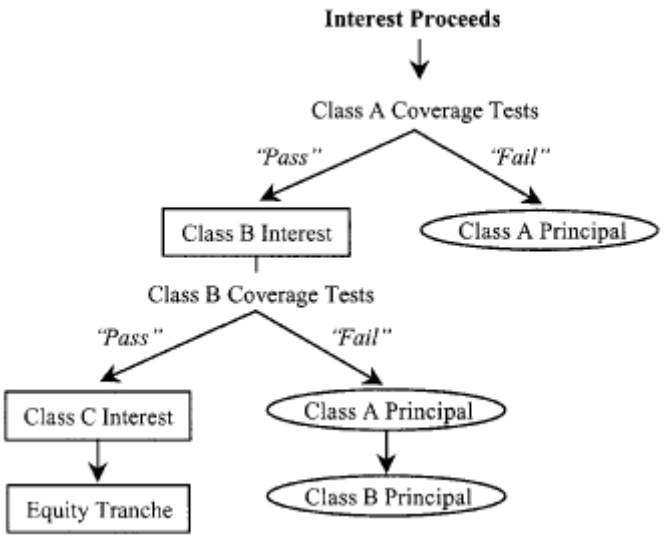
1.3.1. Cash CDOs

There are two large categories of CDOs: cash CDOs and synthetic CDOs. Cash CDOs in its turn can be divided into cash flow CDOs and market value CDOs.

Cash flow CDOs

The main objective of the asset manager is to generate a sufficient amount of cash flows for debtholders without trading collateral assets. Cash is generated from income and principal and is distributed in a way that is called "waterfall": it follows the seniority principle and first cash is paid to the most senior debtholders, then to the owners of mezzanine tranches and at last, residual cash is paid to the owners of equity tranche (Tavakoli, 2008). Before repaying debtholders, there are certain expenses such as various fees and taxes that are paid.

Figure 2: Coverage tests



Source: Goodman S. L., Fabozzi J. F. (2002), p. 17

There is an objective set for each tranche and to be certain this objective is reached so-called coverage tests are run. Figure 2 schematically shows how coverage tests work. If Class A (Senior Tranche) coverage tests are failed, the excess interest instead of flowing to the mezzanine tranches goes to cover Class A principle. The same mechanism works down the line with Class B and C tranches. In case Class A coverage test is passed, but Class B coverage test is failed, the remaining funds go to cover the rest of Class A principle and some of Class B principle. This way, the equity tranche suffers the most when coverage tests are failed.

The main goal of coverage tests is protection of debtholders from the deterioration of the current portfolio. There are two types of coverage tests: overcollateralization tests and interest coverage tests (Fabozzi, 2000). The overcollateralization test measures if a principle of a certain pool of assets is balanced with corresponding liabilities created by the CDO and is calculated as following:

$$O/C\ ratio = \frac{Principal\ value\ of\ collateral\ portfolio}{Principal\ for\ tranche + Principal\ for\ all\ tranches\ senior\ to\ it} \quad (1)$$

After the test is conducted, its result is compared to a tranche's required minimum ratio which is called the overcollateralization trigger. The test is considered to be passed when the O/C ratio is higher than or equal to the respective collateralization trigger. Generally, the higher the O/C ratio is, the greater protection debtholders have.

Interest coverage test is conducted in a very similar way to the O/C ratio. It shows the ratio of the scheduled interest due on the collateral assets to the interest of a tranche in question and all tranches senior to it. The ratio is calculated according to the following formula:

$$I/C\ ratio = \frac{Scheduled\ interest\ due\ on\ underlying\ collateral\ portfolio}{Scheduled\ interest\ to\ a\ tranche + Scheduled\ interest\ to\ all\ tranches\ senior} \quad (2)$$

The higher the I/C ratio, the better debtholders are protected. The I/C ratio is passed in the same way as the O/C ratio – by comparing the result to the interest coverage trigger.

Market value CDOs

Market value CDOs, compared to the cash flow CDOs, represent a minor part of arbitrage deals – 10 to 15% (Tavakoli, 2008, p. 123). Despite this fact, they are highly advantageous in certain situations. Market value CDOs are commonly used for some types of collateral with unpredictable cash flows. Besides, they allow investors and managers to have more flexibility in a transaction. At last, such an instrument is used when assets with a beyond transaction maturity are purchased.

Market value transactions highly depend on the ability of a manager to control the market value of collateral assets, since funds to meet principle payments are generated from the sale of collateral. Interest payments come from collateral assets interest receipts (De Servigny and Jobst, 2007). In other words, in order to proceed with due payments on time, a fund manager should concentrate on minimizing the volatility of collateral pool. Volatility of collateral assets may arise from various movements on the markets, for example interest rate volatility, credit spread movements etc.

Similar to the cash flow CDOs, market value CDOs require overcollateralization tests. According to Fabozzi (2000), overcollateralization is meant to protect investors from collateral assets price volatility and must satisfy the following equation:

$$Market\ value\ of\ assets * Advance\ rate^{5} \geq Outstanding\ debt \quad (3)$$

Advance rates simply represents an adjustment to the collateral asset value, a protective buffer against market risk. The equation above presents a minimum overcollateralization level. In case market value of assets corrected with the advance rate is higher than the outstanding debt, therefore a minimum level is breached, collateral assets must be sold and liabilities must be repaid or collateral assets must be exchanged for more liquid ones.

1.3.2. Synthetic CDOs

Cash CDOs evolved, cash and physical assets seized to be the only type of collateral assets and synthetic CDOs (or synthetics) became ones of the most known or should we say notorious structured financial products (O'Hare, 2014).

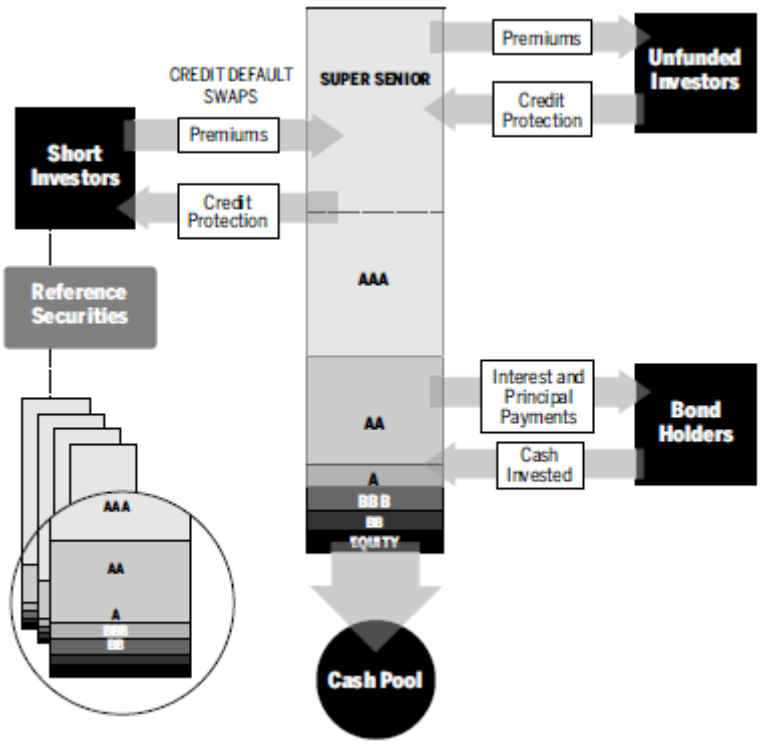
Synthetics are structured in a very similar way as cash CDOs, but there are some crucial differences. First of all, as we have already mentioned, financial derivatives (CDS[6] is the most common one) fill the role of collateral assets. This is a large advantage for investors since they are not limited to physical assets. CDSs generate cash flows which are distributed to the tranches. In case of default, debtholders become responsible and bear all the losses starting with the equity tranche and following its way up to more senior tranches (De Servigny and Jobst, 2007). Synthetics are only affected by credit events connected to CDSs. Credit risk in this case is separated from all other kinds of risk, therefore investors' exposure in synthetics is more limited compared to the cash CDOs. Moreover, synthetics' structuring

[5] "Advance rate is the percentage of the market value of a particular asset that may be issued as rated debt. Advance rates depend upon the price volatility and quality of a price/return data and the liquidity of assets. Assets with lower price volatility and greater liquidity are typically assigned higher advance rates." Goodman S. L., Fabozzi J. (2002). Collateralized Debt Obligation: Structures and Analysis, p. 176

[6] Credit Default Swap (hereinafter: CDS) is a financial derivative contract between two parties in a transaction where the creditor get compensated by seller in case of default of an agreed product.

process is very quick: they do not have a ramp-up period. A clear picture of how synthetic CDOs are structured is presented in the Figure 3 below.

Figure 3: Synthetic CDO structure



Source: The Financial Crisis Inquiry Commission (2011), p. 144, adapted

Standard synthetic CDO generally require much less effort than cash CDOs due to its simplicity. Only possible losses are physically distributed to the tranches and a very limited amount of information about the collateral pool is sufficient (CDS spreads, correlations, tranching details) for pricing and risk management. Due to the simplicity, use of synthetics allows investors for additional customization: they are at liberty to choose reference portfolio and appropriate credit exposure to take on.

According to Tavakoli (2008, p. 357), as an example of customization can serve a **single tranche CDO** (a bespoke CDO). The name speaks for itself: a single tranche CDO has only one tranche, only one part of the capital structure is sold to investors while remaining parts are usually held by the dealer. Such instruments are usually created for needs of a specific investor and fit best into his investing strategy.

Index-linked tranches can be another example of customization (De Servigny and Jobst, 2007, p. 382-383). With constantly expanding CDS market, there is a steady growth of CDS indices that reference new asset classes. Index-linked tranches allow for higher liquidity and transparency. They are predominantly used for hedging purposes.

Advantages of synthetic CDOs can be summarized into the following three points:

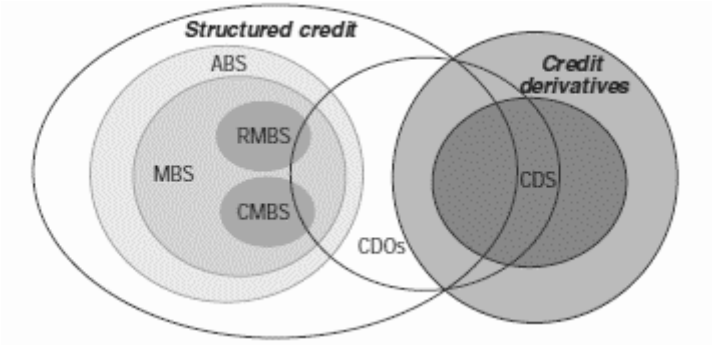
- easy to structure;
- they separate credit risk component from other risks;
- investors are able to customize their performance how they see fit.

There are some disadvantages of synthetic CDOs as well (O'Hare, 2014). The main drawback is connected to accounting policies. Since synthetic CDOs are relatively new instruments and they work with nonstop changing volatility, there might be influential repricings which may attract undesired attention. Moreover, single tranche instruments are criticised due to high credit risk concentration and no diversification. In case of dramatic market events, the ability of single tranche CDOs to survive is questioned. Besides, despite all the simplicity, synthetic CDO contracts may be quite hard to understand for general public, hence whenever default occurs, there is always a legal risk present.

1.4. ABS CDOs

The term "asset-backed securities" or ABS can be heard very often in connection with CDOs, hence the need to present a brief explanation.

Figure 4: ABS CDOs[7]



Source: International Monetary Fund (2008), Global Financial Stability Report, p. 57

[7] Not proportionally representative

According to the above presented classification, ABS CDO is a synthetic CDO with asset-backed securities as collateral assets. Loans, credit card debts, receivables and much more serve as underlying assets in the ABS CDO. It is a generic name for rather large group of CDOs and for simplification it is used in different contexts. Within ABS CDOs there is a very significant group of CDOs which cannot be neglected: mortgage-backed securities (hereinafter: MBS) CDOs. As can be easily seen from the name, various mortgages represent asset pool in this type of CDOs. MBS CDOs in its turn can be divided into two groups: residential mortgage-backed securities CDOs and commercial mortgage-backed securities (hereinafter: CMBS) CDOs. Figure 4 above schematically shows the composition of ABS CDOs.

Both RMBS and CMBS are tranched according to the seniority: the highest-rated securities are parts of senior tranche while securities with the lowest ratings belong to the subordinate debt. In this way we can divide all ABS CDOs into two groups – High Grade ABS CDOs and Mezzanine ABS CDOs. High Grade ABS CDOs are usually assigned ratings AAA, AA and A (Standard & Poor's). Mezzanine ABS CDOs typically have lower ratings – BBB and BB.

MBS CDOs played a significant role in the financial crisis, especially RMBS CDOs. Their role in the financial crisis will be explained in later chapters.

1.5. ABACUS 2007-AC1

By now we have learned some theory about structure and functioning of collateralized debt obligations and we can step aside from theoretical concepts to a tangible real-life example. We will describe a derivative contract, a synthetic CDO, that was designed by Goldman Sachs in cooperation with ACA Management LLC. ABACUS 2007-AC1 (ABACUS, in the following text) found itself right in the center of attention in 2010 when the Securities and Exchange Commission (hereinafter: SEC) charged Goldman Sachs and one of its vice presidents with fraud. How did this happen? What went wrong? We shall go back to the beginning.

In late 2006, Goldman Sachs was approached by John Paulson with the idea of shorting residential mortgage portfolio with credit derivatives, namely credit default swaps (SEC, 2010). Goldman Sachs considered the proposition and concluded that as a counterparty in this transaction could serve IKB Deutsche Industriebank AG (Wilchins and Brettell, 2010). In January 2007 Goldman Sachs approached ACA Management LLC in order to construct a deal, the work on the portfolio started promptly and an agreement was reached by the end of February 2007. In April 2007, the deal was closed (Story and Morgenson, 2010).

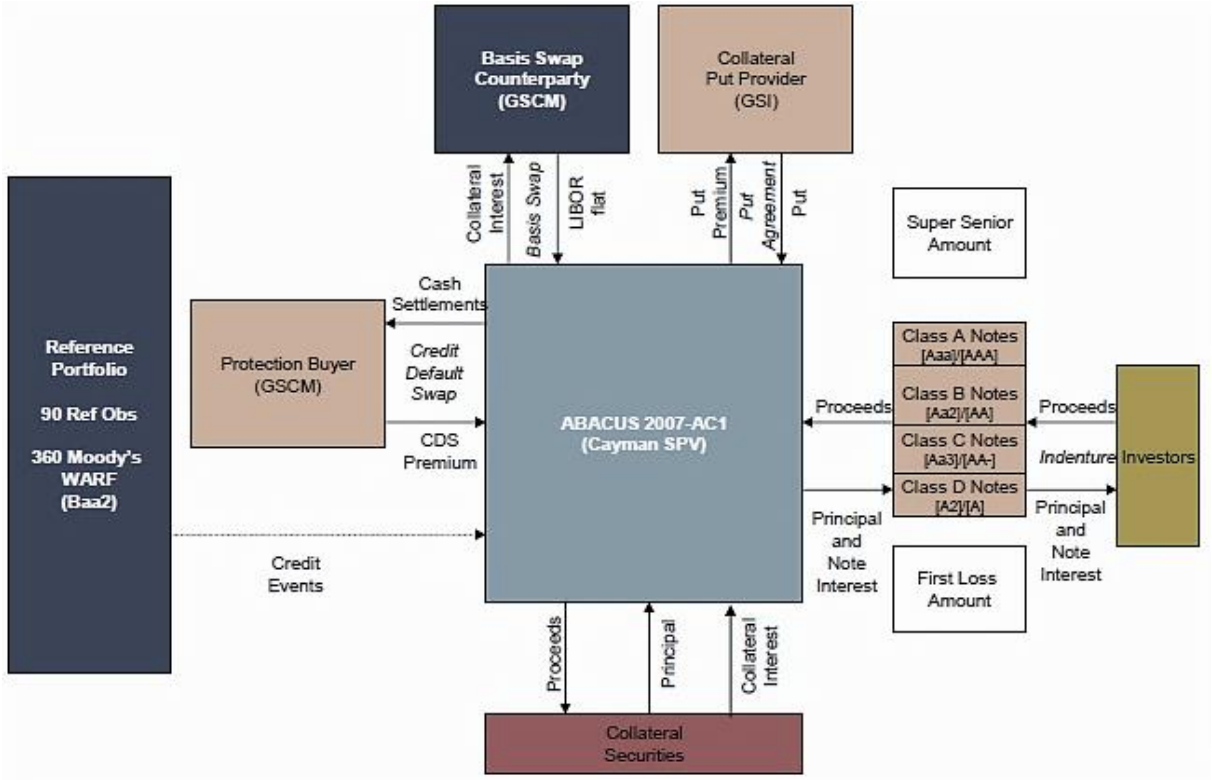
The following parties were involved in the transaction:

- John Paulson was a president and a portfolio manager in an investment management firm Paulson & Co. The company specialized in "global merger, event arbitrage and credit strategies" (Paulson & Co.). John Paulson shorted the very same instrument he proposed to create.
- IKB Deutsche Industriebank was founded in 1924 and it specializes in offering risk management, capital market and advisory services to medium-sized enterprises and private equity funds (IKB Deutsche Industriebank). IKB was unaware of Paulson's intention to bet against the product they were purchasing.
- Goldman Sachs is a large investment bank that was founded in 1869. It facilitated the ABACUS deal and was aware of Paulson's intention to bet against ABACUS (SEC, 2010). Goldman Sachs also was aware of the fact, that potential investors (namely IKB) would not proceed with the transaction unless the reference portfolio was picked and analysed by a third party (Wilchins and Brettell, 2010).
- ACA Capital Holdings participated in the transaction through its subsidiaries: ACA Management LLC and ACA Financial Guaranty Corporation. ACA Management LLC was registered with the SEC as an investment adviser. According to the SEC, ACA Management LLC offered advisory services in structured credit, public finance and CDO asset management. ACA Financial Guaranty Corporation provided financial guaranty insurance on RMBS that were in ABACUS collateral portfolio. ACA Capital Holdings was led to believe by Goldman Sachs that Paulson was going to purchase a part of securities when ABACUS 2007-AC1 was released on the market and was unaware of his intention to short.
- ABN Amro Bank NV is a Dutch bank established in 1991, that was one of the biggest European banks at the time. ABN heavily invested in ABACUS deal. Similar to IKB, was unaware of any wrongdoings of Goldman Sachs and/or John Paulson (Wilchins and Brettell, 2010).

The Figure 5 below clearly presents the complex structure of ABACUS 2007-AC1. According to the Figure, the financial instrument was structured through the special purpose vehicle located on Cayman Islands, which is a common practice to avoid extra taxation and other costs. Collateral portfolio included variety of RMBS and according to Moody's, its weighted average rating factor (WARF) was Baa2.

ABACUS 2007-AC1 was divided into 6 tranches, as can be seen from the Table 2: super senior tranche, 4 mezzanine tranches – Class A through Class D – and one equity tranche – first loss. Super senior tranche is the largest tranche in the portfolio (55%). The second largest tranche is the first mezzanine tranche taking up 24% of the portfolio and rated Aaa by Moody's. Equity tranche takes up 10% of the portfolio and is the third biggest tranche.

Figure 5: ABACUS 2007-AC1 structure



Source: Goldman Sachs & Co., ACA Management LLC. (2007), p. 50

On the 1st of November 2007, just half a year after the deal was closed, Moody's downgraded $50 000 of Class A notes issued by ABACUS 2007-AC1 from Aaa to Baa2 and another $142 000 of the same class to Baa3. Moody's (2007) commented that "the rating actions were the result of deterioration in the credit quality of the transaction's underlying collateral pool, which consisted primarily of structured finance securities". On the 4th of April 2008, the same notes in the same amounts that had already been downgraded in 2007, were downgraded again to the Ca rating (Moody's, 2008). On the 20th September 2010, these ratings were withdrawn, because Moody's (2010) "believed it has insufficient or otherwise inadequate information to support the maintenance of the credit ratings"[8]. According to the complaint filed by the SEC in 2010, by October 2007, 83% of the asset portfolio had been downgraded, while the remaining 17% were on negative watch. Shortly after, in January 2008, up to 99% of the portfolio had been downgraded (SEC, 2010). However, appropriate reports of CRAs are nowhere to be found.

[8] Moody's withdraws the ratings of 21 Notes issued by 4 structured finance CDO transactions, www.moodys.com

Table 2: ABACUS 2007-AC1 capital structure

Tranche	Amount (million US$)	Rating (Moody's/S&P)	Tranche size (%)	Tranche attach (%)	Tranche exhaust (%)	Projected WAL (years)	Legal final
Super Senior	1 100	n/a	55	45	100	3,9	2037
Class A	480	Aaa/AAA	24	21	45	4,4	
Class B	60	Aa2/AA	3	18	21	4,6	
Class C	100	Aa3/AA-	5	13	18	4,7	
Class D	60	A2/A	3	10	13	4,9	
First Loss	200	n/a	10	0	10	5,2	

Source: Goldman Sachs & Co., ACA Management LLC. (2007), p. 14, adapted

The SEC 2010 complaint named one Goldman Sachs Vice President Fabrice Tourre who was believed to be responsible for handpicking RMBS for the collateral portfolio. Due to the fact, that Tourre was aware of John Paulson's real intentions (i.e. shorting ABACUS), the quality of RMBS in the portfolio was chosen accordingly. Moreover, Tourre misled ACA Management into believing that Paulson invested about $200 million in the equity tranche of ABACUS 2007-AC1. In January 2007 Fabrice Tourre wrote a self-incriminating e-mail to his girlfriend: "The whole building is about to collapse anytime now…Only potential survivor, the fabulous Fab…standing in the middle of these complex, highly leveraged, exotic trades he created without necessarily understanding all implications of those monstruosities [*sic*]!!!" (Smith, 2012, p. 243).

The consequences of such fraudulent behaviour were grave. According to Reuters (Wilchins and Brettell, 2010), IKB invested in ABACUS approximately $150 million, while ABN Amro invested much larger amount - $909 million. IKB Deutsche Industriebank lost almost €1 billion from investment securities including ABACUS, which led to the net loss of €32 million in the financial year 2007/2008[9] (IKB Deutsche Industriebank AG, 2008). Besides, IKB share price experienced a dramatic 86% decrease from €29,85 to €4,10. Profits of ABN Amro significantly decreased in 2008 compared to 2007 mainly due to large net trading loss of more than €9 billion (ABN Amro Holding N.V., 2008). On 17th of October 2007 98,8% of ABN Amro Bank was acquired by the consortium that consisted of The Royal Bank of

[9] The financial year of IKB Deutsche Industriebank starts on the 1st of April and ends on the 31st of March.

Scotland, Belgian-Dutch bank Fortis, and Banco Santander of Spain. The merge is the major reason of ABN trading losses not being reflected in the 2007 annual report.

Goldman Sachs received about $15 million in fees from Paulson & Co. Mr. Paulson's credit hedge fund was up 590% in the end of 2007. Paulson & Co. made about $1 billion profit from the ABACUS 2007-AC1 deal.

Shortly after the complaint the US Securities and Exchange Commission filed a lawsuit against Goldman Sachs and Fabrice Tourre for "defrauding investors by misstating and omitting key facts about a financial product tied to subprime mortgages as the U.S. housing market was beginning to falter" (SEC, 2010). Fabrice Tourre was found liable and had to pay more than $1 million in fines out of his own pocket (Raymond and Stempel, 2014). He resigned from Goldman Sachs in 2012. Goldman Sachs reached a $550 million settlement with the SEC in July 2010, although, did not admit any wrongdoings. Neither Mr. Paulson, nor Paulson & Co. were not accused of anything.

ABACUS 2007-AC1 was one of 25 very similar financial structured products created by Goldman Sachs (Story and Morgenson, 2010). This case is a good example of how just one mismanaged CDO can cause dramatic losses and have significant consequences. During the financial crisis, there were millions of such products, thousands of people like Fabrice Tourre and hundreds of financial institutions involved. In the following chapters, we will take a macro approach on the CDO market, its conditions, legislation, participants and establish a connection between the CDO and the financial crisis 2007 – 2008.

2. CDO MARKET

The second chapter of the thesis is dedicated to the CDO market. It briefly presents history of CDOs and explains the role of CDOs on world markets with concentration on the USA and Europe. Besides, market participants are named and described.

2.1. CDO history and background

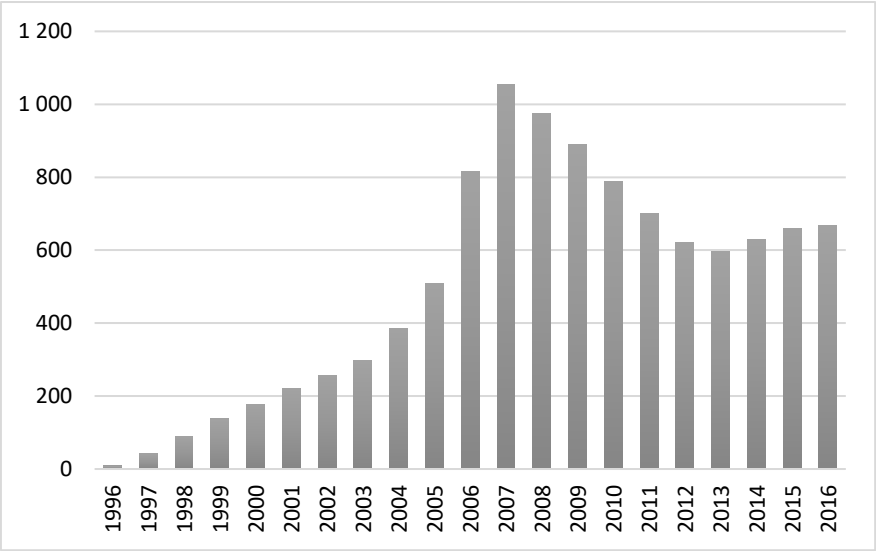
CDO is a relatively new instrument that, however, already has a well-known and controversial history. CDOs were first created in 1987 and were primarily used by commercial banks as small-scale instruments for balance sheet purposes (Lucas, Goodman and Fabozzi, 2006, p. 5). The collateral pool usually consisted of high-yield bond portfolios and a term "collateralized bind obligation" was most frequently used. Two years later, in 1989, corporate and real estate loans were first used as collateral assets and the term "collateralized loan obligation" (hereinafter: CLO) emerged. Normally, CLOs targeted high-yield loans, but there were few loans in distress used. In 1995, residential mortgage-backed

securities first made an appearance. Despite the fact that by 1995 CDOs could work with quite some types of collateral assets, annual CDO issuance did not exceed $2 billion per year on average. According to the Securities Industry and Financial Markets Association (hereinafter: SIFMA; 2017b), it took them a mere 10 years to break the annual issuance of $100 billion. By 2005, there was around $1,1 trillion of CDOs issued globally, which makes CDOs "the fastest-growing investment vehicle of the last decade" (Lucas, Goodman, Fabozzi, Manning, 2007 p. 39).

Financial engineering introduced new instruments with the rapid growth of securitization industry. Subprime securitization first emerged in the U.S. in early 1990s. Credit default swaps were first created in the beginning of 1990s. In the beginning, they were applied to asset-backed securities.

The leading country by structured instruments issuance volume is, no doubt, U.S. It is closely followed by Europe (De Servigny and Jobst, 2007). Japan and Australia are third and fourth respectively. Many more countries are following in the footsteps, among them there is Mexico – the leading country in Latin America, South Korea and China lead in Asia and Turkey is a forward of the Middle East and Eastern Europe region. Markets of the U.S., Europe and Australia can be considered as international markets: they attract not only domestic investors, but foreign and provide significant trading volumes as well as qualitative information and consulting services.

Figure 6: CDO issuance, USA (in billion USD)

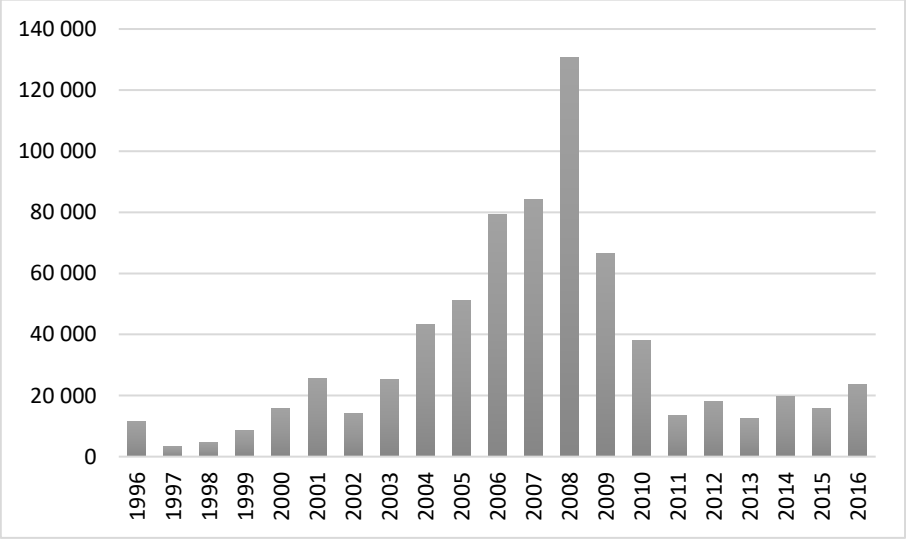


Source: SIFMA (2017b), own work

CDO issuance in the U.S. market for the past 20 years – from 1996 to 2016 – is shown in the Figure 6 above. As was already mentioned, substantial CDO issuance was only reached in 1996 and it was constantly increasing ever since. In 2006, it showed a 37% dramatic increase compared to the previous year – from $508 billion to $815 billion. In the year 2007, the U.S. CDO issuance reached the highest point at the level exceeding $1 trillion. After that, CDO issuance started to decrease by approximately 12% per year till 2012. Another minor decline happened in 2013 (4%). The following years demonstrated growth in CDO issuance on the U.S. market (SIFMA, 2017b).

As for the European market, it does not show such high numbers as the American one, but main trends stay the same. Figure 7 below shows clearly the development of CDO issuance over the same period of time– from 1996 to 2016 – in Europe. As can be seen, CDO issuance increases steadily by 40% on average up to 2001. In 2002 it drops by 82% due to a difficult corporate credit environment. After 2002, it regains its strength quickly, rises in a high tempo and reaches its peak in 2008 at around 130 billion USD. Compared to the American market, we notice that the peak of CDO issuance on the European market came one year later – in 2008. After that, European market clearly loses hope in structured financial products and CDO issuance declines dramatically – by 117% per year on average – over the years 2009 to 2011. Up till 2016, the market still looks destabilized, CDO issuance fluctuates, but the numbers do not rise – it barely goes above $20 billion in 2016 (SIFMA, 2017a).

Figure 7: CDO issuance, Europe (in million USD)



Source: SIFMA (2017a), own work

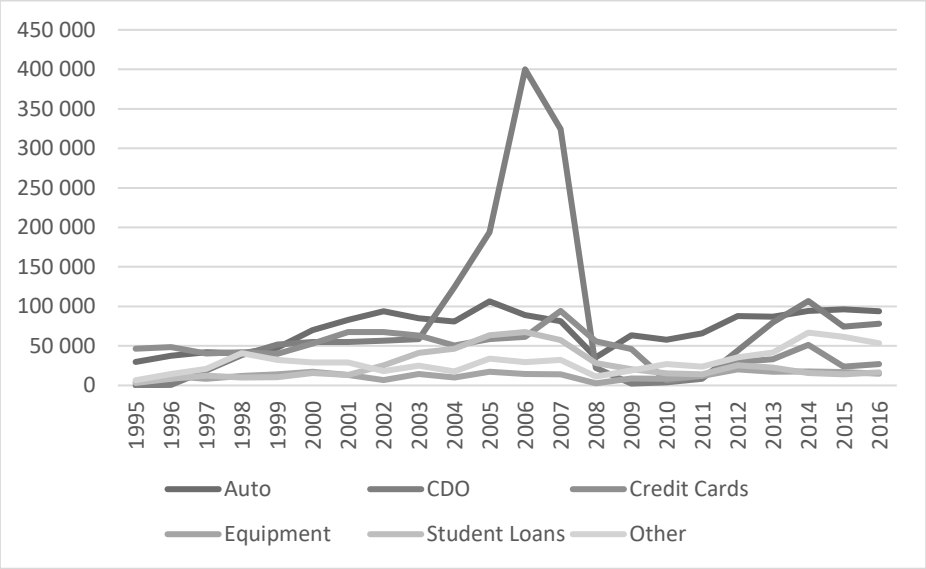
2.2.ABS market

Since asset-backed securities played a significant role on the market, there is a need to present an ABS market performance and its main trends.

After the appearance of the securitization in the early 1990s, the market for structured asset-backed products was constantly developing. There are different types of collateral securities can be backed with aside from mortgages and home equity loans, for example student loans, credit card receivables, auto loans, trade receivables etc. Mortgage-backed securities developed a high recognition, so some consider them a separate instrument with a separate market. Out of other ABS, home equity, auto, student loans and credit card receivables take up more than 80% of the ABS market (SIFMA, 2017b). Financial engineering can create securities practically out of any product that generates regular cash flows, therefore there might be many more asset-backed instruments created in the future (Tavakoli, 2008).

The Figure 8 below presents the issuance of the asset-backed securities in the US over the years 1995 to 2016. We can see immediately that one category of instruments stands out – CDOs. CDO category here includes all tranches of CDOs issued in US dollars regardless of the collateral source. Its performance looks familiar spiking up in 2006 and crashing down in 2008. Compared to other asset-backed instruments, CDO performance looks excessively volatile.

Figure 8: US ABS issuance (in million USD)



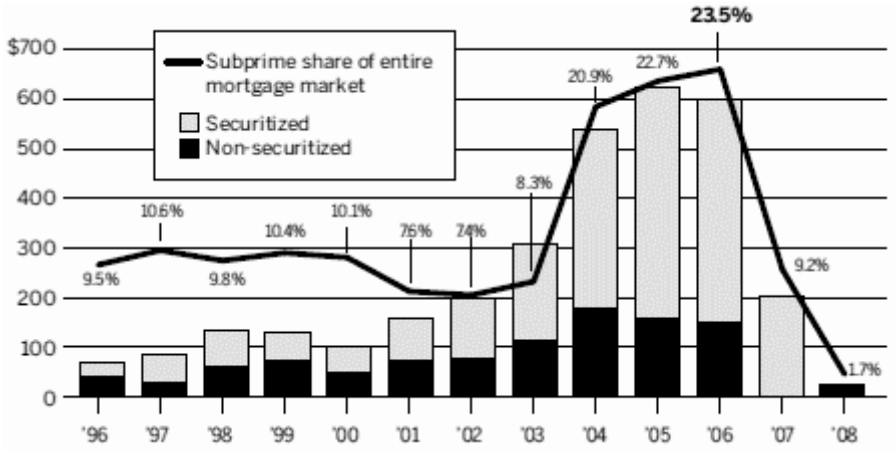
Source: SIFMA (2017b), own work

Auto category includes auto loans and leases and it was leading in ABS issuance from 1999 to 2006 and again after the crisis from 2009 on. It is the only ABS category besides the CDOs which exceeded $100 billion issuance amount and it did so just in 2005. According to Moody's (Black, 2016), portfolios consisted of prime auto loans ABS experienced the highest loss rate at approximately 2,5% in 2007, then it was decreasing steadily and stabilized at around 0,5%.

Credit cards loans performance experienced quite some fluctuations over the years. The ABS issuance was below $50 billion before 1999, then it was increasing reluctantly and decreasing again. In 2007 credit cards ABS reached it 20 years issuance maximum at a little below $100 billion, but declined significantly (SIFMA, 2017b). In 2016, its issuance was almost twice less than in the end of 1990s. During the crisis, credit card receivables experienced negative payment rates, but the situation got better by the middle of 2011. Moody's forecasts that performance on credit cards will likely face some risks in the future due to rising interest rates and loosening underwriting standards (Black, 2016).

Equipment and other ABS look unaffected by the financial crisis. Equipment ABS performance oscillated insignificantly over the years. Other ABS category, that includes the rest of loans that have not been mentioned, trade receivable etc., experienced an increase only recently – in the last couple of years (Black, 2016).

Figure 9: Subprime mortgage originations (in billion USD)



Source: The Financial Crisis Inquiry Commission (2011), p. 70, adapted

Figure 9 conveys major information about the state of the mortgage market and the level of subprime securitization during the crisis. As can be seen, subprime mortgage market took up about 10% of the whole mortgage market before the 2000s with the level of securitization

being 50% on average. From 2003, numbers of subprime loans increased alarmingly, disproportionally large amounts of them being securitized. In 2006, $600 billion of subprime loans were originated, which was 23,5% of the whole mortgage market. About 75% of them were securitized. In 2007, the amount of originated subprime loans decreased three time compared to the previous year, but all of them were repackaged into CDOs. After the crisis, conditions for getting a mortgage changed and it was almost impossible for people with low credit scores to secure a loan, hence subprime mortgages almost vanished from the market.

2.3.Market participants

Collateralized debt obligation is a complex product therefore there is a number of participants taking part in different stages of a CDO transaction. Here we will mention five main market participants and these are (Brose, Flood, Krishna, Nichols, 2014b):

- CDO issuer (underwriter),
- Asset manager (collateral manager),
- Investors,
- Credit rating agencies and
- Guarantors (trustees).

CDO issuer or underwriter. CDO underwriter is usually an investment bank or a securities firm. The underwriter generally looks into any aspect of CDO issuance: approves collateral pool, structures debt and equity tranches and sells them to investors. CDO underwriter collaborates with a law firm in order to create a SPV that will purchase collateral assets and issue CDO tranches. Moreover, underwriter also participates in defining conditions, restrictions and covenants of a CDO transaction.

Issuer's major economic function is to make sure a new CDO transaction is efficient and brings return to its participants. For this purpose, the investment bank is required to estimate an after-default return of the portfolio and costs of funding and to verify the former to be higher than the latter.

In the ramp-up period of CDO issuing, underwriters have to hold collateral assets in order to accumulate desired amount and structure a new CDO (Goodman and Fabozzi, 2002). This fact, no doubt, entails risks: mainly, of assets to decrease in value. Underwriters are rewarded with fees. As an act of good faith, it is common for an investment bank to keep a part of new CDOs for some time after the issuance process is completed.

From 2004 to 2007 only three firms structured more than 30% of CDOs – Merrill Lynch, Goldman Sachs and Citigroup (The Financial Crisis Inquiry Commission, 2011). Among other participants, Deutsche Bank and USB were also key players.

Asset manager or collateral manager. The paramount role of the assets manager is to purchase and manage collateral assets. The manager also takes care of cash flows and its transfer to the debtholders in cooperation with the CDO issuer, hence manager's role cannot be underestimated (Brose, Flood, Krishna, Nichols, 2014b). Managers are also able to maintain credit quality of collateral portfolio and maximize recovery rates in case of default. Synthetic CDOs do not require a physical transfer of assets or routine cash flows, hence the asset manager role is much simplified.

The asset manager comes into play in the very beginning, long before CDO is issued. The manager uses finances provided by an investment bank and purchases collateral assets – it is called warehousing (Tavakoli, 2008, p. 207-208). During the ramp-up period, assets are still being purchased, their value is being manages. Even after the ramp-up period is finished, asset manager continues to play one of the key roles. During the reinvestment period, the collateral manager can be allowed to reinvest principle gains by purchasing additional assets. If allowed by CDO transaction documents, the collateral manager is also able to trade assets in order to achieve a better credit quality of the asset pool.

CDO asset management is offered by variety of companies, such as hedge funds, mutual funds and other companies specializing in CDO management. Collateral managers are also rewarded with fees. Fees are usually based on the amount of assets in management. Opposed to the investment banks, collateral managers do not carry any risk (only the risk of getting lower fees if assets are mismanaged).

Investors. This is the broadest group and the most significant category on the other side of the barricades – CDO buyers. A range of financial institutions bought CDOs: commercial and investments banks, insurance companies, investment and mutual funds, pension funds etc. Profit achieved by investors depends on many factors, starting from the tranche they invest in, its credit rating, level of diversification, professionalism of the asset manager and others. Senior tranches are able to offer higher yields than bonds of a similar credit rating. Owners of equity tranches bear the highest risk in case of default, but in return they are offered yields that are usually not available for other fixed income securities (Brose, Flood, Krishna, Nichols, 2014b).

Rating agencies. Credit rating agencies is an external market participant that does not take part directly in the creation of CDO, although has an influential indirect role. Rating agencies typically provide credit ratings to tranches CDOs consist of and general guidelines as of

seniorities of debt, probable returns, default rates etc. Moreover, agencies typically perform due diligence on the collateral manager and the guarantor. Further details on credit rating agencies will be provided in Chapter 4 of this paper.

As well as other institutions, rating agencies received fees for their services. According to the Financial Crisis Inquiry Report (2011, p. 132) rating agency fees varied between $250 000 and $500 000 per CDO.

Guarantors or trustees. Financial guarantors hold CDO's assets for the benefit of investors. They typically issue a financial guaranty insurance policy – a credit default swap – on a certain CDO tranche. The policy commits the financial guarantor to pay scheduled proceeds to a debtholder if an underlying asset is in distress or default. Moreover, the trustee plays a role of a collateral custodian or administrator meaning monitoring and reporting asset performance regularly, as well as cash distribution between the parties (Lucas, Goodman and Fabozzi, 2006).

Financial guarantors carry majority of the risk that underlying asset pool will default. Normally, financial institutions such as insurance companies or investment banks served as financial guarantors. The biggest financial guarantor during the 2007 – 2008 financial crisis was multinational insurance corporation American International Group Inc (hereinafter: AIG).

3. LEGAL FRAMEWORK

This chapter presents us with the legal framework in force before the financial crisis. It makes an emphasis on deregulation and housing market regulatory framework.

3.1. History of banking system legal framework

The banking system of the USA is one of the largest and most influential banking systems in the world. The first American bank – the Bank of North America – was founded in 1781 in Philadelphia to provide finances for the war of independence (Barth, Li, Wenling, 2009, p. 2). By 1790 there was three more commercial banks established: The Bank of the New York, the Bank of Massachusetts and the Bank of Maryland. One year later, in 1791, the First Bank of the USA was founded (Sylla). It was the first and not the most successful attempt to establish a central bank. The US federal government was not involved in bank regulation for a long time, however, some institutions performed some central bank functions. For example, the National Currency and Bank Acts of 1863 and 1864 gave authority to the Office of the Controller of Currency (OCC) to charter national banks (Barth, Li and Wenling, 2009, p. 4-5). State banks were chartered by various state authorities. This

fact led to the creation of the **dual banking system** that still exists in US in modern days. Dual banking system allows state banks and national banks to be regulated under different legal standards. State banks are supervised by state authorities and regulated by state laws, while national banks are supervised by federal agencies.

After the Civil War in 1861 to 1865, American financial system took a downturn (Herzog, 2009). Banks expanded quickly, but there was no uniform regulator who could keep up with the rapidly spreading system. Some central banks functions were yet to be fulfilled and existing regulatory bodies simply could not suffice. The country experienced several recessions in economic activity, bank runs were a usual activity. In 1907 the first global financial crisis happened – the Panic of 1907, which enhanced the need for a central bank (Moen and Tallman, 2015).

On December 23rd, 1913, as a response to the years of financial instability, the **Federal Reserve System** (hereinafter: the Federal Reserve or Fed) was created – "a decentralized central bank that balanced the competing interests of private banks and populist sentiment" (History of the Federal Reserve). The Federal Reserve is structured in two parts: the Board of Governors is a central authority, stationed in Washington, D.C., and a decentralized network of 12[10] Federal Reserve Banks located throughout the country. The Fed was in charge of monetary policy, it supervised and regulated all national banks and state banks participating in Fed. Besides, it also was a government bank that handled all international transactions.

During the Great Depression of 1929 to 1933 it was clear that the system demands some changes. Among other things done there was the **Banking Act of 1933** passed, also known as the Glass-Steagall Act. The Act was meant "to provide for the safer and more effective use of the assets, to regulate interbank control, to prevent the undue diversion of funds into speculative operations, and for other purposes" (the Banking Act, p. 1). The main changes implemented by this Act are the following (Maues, 2013):

- separation of commercial and investment banking – commercial banks that provided two basic banking activities (taking deposits and giving loans) were not allowed anymore to provide investment services and vice versa. The separation intended primarily to avoid conflicts of interest which undoubtedly happened when both commercial and investment activities were conducted by the same company;
- the Federal Deposit Insurance Corporation (hereinafter: FDIC) was established – it created a nationwide deposit insurance that covered 100% of the first $10 000, 75% of the next $40 000 and 50% of any deposits above $50 000. The major goal of the deposit

[10] Boston, New York, San Francisco, Philadelphia, Cleveland, Chicago, St. Louis, Minneapolis, Atlanta, Kansas City and Dallas Federal Reserve Banks.

insurance was to establish higher trust in banking system and to prevent possible bank runs;
- the Federal Reserve was reorganized: it became independent from the Board of Governors, received more power as to regulation of the national banks and was enabled to purchase securities issued or approved by the US government.

Another law that should be mentioned is the **McFadden Act of 1927**. As the introduction of the Fed considered to be a success, the issue of its longevity was raised. Initially, 12 Federal Reserve Banks were supposed to exits until 1934, but according to the Act the Fed is to exist perpetually. The McFadden Act also allowed national banks to operate branches in states where it was not prohibited, however, there were still strict limitation imposed on branching (Richardson, Park, Komai, Gou, 2013).

Following the McFadden Act, many banks found loopholes by forming chain banks or group banks. To avoid unlawful actions and to fill in the gaps in 1956 the **Bank Holding Company Act** was introduced. The main idea of the Act was to introduce bank holding companies (hereinafter: BHC). Bank holding companies were allowed to operate branches in multiple states. On paper, branches of bank holding companies were considered independent banks (Mahon, 2013), hence it was not against the law. Another advantage of bank holding companies was that they could legally own other non-financial companies such as manufacturing companies, retail business etc.

With increasing international presence on the American market appeared the need to regulate foreign banks and BHCs who were engaged in banking and other activities (Sylla). Besides, foreign banks were allowed to operate in several states and they were not subjects to the non-banking provisions of the Bank Holding Company Act. In 1978 the **International Banking Act** was passed, according to which foreign banks were now treated in the same way as domestic banks. The Act eliminated any competitive advantage of foreign banks and made them subject to all provisions of the Bank Holding Company Act.

The last piece of banking legislation which was under some serious scrutiny in recent post-crisis years is of the **Federal Deposit Insurance Corporation Improvement Act** (hereinafter: FDICIA) of 1991. The Act was passed in response to troubles in banking industry in the late 1980s, defined an approach to banks in distress and guaranteed the resolution method that minimizes taxpayers' costs. However, Section 141 of the FDICIA attracted the most attention (Richards, 2010). This provision "provides for an exception that preserves the potential for the banks to be considered too big to fail" (FDICIA, 1991). his provision received a lot of criticism throughout the time, but it is still valid nowadays.

3.2. Deregulation

Banks and other financial institutions always have and always will adapt to the changing financial environment. Ways around and loopholes to avoid existing undesirable regulations were always found. Besides, American banks had to stand up to the increasing competition.

Things started to shift towards deregulation gradually in the end of 1970s. Before, as we have already mentioned, branching for both national and state banks was massively restrained. In 1994, the **Riegle-Neal Interstate Banking and Branching Efficiency Act** (hereinafter: Riegle-Neal) was passed and it was implemented in two phases (Barth, Li, Wenling, 2009, p. 15). In the first phase in 1995, banks were allowed to acquire banks in any states. In the second phase in 1997, there was a uniform set of branching rules created across the US and many restrictions on nationwide branching were removed. Only two states decided to opt-out (Montana and Texas), but both of them eventually allowed interstate branching.

Separation of commercial and investment banking as one of the results of the Banking Act of 1933 was believed to lead to a healthier financial system, but as time passed a change was needed. In 1999 the **Gramm-Leach-Bliley Act** (hereinafter: GLBA) was implemented. The main idea of GLBA was to widen the range of services banks and bank holding companies could offer: banks and BHC now were allowed to engage in investment and insurance activities. According to GLBA, financial institutions were permitted to form financial holding companies (hereinafter: FHC) that via subsidiaries could operate in banking, insurance and investment industries. Although, incorporating commercial and investment activities was still prohibited.

The two above mentioned Acts were the starting point of deregulation. They accelerated the trend toward more complex banking structure even more. With the creation of financial derivatives, banks slowly started to expand their services from deposits and loans toward structured finance and investment activities. The increasing complexity of banks led to consolidation and conglomeration, which nowadays is still in trend. In the early 1980s there were approximately 15 000 banks in the US, while in 2008 the number decreased almost twice – to 8 000 (Barth, Li, Wenling, 2009, p. 19).

The last but not the least deregulation law we mention is the **Depository Institutions Deregulation and Monetary Control Act** (hereinafter: DIDMCA) of 1980. "One of the most important pieces of legislation to affect the Federal Reserve in its hundred-year history" (Robinson, 2013). The name of the act suggests two major areas of reformation: depositary institutions and Fed's monetary policy. The most significant implemented changes were (DIDMCA, 1980):

- Negotiable Order of Withdrawal (NOW) accounts11 could now be offered nationwide;
- interest ceilings on loans and deposits were removed (with minor exceptions);
- all banks were now obligated to follow Fed's rules (not only the ones participating in the system);
- credit unions and savings and loans associations were permitted to take deposits.

Moreover, DIDMCA introduced fees for Fed's services, while beforehand they were provided for free. Banks and BHCs received even more freedom after the introduction of this Act. The shape of the banking system started to resemble the modern one step by step.

3.3.Housing market legislation

In 1934 the **National Housing Act** was passed. The Act established the Federal Savings and Loan Insurance Corporation (hereinafter: FSLIC) that regulated savings and loan industry (S&L) and the Federal Housing Administration (hereinafter: FHA). The major goal of the FHA was to "stimulate construction jobs, not to assist low-income individuals"[12] (Michel and Ligon, 2015). The FHA was also responsible for insuring lenders (banks) against the risk of mortgage default. In other words, this Act enabled private companies to buy out mortgages from the banks in order to lower bank's credit risk. This implementation was a milestone in the housing market and it led to further governmental interventions (Leef, 2014).

Federal National Mortgage Association (hereinafter: FNMA), commonly known as Fannie Mae, was established in 1938 as an amendment of The National Housing Act, when private companies showed lack of enthusiasm in purchasing banks' mortgages (Herzog, 2009, p. 24). Fannie Mae's main mission was to encourage low- and middle-class home ownership and reduce its costs (Cannato, 2010).

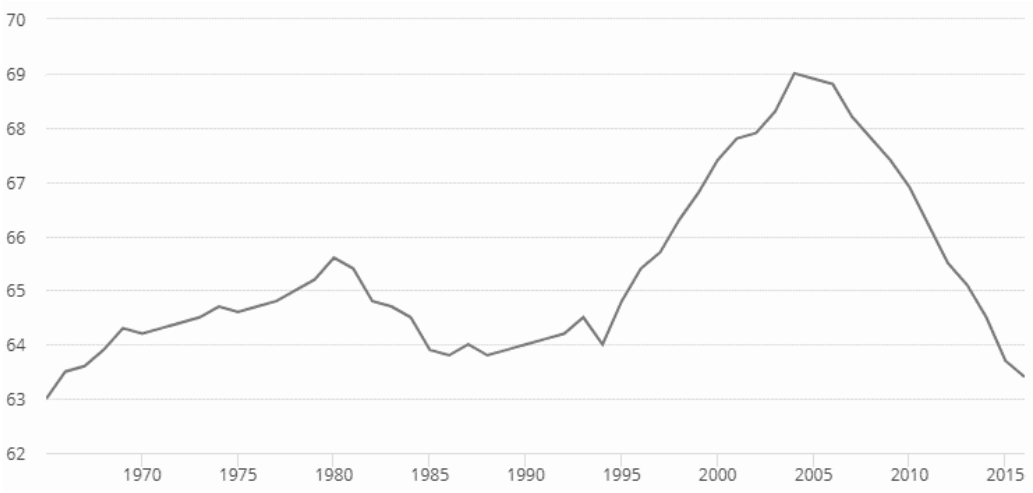
Initially, Fannie Mae insured only loans approved by the FHA, but later on it got authority to insure loans of other institutions (Herzog, 2009, p. 24). In 1954, the FNMA was restructured and the ownership was divided between state and private corporations. In 1968, it went into private ownership completely and became a publicly traded company on the New York Stock Exchange (hereinafter: NYSE). One of the reasons the FNMA was taken off the federal budget was to respond to the problem of redlining (Barth, Li, Lu, 2009, p. 23). In the same year, 1968, according to the Housing and Urban Development Act of 1968, Fannie Mae was split into two separate agencies: the FNMA (it kept the name) and the **Government National Mortgage Association** (hereinafter: GNMA), known as Ginnie

[11] Negotiable Order of Withdrawal account is an interest-earning bank account with which the customer is permitted to write drafts against money held on deposit. (Investopedia)
[12] The Federal Housing Administration: What Record of Success?

Mae. Ginnie Mae is fully owned by the US government and "it is the primary financing mechanism for all government-insured or government-guaranteed mortgage loans" (The Government National Mortgage Association). The GNMA purchased mortgages and played a role of a guarantor. From 1981, it could also securitize them into mortgage-backed securities (Herzog, 2009, p. 25).

Another piece of the housing legislation was passed in 1970 – the Emergency Home Finance Act. This act was meant to create a competitive market and to resolve a critical housing shortage situation at that time. The Emergency Home Finance Act created a new government-sponsored entity – the **Federal Home Loan Mortgage Corporation** (hereinafter: FHLMC), also known as Freddie Mac. The idea of Freddie Mac was similar to Fannie Mae: it was supposed to create a competitive mortgage market and increase the supply of money for mortgage lending. In 1971, Freddie Mac began to issue mortgage-backed securities, which initially were called "participation certificates" (Herzog, 2009, p. 26).

Figure 10: Homeownership rate in the US, 1965 – 2016 (in %)



Source: Federal Reserve Bank of St. Louis

According to the American Enterprise Institute, the US is the only developed country where the government has a significant role in housing policy (Wallison and Pinto, 2012). Many decades the US government's main priority on housing markets was to increase a homeownership rate (Wallison and Pinto, 2012), but according to the Figure 10 above, it was unsuccessful. The introduction of Fannie Mae and Freddie Mae managed to increase the homeownership rate insignificantly over the years up to 65,6% in 1980, but it did not last. The highest rate was reached in 2004 (69%). In 2016, the homeownership rate went down to its minimum since 1966 – 63% (Federal Reserve Bank of St. Louis).

In 2010, following the results of the financial crisis, Fannie Mae was delisted from the NYSE and nowadays it is traded over-the-counter.

4. CREDIT RATING AGENCIES

This chapter will be dedicated to credit rating agencies (hereinafter: CRAs). We start by mentioning briefly CRAs' history, then continue with its market nowadays. A special role is given to the Big Three rating agencies as they found themselves in the middle of 2007 – 2008 events.

4.1. Credit rating agencies history and market

As we have already mentioned previously, credit rating agencies play a significant role on the financial markets. Their major goal is to assess the risk of various companies, both private and state. Credit rating agencies review the ability of a company to meet its short- and long-term obligations and issue an appropriate rating that reflects a rating agency's confidence in solvency of a reviewed company (Brose, Flood, Krishna, Nichols, 2014b, p. 14). Credit ratings are issued not only for entities, but also to separate debt instruments and whole countries. The rating of a particular debt instrument may differ from a company's rating it belongs to, due to various specific terms and conditions (Kolakowski, 2017).

Credit agencies are privately owned companies that are supposed to offer an objective and uninfluenced opinion. By doing so, credit agencies perform as intermediaries and reduce the asymmetry of information between debtholders and investors. This fact, however, is debatable, since rating agencies are paid for their services by the debtholders. Some argue, that rating agencies create a conflict of interest (Neate, 2011).

Credit rating industry as we know it started to appear only in 1970s. Before, research of rating agencies was free of charge and the publications were rather informative (Finney). Gradually, financial institutions realised that the issuance of credit ratings influenced the value of rated securities or companies. Rating agencies' role on the market shifted from free informative articles to prominent analytical services.

In 1975, the term "nationally-recognized statistical ratings organizations" or NRSROs was introduced by the Securities and Exchange Commission. The initial idea was that banks and other financial institutions were not required to keep the same amount of reserves if they invested in securities that received high ratings by one or several NRSROs (Finney). In the 1970s, the SEC did not specify the process of a rating agency becoming a NRSRO (The Financial Crisis Inquiry Report, 2011, p. 119). If the rating agency was approved by the SEC, it received a no-action letter (SEC, 2003, p. 9). There was only one factor that

contributed to the decision – "the single most important factor to be whether the credit rating agency is "nationally recognised" in the United States as an issuer of credible and reliable ratings" (SEC, 2005, p. 9). In 1997, the SEC proposed additional criteria for the rating agencies to become a NRSRO.

As of the end of 2015, there are ten nationally-recognized statistical rating organizations in the US: Standard & Poor's (hereinafter: S&P), Moody's Investors Service, Fitch Ratings, A.M. Best, DBRS, Egan-Jones Ratings, HR Ratings, Japan Credit Rating, Kroll Bond Rating Agency and Morningstar Credit Ratings (SEC, 2016, p. 2). The Big Three CRA – Standard & Poor's, Moody's Investors Service and Fitch Ratings – are leading CRAs in ratings attributed to financial institutions, corporate issuers, asset-backed securities and government securities. A.M. Best rating agency, despite its size (just 9 173 outstanding ratings as of December 2015), is the leading CRA in rating insurance companies (SEC, 2016, p. 10). It maintains its leadership since 2007.

Table 3: The inverse of the HHI Index, 2015

Year	Financial institutions*	Insurance companies**	Corporate issuers**	ABS *	Government securities*	Total (all rating categories)
2015	3,72	3,82	3,23	3,53	2,40	2,65

Source: SEC (2016), adapted

We can learn some additional information about the CRA industry using the Herfindahl-Hirschman Index (hereinafter: HHI). HHI Index is used to measure the competitiveness of an industry, while its inverse "can be used to represent the number of firms with equal market share necessary to replicate the degree of concentration in a particular industry" (SEC, 2016, p. 14). As we can see in the Table 3 above, the inverse of the HHI Index takes the lowest of 2,4 for government securities category and the highest of 3,82 for insurance companies. In total, for all rating categories, the inverse HHI is 2,65. It means that the industry has such a concentration, where the entire market can be divided between 2,65 CRAs each of them having an approximately equal market share. Numbers look logical in light of the fact that the Big Three CRA have the altogether have over 90% of the market share in all categories, but insurance companies, where A.M. Best takes leadership.

4.2.The Big Three

There is the Big Three of the rating agencies: Standard & Poor's, Moody's Investor Service and Fitch Ratings (SEC, 2016). Standard & Poor's is the oldest rating service that was founded in 1860 with Henry Varnum Poor publishing an investor's guide to the US railroad

industry (S&P Global). Modern S&P as we know it was formed in 1941 when Poor merged with the Standard Statistics Bureau. In 1923 first ratings are issued and those are of mortgage bonds. Standard & Poor's is also known for its S&P 500 Stock Index, that was introduced in 1957 as "a measure of the general level of stock prices" (S&P Global). As of the end 2015, Standard & Poor's had the highest market share of almost 50%, as can be seen from the Table 4 below.

Table 4: Market share of the Big Three rating agencies, December 2015

	Number of ratings	Market %
S&P	1 146 932	49,13
Moody's	802 482	34,37
Fitch	303 501	13,00

Source: SEC (2016), own work

Moody's Investors Service was founded in 1909 by John Moody as a company providing analysis of securities values. Similar to S&P, Moody's major market of interest was railroads and their outstanding securities (Finney). By 1924, Moody's expanded to analysing the US government and municipality bonds. In the 1970s, the business was spread further to commercial papers and bank deposits. In 2015, Moody's was the second big rating agency which produced more than 800 000 out of 2 334 600 ratings (SEC, 2016).

Fitch Ratings was founded in 1913 by John Knowles Fitch under the name of Fitch Publishing Company. Initially, it published financial statistics for the investment industry in the form of manuals: "The Fitch Stock and Bond Manual" and "The Fitch Bond Book". The rating system that is used nowadays by Fitch was introduced in 1924. Fitch Ratings is the smallest of the Big Three rating agencies with market share of 13%, as of December 2015 (SEC, 2016).

CRAs issue ratings in the form of big or small letters, alphabetically: AAA (or Aaa) being the highest rating and C being the lowest. The Table 5 below presents us with a long-term rating scale issued by Moody's. Long-term rating scale relates to financial instruments with maturity over one year. S&P's and Fitch's rating scales are very similar, therefore we will not list them here. Short-term rating scales refer to the maturity up to 13 months and use letters as well as numbers (Moody's Rating Scale and Definitions). We can find Moody's short-term rating scale in the Table 6 below. It marks different investment grade ratings with a term "Prime" (P) and a number, for example Prime-1. Standard & Poor's use letter alphabetically with numbers (S&P, 2016), while Fitch marks the highest three rating groups

as F1, F2 and F3 and ratings B, C and RD (restricted default) to the rest (Rating Definitions, Fitch). While issuing a rating, CRAs state their opinion – outlook – on which direction the rating is most expected to move (Hill, Auquier, Bauer, Foley, LaMonte, Drevon. F., 2016). Rating outlook does not mean that ratings will necessarily be upgraded or downgraded accordingly, it simply states a possibility. Furthermore, credit ratings can be placed on credit watch. This can be done in situation when a company experienced some event or change in performance that is likely to affect a company's credit rating. A credit watch listing may not affect the current rating of a company, it simply means a need for further analysis (S&P, 2016).

Table 5: Global long-term rating scale, Moody's

Aaa	Obligations rated Aaa are judged to be of the highest quality, subject to the lowest credit risk
Aa	Obligations rated Aa are judged to be of high quality, subject to very low credit risk
A	Obligations rated A are judged to be upper-medium grade, subject to low credit risk
Baa	Obligations rated Baa are judged to be medium grade, subject to moderate credit risk, may possess certain speculative characteristics
Ba	Obligations rated Ba are judged to be speculative, subject to substantial credit risk
B	Obligations rated B are considered speculative, subject to high credit risk
Caa	Obligations rated Caa are judged to be speculative of poor standing, subject to very high credit risk
Ca	Obligations rated Ca are highly speculative and are likely in, or very near, default, with some prospect of recovery of principal and interest
C	Obligations rated C are the lowest rated and are typically in default, with little prospect for recovery of principal or interest

Source: Moody's, adapted

Table 6: Global short-term rating scale, Moody's

P-1	Issuers rated Prime-1 have a superior ability to repay short-term debt obligations
P-2	Issuers rates Prime-2 have a strong ability to repay short-term debt obligations
P-3	Issuers rated Prime-3 have an acceptable ability to repay short-term debt obligations
NP	Issuers rated Not Prime do not fall within any of the Prime rating categories

Source: Moody's, adapted

In this paper when mentioning a credit rating agency, we will be mostly concentrated on the Big Three.

4.3. Rating methodologies of the Big Three

There are many factors that CRAs take into consideration when issuing ratings. Rating agencies conduct applicable quantitative, qualitative and legal analysis and only then, when all relevant factors are looked at, the rating is assigned. The list of factors may vary depending on the institution, country or specific financial instrument under the scrutiny. In this paper, we are most interested in financial institutions and structured securities.

General rating criteria that cannot be overlooked are the following (Standard & Poor's; Needham and Carter, 2015):

- Country risk. This risk includes basic information about the country a company operates in, its economic environment, legal framework and financial system, as well as governance. Needless to say, that developed countries usually have more favourable conditions for conducting businesses, hence lower country risks and higher ratings.
- Industry risk. An industry a company conducts its business in also plays a very significant role. Under industry risk, market structure and competition is accessed, industry-specific development trends and general performance are evaluated.
- Competitive position. As the market and its performance is already known, a company's position on the market is being accessed: if the company has any competitive advantages, its primary niche and product and service diversity. Furthermore, the company's profitability and efficiency is estimated.
- Cash flow and leverage. A company's financial performance is essential. By looking at company's cash flows and level of leverage, possible financial risks can be determined and the overall financial stability of the company.

The first three criteria contribute to the business risk profile of the company, while the last one shows the financial risk profile. Based on these two profiles, further detailed analysis is performed.

We are especially interested in quantitative analysis of rating agencies, which include default and recovery rates analysis and transitions matrices. Major part of statistical analysis is based on past data, including default rates, hence the prediction of future default rates must be approached with caution: various factors such as state of economy, interest rates, other influential conditions should be taken into consideration. Another difficulty comes with the complexity of structured finance. Structured financial instruments have often large collateral

portfolios, a number of tranches and an occurrence of one missed payment or a default of a small portion of the tranche or portfolio can easily be missed (Goodman and Fabozzi, 2002).

Standard & Poor's reflects changes in current ratings via one-year rating transition matrices. Transitions matrices show probabilities of certain ratings keeping their values or changing them in a period of one year. Transition matrices of global structured finance and the US RMBS can be seen in Appendix 2. From transition matrices (year 2015), we can see that overall structured finance have lower probabilities of being downgraded and higher probabilities of being upgraded that the US RMBS. Comparing global structured finance transition matrices in 2015 to 2007 we can see, that transition probabilities in 2007 are generally higher, meaning that more structured products during financial crisis were downgraded. Moreover, according to 2007 data, the amount of not reported ratings was uncharacteristically high. This could mean that the actual downgrade statistics was above presented numbers.

Transition matrix approach is quite simple, but reliable approach. It allows us to calculate reliable transition matrices over shorter and longer periods of time. However, this method does not account for the possible serial correlation of rating changes: it is when rating is downgraded, it is more likely to be downgraded again (Lucas, Goodman, Fabozzi, 2006, p. 158).

From transition matrices, default rates are estimated. The default rate is a rate of borrowers that are not able to repay their obligations. Since our interest lies in structured finance, we will talk about the default rate of financial instruments, for instance asset-backed securities or RMBS. Moody's has taken an approach of so-called extensive default rates – material impairments approach (Hill, Auquier, Bauer, Foley, LaMonte et al., 2016). Structured products are considered to be "in material impairment if they have suffered an interest shortfall or a principal write-down that remained outstanding at the end of the study period. Securities that were downgraded to Ca or C, even though they had not yet experienced interest shortfalls or principal losses, are also considered to be materially impaired" (Hu, Tung, Alexander, Roy, Cantor, Weill, Rosa, Scholtz, 2007, p. 6).

According to Moody's methodology, it performs an original issue cohort methodology and a rolling cohort methodology (Hill, Auquier, Bauer, Foley, LaMonte et al., 2016). An original issue cohort means forming a group of similar rated tranches that were issued in the same year. Their defaults are then recorded jointly. A rolling cohort means that a similar rated group of tranches includes tranches issued in different years. Moody's reports, that rolling cohort method shows twice higher default rates than original issue method (Lucas, Goodman, Fabozzi, 2006, p. 161). This difference is explained by the fact that marginal defaults of structured financial products tend to increase three years after the issuance and

then they decline. Moody's methodology also deducts half of withdrawn ratings when estimating default rates. Since a lot of ratings mature every year and have their ratings withdrawn, this leads to the overestimation of real default rates (Hu, Tung, Alexander, Roy, Cantor at al., 2007).

Table 7: Standard & Poor's 5-year default rates (in %)

	ABS	CMBS	RMBS&HELs	All SF	Corporates
AAA	0,03	0,00	0,00	0,06	0,10
AA	1,47	0,01	0,04	0,18	0,31
A	3,14	0,25	0,45	1,11	0,65
BBB	13,64	1,15	1,32	3,53	3,41
BB	40,65	10,93	5,28	9,68	12,38
B	76,02	14,66	14,02	21,12	26,82

Source: Lucas J. D., Goodman S. L., Fabozzi J. F. (2006), p. 158

Table 8: Moody's 5-year default rates (in %)

	ABS w/o Mfd. housing	CMBS	RMBS&HELs	All SF	Corporates
Aaa	0,26	0,00	0,33	0,27	0,40
Aa	5,42	0,00	0,48	1,33	0,40
A	1,55	0,52	0,57	1,23	0,81
Baa	4,24	1,64	3,56	5,10	2,52
Ba	12,58	1,49	6,95	8,15	13,85
B	42,86	7,44	14,06	11,46	33,39

Source: Lucas J. D., Goodman S. L., Fabozzi J. F. (2006), p. 161

Tables 7 and 8 above show 5-year default rates of different kinds of financial instruments – ABS, CMBS, RMBS and home equity loans (hereinafter: HEL), all structured finance (hereinafter: SF) and corporates – by Standard & Poor's and Moody's (using original issue methodology). Comparing both Tables, we can see that the highest default rates belong to

ABS. However, S&P's estimated default rates are much higher than Moody's, which can be partly explained by the fact that Moody's excludes manufactured housing from the calculation. Moody's has twice smaller CMBS and all SF default rates. Both Moody's and S&P show that corporate default rates are higher than CMBS and RMBS & HELs default rates except several categories. Other rating differences between the two agencies can be explained not only with different rating methodologies, but also with differences in securities these CRAs rate, downgrade practices they use, small differences in ratings they attach etc.

Table 9: Standard & Poor's annual default rates/recovery rates

	ABS	CMBS	RMBS&HELs	All SF	Corporates
AAA	0,01/77	0,00/NA	0,00/98	0,01/88	0,02/NA
AA	0,29/50	0,00/NA	0,01/74	0,04/62	0,06/NA
A	0,63/50	0,05/NA	0,09/58	0,22/54	0,13/NA
BBB	2,73/36	0,23/57	0,26/53	0,71/49	0,68/NA
BB	8,13/24	2,19/47	1,0/41	1,94/37	2,48/NA
B	15,20/33	2,93/43	2,80/37	4,22/38	5,36/NA

Source: Lucas J. D., Goodman S. L., Fabozzi J. F. (2006), p. 160

Table 10: Moody's annual default rates/recovery rates

	ABS w/o Mfd. housing	CMBS	RMBS&HELs	All SF	Corporates
Aaa	0,05/96	0,00/NA	0,07/97	0,05/96	0,08/80
Aa	1,08/95	0,00/NA	0,10/90	0,27/92	0,08/40
A	0,31/61	0,10/87	0,11/79	0,25/69	0,16/44
Baa	0,85/54	0,33/43	0,71/60	1,02/58	0,50/41
Ba	2,52/60	0,30/60	1,39/63	1,63/60	2,77/41
B	8,57/35	1,49/51	2,81/49	2,29/48	6,68/36

Source: Lucas J. D., Goodman S. L., Fabozzi J. F. (2006), p. 166, adapted

Tables 9 and 10 above present S&P's and Moody's annual default and recovery rates. Compared to the 5-year default rates, we can see that short-term default rates are significantly smaller for both CRAs – five times lower on average. Similar to the situation with the 5-year default rates, ABS have the greatest annual default rates in all classes. Similarly, Moody's ABS default rates are almost twice lower than S&P's rates partly due to exclusion of manufactured housing. S&P has approximately twice higher default rates in CMBS and all SF categories, while RMBS & HELs have very similar default rates. As for recovery rates, they are proportionated to the default rates.

Needless to say, that sometimes both default rates and recovery rates are relative. For example, the smallest asset in the portfolio takes up 1% of the portfolio, then it is uncertain how to interpret the tables. In some cases, it is impossible to take into consideration all possible factors and sometimes the best-looking securities suddenly default. CRAs exist to minimize such possibilities.

5. MELTDOWN

In the previous chapters we thoroughly reviewed and explained various factors which may have contributed to the financial crisis. This chapter will be dedicated to the crisis itself, its timeline, consequences and aftermath. The events will be described chronologically, starting from the formation of the housing bubble, its inevitable burst, followed by numerous bankruptcies (the biggest being the collapse of Lehman Brothers) and various attempts to save the economy.

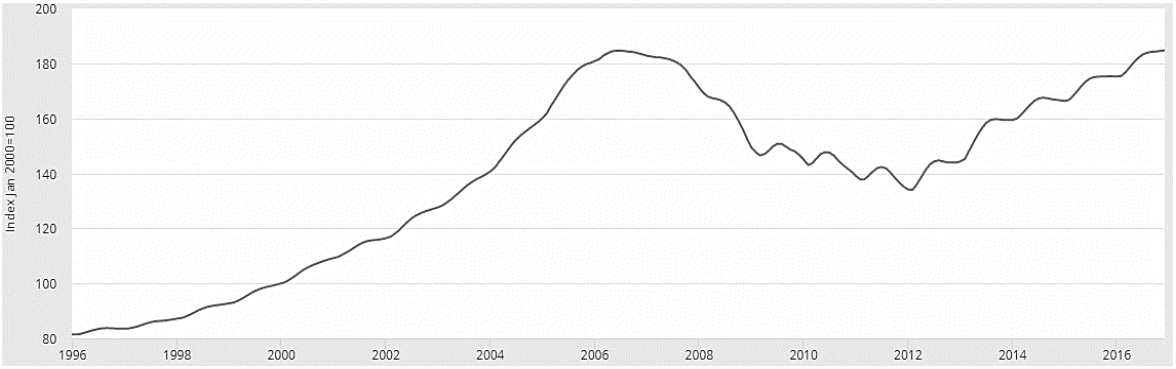
5.1. 2007: housing bubble and Fed interventions

With constantly increasing housing prices and progressive subprime mortgage securitization, a bubble was inevitable, but few saw it coming (Bartlett, 2009). As was already mentioned in earlier chapters, the US homeownership rate was steadily increasing since mid-1990s and peaked at 69% during the years before the crisis, but at the same time the US national home price index (that is measured by S&P/Case-Shiller indicator) was constantly going up in the same period of time, as can be seen from the Figure 11 below. The fact alone that rapidly rising hosing prices did not slow homeownership rate looks alarming. As Michael Lewis (2012, p. 65) put it: "Home prices didn't even need to fall. They merely needed to stop rising at the unprecedented rates they had the previous few years for vast numbers of Americans to default on their home loans".

An economic bubble happens when "trade is in high volumes at prices that are considerably at variance with intrinsic values" (King, Smith, Williams, Van Boening, 1993, p. 183). In the beginning of 2000s, the signs of an upcoming bubble were noted by some economists

and journalists[13], but they were dismissed. Alan Greenspan[14], then Chairman of the Federal Reserve, rejected these red flags on various occasions claiming that there was nothing to be worried about and Fed clearly shared his views (Andrews, 2007).

Figure 11: S&P/Case-Shiller US national home price index (1995-2016)



Source: Federal Reserve Bank of St. Louis

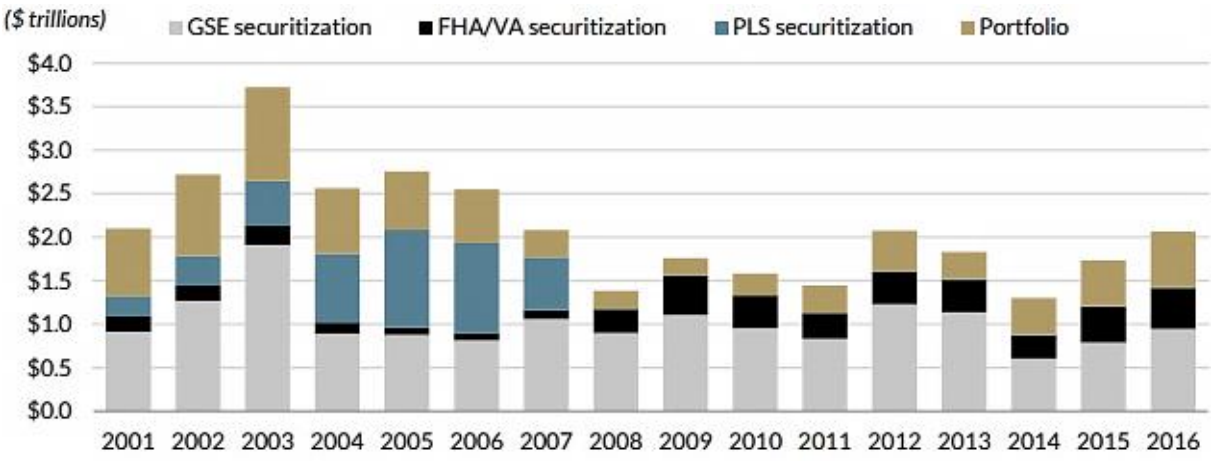
Securitization and uncontrolled subprime lending presented another crucial problem. By now we are well aware of all the benefits of securitization, but in the years before the crisis securitization only seemed to bring problems. Bernanke[15] (2007) named one of the reasons being the migration of mortgage origination from regulated banking sector to unregulated mortgage brokers. According to the Home Mortgage Disclosure Act Data (Avery, Brevoort, Canner, 2007, p. 25, p. 66), more than 45% of first-time higher-priced loans in 2006 were originated by independent mortgage companies, while only 25% by depository institutions. Figure 12 below clearly confirms this fact: the percentage of private-label securitization is very high in years 2004 to 2007. These companies often sold mortgages in bulk to banks for securitization purposes in order to receive fees (Smith, 2012).

Apart from private mortgage companies, government-sponsored entities (hereinafter: GSEs) also contributed to the situation. Fannie Mae and Freddie Mac were highly involved in the subprime RMBS since they acted as intermediaries and purchased mortgages in order to create RMBS. GSEs did not have as strict capital requirements as banks and lending standards were lowered to make housing more accessible and affordable, hence Fannie Mae and Freddie Mac were collecting high profits on RMBS trading, which only gave a green light for the same behaviour to banks and other private mortgage companies involved. Moreover, Fannie Mae introduced a program called "HomeStay", that was further

[13] S. Fitch and B. Copple (Forbes), E. Leamer (UCLA), K. Case and R. Shiller (Brookings Institution), P. Kasriel (Northern Trust) etc.
[14] Alan Greenspan was the Chairman of the Federal Reserve from August 11, 1987 to January 31, 2006
[15] Ben Bernanke was the Chairman of the Federal Reserve from February 1, 2006 to February 3, 2014

transformed by Freddie Mac into "HomePossible" (Amadeo, 2017a). The program, among other things, allowed refinancing, but that only made payments higher.

Figure 12: Origination of mortgage-backed securities (2001-2016)



Source: Urban Institute (2017), p.8, adapted

In August 2007 the Fed announced that in order to meet the "unusual funding needs because of dislocations in money and credit markets" (in Somerville and Kadoya, 2007) it will make some large purchases that injected funds into the banking system. The Federal Reserve made permanent and temporary purchases of treasury securities on the open market, giving the banking system the total of $24 billion of additional liquidity (the Federal Reserve Bank of San Francisco, 2007).

In September 2007, attempting to equalize market forces after the liquidity injection, the Federal Open Market Committee (hereinafter: FOMC) lowered the federal funds rate by 50 basis points from 5,25% to 4,75%. Usually, the Fed only changes the benchmark rate for 25 basis points, therefore lowering it for 0,5% conveyed the message that Fed is ready for expansive actions. In the following months, the federal funds rate was lowered twice, each time by 25 basis point, until it reached 4,25% in December (Board of Governors of the Federal Reserve System, 2017).

In October 2007, a group of leading banks such as Citigroup, JPMorgan Chase and Bank of America set out to establish a so-called superfund – the "master liquidity enhancing conduit" (Doran, 2007). The fund was $75 billion large and was managed by Blackrock Investments (Amadeo, 2017a) [16]. Its main goal was to buy dysfunctional mortgage-backed securities, enhance liquidity on the market and buy more time. However, the superfund did not succeed.

[16] According to The Guardian (Doran, 2007), the amount of money invested in the superfund was $100 billion.

One single fund, even with $75 billion in storage, was too small of a measure to improve the situation, that by then accelerated dramatically.

As the financial year 2007 was coming to the end and the situation on the market was still grave, Bernanke and the Fed introduced the brand-new tool that was supposed to relieve some of the bad loans pressure on banks' financial statement – the Term Auction Facility (hereinafter: TAF). All previous attempts to restore liquidity and trust on the market failed, because depository institutions were under pressure of maintaining own financial stability and not showing any signs of a possible financial distress. The least every bank needed was to provoke a bank run or to show weakness. The TAF auctioned loans to banks "in generally sound financial condition" (Board of Governors of the Federal Reserve System, 2016). The program provided the distribution of liquidity to higher range of institutions and as a result relieved at least part of the pressure on the distressed market.

Home prices continued to decrease in the second half of 2007 and through 2008, as can be seen from the Figure 11. With falling housing prices, foreclosure numbers started to spike. According to Reuters (Yoon, 2008), in 2007 foreclosure filings rose by 75% compared to 2006 and reached the total number of more than 2,2 million. More than 860 000 families lost their homes in foreclose proceedings. In 2008, CNN Money (Christie, 2009) reported, foreclosure filings continued to rise: by 81% compared to the year 2007, the total number of filings exceeded 3,1 million. Judging by the numbers, the Fed's attempts to somewhat stabilize the situation did not succeed.

5.2. 2008: madness, bailouts and the biggest bankruptcy in American history

In the beginning of 2008 the Fed interfered again by lowering the Fed funds rate. Overall, in the first quarter the FOMC the interbank rate was changed three times: by unprecedented 75 basis points on January 22 following shortly by the 0,5% decrease a week after on January 30 and on March 18 for 0,75%. Only for the first three months of 2008, the funds rate decreased by 2% from the 2007 end level of 4,25% to 2,25% in March 2008 (Board of Governors of the Federal Reserve System, 2017).

Needless to say, that homeowners found themselves in even bigger troubles. Adjustable-rate mortgages reset themselves, monthly payments rose and more people ended up in financial distress. Home price index continued to fall, people were unable to sell homes, housing market was in depression.

In another attempt to bolster economic performance and slow down the recession, President Bush signed the Economic Stimulus Act of 2008 on February 13. The Act eliminated taxes on first $6 000 of taxable income for individuals and on first $12 000 for couples, hence

taxpayers received tax rebate checks (Levine, 2008). According to the University of Michigan Survey of Consumers (Shapiro and Slemrod, 2009), about 50% of tax rebate checks were spent to pay off existing debt. Besides, the Stimulus Act also raised loan limits for Fannie Mae, Freddie Mac and the FHA, therefore more poor-quality subprime mortgages were transferred from banks' balance sheets to GSEs.

Foreclosure filings were unprecedently high in 2008: increased by dramatic 81% since 2007, total of more than 3,1 million (Christie, 2009). In foreclosure proceedings more than 861 000 families lost their homes. "Clearly the foreclosure prevention programs implemented to date have not had any real success in slowing down this foreclosure tsunami" (Saccacio[17] in Adler, 2009).

In March, the first casualty of financial crisis emerged – Bear Sterns. According to the Financial Crisis Inquiry Report (The Financial Crisis Inquiry Commission, 2011, p. 280), mortgage securitization within its fixed-income division generated 45% of total revenues. Bear Sterns was the second biggest broker in the US following Morgan Stanley with 21% and 23% market share respectively. Bear Sterns was one of the largest underwriters of collateralized debt obligation of all kinds on the market. Only in 2006, it underwrote $36 billion, which is more than double of what it underwrote in 2005 – $14,5 billion. Its net income in 2007 amounted to $233 million, which decreased more than 8 times since the previous year. Diluted earnings per share decreased accordingly: from $14,27 in 2006 to just $1,52 in 2007. In 2007, Bear Sterns owned more than $46 billion of mortgages, mortgage-backed and asset-backed securities, $6 billion more than in the year 2006 (Bear Sterns, 2007).

In November 2007[18], Moody's downgraded Bear Sterns' long-term debt from A1 to A2 with the stable outlook, as a result of bank's writedowns of CDOs and subprime mortgages. In January 2008, 46 tranches of subprime CDOs were downgraded significantly, some of them to Caa2 and Caa3, which basically meant that this debt was unrecoverable. 11 more tranches from 2007 deals were placed under review for possible downgrade (Moody's, 2008), Bear Sterns debt rapidly lost its quality and the bank headed for the bankruptcy full speed.

In the beginning of March, the Fed activated the Term Auction Facility program for the second time. During March it injected $100 billion into the market (Amadeo, 2017b). The program was thought to bail out Bear Sterns, but it failed. The bank was short of liquidity and even $30 billion loan from JP Morgan Chase, that was guaranteed by the Fed, did not restore liquidity (Amadeo, 2017c). On March 16, JPMorgan Chase acquired Bear Sterns

[17] James Saccacio was the CEO of RealityTrac until November 2011. RealityTrac was a real estate company that specialized in purchasing and selling defaulted properties and properties in foreclosure proceedings.
[18] Bear Sterns had a fiscal year from December 1st till November 30th

paying staggering $2 a share (Sorkin, 2008). This represented a huge loss considering that in January 2007 Bear Sterns shares were traded at $172 a share (Moyer, 2007).

FOMC continued to lower the funds rate: on April 30 the rate was decreased by 25 basis points and amounted to 2% (Board of Governors of the Federal Reserve System, 2017). The Term Auction Facility proceeded to inject more money to the market. By June, the amount of injections levelled at $1,2 trillion and the Fed lent another $225 billion to sustain liquidity (Amadeo, 2017b).

In the end of July, after the stress test report of the two GSEs Fannie Mae and Freddie Mac were released, the US Treasury Department announced that Fannie Mae and Freddie Mac could need a bailout of nearly $100 billion. As we already know, these two GSEs purchased loans and repackaged them into mortgage-backed securities, which were further sold with guarantees to further depository institutions. According to Bloomberg (Light, 2017), total amount of securities owned or guaranteed by GSEs exceeded $5 trillion figure, which was roughly half of the total nation's mortgages. In case of collapse of either one of the two institutions, GDP might have declined by as much as 6,5%, unemployment would have increased by 10% and home prices would fell for additional 25%. As a response to such possible events, Treasury Department guaranteed Fannie Mae and Freddie Mac $25 billion in loans in exchange for GSEs turning majority of their profits to the Treasury Department (Amadeo, 2016c), but this was not enough. In the beginning of September, government seized Fannie and Freddie injecting them with the total amount of $187,5 billion of bailout money. The Treasury Department placed "the two companies into a "conservatorship" to be overseen by the Federal Housing Finance Agency (hereinafter: FHFA). Under conservatorship, the government would temporarily run Fannie and Freddie until they are on stronger footing" (Ellis, 2008).

September 2008 was marked by several crucial events. Apart from the nationalization of GSEs, on September 14, it was announced that Bank of America was buying Merrill Lynch for $50 billion[19]. Merrill Lynch was one of the leading investment banks that was on the front line of mortgage-backed securities trading. As can be seen from the Table 11 below, only in 2007 Merrill Lynch issued $168,4 billion in ABS CDOs including subprime RMBS, which is approximately 11,5% of the market. Along with other banks, during 2007 and 2008 it was struggling with insufficient liquidity. At the end of the year 2008, it showed a loss of more than $27 billion, while in 2007 it experienced a $7,7 billion loss compared to the $7,5 billion profit in 2006. According to the Merrill Lynch annual financial statement of 2008, only from mortgage-and asset-backed securities the bank experienced a loss of almost $10

[19] The deal was completed in the Q1 of 2009.

billion not counting frequent write-offs. Bank of America paid about $29 per Merrill Lynch share, however in May shares were trading at $50 (Gasparino, 2008).

Table 11: CDO dealers issuance of subprime RMBS and ABS CDOs (in $ million), 2007

CDO dealers	RMBS issuance	CDO issuance
Merrill Lynch	76,747	91,767
Citigroup	54,032	70,552
UBS Warburg	20,024	65,409
Goldman Sachs	52,727	59,103
Credit Suisse First Boston	99,081	38,209
Deutsche Bank Securities	59,635	37,362
Wachovia Securities	12,528	25,033
RBS Greenwich Capital	31,643	23,869
Banc of America Securities	28,524	22,617
Barclays Capital	33,812	21,424
Lehman Brothers	170,342	19,116
Bear Stearns	61,698	19,111
Morgan Stanley	121,289	14,237
SG Corporate & Investment Banking	4,796	11,609
JP Morgan	53,628	7,584
Total		

Source: Beltran O. D., Cordell L., Thomas P. C. (2013), p. 23, adapted

On September 15 the unexpected happened: one of the leading investment banks with more than $670 billion in assets filed for Chapter 11 bankruptcy protection[20] (Amadeo, 2017b). According to the financial statements of Lehman Brothers, only in March, April and May they have lost more than $2,7 billion, while same months in 2007 brought nearly $1,3 billion in profit. This loss came for major part because of Lehman's positions in CDO-related contracts. By May 31, 2008 Lehman had nearly $295 billion of collateralized agreements

[20] Chapter 11 of the United States Bankruptcy Code "generally provides for reorganization, usually involving a corporation or partnership", United States Courts.

and more than $207 billion in collateralized financings. $60,8 billion were mortgage and asset-backed securities. According to the Table 11 above, Lehman Brothers was the leader in issuing subprime RMBS and ABS CDOs. As the market situation worsened and mortgages took a turn for worse in terms of credit quality, collateralized financial instruments in Lehman books lost their value dramatically.

Moreover, according to the court-appointed examiner's report – a 2200 pages report published in 2010 – Lehman Brothers used various accounting tricks to temporarily reduce its balance sheet by $50 billion in order to conceal the actual indebtedness. The question arises: is it the only thing hidden from the stakeholders' view or is there more? We will not emerge ourselves into details, but the fact remains: Lehman not only endangered American economy on the large scale, but intentionally misled everybody as to the actual degree of the financial distress (De la Merced and Sorkin, 2010).

Lehman Brothers was definitely "too big to fail", however, the federal government decided against bailing out the bank or guaranteeing a certain amount on loans as they did with Bear Sterns (Michel, 2013). Hence, negotiations with Barclays and Bank of America about acquiring Lehman Brothers failed. American government was clear in their determination not to rescue any other financial institutions. Lehman Brothers bankruptcy filing was the largest in the American history (De la Merced and Sorkin, 2010).

The collapse of Lehman Brothers triggered panic. The next day, on September 16, the Fed had to give an emergency loan to AIG in exchange for the 79,9% share of the company and immediate control over company's decisions including veto power (Amadeo, 2017b). The Federal Reserve described this action as an attempt to prevent "a disorderly failure of AIG that could add to already significant levels of financial market fragility and lead to substantial higher borrowing costs, reduced household wealth, and materially weaker economic performance" (Board of Governors of the Federal Reserve System, 2008). AIG is American multinational insurance company. Before and during the financial crisis the company was one of the leaders in selling credit default swaps – instruments that bet on failure of a certain financial instrument, company or institution. According to the Financial Crisis Inquiry Report (The Financial Crisis Inquiry Commission, 2011, p. 344-347), AIG struggled with liquidity as demands for repayments piled up, the amount of off-balance-sheet commitments was high ($33 billion if AIG was downgraded) and it experienced dramatic losses on its investments.

Usually safe money markets also experienced panic. On September 17 alone investors withdrew $144,5 billion from their money market accounts – an unprecedented amount compared to $7 billion withdrawals on an average week (Amadeo, 2017d). Investors were moving their funds from money markets to governmental financial instruments which

pushed down interest rates even more. Banks were unsure of what to do and stopped majority of lending operations. They had unusually high amounts of cash on hand – up to $190 billion opposite to average $2 billion. The whole American economy was on the edge of collapse. If confidence in money markets was not restored shortly, the end consumer would have been be affected within weeks. "At that point, you don't need to map out which particular mechanism – it's not relevant anymore – it's become systemic and endemic and it needs to be stopped" (Palumbo in the Financial Crisis Inquiry Report, p. 359).

At this stage the Federal Reserve recognised the importance and emergency of measures that need to be taken in order to save the economy. Paulson and Bernanke started negotiations with the government about bailing out institutions who possessed RMBS. After a rejection of the proposal for the first time, the Emergency Economic Stabilization Act of 2008 (thereinafter: EESA) was finally passed on October 3. The main idea of the Act was to establish the Troubled Asset Relief Program (thereinafter: TARP) "to purchase and to make and fund commitments to purchase, troubles assets from any financial institution, on such terms and conditions that as are determined by the Secretary" (EESA, sec. 101 (a)(1)). According to the program, Treasury was allowed to spend $700 billion on purchasing mortgages, mortgage-backed securities and other troubled assets from distressed banks. One of other priorities of EESA was the homeownership preservation: the FHFA, the FDIC and the Fed should provide assistance to homeowners and efforts such as loan guarantees and credit enhancement should be taken in order to minimize foreclosures.

Figure 13: Dow Jones Industrial Average (January 2007 – January 2010)

Source: MarketWatch

Meanwhile, stock markets were still in panic. On the day of the first bailout rejection, the Dow Jones Industrial Average (hereinafter: DJIA) index went down by unprecedented 777,68 basis points, which was the drop in a single day in history (Amadeo, 2017b). EESA eventually passed, but markets were still in turmoil. As can be seen from the Figure 13 above, DJIA was falling lower and lower until march 2009 when it reached the lowest point during the financial crisis and then began to increase. The S&P 500 index fell nearly 20% the second week of October having plunged in eight consecutive trading days and lost $889 billion of its value (Sibun, 2008). Major non-financial American companies like General Motors, Ford, Chrysler experienced dramatic drops in share prices, which could have lead into further financial distress and even bankruptcy. Unemployment rate spiked, the Labour Department reported that 159 000 Americans lost their jobs in one month. The Fed funds rate was lowered twice in October and stopped at 1%, while LIBOR increased above 3%, which made short-term loans even more expensive.

In October, the Federal Reserve established the Commercial Paper Funding Facility, which was a program that allowed the Fed to give short-term (up to 3 months) loans to limited liability companies in order to save those companies from illiquidity, insufficient cash flows and – eventually – bankruptcy (Board of Governors of the Federal Reserve System, 2010). Overall, according to the Fed, the highest amount of loans outstanding was $350 billion. The program was closed on February 1, 2008.

As we have already mentioned, money markets were also in trouble. Apart from bailing out financial institutions and large American companies, the Federal Reserve also had to attend to decreasing liquidity on money markets, therefore the Money Market Investor Funding Facility (hereinafter: MMIFF) was introduced. It was created "to support a private-sector initiative designed to provide liquidity to US money market investors" (Federal Reserve Bank of New York, 2010). According to The Balance (Amadeo, 2017b), the MMIFF purchased up to $600 billion of deposits, commercial papers and notes that were due within the next 90 days. Apart from these funds, the Treasury also guaranteed investors' money market funds in the amount of $50 billion.

Credit card debt, automobile and student loans were also used in creation of ABS and CDOs and as RMBS they were in major distress. Another bailout program was created to help banks get rid of more poisoned financial instruments – the Term Asset-Backed Securities Loan Facility (hereinafter: TALF). According to the program, the Fed gave another $48 billion in bailouts (Weinberg, 2015).

In December 2008, the FOMC lowered the federal funds rate yet again to unprecedented level between 0,25% and 0. It was the lowest funds rate in American history and was raised only in December 2015 (Board of Governors of the Federal Reserve System, 2017).

Bailouts, however, did not seize. The Fed injected $20 billion more into Citigroup. Apparently, "too big to fail" policy established its significance with Lehman brothers collapse and it could not be taken lightly anymore, hence the government had to bailout multiple "too big to fail" institutions in order to save already shaken economy. The automotive industry furthermore found itself in distress. In order to save approximately 3 million jobs, General Motors, Ford and Chrysler have asked for $34 billion altogether, but after the first-time rejection eventually gotten $24,9 billion (Amadeo, 2017e). According to the CNN (Isidore, 2008), the costs of bailing them out were much smaller than the consequences of either of them going bankrupt.

6. CHANGES IN LEGAL FRAMEWORK AFTER THE CRISIS

As we have already learned how much damage the financial crisis brought, the last chapter will address measures that has been taken after the crisis to change the existing legal framework in order to salvage the situation and find a way to "prevent excessive risk-taking by large financial firms and make sure that when those firms fail during a future crisis, the government can contain damage to the economy without imposing costs on taxpayers" (Geithner, 2009, p. 1). The last part of the chapter will look into the actual changes that new legislation brought.

6.1. American Recovery and Reinvestment Act of 2009

In 2009 many attempts were taken in order to make the situation better. In February, the American Recovery and Reinvestment Act (hereinafter: ARRA) was approved. ARRA's (2009, p. 2) major goals were "to preserve and create jobs and promote economic recovery, to assist those most impacted by recession". In order to fulfil this mission ARRA provided a stimulus package of $787 billion that were allocated to multiple sectors of economy including education, infrastructure, health care and more. The Act offered immediate relief to individuals, families and small businesses in a form of tax cuts, deductions and reductions. Unemployed people got an extension of unemployment benefits for 33 weeks. Small businesses were eligible to special increased deductions and to tax credits for hiring students or long-term unemployed veterans. ARRA also provided financial support to health care industry helping finance premiums for laid off workers and paying additional health care costs. Moreover, ARRA also spent $54 billion to pay for teachers' salaries and additional educational programs. (Amadeo, 2017f)

The American Recovery and Reinvestment Act proved to be quite a success. According to Macroeconomic Advisers and Moody's (in Leonhardt, 2009), the bill created roughly 2,5 million jobs. According to the Congressional Budget Office (2015), already in 2009 ARRA managed to increase real gross domestic product by 1,1% on average and decrease

unemployment rate by 0,3% on average. In 2010, numbers only improved: real GDP further increased by 2,4% on average, while unemployment rate went down by 1,1% on average.

6.2. Dodd-Frank Wall Street Reform and Consumer Protection Act

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

Among the implemented changes the most significant are:

- The Financial Stability Oversight Committee (hereinafter: FSOC) is created. It promotes efficiency, oversees financial institutions other than banks and their transparency and introduces the term "systemically important financial institution" (SIFI), that is basically an official term for "too big to fail". Among other things, FSOC has a right to prevent mergers of large institutions from happening (Brose, Flood, Krishna, Nichols, 2014b, p. 19).
- The Volker Rule (Sec. 619 of Dodd-Frank) prohibits "proprietary trading and certain relationship with hedge funds and private equity funds". In other words, banks are not allowed to own or use hedge funds for their own sake, only on behalf of their customers. Banks were given 7 years until July 2015 in order to fully comply with these provisions.
- Under the Wall Street Transparency and Accountability Act of 2010 (Dodd-Frank, 2010), hedge funds are now to be regulated by the SEC and the Commodities Futures Trading Commission (hereinafter: CFTC). They are also obligated to provide information about their portfolios and trades, so the SEC could evaluate and control market and other risks. Moreover, the SEC and the CFTC also oversee risky derivatives such as credit default swaps. Previously traded over-the-counter derivatives are now required to be traded through exchanges or clearing houses, overseen by the SEC.
- Within SEC the Office of Credit Ratings is created. It oversees all nationally recognised statistical rating organizations and among other things requires them to disclose all crucial information such as rating methodologies, policies and procedures.
- The Consumer Financial Protection Bureau under the Treasury Department took the responsibility of overseeing credit and debit cards and consumer loans (excluding auto loans), regulating credit cards fees, bank fees and underwriting fees. Banks now have more requirements in terms of mortgage underwriting. The main goal was to protect consumers from excessive fees risky mortgage loans (Amadeo, 2017g).

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

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

6.3. What actually changed and what does it mean?

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

American government injected trillions of dollars into the economy after the crisis in attempt to stabilize the banking system. Interest rates were pushed down to 0 – 0,25% and they stayed on this level till 2015 (Board of Governors of the Federal Reserve System, 2017). Banks paid billions in fines and penalties, in fact, the six largest banks altogether paid at least $110 billion in penalties (Podkul, Gianordoli, Kuronen, Paige, Santilli, Sender, 2018). Banks and other depository institutions were ordered to decrease their indebtedness and they did: in 2008 financial sector's outstanding debt was $18 trillion, while already the next year outstanding debt decreased by 8%. In 2015 it totalled $15,2 trillion (which is 15,5% decrease compared to 2008). An average number of financial sector's outstanding debt for 3 quarters of 2017 was $15,7 trillion (Board of Governors of the Federal Reserve System). As Gross (2017) noticed, giant unleveraged banks don't exist anymore: Lehman Brothers collapsed, Bear Sterns got acquired by JP Morgan Chase, Morgan Stanley and Goldman Sachs went from investment banking into commercial banking and Merrill Lynch merged with Bank of America. Moreover, Basel III regulatory framework is being gradually implemented. Among other things, main changes also included a 4,5% common equity requirement (instead of 2%; implemented in 2015), a 6% Tier 1 capital ratio (instead of 4%; valid from January 2015) and introduction of a 3% leverage ratio (implemented in 2013) and additional

liquidity requirements (Moody's Analytics, 2013). Full Basel II framework is supposed to be fully implemented by 2019 (Basel Committee on Banking Supervision, 2015).

Among other problems banking sector was facing there is one worth mentioning again: bonuses and rewards of top banking executives, traders and CEOs. On many occasions they overlooked their customers' goals and chased only their own in order to land such bonuses. Their compensations totalled millions yearly and were far too high for ordinary taxpayers. Did the situation change after the financial crisis? Both, yes and no. According to Dodd-Frank, banks had to come up with new compensations systems that included deferred bonus payments instead of immediate cash bonuses, but all negotiations in this regard halted after Donald Trump became President of the United States in 2017 (Hamilton and Dexheimer, 2016). Some banks even implemented so-called clawback provisions, according to which some of the bonuses have to be returned in case of big losses or violation of risk guidelines (Cassidy, 2013). In other words, banks included stocks and stock options in their compensation plans in order to tone down society's disapproval, but laws remained the same so far. Not only big bonuses did not cease to exist, top bankers also did not carry any responsibility for almost failing the whole economy. "The largest man-made economic catastrophe since Depression resulted in the jailing of a single investment banker" (Eisinger, 2014). Mr Seragelding, a Credit Suisse executive, who was sentenced to 30 months in prison "in connection with a scheme to hide more than $100 million in losses in a mortgage-backed securities trading book" (U. S. Department of Justice, 2013). Many more individuals committed same or even worse financial crimes during the financial turmoil of 2007 – 2008, but why they were not prosecuted – it is a question for the American government.

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

As for credit rating institutions, despite higher transparency requirements implemented by Dodd-Frank, nothing else has changed. CRAs still assign ratings to financial institutions and financial institutions still pay for them, hence the conflict of interest is still present. The Big Three still dominate the market: according to the Wall Street Journal (Podkul, Gianordoli,

Kuronen, Paige, Santilli et al., 2018), Moody's Investors Service, S&P Global Ratings and Fitch Ratings earned 94% of total revenues in the credit rating industry in 2016. "One reason, market participants say, is that many investors remain wedded to the idea that a rating from the big three is an assurance of quality" (Ramakrishnan and Scipio, 2016).

Mortgage debt was falling constantly after the crisis. In third quarter of 2012, for example, it totalled $8,03 trillion (Federal Reserve Bank of New York, 2012), the same time in 2013 it decreased even further to $7,9 trillion (Federal Reserve Bank of New York, 2013). In the next years, however, it started to rise again and in the last quarter of 2017 it totalled $8,88 trillion (Federal Reserve Bank of New York, 2017) and surpassed the financial crisis levels. Other household debt such as student loan debt, auto debt and credit card debt is on the rise as well and some say (Podkul, Gianordoli, Kuronen, Paige, Santilli et al., 2018; Davidson, 2017) that continuously rising household debt represent an area of concern and may even lead to future bubbles.

One thing that stayed unaffected by after-crisis regulations was housing policy. Today, GSEs such as Fannie Mae and Freddie Mac still buy mortgages and repackage them into mortgage-backed securities. Some new capital and liquidity requirements for non-bank mortgage loans servicers were implemented in September 2015 (Beck, Kohler, Pinedo, 2015), but they are far from strict banking regulations. There are plans to introduce a GSE reform for several years now, but according to the U.S. Department of the Treasury Secretary Mnuchin (in Ramirez, 2018), the reform will most probably not happen this year as well.

CONCLUSION

The financial crisis brought grave consequences to the American economy and triggered global financial crisis. According to the U. S. Bureau of Labor Statistics (2012), in October 2009 the unemployment rate reached 10%, which was the worst result since 1982. Same time in 2007, the unemployment rate amounted to 4,7%. Nearly 2,4 million Americans lost their jobs in the last quarter of 2008 and another 5 million – in 2009. Foreclosure filings continued to increase – by 21%, total of 2,8 million filings, according to CNN Money (Christie, 2010). From Q2 2008 till Q3 2009 real GDP was constantly decreasing. The biggest decrease happened in Q4 2008 – by 6,3% – and it was the worst shakedown since 1982. Overall, real GDP in 2009 decreased by 2,1% compared to the previous year. According to the U. S. Government Accountability Office (Clowers, 2013), total losses from the financial crisis could exceed $13 trillion, which is the size of pre-crisis GDP. However, the real number is impossible to estimate since many economic costs are unmeasurable. People not only lost their jobs, homes, savings and retirement funds, but also trust in the financial system altogether.

Having made our research of various aspects of the 2007 – 2008 financial crisis we can finally attempt to answer the question posed in the beginning: what are the reasons of the 2007 – 2008 financial crisis?

One of the most significant reasons, I believe, is an *insufficient regulation of derivative contracts and CDOs*. A lot has been said about deregulation and poor understanding of derivative contracts and other similar financial instruments and, in my opinion, this influenced the environment before the crisis to a very high extent. Lack of regulation enhances low understanding of financial products and poor knowledge contributes to rougher consequences. Wall Street and American investment banking industry is understandably against any further regulation, but as we have already noticed after the above mentioned events, CDOs are too complex instruments to be left on its own. Moreover, its misuse, intentional or not, can cause dramatic problems and it is easy to misuse instruments that are not regulated.

Another important contributing factor to the financial crisis 2007 – 2008 is *aggressive lending practices.* As we know, one of the major roles banks and other depositary institutions play on the market is being an intermediary. Without end consumers banks would go out of business. Before and during the financial crisis, banks somehow abandoned this role and became involved into the frantic money-making business. They lowered standards (including standards of lending practices) and disregarded any potential risk. This led to the increase in uncontrolled subprime lending which, furthermore, contributed to the housing bubble. By taking on aggressive strategies and neglecting long-term risks, economy was put in jeopardy.

"The United States is the only developed country with a significant government role in housing policy" (Wallison and Pinto, 2012). This unconventional fact – *federal involvement in the housing policy* – made a significant contribution to the financial crisis. The roots of this entanglement go back to the Great Depression, but almost a century has passed and government role on the housing market did not evolve or change much. Government-sponsored entities such as Fannie Mae and Freddie Mac confidently encouraged homeownership, but as mortgage-backed securities came into the picture something went wrong. Moreover, GSEs were not depositary institutions, hence they were even less regulated than banks, and by dealing with CDOs and RMBS they took on additional risk. During the crisis, both GSEs guaranteed and purchased a significant amount of subprime RMBS, consequently when losses started to pile up, the Fed did not have any choice but to bail them out.

Credit rating agencies' practices cannot be omitted from the list of determinants of the financial crisis, since CRAs represent a crucial pillar of financial markets. Initially, credit

rating agencies were meant to relieve some of asymmetry of information between depositary institutions and stakeholders. As securitization rapidly developed and the amount of CDOs issued increased accordingly, CRAs needed to keep pace. They were assigning ratings to instruments that consisted of hundreds or thousands of mortgages or other loans without actually checking the quality of underlying items. Needless to say, downgrades were inescapable. In connection with CRAs, conflict of interest arises: CRAs were paid by banks and in order to receive more fees CRAs published ratings favourable to banks neglecting long-term picture once again. Credit rating agencies were completely unregulated as companies that worked with such complex products. Despite its contribution to the instability on the market, CRAs went out of the crisis unscathed.

The last but not the least reason that contributed to the crisis dramatically is *"too big to fail" policy*. The policy was initially introduced in 1950s and it was meant to deal with cases when a bank in distress was the only bank in a small rural community (Federal Reserve Bank of Cleveland, 2017), but in 70s and 80s the term "community" expanded. During the 2007 – 2008 financial crisis, "too big to fail" policy came on a whole new level. As we can see, the idea of the "too big to fail" is very clear – to save a falling bank that is essential to a certain community or region – but specifics are extremely vague. In September 2008 the policy was disregarded altogether, hence the Lehman Brothers collapse that basically started major panic on various markets. The question arises: do we neglect the policy or enforce it? Which of the two?

From my point of view, the above stated reasons and its combination has contributed dramatically to the financial crisis as we know it. It was an unfortunate chain of events, the domino effect that, no doubt, should have been foreseen. Some economists (Stiglitz, for one), indeed, have seen those red flags coming up, but their opinion was not heard. I, personally, believe that the crisis could have been very hard to prevent since events were happening on a massive scale and only precise and timely governmental interferences could have reduced potential consequences and losses.

Collateralized debt obligations became a tool of this crisis. CDOs were involved almost every step of the way. The development of the securitization brought undebatable opportunities, but at the same time it exposed weak spots of the American economy, it enforced a chain of events that almost destroyed the system. Structured financial products are highly complex financial instruments with remarkable power, therefore they should be treated with caution. All market participants working with such instruments, especially banks – large institutions that manage other people money – have to be competent and trustworthy.

The Wall Street Reform was the first but very significant step towards keeping the legislation up with modern, demanding and rapidly developing economic environment. Previous deregulation-oriented legislation gave depositary institutions too much power and regulatory system lost too much control. We can clearly see now that this model did not work and a lot needs to be changed. However, the current American President seems to take the side of depositary institutions and corporations over American people in this matter (which is not surprising, due to his entrepreneurial past), hence I personally believe that Dodd-Frank will not get continuation, if not be discontinued altogether.

Ten years after the crisis the situation remains quite complicated: banks nowadays have more requirements to comply with in order to conduct business safely, but on the other hand, stricter regulations contribute to consolidation and enlargement of depository institutions – we have already mentioned that the number of commercial banks decreased significantly by 32% in 2017 compared to mid-crisis 2008. This logically leads to another problem: "too big to fail". Dodd-Frank introduced an official term for it, but its essence did not change slightly. Such large institutions still exist, now probably even more then before and they are still capable of endangering the economy. Will American government bail them out in case something else goes wrong? We have witnessed collapse of Lehman Brothers and its consequences, we have also seen multiple bailouts and cash injections. What would be the procedure in case something of a similar magnitude happen in the future? These questions still remain unanswered.

One major problematic area that Dodd-Frank failed to address properly is credit rating agencies. These institutions still offer auxiliary services to various companies and institutions including banks and they are still getting paid for it. There are increased transparency requirements implemented, but it does not change the system or CRAs' market a single bit. Issued ratings are relied on by many and there is no way to verify them. In my opinion, until ratings are issued for companies and paid for by the same companies the system is highly unlikely to work well.

Housing policy played a significant role in the financial crisis, but surprisingly this topic managed to slip away from legislator's consideration. GSEs' activities remained practically unaffected – Fannie Mae and Freddie Mac are still in business of working with structured financial products, yet their capital and other legal requirements are much less strict than those of banks. GSE reform is being discussed for several years now, but no action has been taken so far.

On the positive side, ARRA and the Wall Street Reform managed to reduce some of the consequences of financial crisis such as unemployment, mortgage debt. There are also a lot of measures taken and implemented in order to make banks presumably safer: higher capital

and liquidity requirements, limitations on hedge fund ownership, whistleblower program, higher control of derivative instruments etc. The big picture, however, has not changed much. The system is working in the same way it did before the crisis and is not likely to be changed in the near future. I believe, that a more fundamental, systemic approach needs to be taken in order to avoid possible future exposures, but such significant changes require long time to be implemented and even longer time for the first results to be seen. According to Stiglitz (2008), whose beliefs truly resonate with me, we should start with corporate governance, with making complex financial products safe for end-consumers and prohibiting predatory lending, with enhancing competition and abolishing "too big to fail".

Another crisis will inevitably come, let's hope we are now prepared for it.

LIST OF REFERENCES

1. ABN Amro Holding N.V. (2008). *Annual report 2007*. Retrieved August 27, 2017 from https://www.abnamro.com/nl/images/010_About_ABN_AMRO/050_Reports_and_reviews/Files/2007_Annual_Report_English_pdf.pdf
2. Adler, L. (2008, January 15). Foreclosures soar 81 percent in 2008. *The Reuters*. Retrieved August 18, 2017 from https://www.reuters.com/article/us-usa-mortgages-foreclosures/foreclosures-soar-81-percent-in-2008-idUSTRE50E1KV20090115
3. Amadeo, K. (2016, November 18). CDOs, Pros, Cons and How They Caused the Financial Crisis. *The Balance*. Retrieved June 26, 2017 from https://www.thebalance.com/g00/cdos-collateralized-debt-obligations-3305822?i10c.referrer=https%3A%2F%2Fwww.google.si%2F
4. Amadeo, K. (2017, July 10). 2007 Financial Crisis: Explanation, Causes, Timeline. *The Balance*. Retrieved October 12, 2017 from https://www.thebalance.com/2007-financial-crisis-overview-3306138
5. Amadeo, K. (2017, March 27). 2008 Financial Crisis Timeline: The 33 Most Critical Events in the Worst Crisis Since the Depression. *The Balance*. Retrieved October 12, 2017 from https://www.thebalance.com/2008-financial-crisis-timeline-3305540
6. Amadeo, K. (2016, November 4). 2009 Financial Crisis: Explanation, Timeline, Bailouts. *The Balance*. Retrieved October 12, 2017 from https://www.thebalance.com/2009-financial-crisis-bailouts-3305539
7. Amadeo, K. (2017, September 17). Bear Sterns: Collapse and Bailout. How a Bank That Survived the Depression Started the Great Recession. *The Balance*, September 2017. Retrieved 25.10.2017 from https://www.thebalance.com/bearn-stearns-collapse-and-bailout-3305613
8. Amadeo, K. (2016, August 25). What Was the Fannie Mae and Freddie Mac Bailout? *The Balance*. Retrieved October 25, 2017 from https://www.thebalance.com/what-was-the-fannie-mae-and-freddie-mac-bailout-3305658
9. Amadeo, K. (2017, April 16). Reserve Primary Fund: It Broke the Buck, Causing a Money Market Run. *The Balance*. Retrieved November 14, 2017 from https://www.thebalance.com/reserve-primary-fund-3305671
10. Amadeo, K. (2017, October 20). Auto Industry Bailout (GM, Chrysler, Ford). *The Balance*. Retrieved November 15, 2017 from https://www.thebalance.com/auto-industry-bailout-gm-ford-chrysler-3305670
11. Amadeo, K. (2017, August 10). ARRA: Details, Pros and Cons. *The Balance*. Retrieved February 21, 2018 from https://www.thebalance.com/arra-details-3306299
12. Amadeo, K. (2017, September 18). What is the Dodd-Frank Wall Street Reform Act? *The Balance*. Retrieved November 21, 2017 from https://www.thebalance.com/dodd-frank-wall-street-reform-act-3305688

13. Andrews, L. E. (2007, March 2). Greenspan Is Still Able to Move Markets. *The New York Times*. Retrieved July 25, 2017 from https://www.nytimes.com/2007/03/02/business/02greenspan.html
14. Bear Sterns (2007). *Annual Financial Report 2007*. Retrieved October 25, 2017 from https://www.sec.gov/Archives/edgar/data/777001/000091412108000077/be11750956-ex13.txt
15. Avery, B. R., Brevoort, P. K., Canner, B. G. (2007). The 2006 HMDA Data. *Board of Governors, Division of Research and Statistics*. Retrieved October 13, 2017 from https://www.federalreserve.gov/pubs/bulletin/2007/pdf/hmda06draft.pdf
16. *Banking Act of 1933*, Pub. L. 73 – 66, 48 Stat. 162, enacted June 16, 1933.
17. Bartlett, B. (2009, January 2). Who Saw The Housing Bubble Coming? *Forbes*. Retrieved October 12, 2017 from https://www.forbes.com/2008/12/31/housing-bubble-crash-oped-cx_bb_0102bartlett.html
18. Barth, R. J., Li, T., Lu, W. (2009, November 5). Bank Regulation in the United States. *CESifo Economic Studies*. Retrieved August 10, 2017 from https://harbert.auburn.edu/~barthjr/publications/Bank%20Regulation%20in%20the%20United%20States.pdf
19. Basel Committee on Banking Supervision (2015). *Implementation of Basel standards*. Retrieved May 5, 2018 from https://www.bis.org/bcbs/publ/d345.pdf
20. Beck, D. M., Kohler, E. K., Pinedo, T. A. (2015, February 17). FHFA Announces Minimum Capital and Liquidity Requirements for Non-Bank Servicers. *Morrison & Foerester*. Retrieved October 12, 2017 from https://media2.mofo.com/documents/150217fhfaannouncesminimumcapital.pdf
21. Beltran, O. D., Cordell L., Thomas P. C. (2013). Asymmetric Information and the Death of ABS CDOs. *Board of Governors of the Federal Reserve System*. Retrieved August 8, 2017 from https://www.federalreserve.gov/pubs/ifdp/2013/1075/ifdp1075.pdf
22. Bernanke, S. B. (2007, September 20). Subprime mortgage lending and mitigating foreclosures. *Board of Governors of the Federal Reserve System*. Retrieved July 28, 2017 from https://www.federalreserve.gov/newsevents/testimony/bernanke20070920a.htm
23. Black, W. (2016). US ABS Credit Trends. *Moody's Investors Service*. Retrieved August 30, 2017 from https://www.moodys.com/sites/products/ProductAttachments/US%20ABS%20Credit%20Trends.pdf
24. Board of Governors of the Federal Reserve System (2008, September 16). *Federal Reserve Board, with full support of the Treasury Department, authorizes the Federal Reserve Bank of New York to lend up to $85 billion to the American International Group (AIG)*. Retrieved November 14, 2017 from https://www.federalreserve.gov/newsevents/pressreleases/other20080916a.htm

25. Board of Governors of the Federal Reserve System (2017). *Policy Tools*. Retrieved October 15, 2017 from https://www.federalreserve.gov/monetarypolicy/openmarket.htm
26. Board of Governors of the Federal Reserve System (2010). *Policy Tools. Commercial Paper Funding Facility*. Retrieved October 15, 2017 from https://www.federalreserve.gov/monetarypolicy/cpff.htm
27. Board of Governors of the Federal Reserve System (2016, February 12). *Regulatory Reform*. *Term Auction Facility (TAF).* Retrieved October 15, 2017 from https://www.federalreserve.gov/regreform/reform-taf.htm
28. Brose, S. M., Flood, D. M., Krishna, D., Nichols, B. (2014) *Handbook of Financial Data and Risk Information I: Principles and Context*. Cambridge: Cambridge University Press.
29. Brose, S. M., Flood, D. M., Krishna, D., Nichols, B. (2014) *Handbook of Financial Data and Risk Information II: Software and Data*. Cambridge: Cambridge University Press.
30. Cannato, J. V. (2010). A Home of One's Own. *National Affairs*. Retrieved July 18, 2017 from https://www.nationalaffairs.com/publications/detail/a-home-of-ones-own
31. Cassidy, J. (2013, August 28) What has changed since Lehman failed? *The New Yorker*. Retrieved May 6, 2018 from https://www.newyorker.com/news/john-cassidy/what-has-changed-since-lehman-failed
32. Christie, L. (2009, January 15). Foreclosures up a record 81% in 2008. *CNN Money*. Retrieved October 15, 2017 from http://money.cnn.com/2009/01/15/real_estate/millions_in_foreclosure/
33. Christie, L. (2010, January 14). Record 3 million households hit with foreclosure in 2009. *CNN Money*. Retrieved November 21, 2017 from http://money.cnn.com/2010/01/14/real_estate/record_foreclosure_year/
34. Clowers A. N. (2013). Financial Crisis Losses and Potential Impacts of the Dodd-Frank Act. *United States Government Accountability Office*. Retrieved October 27, 2017 from https://www.gao.gov/assets/660/651322.pdf
35. Congressional Budget Office (2015). *Estimated Impact of the American Recovery and Reinvestment Act on Employment and Economic Output in 2014*. Retrieved February 21, 2018 from https://www.cbo.gov/sites/default/files/114th-congress-2015-2016/reports/49958-ARRA.pdf
36. Davidson, P. (2017, May 17). Household debt tops 2008 peak ahead of financial crisis. *USA Today*. May 2017. Retrieved May 6, 2018 from https://www.usatoday.com/story/money/2017/05/17/household-debt/101774626/
37. De la Merced, J. M., Sorkin, R. A. (2010, March 11). Report Details How Lehman Hid Its Woes. *The New York Times*. Retrieved November 14, 2017 from http://www.nytimes.com/2010/03/12/business/12lehman.html?pagewanted=all
38. De Servigny, A., Jobst, N. (2007). *The Handbook of Structured Finance*. McGraw-Hill.

39. *Dodd-Frank Wall Street Reform and Consumer Protection Act*. Pub. L. 111-203, 124 Stat. 1376, enacted July 21, 2010.
40. Doran, J. (2007, October 21). Superfund: banks in debt rescue bid. *The Guardian*. Retrieved October 15, 2017 from https://www.theguardian.com/business/2007/oct/21/observerbusiness.businessandmedia11
41. Eisinger, J. (2014, April 30). Why Only One Top Banker Went to Jail for the Financial Crisis. *The New York Times*. Retrieved May 6, 2018 from https://www.nytimes.com/2014/05/04/magazine/only-one-top-banker-jail-financial-crisis.html
42. Ellis, D. (2008, September 7). U.S. seizes Fannie and Freddie. *CNN Money*. Retrieved October 25, 2017 from http://money.cnn.com/2008/09/07/news/companies/fannie_freddie/
43. *Emergency Economic Stabilization Act of 2008*. Pub. L. 110-343, 122 Stat. 3765, enacted October 3, 2008.
44. Fabozzi, J. F. (2000). *Bond Markets, Analysis and Strategies (4th ed.)*. London: Prentice Hall International Inc.
45. Federal Deposit Insurance Corporation (2017). *Statistics At A Glance*. Retrieved May 6, 2018 from https://www.fdic.gov/bank/statistical/stats/2017dec/fdic.pdf
46. Federal Reserve Bank of Cleveland (2017, October 18). *The 1970s Origins of Too Big to Fail*. Retrieved November 21, 2017 from https://www.clevelandfed.org/newsroom-and-events/publications/economic-commentary/2017-economic-commentaries/ec-201717-origins-of-too-big-to-fail.aspx#U3
47. Federal Reserve Bank of New York (2012, November 27). *Decrease in Overall Debt Balance Continues Despite Rise in Non-Real Estate Debt*. Retrieved May 6, 2018 from https://www.newyorkfed.org/newsevents/news/research/2012/an121127.html
48. Federal Reserve Bank of New York (2017, May 17). *Household Debt Surpasses its Pear Reached During the Recession in 2008*. Retrieved May 6, 2018 from https://www.newyorkfed.org/newsevents/news/research/2017/rp170517
49. Federal Reserve Bank of New York (no date). *Money Market Investor Funding Facility*. Retrieved November 6, 2017 from https://www.newyorkfed.org/markets/mmiff.html
50. Federal Reserve Bank of New York. (2013, November 14). *New York Fed Report Shows Household Debt Rises In Third Quarter*. Retrieved May 6, 2018 from https://www.newyorkfed.org/newsevents/news/research/2013/rp131114
51. Federal Reserve Bank of San Francisco (2007). *Why did the Fed inject liquidity into the financial system in August 2007?* Retrieved October 15, 2017 from http://www.frbsf.org/education/publications/doctor-econ/2007/august/temporary-reserves-liquidity-injection/

52. FederalReserveEducation.org. (no date). *History of the Federal Reserve*. Retrieved August 10, 2017 from https://www.federalreserveeducation.org/about-the-fed/history
53. Financial Post Inc. (no date). *Abacus 2007-AC1: Built to fail*. Retrieved July 19, 2017 from http://business.financialpost.com/news/economy/abacus-2007-ac1-built-to-fail
54. Finney, D. (no date). A Brief History Of Credit Ratings Agencies. *Investopedia*. Retrieved August 20, 2017 from http://www.investopedia.com/articles/bonds/09/history-credit-rating-agencies.asp
55. Fitch Ratings (no date). *Rating Definitions*. Retrieved July 20, 2017 from https://www.fitchratings.com/site/home
56. Gasparino, C. (2008, September 14). Bank of America to Buy Merrill Lynch for $50 Billion. *CNBC*. Retrieved October 25, 2017 from https://www.cnbc.com/id/26708319
57. Geithner, F. T. (2009, October 29). Final Written Testimony. *House Financial Services Committee*. Retrieved August 20, 2018 from https://financialservices.house.gov/media/file/hearings/111/geithner_-_treasury.pdf
58. Goodman, S. L., Fabozzi, J. F. (2002). *Collateralized Debt Obligations: structures and analysis*. New Jersey: John Wiley & Sons.
59. Goldman Sachs & Co., ACA Management LLC. (2007). *ABACUS 2007-AC1 Offering Circular*. Cayman Islands: ACA Management LLC.
60. Goldman Sachs & Co., ACA Management LLC. (2007). *ABACUS 2007-AC1 Term sheet*. Cayman Islands: ACA Management LLC.
61. Gross, D. (2013, September 17). Bank Really Are Different 5 Years After the Financial Crisis. *The Daily Beast*. Retrieved May 5, 2018 from https://www.thedailybeast.com/banks-really-are-different-five-years-after-the-financial-crisis
62. Guynn, D. R., Polk, D. (2010, November 20). The Financial Panic of 2008 and Financial Regulatory Reform. *Harvard Law School Forum on Corporate Governance and Financial Regulation.* Retrieved February 20, 2018 from https://corpgov.law.harvard.edu/2010/11/20/the-financial-panic-of-2008-and-financial-regulatory-reform/
63. Hamilton, J., Dexheimer, E. (2016, April 21). Wall Street Bonus Pay Restricted Under Regulator' Proposal. *Bloomberg.* Retrieved May 6, 2018 from https://www.bloomberg.com/news/articles/2016-04-21/wall-street-bonus-pay-restricted-under-u-s-regulators-proposal
64. Herzog, N. T. (2009). History of Mortgage With an Emphasis on Mortgage Insurance. *Society of Actuaries*. Retrieved August 17, 2017 from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.514.857&rep=rep1&type=pdf

65. Hill, N., Auquier, R., Bauer, G., Foley, M., LaMonte, M., Drevon, F. (2016, January 7). Rating Methodology. *Moody's Investors Service*. Retrieved August 22, 2017 from https://www.moodys.com/researchdocumentcontentpage.aspx?docid=PBC_186998
66. Hu, J., Tung, J., Alexander, H., Roy, D. D., Cantor, R., Weill, N., Rosa, D., Scholtz, D. (2007). Default & Loss Rates of Structures Finance Securities: 1993 – 2006. *Moody's Investors Service.* Retrieved August 21, 2017 from https://www.moodys.com/sites/products/DefaultResearch/2006600000428199.pdf
67. IKB Deutsche Industriebank AG (2008). *Annual report 2007/2008*. Retrieved August 27, 2017 from https://www.ikb.de/fileadmin/content/30_Investor_Relations/30_Finanzberichte/Englisch/2007_08_IKB_Konzern_EN.pdf
68. International Monetary Fund (2008). *Global Financial Stability Report: Containing Systemic Risks and Restoring Financial Soundness*. Retrieved August 14, 2017 from https://www.imf.org/en/Publications/GFSR/Issues/2016/12/31/Containing-Systemic-Risks-and-Restoring-Financial-Soundness
69. *International Banking Act of 1978*, Pub. L. 95 – 369, 92 Stat. 607, enacted September 17, 1978.
70. Isidore, C. (2008, October 29). The Big Three bailout debate. *CNN Money*. Retrieved November 15, 2017 from http://money.cnn.com/2008/10/29/news/companies/bigthree_bailout/index.htm?postversion=2008102907
71. King, R. R., Smith, L. V., Williams, W. A., Van Boening, M. (1993). *The Robustness of Bubbles and Crashes in Experimental Stock Markets*. Oxford: Oxford University Press.
72. Kolakowski, M. (2017, March 15). Rating Agencies. The Balance. Retrieved August 21, 2017 from https://www.thebalance.com/rating-agencies-1287346
73. Leef, G. (2014, January 10). One Bad Law Usually Leads To Others: The Housing Bubble and Dodd-Frank. *Forbes*. Retrieved August 17, 2017 from https://www.forbes.com/sites/georgeleef/2014/01/10/one-bad-law-usually-leads-to-others-the-housing-bubble-and-dodd-frank/#5e6bc1065be3
74. Lehman Brothers Holdings Inc. (2007). *Lehman Brothers Annual financial report 2007*. Retrieved October 27, 2017 from https://www.sec.gov/Archives/edgar/data/806085/000110465908005476/a08-3530_110k.htm
75. Lehman Brothers Holdings Inc. (2008). *Lehman Brothers Quarterly financial report 2008*. Retrieved October 27, 2017 from https://www.sec.gov/Archives/edgar/data/806085/000110465908045115/a08-18147_110q.htm
76. Leonhardt, D. (2010, February 16). Judging Stimulus by Job Data Reveals Success. *The New York Times*. Retrieved February 21, 2018 from https://www.nytimes.com/2010/02/17/business/economy/17leonhardt.html

77. Levine, A. (2008, February 13). Bush signs stimulus bill; rebate checks expected in May. *CNN politics*. Retrieved October 25, 2017 from http://edition.cnn.com/2008/POLITICS/02/13/bush.stimulus/
78. Lewis, M. (2010). *The Big Short: Inside the Doomsday Machine*. London: Penguin books.
79. Light, J. (2017, August 7). Fannie-Freddie Might Need $100 Billion in New Crisis, FHFA Says. *Bloomberg Markets*. Retrieved October 25, 2017 from https://www.bloomberg.com/news/articles/2017-08-07/fannie-freddie-might-need-100-billion-in-new-crisis-fhfa-says
80. Lorenz, M. (2008). *Collateralized debt obligations: Structure, pricing and applications*. Hamburg: Verlag GmbH.
81. Lucas, J. D., Goodman S. L., Fabozzi J. F. (2006). *Collateralized Debt Obligations: Structures and Analysis (2nd ed.)*. New Jersey: John Wiley & Sons, Inc.
82. Lucas, J. D., Goodman S. L., Fabozzi J. F., Manning, R. (2007). *Developments in Collateralized Debt Obligations: New Products and Insights*. New Jersey: John Wiley & Sons, Inc.
83. Mahon, J. (2013, November 22). Bank Holding Company Act of 1956. *Federal Reserve History*. Retrieved August 10, 2017 from https://www.federalreservehistory.org/essays/bank_holding_company_act_of_1956
84. MarketWatch. (no date). *Dow Jones Industrial Average*. Retrieved October 15, 2017 from https://www.marketwatch.com/investing/index/djia
85. Maues, J. (2013, November 22). Banking Act of 1933 (Glass-Steagall). *Federal Reserve History*. Retrieved August 10, 2017 from https://www.federalreservehistory.org/essays/glass_steagall_act
86. *McFadden Act of 1927*. Pub. L. 69-639, 44 Stat. 1224, enacted February 25, 1927.
87. Medley, B. (no date). Riegle-Neal Interstate Banking and Branching Efficiency Act of 1994. *Federal Reserve History*. Retrieved August 6, 2017 from https://www.federalreservehistory.org/essays/riegle_neal_act_of_1994
88. Merrill Lynch & Co., Inc. (2008). *Merrill Lynch Annual financial report 2008*. Retrieved August 15, 2017 from https://www.sec.gov/Archives/edgar/data/65100/000095012308002050/y46644e10vk.htm
89. Michel, N. (2013, September 12). Lehman Brothers Bankruptcy and the Financial Crisis: Lessons Learned. *The Heritage Foundation*. Retrieved October 29, 2017 from http://www.heritage.org/report/lehman-brothers-bankruptcy-and-the-financial-crisis-lessons-learned
90. Michel, N., Ligon, J. (2015, May 11). The Federal Housing Administration: What Record of Success? *The Heritage Foundation*. Retrieved August 17, 2017 from http://www.heritage.org/housing/report/the-federal-housing-administration-what-record-success#_ftn4

91. Moen, R. J., Tallman, W. E. (2015, December 4). The Panic of 1907. *Federal Reserve History*. Retrieved August 6, 2017 from https://www.federalreservehistory.org/essays/panic_of_1907
92. Moody's Analytics. (2013). *Basel III Capital and Liquidity Standards – FAQs.* Retrieved May 5, 2018 from https://www.moodysanalytics.com/-/media/article/2013/2013-18-10-basel-iii-capital-and-liquidity-standards-faq.pdf
93. Moody's Investors Service (2003). *Financial Guarantor CDO exposure: An Overview*. Retrieved August 19, 2017 from http://www.quantcandy.com/blog/wp-content/uploads/2008/01/financial_guarantor_cdo_report_feb_20031.pdf
94. Moody's Investors Service (2008, January 8). *Rating Action: Moody's downgrades Bear Sterns Alt-A deals*. Retrieved October 25, 2017 from https://www.moodys.com/research/Moodys-downgrades-Bear-Stearns-Alt-A-deals--PR_147264
95. Moody's Investors Service (2008, April 4). *Rating Action: Moody's takes action on ABACUS 2007-AC1*. Retrieved June 20, 2017 from https://www.moodys.com/research/Moodys-takes-action-on-ABACUS-2007-AC1-Ltd--PR_152370
96. Moody's Investors Service (2007, November 1). *Rating action: Moody's Takes Neg Action on ABACUS 2007-AC1*. Retrieved on 20.6.2017 from https://www.moodys.com/research/Moodys-Takes-Neg-Action-on-ABACUS-2007-AC1--PR_143250
97. Moody's Investors Service (2010, September 20). *Rating Action: Moody's withdraws the ratings of 21 Notes issued by 4 structured finance CDO transactions*. Retrieved June 20, 2017 from https://www.moodys.com/research/Moodys-withdraws-the-ratings-of-21-Notes-issued-by-4--PR_206100
98. Moody's (no date). *Moody's History: A Century of Market Leadership*. Retrieved November 5, 2017 from https://www.moodys.com
99. Moody's Investors Service (no date). *Moody's Rating Scale and Definitions,*. Retrieved August 9, 2017 from https://www.moodys.com/sites/products/ProductAttachments/AP075378_1_1408_KI.pdf
100. Moyer, L. (2007, September 26). Buffett Buy Would Be Out Of Character For Bear. *Forbes*. Retrieved October 25, 2017 from https://www.forbes.com/2007/09/26/buffett-bear_stearns-biz-wall_cx_lm_0926buffett.html#4d87c0905487
101. Neate, R. (2011, August 22). Ratings agencies suffer "conflict of interest", says former Moody's boss. *The Guardian*. Retrieved August 24, 2017 from https://www.theguardian.com/business/2011/aug/22/ratings-agencies-conflict-of-interest

102. Needham, L. C., Carter, J. (2015). Global Corporate Finance 2014 Transition and Default Study. *Fitch Ratings*. Retrieved August 22, 2017 from https://www.fitchratings.com
103. O'Hare, J. (2014). Synthetic CDOs, Conflicts of Interest, and Securities Fraud. *University of Richmond Law Review, 48*(2), 667-731.
104. Paulson & Co. (no date). *John Paulson*. Retrieved May 7, 2017 from http://www.paulsonco.com/john-paulson/
105. Pitman, T., Moss, J. (2016). The Rating Process: The Ratings Process under Fitch Criteria. *Fitch Ratings*. Retrieved August 22, 2017 from https://www.fitchratings.com
106. Podkul, C., Gianordoli, G., Kuronen, J., Paige, T., Santilli, P., Sender, H. (2017, March 27). 10 years after the crisis. *The Wall Street Journal*. Retrieved May 5, 2018 from http://graphics.wsj.com/how-the-world-has-changed-since-2008-financial-crisis/
107. Ramakrishnan, S., Scipio, P. (2016, May 4). Big three in credit ratings still dominate business. *Reuters*. Retrieved May 6, 2018 from https://www.reuters.com/article/uscorpbonds-ratings-idUSL2N17U1L4
108. Ramirez, K. (2018, May 1). Mnuchin: GSE reform isn't happening in 2018. *Housing Wire*. Retrieved May 6, 2018 from https://www.housingwire.com/articles/43249-mnuchin-gse-reform-isnt-happening-in-2018
109. Raymond, N., Stempel, J. (2014, March 12). *Big fine imposed on ex-Goldman trader Tourre in SEC case.* Reuters. Retrieved July 19, 2017 from http://www.reuters.com/article/us-goldmansachs-sec-tourre-idUSBREA2B11220140312
110. Richards, N. (2013, November 22). Federal Deposit Insurance Corporation Improvement Act of 1991. *Federal Reserve History*. Retrieved August 17, 2017 from https://www.federalreservehistory.org/essays/fdicia
111. Richardson, G., Park, D., Komai, A., Gou, M. (2013, November 22). McFadden Act of 1927. *Federal Reserve History*. Retrieved August 10, 2017 from https://www.federalreservehistory.org/essays/mcfadden_act
112. Robinson, J. K. (2013, November 22). Depository Institutions Deregulation and Monetary Control Act of 1980. *Federal Reserve History*. Retrieved August 11, 2017 from https://www.federalreservehistory.org/essays/monetary_control_act_of_1980
113. Securities Industry and Financial Markets Association (2017). *Europe Structured Finance Issuance and Outstanding.* Retrieved July 26, 2017 from https://www.sifma.org/resources/research/europe-structured-finance-issuance-and-outstanding/
114. Securities Industry and Financial Markets Association (2017). *US ABS Issuance Outstanding*. Retrieved July 26, 2017 from https://www.sifma.org/resources/research/us-abs-issuance-and-outstanding/

115. Shapiro, D. M., Slemrod, J. (2009). Did the 2008 Tax Rebates Stimulate Spending? *The American Economic Review*, *99*(2), 374-379.
116. Sibun, J. (2008, October 10). Financial crisis: US stock markets suffer worst week ever on record. *The Telegraph*. Retrieved November 15, 2017 from http://www.telegraph.co.uk/finance/financialcrisis/3174151/Financial-crisis-US-stock-markets-suffer-worst-week-on-record.html
117. Smith, G. (2012). *Why I Left Goldman Sachs. A Wall Street Story*. New York: Grand Central Publishing.
118. Somerville, G., Kadoya, T. (2007, August 10). Fed vows, then pumps massive funds to calm markets. *The Reuters*. Retrieved August 3, 2017 from https://www.reuters.com/article/us-usa-fed/fed-vows-then-pumps-massive-funds-to-calm-markets-idUSN1027621620070810?sp=true
119. Sorkin, R. A. (2008, March 17). JPMorgan Pays $2 a Share for Bear Sterns. *The New York Times*. Retrieved October 20, 2017 from http://www.nytimes.com/2008/03/17/business/17bear.html
120. South, H. A., Gurwitz, R. Z. (2016). 2015 Annual Global Structured Finance Default Study And Rating Transitions. *S&P Global Ratings*. Retrieved August 20, 2017 from https://www.standardandpoors.com/ratingsdirect
121. Standard & Poor's Global (2016). *S&P Global Ratings Definitions*. Retrieved August 8, 2017 from https://www.standardandpoors.com/en_EU/delegate/getPDF;jsessionid=2rDC4_A2SRQqFr9_5A9E7kG36WCSHD45UJ-kaPnz-XztgMfjdmId!711566155?articleId=1824955&type=COMMENTS&subType=REGULATORY
122. Standard & Poor's Global (no date). *Standard & Poor's history*. Retrieved August 8, 2017 from https://www.spglobal.com
123. Standard & Poor's Ratings Services. (2014). *Corporate Ratings Methodology*. Retrieved August 22, 2017 from https://www.spglobal.com
124. Stiglitz, E. J. (2008, September 17). Commentary: How to prevent the next Wall Street crisis. *CNN Politics*. Retrieved November 21, 2017 from http://edition.cnn.com/2008/POLITICS/09/17/stiglitz.crisis/index.html
125. Stiglitz, E. J. (2010). Lessons from the Global Financial Crisis of 2008. *Seoul Journal of Economics 2010*, *23*(3), 321-339.
126. Story, L., Morgenson, G. (2010, April 16). S.E.C. Accuses Goldman of Fraud in Housing Deal. *The New York Times*. Retrieved July 19, 2017 from http://www.nytimes.com/2010/04/17/business/17goldman.html?pagewanted=all
127. Sylla, R. (no date). The US Banking System: Origin, Development, and Regulation. *The Gilder Lehrman Institute of American History*. Retrieved August 10, 2017 from https://www.gilderlehrman.org/history-by-era/hamiltoneconomics/essays/us-banking-system-origin-development-and-regulation

128. Tavakoli, M. J. (2008). *Structured Finance and Collateralized Debt Obligations, New Developments in Cash and Synthetic Securitization* (2nd ed.). New Jersey: John Wiley & Sons, Inc.
129. *The American Recovery and Reinvestment Act of 2009*. Pub. L. 111 – 5, 123 Stat. 115, enacted February 17, 2009.
130. *The Bank Holding Company Act of 1956*, Pub. L. 84 – 511, 70 Stat. 133, enacted May 9, 1956.
131. The Board of the Federal Reserve System (2017, December 7). *Financial Accounts of the United States*. Retrieved May 5, 2018 from https://www.federalreserve.gov/releases/z1/current/html/d3.htm
132. *The Depositary Institutions Deregulation and Monetary Control Act of 1980*, Pub. L. 96 – 221, 94 Stat, 132, enacted March 31st, 1980.
133. *The Economic Stimulus Act of 2008*. Pub. L. 110 – 185, 122 Stat. 613, enacted February 13, 2008.
134. *The Emergency Home Finance Act of 1970*, Pub. L. 91 – 351, 84 Stat. 450, enacted July 24, 1970.
135. *The Federal Deposit Insurance Corporation Improvement Act of 1991*, Pub. L. 102 – 242, 105 Stat. 236, enacted September 29, 1991.
136. The Federal Reserve Bank of St. Louis (no date). *Homeownership Rate for the United States*. Retrieved August 20, 2017 from https://fred.stlouisfed.org/series/RHORUSQ156N
137. The Financial Crisis Inquiry Commission (2011). *The Financial Crisis Inquiry Report*. Retrieved July 26, 2017 from http://fcic-static.law.stanford.edu/cdn_media/fcic-reports/fcic_final_report_full.pdf
138. The Government National Mortgage Association (no date). *Ginnie Mae*. Retrieved November 7, 2017 from https://www.ginniemae.gov/pages/default.aspx
139. *The Gramm-Leach-Bliley Act of 1999*, Pub. L. 106 – 102, 113 Stat. 1338, enacted November 12, 1999.
140. *The Housing and Urban Development Act of 1968*, Pub. L. 90 – 448, 82 Stat. 475, enacted August 1st, 1968.
141. *The National Housing Act of 1934*, Pub. L. 73 – 479, 48 Stat. 1246, enacted June 27, 1934.
142. The New York Times (2010, March 11). *Court-Appointed Lehman Examiner Unveils Report.* Retrieved October 27, 2017 from https://dealbook.nytimes.com/2010/03/11/lehman-directors-did-not-breach-duties-examiner-finds/#reports
143. *The Riegle-Neal Interstate Banking and Efficiency Act of 1994*, Pub. L. 103 – 328, H.R.3841, enacted February 10, 1994.
144. Urban Institute (2017). *Housing Finance at a Glance, a monthly chartbook*. Retrieved October 12, 2017 from

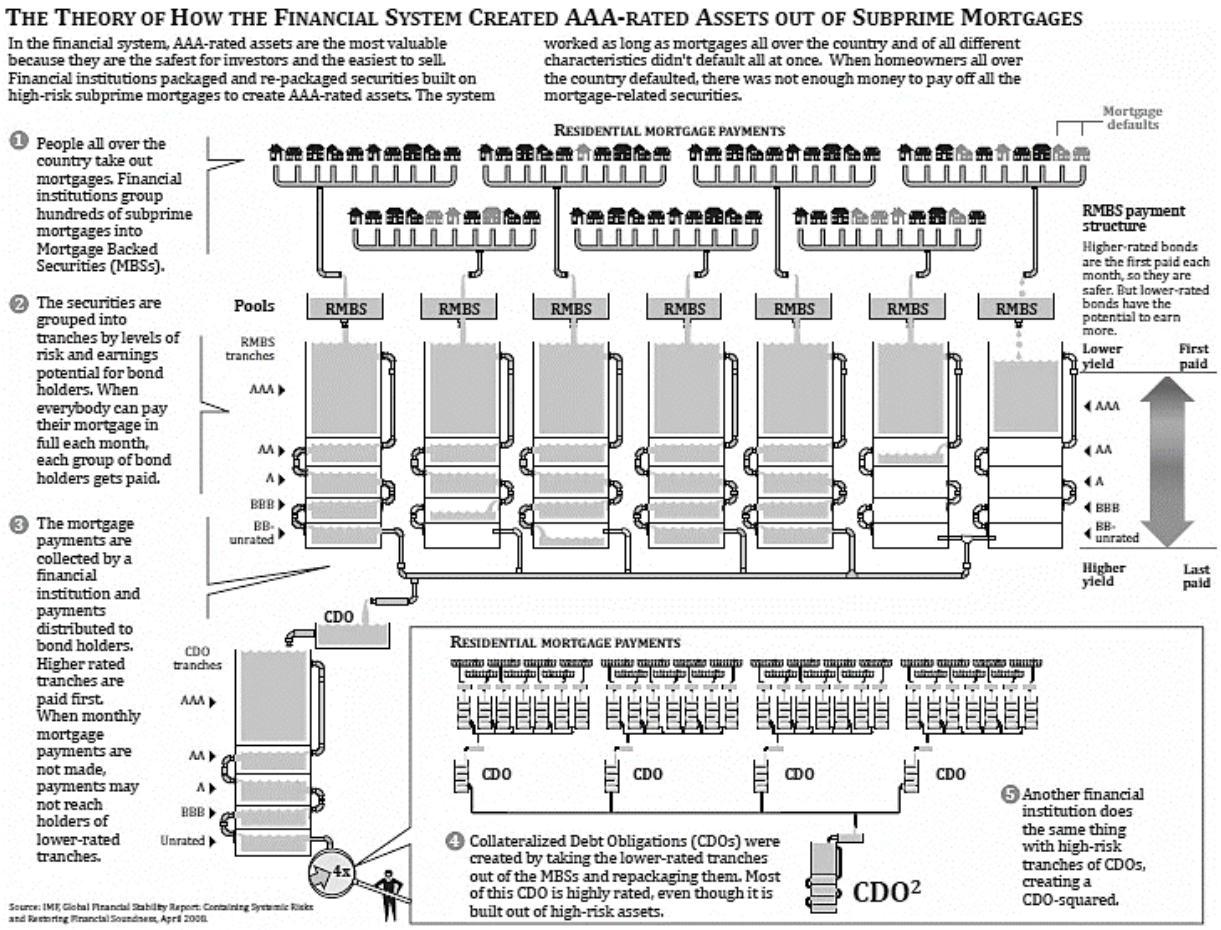
https://www.urban.org/sites/default/files/publication/88431/february_chartbook_final.pdf

145. U. S. Bureau of Labor Statistics (2012). *The Recession of 2007 – 2009*. Retrieved November 16, 2017 from https://www.bls.gov/spotlight/2012/recession/pdf/recession_bls_spotlight.pdf
146. U. S. Department of Justice (2013, November 22). *Former Credit Suisse Managing Director Sentenced In Manhattan Federal Court To 30 Months In Prison In Connection With Scheme To Hide Losses In Mortgage-Backed Securities Trading Book*. Retrieved May 6, 2018 from https://www.justice.gov/usao-sdny/pr/former-credit-suisse-managing-director-sentenced-manhattan-federal-court-30-months
147. U.S. Securities and Exchange Commission (2016). *Annual Report on Nationally Recognized Statistical Rating Organizations.* Retrieved August 21, 2017 from https://www.sec.gov/files/2016-annual-report-on-nrsros.pdf
148. U.S. Securities and Exchange Commission. (2010). *Complaint against Goldman Sachs & Co. and Fabrice Tourre*. Retrieved August 27, 2017 from https://www.sec.gov/litigation/complaints/2010/comp21489.pdf
149. U.S. Securities and Exchange Commission (2005, April 19). *Definition of Nationally Recognized Statistical Rating Organization*. Retrieved August 22, 2017 from https://www.sec.gov/rules/proposed/33-8570.pdf
150. U.S. Securities and Exchange Commission (2003). *Report on the Role and Function of Credit Rating Agencies in the Operation of the Securities Markets.* Retrieved August 20, 2017 from https://www.sec.gov/news/studies/credratingreport0103.pdf
151. U.S. Securities and Exchange Commission (2010, April 16). *SEC Charges Goldman Sachs With Fraud in Structuring and Marketing of CDO Tied to Subprime Mortgages.* Retrieved July 19, 2017 from https://www.sec.gov/news/press/2010/2010-59.htm
152. Vazza, D., Devi, A., Kraemer, N. (2008). 2007 Annual Global Structured Finance Default Study And Rating Transitions. *S&P Global Ratings*. Retrieved August 20, 2017 from https://www.standardandpoors.com/ratingsdirect
153. Wallison, J. P., Pinto, J. E. (2012, April 26). Free fall: how government policies brought down the housing market. *American Enterprise Institute*. Retrieved August 17, 2017 from http://www.aei.org/publication/free-fall-how-government-policies-brought-down-the-housing-market/
154. Weinberg, J. (2015, November 22). Federal Reserve Credit Programs During the Meltdown 2007-2010. *Federal Reserve History*. Retrieved November 15, 2017 from https://www.federalreservehistory.org/essays/fed_credit_programs
155. Wilchins, D., Brettell, K. (2010, April 16). Factbox: How Goldman's ABACUS deal worked. *Reuters*. Retrieved July 19, 2017 from https://www.reuters.com/article/us-goldmansachs-abacus-factbox-idUSTRE63F5CZ20100416
156. Yoon, A. (2008, January 29). Foreclosure rate almost doubles in 2007: report. *Reuters*. Retrieved October 15, 2017 from http://www.reuters.com/article/us-usa-

housing-foreclosures/foreclosure-rate-almost-doubled-in-2007-report-idUSN2849823320080129

APPENDICES

Appendix 1: The theory of how the financial system created AAA-rated assets out of subprime mortgages



Source: IMF, Global Financial Stability Report: Containing Systemic Risks and Restoring Financial Soundness

Appendix 2: Transitions matrices

Global structured finance rating transition matrix, 2015 (in %)

From/To	AAA	AA	A	BBB	BB	B	CCC	CC	C	D
AAA	97,95	1,27	0,47	0,16	0,06	0,03	0,06	0,00	0,00	0,00
AA	9,26	89,26	2,15	0,87	0,18	0,02	0,21	0,00	0,00	0,05
A	1,90	7,70	81,87	7,42	0,63	0,19	0,23	0,00	0,00	0,06
BBB	0,71	2,50	8,90	82,06	3,94	1,09	0,76	0,00	0,00	0,05
BB	0,14	0,69	2,33	7,95	81,05	5,07	2,26	0,03	0,00	0,48
B	0,06	0,38	0,32	1,66	5,75	81,20	8,78	0,03	0,00	1,82
CCC	0,00	0,07	0,00	0,19	0,53	2,10	85,82	2,03	0,00	9,26
CC	0,00	0,00	0,00	0,00	0,04	0,27	12,37	61,09	0,00	26,22
C	N/A									

Source: 2015 Annual Global Structured Finance Default Study And Rating Transitions, S&P, p. 46, adapted

The US RMBS rating transition matrix, 2015 (%)

From/To	AAA	AA	A	BBB	BB	B	CCC	CC	C	D
AAA	90,07	4,64	1,99	1,66	0,66	0,33	0,66	0,00	0,00	0,00
AA	6,01	86,73	3,09	2,50	0,67	0,08	0,75	0,00	0,00	0,17
A	1,55	7,14	83,48	4,04	2,07	0,52	0,95	0,00	0,00	0,26
BBB	0,41	2,87	7,96	77,11	7,05	2,38	2,13	0,00	0,00	0,08
BB	0,00	0,43	2,49	6,53	75,67	8,94	4,99	0,00	0,00	0,95
B	0,00	0,40	0,33	0,93	4,50	78,77	13,89	0,00	0,00	1,19
CCC	0,00	0,00	0,00	0,05	0,18	1,11	88,32	1,70	0,00	8,64
CC	0,00	0,00	0,00	0,00	0,00	0,26	13,51	59,61	0,00	26,63
C	N/A									

Source: 2015 Annual Global Structured Finance Default Study And Rating Transitions, S&P, p. 51, adapted

Global structured finance rating transition matrix, 2007 (in %)

From/To	AAA	AA	A	BBB	BB	B	CCC/C	D	NR
AAA	95,60	2,20	0,00	0,00	0,00	0,00	0,00	0,00	2,20
AA	0,60	91,37	3,21	0,00	0,00	0,00	0,00	0,00	4,82
A	0,00	2,90	86,26	2,75	0,22	0,30	0,07	0,00	7,50
BBB	0,00	0,26	3,81	83,69	2,70	0,66	0,07	0,00	8,81
BB	0,00	0,00	0,00	6,72	75,26	6,44	0,09	0,19	11,30
B	0,00	0,00	0,00	0,08	7,43	75,40	2,56	0,24	14,30
CCC/C	0,00	0,00	0,00	0,00	0,00	20,00	45,45	14,55	20,00

Source: 2007 Annual Global Structured Finance Default Study And Rating Transitions, S&P, p. 26, adapted