

MASTERARBEIT / MASTER'S THESIS

Titel der Masterarbeit / Title of the Master's Thesis

„Development and Structure of the Shadow Banking
System and its Role in the Subprime Crisis“

verfasst von / submitted by

Michael von Radloff

angestrebter akademischer Grad / in partial fulfilment of the requirements for the degree of
Master of Science (MSc)

Wien, 2017 / Vienna, 2017

Studienkennzahl lt. Studienblatt /
degree programme code as it appears on
the student record sheet:

A 066 915

Studienrichtung lt. Studienblatt /
degree programme as it appears on
the student record sheet:

Masterstudium Betriebswirtschaft UG2002

Betreut von / Supervisor:

Univ.-Prof. Dipl.-Vw. Thomas Gehrig, PhD

Abstract

The shadow banking system experienced a massive increase in the 1990s and 2000s until it finally crashed during the subprime mortgage crisis between 2007 and 2009. This master's thesis will describe the most important developments and instruments with regards to shadow banking. It will argue, that the regulation of the traditional financial sector played a huge role in the run-up of shadow banking. The regulation provided huge incentives and possibilities for regulatory arbitrage. During the crisis, the structure of the shadow banking system favored a run on its short-term funding instruments. After the subprime crisis, regulation mostly ignored shadow banking, but tightened the regulation of the traditional financial sector, leaving shadow banking room for future developments. This thesis comes to a conclusion that instead of tightening banking regulation, the regulation gap between shadow banking and traditional banking should be minimized. A stronger regulation can only be achieved, when regulations in the whole financial sector change. This does not mean stricter and more complex approaches.

Abstract – Deutsch

Das Schattenbanken System erlebte einen enormen Zuwachs in den 1990ern und 2000ern, bis es während der Finanzkrise zwischen 2007 und 2009 stark schrumpfte. Diese Masterarbeit wird die wichtigsten Instrumente und Entwicklungen im Zusammenhang mit Schattenbanken beleuchten. Sie wird argumentieren, dass die Regulierung des Finanzsektors einen entscheidenden Beitrag zum starken Wachstum des Schattenbanken Sektors geleistet hat. Diese Regulierung gab große Anreize und Möglichkeiten die Selbige zu umgehen. Während der Finanzkrise wurden die kurzfristigen Finanzierungsinstrumente der Schattenbanken Opfer eines Runs. Nach der Finanzkrise wurden Schattenbanken von der Regulierung weitestgehend ignoriert und eine strengere Regulierung des traditionellen Finanzsektors forciert. Dies gibt Schattenbanken Raum für ihre zukünftige Entwicklung. Die Arbeit kommt zu dem Schluss, dass es sinnvoller wäre die Unterschiede in der Regulierung zwischen Schattenbanken und klassischen Finanzinstituten zu verringern. Dabei sollte die Regulierung des gesamten Finanzsektors überdacht werden. Dies ist jedoch nicht gleichbedeutend mit einer strikteren und komplexeren Regulierung.

Table of Contents

Abstract	2
Abstract – Deutsch	3
List of Figures.....	6
List of Abbreviations.....	7
1 Introduction.....	9
2 Definitions	10
2.1 The Financial System	10
2.2 Financial Intermediation	11
2.3 Classic Banking	11
2.4 Shadow Banking	14
3 Developments	14
3.1 Changes in Bank Business Models.....	15
3.2 The Growth of Shadow Banking.....	16
3.3 The Causes.....	24
3.3.1 Regulation.....	25
3.3.2 Deregulation.....	28
3.3.3 Incentives	28
4 The Shadow Banking System.....	29
4.1 The Intermediation Process	30
4.2 Players	31
4.2.1 Commercial Banks	31
4.2.2 Government-sponsored Enterprises	31
4.2.3 Rating Agencies	33
4.2.4 Other	33
4.3 Entities.....	33
4.3.1 Money Market Mutual Funds.....	33
4.3.2 Broker-Dealers.....	34
4.3.4 Special Purpose Vehicles & Special Investment Vehicles.....	34
4.4 Instruments	35
4.4.1 Securitization	36
4.4.2 Asset-backed Commercial Papers	38
4.4.3 Repurchase Agreements	38
4.4.4 Derivatives	40
4.4.5 Leverage	41
4.5 Economic Role	41

4.6 Risks	41
4.7 Regulation.....	42
5 Shadow Banking and the Subprime Crisis	43
5.1 The Subprime Crisis	43
5.2 The Role of Shadow Banking	44
5.2.1 Securitization	45
5.2.2 Asset-backed Commercial Papers	45
5.2.3 Repurchase Agreements	46
5.2.4 Others	46
5.3 Mechanisms.....	47
5.3.1 Loss Spirals and Margin Spirals	47
5.3.2 Lending Channels	49
5.3.3 Runs on Financial Institutions	49
5.3.4 Network Effects	50
5.4 Market Failures.....	51
5.5 Regulation Flaws.....	52
5.6 Government Intervention	54
5.7 Examples form the Crisis	55
5.7.1 American International Group	55
5.7.2 Federal National Mortgage Association	57
6 Latest Developments.....	60
6.1 Developments in the Aftermath of the Subprime Crisis	60
6.2 Current Situation	62
6.3 Regulation Attempts	64
6.4 Outlook: China.....	67
7 Conclusion	69
References	71

List of Figures

Figure 1: Commercial Bank Business Model	12
Figure 2: Shadow Banking Intermediation Chain	14
Figure 3: Evolution of Bank Assets	15
Figure 4: Evolution of Bank Liabilities	16
Figure 5: Shadow Bank Liabilities vs. Traditional Liabilities	17
Figure 6: Money Market Mutual Funds Total Assets	18
Figure 7: U.S. Mortgage-Related Securities Issuance.....	19
Figure 8: U.S. Asset-backed Securities Issuance.....	20
Figure 9: Asset-Backed Commercial Paper Outstanding.....	21
Figure 10: Primary Dealers Average Daily Repo Outstanding.....	22
Figure 11: Shares of non-farm residual mortgage debt, 1910-2007.....	23
Figure 12: Global OTC Derivatives Market - Notional Amounts Outstanding.....	24
Figure 13: Risk-Weighted Assets	26
Figure 14: The Intermediation Process	30
Figure 15: Government-sponsored Enterprise Business Model	32
Figure 16: Creation of ABS.....	35
Figure 17: Collateralized Debt Obligations.....	37
Figure 18: The Two Liquidity Spirals: Loss Spiral and Margin Spiral.....	48
Figure 19: Infrastructure Lending Structure.....	64
Figure 20: Estimates of the Size of China's Shadow Banking Sector	67
Figure 21: International Shadow Banking Size Comparison.....	69

List of Abbreviations

ABCP	Asset-backed commercial paper
ABS	Asset-backed security
AIG	American International Group
AIG GSL	AIG Global Securities Lending
BIS	Bank for International Settlement
BCBS	Basel Committee on Banking Supervision
BHC	Bank holding company
CCP	Central counter party
CDO	Collateralized loan obligation
CDS	Credit default swap
CLO	Collateralized loan obligation
CMBS	Commercial mortgage backed security
Dodd-Frank Act	Dodd-Frank Wall Street Reform and Consumer Protection Act
EMIR	European Market Infrastructure Regulation
ESFS	European System of Financial Supervision
EU	European Union
Fannie Mae	Federal National Mortgage Association
FDIC	Federal Deposit Insurance Corporation
Fed	Federal Reserve Bank
FSB	Financial Stability Board
G10	Group of ten
GSE	Government-sponsored enterprise
IMF	International Monetary Fund
LCFI	Large and complex financial institution
MBS	Mortgage-backed security
MiFID	Market in Financial Instruments Directive
MMMF	Money market mutual fund
NAV	Net asset value
OTC	Over the counter
Repo	Repurchase agreement

RMBS	Residual mortgage-backed security
SBS	Shadow Banking System
SIV	Structured investment vehicle
SME	Small and medium-sized enterprise
SOE	State-owned enterprise
SPE	Special purpose entity
SPV	Special purpose vehicle
TBTF	Too big to fail

1 Introduction

The term shadow banking first got greater attention, when Paul McCulley mentioned it at a conference of the Federal Reserve Bank of Kansas City in 2007. At that time, McCulley was CEO of Pacific Investment Management Company (PIMCO), which is an investment management company owned by German financial services company Allianz. This was in the wake of the subprime crisis, which should have led the global financial markets and the global economy into a huge crisis. McCulley defined the shadow banking system (SBS) as “the whole alphabet soup of levered up non-financial investment conduits, vehicles and structures.”¹

In the following time, the term shadow banking was widely used by politicians and in the media in all kind of different meanings. It was often used in a negative context and described as something bad, which the word “shadow” somehow indicates. There is a wide range of different definitions for shadow banking, either narrow or open.² Since the mid-1980s the financial system changed substantially. The market-based financial system experienced a huge growth. Influenced by that, the methods of financial intermediation changed and the SBS developed.³ The SBS is characterized by a huge growth in the 1990s, which especially accelerated up to the crisis in 2007 (cf. Figure 5).

This master’s thesis will take a closer look at the financial system and the SBS. The goal is to describe, what shadow banking is, how it developed over the years and why it developed in the first place. For that purpose, the main players, instruments, and mechanisms of the SBS will be explained. Furthermore, the connection between shadow banks and other financial intermediaries will be under review. Since the SBS is highly connected to the subprime mortgage crisis of 2007/2008, the impact of shadow banking on the crisis and implications from the crisis will be discussed. In this context, risks, role and possible regulation needs of the SBS will be discussed. This will include an assessment of the post-crisis regulation initiatives around the globe.

The master’s thesis is organized as follows. Chapter two will give an overview of the financial system. This will include descriptions of financial intermediation, classic banking and shadow

¹ McCulley (2007)

² Financial Stability Board (2015): P. 1-19

³ Pozsar et al. (2010): P. ii

banking. Chapter three will describe the developments in the financial system. It will review the changes in financial intermediation, the development of shadow banking and causes for both. Chapter four is dedicated to the SBS. It will describe the most important players and instruments in the SBS. Furthermore, that chapter will deal with the economic role and risks of shadow banks. Chapter five will look at the subprime mortgage crisis, and the role shadow banking took in the crisis. It will briefly describe the subprime mortgage crisis before explaining the SBS's role and market failures. The chapter will also provide two case studies from the crisis. Afterward, chapter six will explain the developments after the subprime crisis. This will include information about the current situation of shadow banking, regulation initiatives, and their influence, as well as a case study about shadow banking in China. Chapter seven will close this master's thesis with a conclusion.

2 Definitions

This chapter will give an overview of the structure of the financial system. It will describe financial intermediation and commercial banks. It will also provide possible definitions for shadow banking.

2.1 The Financial System

Financial systems perform many important functions. They basically bring together users and suppliers of funds. They channel funds from lenders to borrowers. More specifically they perform clearing and settlements of payments, pooling and transferring of resources, management of risks and information production. While performing these functions, financial systems around the world differ in the way, these functions are performed. There are three possible alternatives. The first option would be the use of capital and money markets. The second option would be the use of financial intermediaries. The third option would be an internal financing, which means, that one part of an organization supports a different part of the same. Financial systems can be separated by the degree they use these options. In the U.S., capital markets and money markets play the dominant role, while in the European Union (EU) and especially Germany, financial intermediation takes the dominant part.⁴

⁴ Neave (2009): P. 3-10 / P. 15-24

2.2 Financial Intermediation

In an ideal world, markets are complete and without any frictions. Suppliers and users of funds can come together easily and exchange funds. However, the reality is different. Financial markets do have frictions. Transaction costs or asymmetric information can be named as examples. Frictions lead to high costs or even prevent a market from existing. Financial intermediaries can help to reduce the costs of frictions and therefore can create a beneficial outcome for all market participants. As an example of that fact, the model regarding coalitions of depositors with the function of liquidity insurance can be mentioned, like described by Brant (1980) and Diamond and Dygling (1983).⁵ However, while improving the market, financial intermediaries are also exposed to risks and therefore can create new market failures.

The existence of financial intermediaries does not mean that direct lending via financial markets does not exist; it is just in a certain environment more feasible to use either of these.⁶

A wide range of different financial intermediaries exists. Important intermediaries are for example commercial banks, investment banks, universal banks (bank holding companies), insurance companies, broker-dealers, pension funds, mutual funds, hedge funds and many more.⁷ Later in this thesis, there will be more detailed descriptions of some of the intermediaries, which are most important in the context of shadow banking.

Financial intermediaries transform assets in favor of market participants. While doing so, they perform maturity transformation, risk transformation and cost reduction for contracts by overcoming information asymmetries before, during and after contracts. At least one of these functions must be fulfilled. Apart from that, they can provide brokerage services, provide investment advice, provide payment services or manage assets on behalf of customers.⁸

2.3 Classic Banking

Classic commercial banking describes a bank as an institution, which collects deposits from the public. With the collected money, the bank finances loans to households, businesses or

⁵ Freixas & Rochet (2008): P. 15-30

⁶ Freixas & Rochet (2008): P. 34

⁷ Financial Stability Board (2015): P. 1-19

⁸ Peterson Drake & Fabozzi (2010): P. 19/20

the government. The bank holds the loans until they are repaid.⁹ It earns from the spread between the interest it pays on deposits and the interest it earns from loans. Apart from that, banks earn fees on other financial services like for example credit cards.¹⁰ An illustration of the business model of a classic commercial bank is shown in Figure 1.

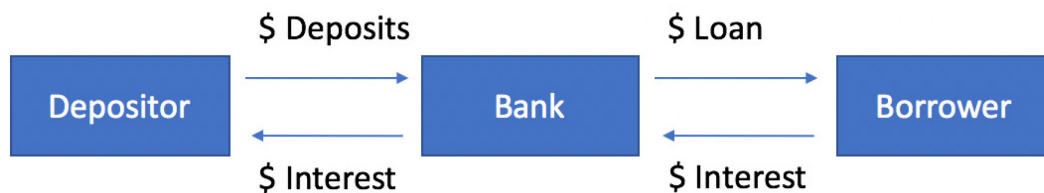


Figure 1: Commercial Bank Business Model¹¹

While banks help to channel funds from savers to borrowers and therefore can improve the financial system, they are exposed to risks. Risks arise mainly due to asymmetric information and the maturity mismatch between short-term deposits and long-term loans. Short-term deposits can be withdrawn at any time. The main risks that banks face are a credit risk, market risk, liquidity risk, operational risk, interest rate risk and systemic risk.

Credit risk is “the potential that a bank borrower or counterparty will fail to meet obligations in accordance with agreement terms.” This risk can be controlled for individual loans as well as for the portfolio of loans.¹²

Market risk is “the risk of losses arising that from movement in market prices.” This includes on- and off-balance sheet instruments. Examples of market risk are default risk, foreign exchange risk, equity risk, interest rate risk, commodity risk or credit spread risk.¹³

For banks, it is important to take the liquidity risk into account. It refers to the fact, that banks collect short-term deposits, which are withdrawable at any time, and fund long-term loans with that money. When only a portion of the collected money will be liquid and too many customers want to withdraw money at the same time, the bank goes bankrupt. This

⁹ Adrian & Shin (2010): P. 1

¹⁰ DeYoung & Rice (2004): P. 34

¹¹ Adrian & Shin (2010): P. 1

¹² Bank for International Settlement (2010): P. 1

¹³ Bank for International Settlement (2016a): P. 5

phenomenon is called a bank run. It is the biggest point of the fragility of a classic commercial bank.¹⁴

The definitions of operational risk vary between banks and their different engagements in financial activities. The Basel Committee on Banking Supervision (BCBS) defines operational risk as “the risk of loss resulting from inadequate or fail internal processes, people and system or external events.” Examples for this can be internal or external fraud, failures in information systems, failures in information technologies or incomplete legal documents.¹⁵

Systemic risk got to a broader attention during the subprime crisis. It stems back to the interconnection between large financial institutions. The failure of one of these institutions imposes a risk onto the connected ones or the whole economy – similar to a domino effect.¹⁶ The Financial Stability Board (FSB), the Bank for International Settlements (BIS) and the International Monetary Fund (IMF) define systemic risk “as a risk of disruption to financial services that is (i) caused by impairment of all or parts of the financial system (ii) has the potential to have serious negative consequences for the real economy.”¹⁷ There are three different types of systemic risk. The first one is the counterparty risk. If a financial institution is very connected with many other players in the industry, the failure of this one particular institution can potentially bring down others. The second form is spill-over effects to the market. The failure of one institution can set off liquidity spirals. When asset prices go down, and funding gets more difficult, this can bring down other institutions. However, the situation can even get worse. Asset prices decline even more, and funding gets even tougher, endangering other institutions. The last type of systemic risk are risks from institutions operating in the shadow banking system. They are prone to bank-like runs, which through their connection to the traditional banking sector can potentially bring down those institutions.¹⁸

¹⁴ Banks (2014): P. 3/4

¹⁵ Bank for International Settlement (2010): P. 2

¹⁶ Swiss Re (2010): P. 24

¹⁷ International Monetary Fund et al. (2009): P. 2

¹⁸ Acharya et al. (2009): P. 16/17

2.4 Shadow Banking

Definitions of shadow banking and the SBS vary a lot. A definition from the Federal Reserve Bank of New York describes shadow banks as “financial intermediaries that conduct maturity, credit and liquidity transformation without explicit access to central banks liquidity or public sector guarantees.”¹⁹

The FSB defines the SBS as “credit intermediation involving entities and activities (fully or partly) outside the regular banking system.”²⁰

While definitions differ, one common theme is, that shadow banks fulfill similar tasks like banks without being treated like banks or being regulated in the same way. In the course of this thesis the definition, which describes shadow banks as financial intermediaries that undergo bank-like credit intermediation without access to public safety nets and without falling under the banking regulation, will be used. To accomplish this credit intermediation, shadow banks use a variety of funding and investment instruments, often combined with massive leverage.

Shadow banks break up the intermediation chain between lenders and borrowers into multiple steps. This involves a wide range of different instruments and different players along the chain (cf. Figure 2).

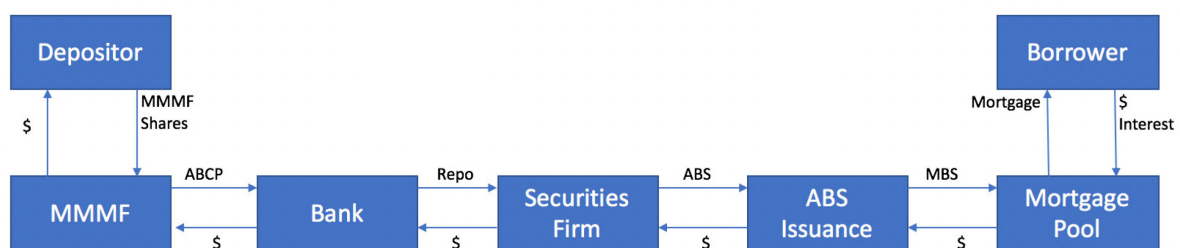


Figure 2: Shadow Banking Intermediation Chain²¹

3 Developments

This chapter will show the developments of shadow banking over the years. It will also describe the changes in bank business models and financial intermediation. Both

¹⁹ Pozsar et al. (2010): P. 2

²⁰ Financial Stability Board (2013): P. ii

²¹ Adrian & Shin (2010): P. 4

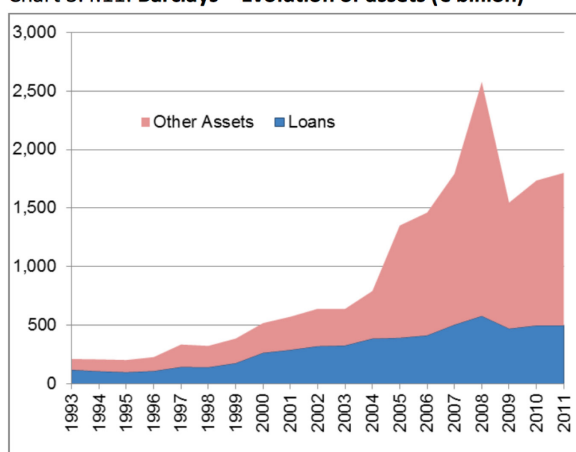
developments happened at the same time and are connected to each other. Furthermore, the causes of the changes will be described.

3.1 Changes in Bank Business Models

In the classic model of banking, banks collect deposits and give out loans. The loans are held until maturity. Banks originate loans, to hold them on their balance sheets. Over the time the business model of banks changed from an originate-to-hold model to an originate-to-distribute model. Loans were pooled and resold to the market. This was done through securitization. The new business model also involved a lot of activities with regards to trading and brokerage.²² Furthermore, banks changed their sources of funding. They switched to more short-term funding sources.²³ This meant a switch or at least an additional use of funding via bond financing, commercial papers, and repurchase agreements.²⁴

The originate-to-distribute model became popular in the 1990s. Banks did not sell their loans instantly after the origination, but often after holding them for some time. The model was especially used for term-loans.²⁵

Chart 3.4.11: Barclays – Evolution of assets (€ billion)



Source: Data from published accounts.

Chart 3.4.12: Deutsche Bank – Evolution of assets (€ billion)

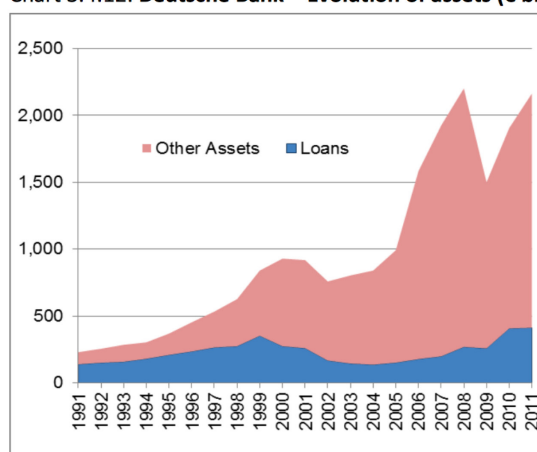


Figure 3: Evolution of Bank Assets²⁶

²² Adrian & Shin (2010): P. 1-5

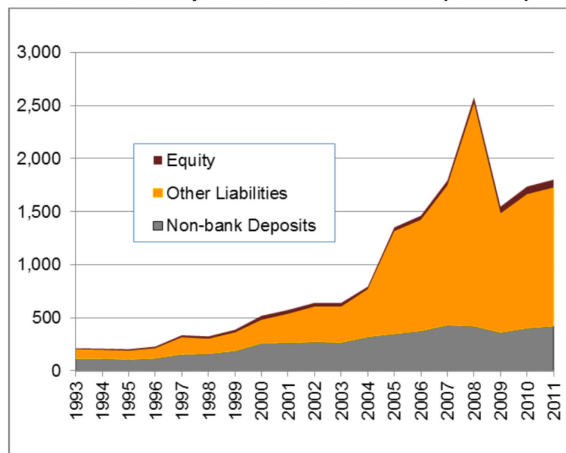
²³ Brunnermeier (2009): P. 78

²⁴ Bord & Santos (2012): P. 21

²⁵ Bond & Santos (2012): P. 22

²⁶ Liikanen (2012): P. 48

Chart 3.4.18: Barclays – Evolution of liabilities (€ billion)



Source: Data from published accounts.

Chart 3.4.19: Deutsche Bank – Evolution of liabilities (€ billion)

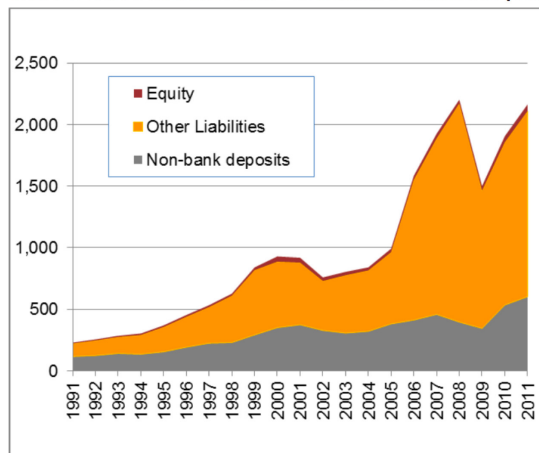


Figure 4: Evolution of Bank Liabilities²⁷

Balance sheets of banks experienced a rapid growth in the 2000s (cf. Figure 3 and Figure 4). On the assets side this was not created through classic loans, but other assets like trading assets or derivatives.²⁸ On the liabilities side, other liabilities grew to the most important class, while equity got unimportant compared to the total balance sheet. Banks relied heavily on wholesale funding and increased their leverage.²⁹

3.2 The Growth of Shadow Banking

To properly illustrate the growth of the shadow banking over time, there does not exist a good and precise measure. Shadow banking is not clearly defined, and many transactions are opaque. This makes it difficult to come up with a proper measure for the size of the SBS. One possibility to size the SBS, is to look at the liabilities of traditional intermediation and SBS intermediation. This approach has some problems, and the numbers should not be taken as fact, but it should be enough as an indication to illustrate the size of the two relatively to each other. For example, the Flow of Funds was used for shadow banking liabilities, which does not cover every movement for all shadow banks. In some cases, transactions could be double counted, and a lot of the assets of shadow banks are or were on the balance sheets of regulated institutions like banks or insurance companies.³⁰

²⁷ Liikanen (2012): P. 49

²⁸ Liikanen (2012): P. 43

²⁹ Liikanen (2012): P. 49/50

³⁰ Pozsar et al. (2010): P. 7-9

Liabilities in traditional banking and shadow banking both increased over time (cf. Figure 5). Shadow banking liabilities increased much stronger from the 1990 and became bigger than traditional liabilities.

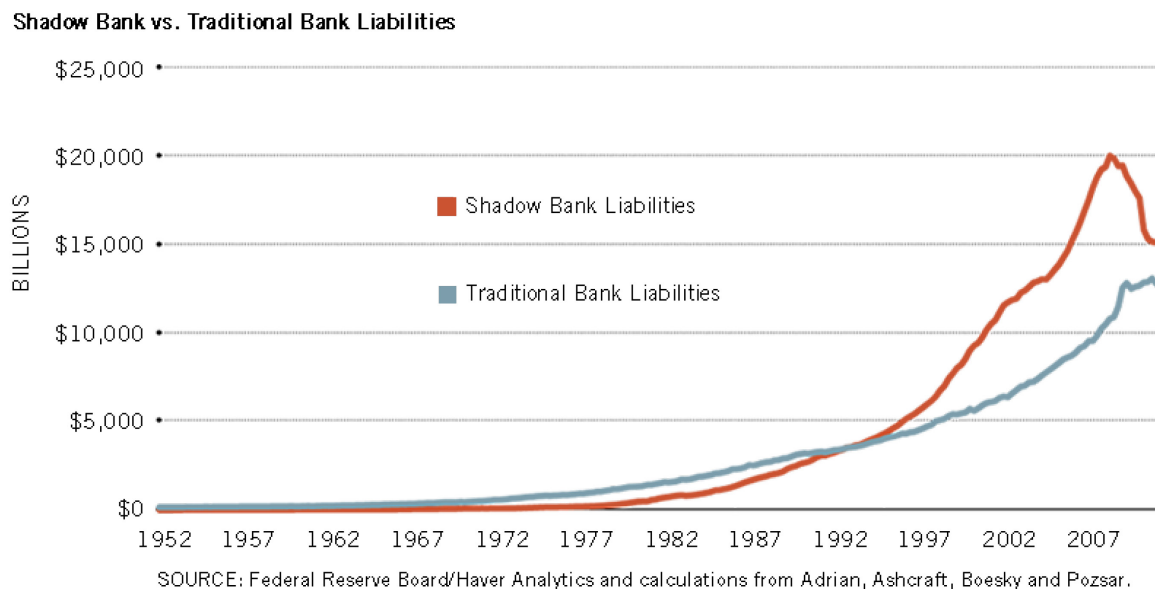


Figure 5: Shadow Bank Liabilities vs. Traditional Liabilities³¹

Apart from that, one could look at the developments of certain instruments or entities, which are part of shadow banking.

Figure 6 shows the development of total assets held by money market mutual funds (MMMFs). It shows a continuous growth from 1973, an acceleration in the mid-1990s, a further acceleration from around 2005 and a sharp decline during the subprime crisis. Since then assets have consolidated. The dip in the early 2000s was triggered by the bust of the dot-com bubble and the 9/11 terror attacks on the U.S.

³¹ Noeth & Sengupta (2011): P. 2

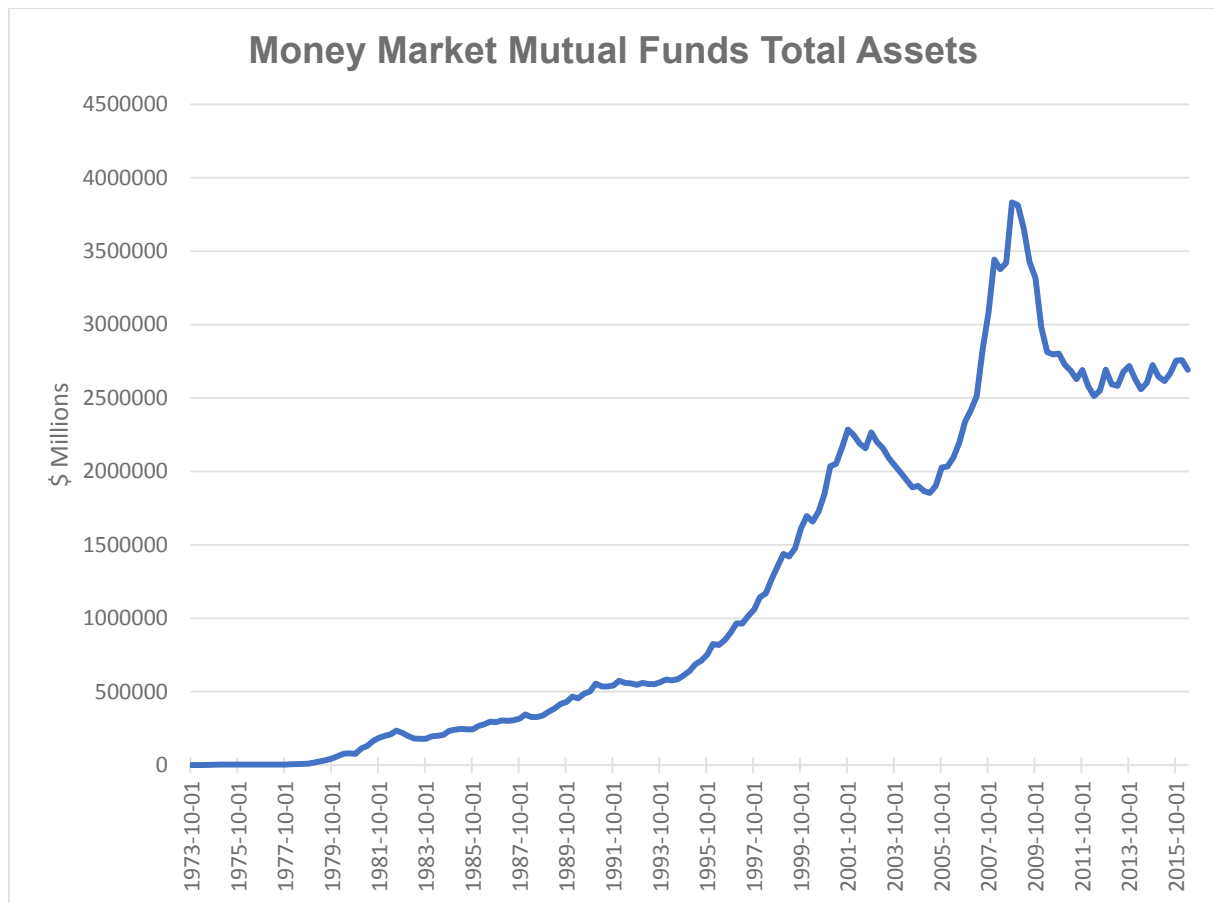


Figure 6: Money Market Mutual Funds Total Assets³²

Securitization has a long history – like for example the Pfandbriefe in Germany. The base for the “modern” securitization in the U.S. mortgage market was created after the Great Depression through the invention of the Federal Housing Administration (FHA). From the late 1970s, besides securitization through government agencies, also private-label securitization developed.³³ Private-label securitization got strong in the 2000s but vanished with the subprime crisis (cf. Figure 7).

³² Federal Reserve Economic Data (2017a)

³³ Kothari (2006): P. 108-115

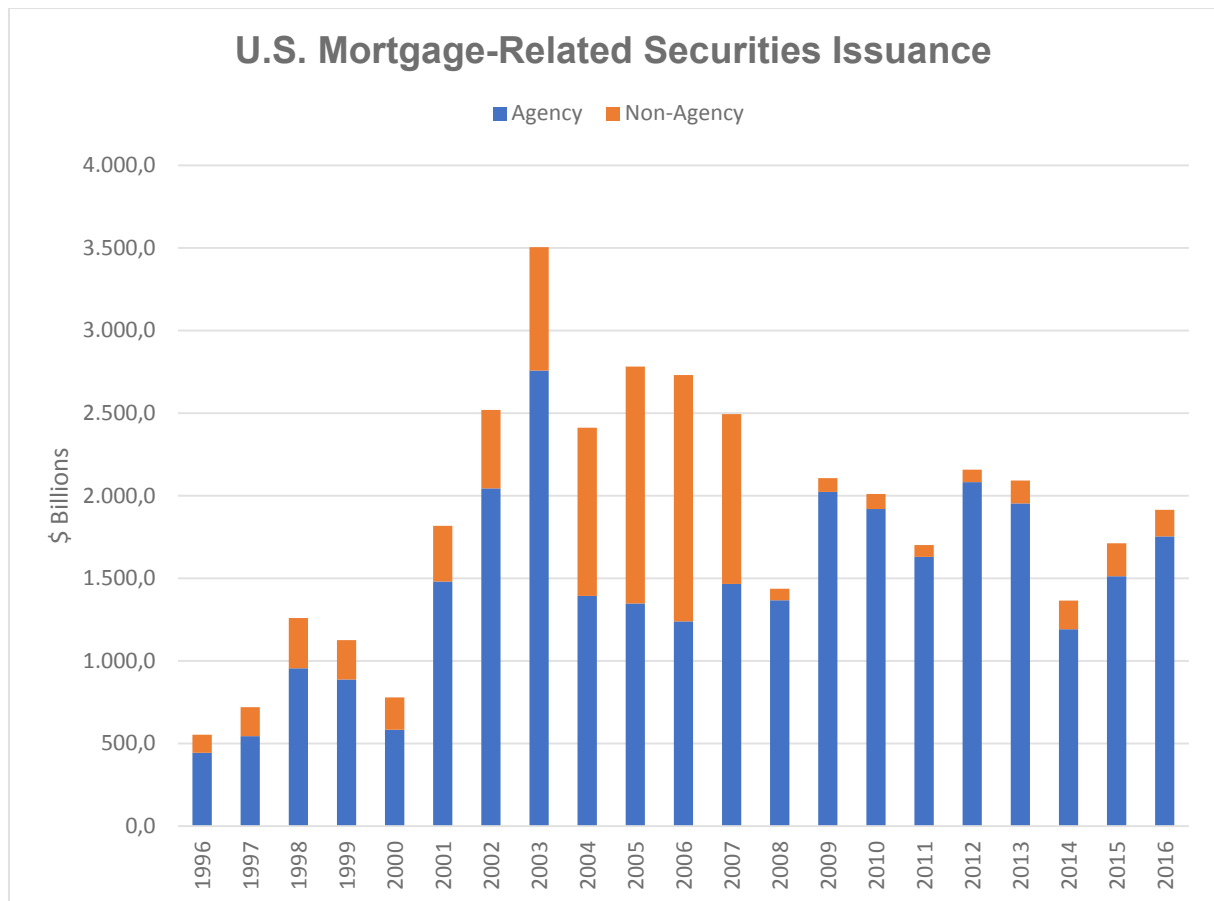


Figure 7: U.S. Mortgage-Related Securities Issuance³⁴

When looking at the issuance of asset-backed securities (ABSs), one can see, that these products increased significantly in the 2000s. The increase was mainly driven by the enormous issuance of collateralized debt obligations (CDOs). After the subprime crisis, CDO issuance completely collapsed as well as credit card related issuance. Since 2012, the issuance picked up momentum again (cf. Figure 8).

³⁴ Securities Industry and Financial Markets Association (2017a)

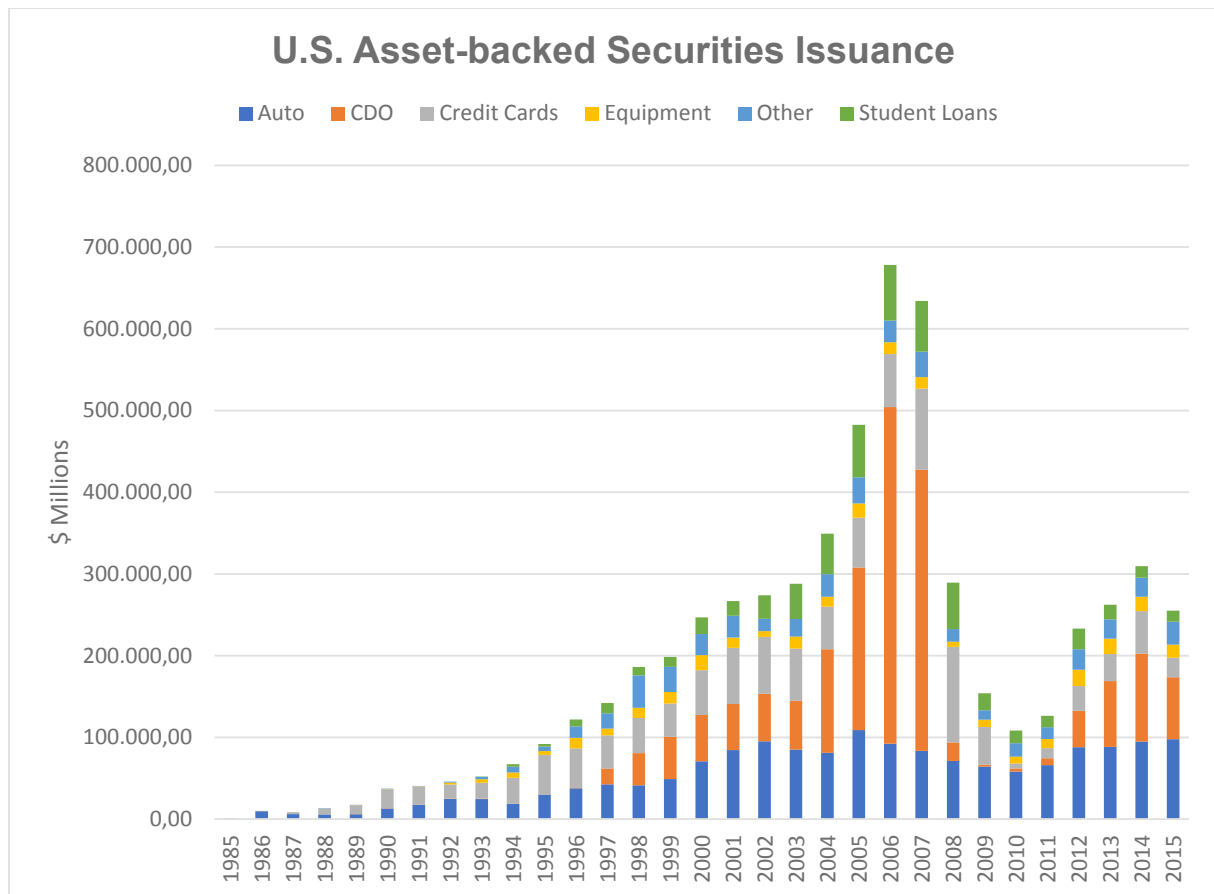


Figure 8: U.S. Asset-backed Securities Issuance³⁵

Asset-backed commercial papers (ABCPs) were basing just below \$700 billion in the early 2000s before doubling from May 2005 within two years. In the following months until December 2007 they got back to around \$700 billion. Since then, there is a steady decline in ABCPs outstanding (cf. Figure 9).

³⁵ Securities Industry and Financial Markets Association (2017b)

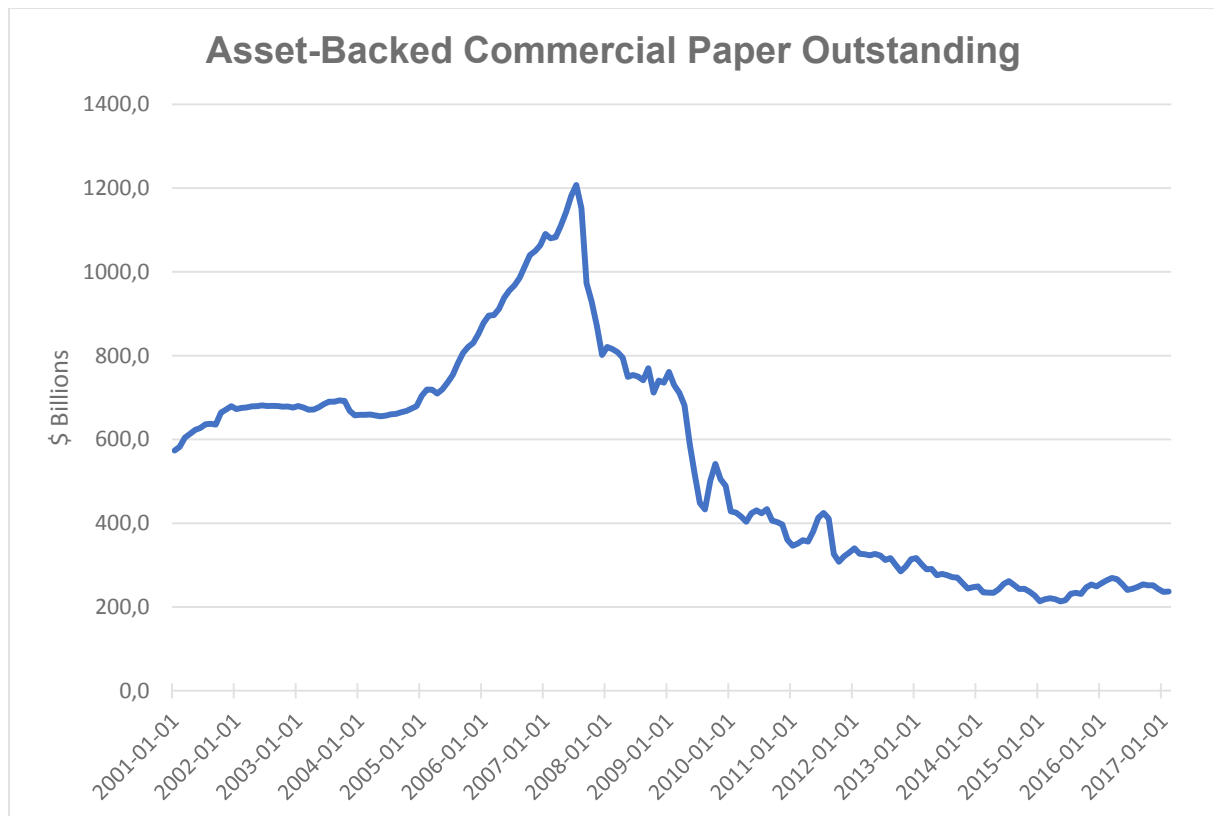


Figure 9: Asset-Backed Commercial Paper Outstanding³⁶

The repurchase agreement (repo) market experienced a steady growth until 2008 when it crashed. In contrast to other instruments, the growth was not accelerated. However, the structure changed. Overnight repos still grew, while term repos basically have been stalling since 2004 (cf. Figure 10). This indicates a strong shift to as “short as possible” funding instruments in the financial sector.

³⁶ Federal Reserve Economic Data (2017b)

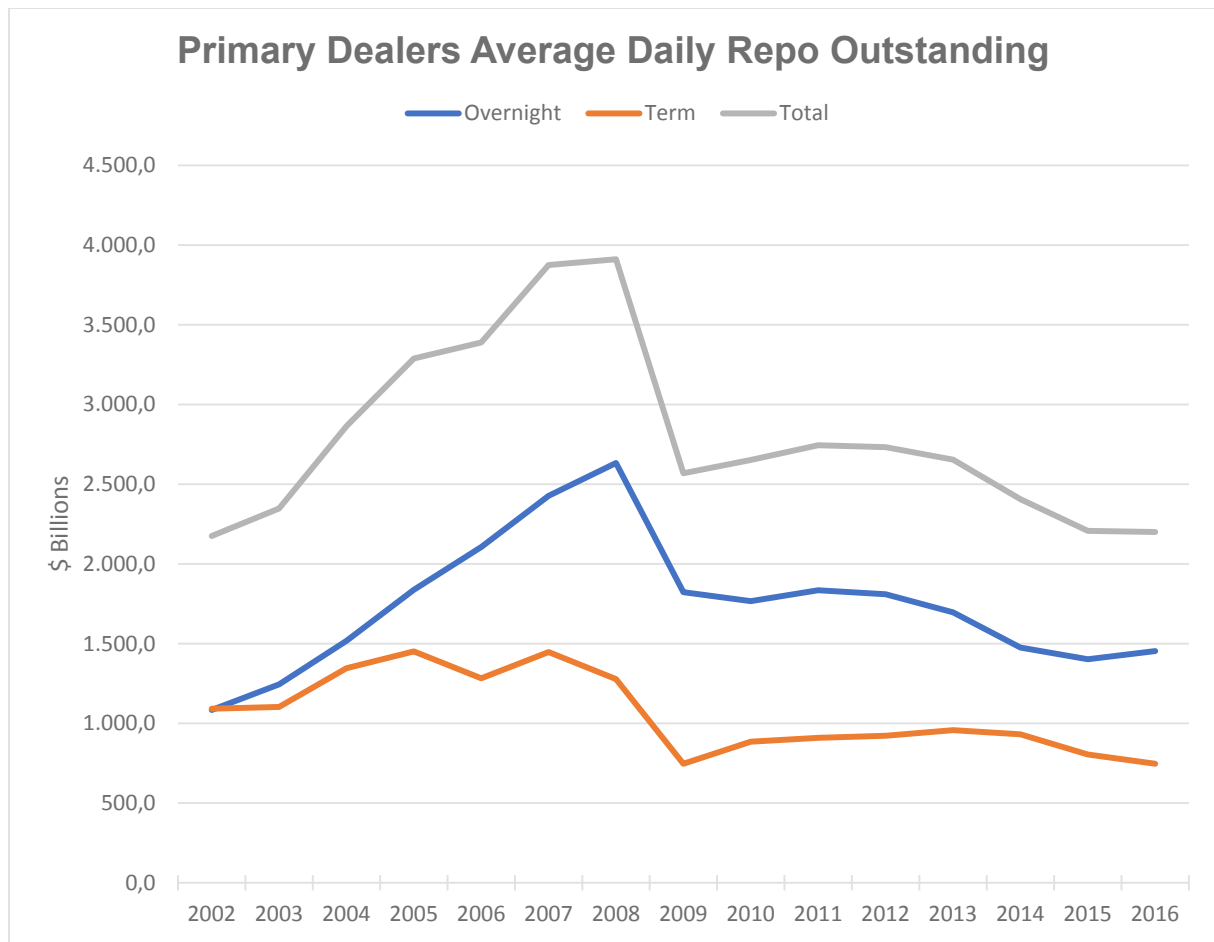


Figure 10: Primary Dealers Average Daily Repo Outstanding³⁷

Mortgages play a major role in securitization because they are within the most assets, that back the notes created by securitization. When looking at the holders of mortgages in the U.S. one could see, that banks and savings institutions once were one of the main holders of mortgages. Especially agency and government-sponsored enterprise (GSE) mortgage pools experienced a huge increase since the mid-1980s. Private mortgage-backed securities (MBSs) holders increased exponentially from 2004, while commercial bank holdings increased steadily. The increase accelerated in the 2000s (cf. Figure 11).

³⁷ Securities Industry and Financial Markets Association (2017c)

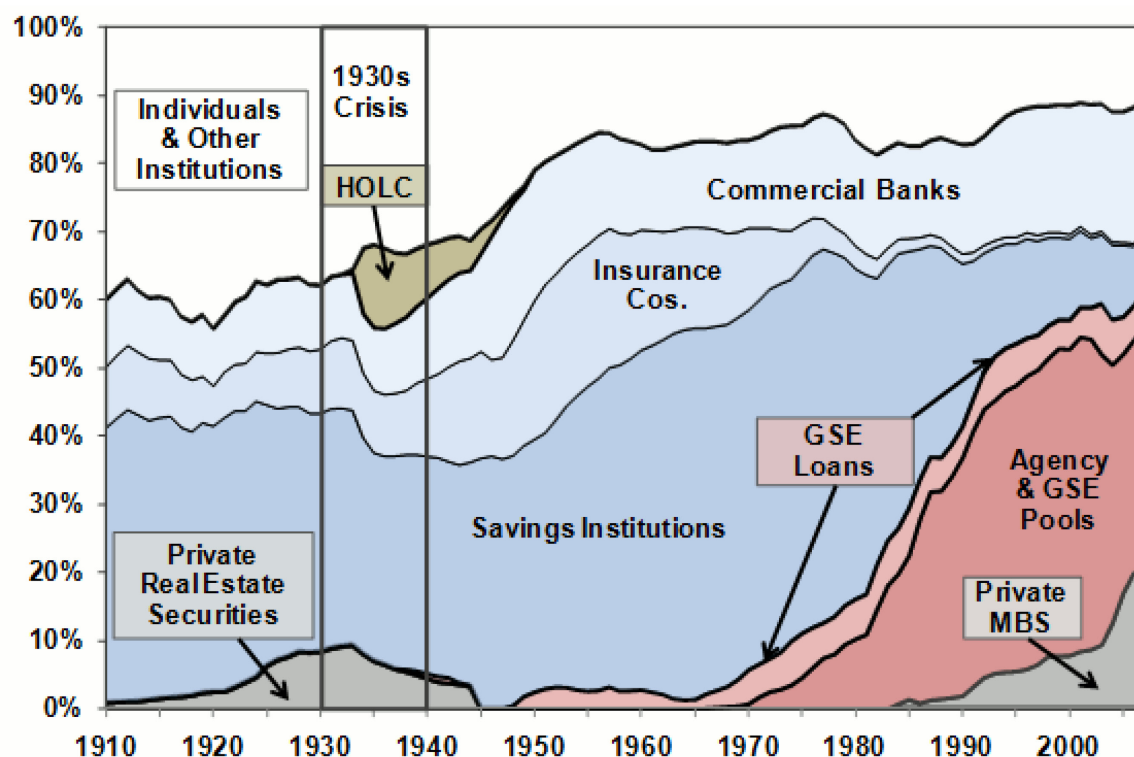


Figure 11: Shares of non-farm residual mortgage debt, 1910-2007³⁸

When looking at the over-the-counter (OTC) derivatives market, one can see, that derivatives strongly increased in the 2000s, with a sharp acceleration from 2005 on. This was mainly driven by commodity contracts and interest rate instruments. Credit default swaps (CDSs), which got attention in the crisis due to the near failure of American International Group (AIG), increased from nothing to around \$60 trillion outstanding. Still, the CDS volume was tiny compared to the overall OTC derivatives market (cf. Figure 12).

³⁸ Snowden (2010)

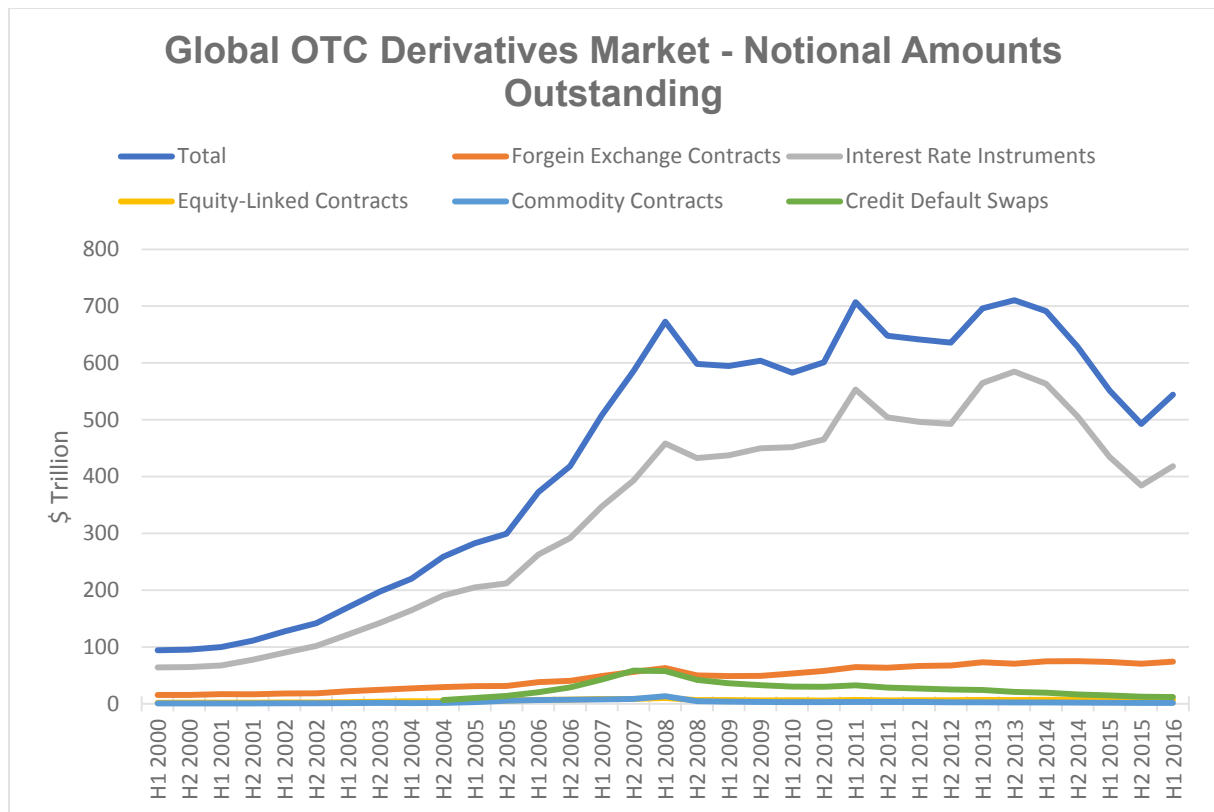


Figure 12: Global OTC Derivatives Market - Notional Amounts Outstanding³⁹

3.3 The Causes

After describing the developments in bank business models and shadow banking, the interesting question is: why did all these changes happen? There are several factors that fueled shadow banking and changed the financial environment. A lot of this comes down to government intervention and regulation. Other factors can be asymmetric information problems, incentive structures, specialization, and innovations.

For example, MMMFs can be seen as an innovation or rather an alternative to bank deposits. While MMMFs provided a “safe” investment, they were not subject to an interest ceiling. Furthermore, they provided a higher “deposit insurance”, because deposits were only guaranteed up to a certain amount – assuming MMMFs are safe. It is obvious that the structure of the regulation had an influence. Without an interest rate ceiling on bank deposits – Regulation Q – the demand for the innovation may not have been there.⁴⁰

³⁹ Bank for International Settlement (2016b): D5-D10

⁴⁰ Adrian & Ashcraft (2012b): P. 12

3.3.1 Regulation

Government intervention could be an appropriate tool when markets fail. It can potentially improve the market situation. By doing so, it also implies direct or indirect costs for market participants and can have adverse effects on markets. For example, while capital requirements for banks can make the market eventually sounder, they imply costs and could reduce the lending willingness of banks.⁴¹ Different types of regulation instruments regarding banking exist. Deposit insurance, interest rate ceilings, specific capital requirements for institutions or supervision instruments can be named for this. However, the need for licenses or investment restrictions are possible instruments.⁴²

If looking at the banking regulation, it influences the behavior of the bank sector, but potentially creates possibilities for outsiders. In that context, the earlier mentioned MMMFs can be presented. Through the existence of an interest ceiling on bank deposits, MMMFs developed to mitigate the ceiling and providing investors higher returns. When Regulation Q was removed, MMMFs already had an established market position.⁴³

The influence on the banking sector can be described the best when taking a look at the capital requirements. The implementation of capital requirements started in the U.S. in 1981.⁴⁴ A multinational regulation of the international financial sector within the Group of Ten (G10) started with the Basel Accord of 1989 (Basel I). The focus was on credit risk. Banks had to meet certain capital requirements for particular types of assets. The assets were grouped in certain categories. For example, banks did not have to put aside any money for cash or gold (cf. Figure 13). Companies had to hold at least eight percent of capital for risk-weighted assets in total. Assets were weighted according to their perceived risk. Although there do exist different types of capital, the formula for the capital ratio can be broken down to capital divided by risk-weighted assets. It should be clear, that a bank now has two options to improve the capital ratio. The bank could increase capital, which was the original goal to make banks sounder. However, the bank could instead lower its risk-weighted assets, which can be done by restructuring the bank's balance sheet.⁴⁵

⁴¹ Neave (2009): P. 491-495

⁴² Freixas and Rochet (2008): P. 305-307

⁴³ Olson (2012): P. 13/14

⁴⁴ Olson (2012): P. 16

⁴⁵ Jablecki (2009): P. 16-18

Risk weight in %	Assets
0	Cash, gold, OECD government bonds
20	Debt of OECD government agencies
50	Mortgage loans
100	Private sector claim, real estate investments in other assets

Figure 13: Risk-Weighted Assets⁴⁶

Capital ratios impose additional costs on banks. Since equity for banks is perceived to be costlier than debt, if banks need to hold more equity due to capital requirements, they have to deal with higher costs. Banks can try to minimize the costs via capital arbitrage instruments. These are also costly, but the costs may be less than the costs of equity. When talking about the Basel I regulation, the for most common instruments are cherry picking, securitization with partial resources, remote origination, and indirect credit lending.⁴⁷ While cherry-picking allows a riskier portfolio with the same capital requirements, securitization can reduce capital requirements by moving assets off the balance sheet.⁴⁸ Regulation – in this case, capital requirements - gives banks huge incentives to avoid it.⁴⁹

Cherry-picking means that a bank within one risk weight class chooses riskier assets to generate higher returns on equity. For example, the bank could invest in riskier mortgage loans, that potentially generate higher returns and to compensate for that, invest less in low-risk mortgage loans. The total volume of mortgage loans stays the same, the portfolio gets much riskier, but the capital ratio is untouched. This comes from the fact that all mortgage loans have a risk weight of 50%.⁵⁰

In securitization with partial resources, the sponsor bank sells assets to a special purpose vehicle (SPV), which then issues the pooled assets as ABSs to investors. Since asset sales are treated as true sales and the SPV as a separated financial entity, they are not in the sponsor's financial statements. Although the sponsor must bear most of the risk through credit enhancement, it does not touch its capital ratio fully. This is also a form of cherry-

⁴⁶ Jablecki (2009): P. 18

⁴⁷ Bank for International Settlement (1999): P. 22

⁴⁸ Bank for International Settlement (1999): P. 23-25

⁴⁹ Olson (2012): P. 16

⁵⁰ Bank for International Settlement (1999): P. 23

picking because in most cases it is optimal to securitize the low-risk assets from the balance sheet and to keep the higher risk ones.⁵¹

Remote origination describes the origination of assets by a sponsored SPV rather than within the bank. The bank never officially owns the assets. In that case, the credit enhancement is treated as a direct credit substitute. Although the risk – in contrast to classic securitization – doesn't change, this classification leads to a required capital ratio of eight percent, while without it would be 100%.⁵²

Indirect credit enhancement describes the use of instruments that fulfill the same functions as credit enhancement without being treated as such. Financial guarantees are replaced by early amortization, fast-payout provisions or similar contractual agreements. This often allows banks to reduce required capital to as low as zero.⁵³

Basel I was modified by the Market Risk Amendment in 1996. Banks could use own risk models, which were meant to recognize the bank's exposure to market risk. This is mostly present in the bank's trading books. From a capital arbitrage point of view, it allowed banks to manipulate capital ratios by holding assets in their trading books rather than in their classic banking books. The trading book was not subject to capital requirement rules, which allowed banks to bypass them.⁵⁴

Regulators seemed not interested in blocking these kinds of behavior. In the aftermath of the Enron Corporation scandal, where Enron – an energy and commodities company – went bankrupt after having obscured its true leverage with the help of off-balance sheet vehicles, accounting standards were supposed to be tightened. It was proposed to consolidate sponsored SPVs on the sponsor's balance sheet. If SPVs had come back on the bank's balance sheets, this would have led to a huge increase in required capital.⁵⁵ This never became a problem for banks, though, because regulators decided to exclude ABCP program assets, that now had to be consolidated on sponsor's balance sheets, from being added to

⁵¹ Bank for International Settlement (1999): P. 23/24

⁵² Bank for International Settlement (1999): P. 24

⁵³ Bank for International Settlement (1999): P. 24/25

⁵⁴ Lopez & Saidenberg (2001)

⁵⁵ Acharya et al. (20012): P. 524

the risk-weighted capital.⁵⁶ This decision essentially could fuel the continuous growth of the ABCP market.

3.3.2 Deregulation

Since the Great Depression, commercial banking was strictly separated from investment banking. Banks lobbied intensively for the repeal of regulations. They were especially successful in the 1980s and 1990s when much deregulation took place. Piece by piece they took down certain borders. They became allowed to underwrite MBSs or commercial papers (CPs). Finally, commercial banks became bank holding companies, which were allowed to do business in every state and worldwide, and that could be active in any business through their subsidiaries. Bank holding companies were allowed to have commercial banks, securities brokerage, and insurance subsidiaries. The deregulation in that sense opened the door for a lot of fee-based income streams for commercial banks and strengthened the move towards the originate-to-distribute model.⁵⁷

However, the creation of bank holding companies was not the only part of deregulation. Regarding derivatives regulation, the Commodity Futures Modernization Act of 2000 gave financial institutions a free ride to use and create derivatives in the OTC market. It basically excluded all OTC derivatives transactions, that were negotiated between two professional parties, from the coverage through regulators.⁵⁸

The Bankruptcy Amendments and Federal Judgeship Act of 1984 changed the regulation regarding repos. Certain repos on high-quality assets were taken out of the automatic stay in the case of a bankruptcy of a firm. In 2005 extensions to mortgage-related securities, mortgage loans or interests in one of these were made. In the beginning, just U.S. Treasury securities and U.S. agency securities were exempted, later even non-investment grade securities were taken out of the automatic stay.⁵⁹

3.3.3 Incentives

Incentives do have an influence on the behavior of the institutions in the banking industry and their employees. As it was shown in the chapters before, banking regulation or regulation, in general, can lead to wrong incentives, or at least unplanned incentives. One

⁵⁶ Department of the Treasury (2004): P. 1

⁵⁷ Olson (2012): P. 17

⁵⁸ International Swaps and Derivatives Association (2001): P. 4-13

⁵⁹ Adrian & Ashcraft (2012a): P. 16

additional instrument which is not part of the regulation, in general, is the too big to fail (TBTF) regime. This takes an important regarding incentives. TBTF means that the government or the central bank will jump in as a lender of last resort if a company is close to failing, because they are afraid the failure will have a huge negative impact on other institutions in the industry or the whole economy. They are afraid of the systemic risks, which could be created by the failing company. The TBTF regime can lead to an overly high risk taking of companies, because they know, they will be rescued in the end. Companies also have a perverse incentive to grow as much, as they will be considered as TBTF. There were a couple of previous examples of interventions by the government, which made companies confident to receive help in the worst case. One prominent example was Continental Illinois National Bank and Trust Company, which got into trouble during the Saving and Loan Crisis in the 1980s. A somewhat key example is the hedge fund Long-Term Capital Management. Hedge funds are not subject to any government backstops, and investors bear the risk of a failure. Nevertheless, the Fed organized a bailout, involving multiple large banks. Although no actual government money was used, one could argue, if the Fed is willing to rescue such a generally unsecured institution like a hedge fund, it would be willing to rescue anyone connected to the financial sector.⁶⁰

Also, incentives within the industry or organization of institutions can have a bad influence. In this context, the move from a partnership model to a public corporation model for New York Stock Exchange members can be mentioned. While members had to use the partnership model, they were much more serious about the risks, because they risked their own money. In public corporations, they only use the money of shareholders.⁶¹

4 The Shadow Banking System

This chapter will provide a detailed description of the SBS. It will cover the most important players and instruments. It will also examine potential risks and the economic role of the SBS.

⁶⁰ Financial Crisis Inquiry Commission (2011): P. 56-58

⁶¹ Financial Crisis Inquiry Commission (2011): P. 61-64



Figure 14: The Intermediation Process⁶²

4.1 The Intermediation Process

The SBS performs credit intermediation like classic banks. Like mentioned before, to accomplish that, a long chain of intermediation is involved. It can be split up into various steps and involves various intermediaries. Basically, it can be split into seven steps (cf. Figure 14). The intermediation process does not have to consist of all seven steps, or it can have more steps if some steps are taken multiple times. The worse the pool of underlying assets is, the more steps are needed to sell the final product successfully. Nevertheless, the process always starts with step one – the origination of loans – and ends with step seven – the wholesale funding. The first step is the loan origination in which financial companies decide in a complex process, who has the creditworthiness to get a loan. The funding of these companies comes from ABCPs, bonds or medium-term notes (MTN). In the second step, loan warehousing is performed. ABCPs are used as funding sources again. The third step is the issuance of ABSs. In this step, different loans will be pooled together by broker-dealers. ABS warehousing, the fourth step, is accomplished through trading books. Financing in this step uses mainly repos. The fifth step is the ABS CDO issuance. It describes the structuring and pooling of ABSs into CDOs, which is performed by broker-dealers, like in step three. In the penultimate step, ABS intermediation is done. This is mainly done by special investment vehicles (SIVs), securities arbitrage conduits or credit hedge funds. The funding uses a variety of methods including ABCPs, repos, and MTNs. The last step is the wholesale funding. The

⁶² Pozsar et al. (2010): P. 10/11

funding for this step is provided by the wholesale funding markets. Regulated or unregulated money market intermediaries and direct money market investors fund the SBS via short-term ABCPs and repos, while insurance companies, fixed income funds or pension funds invest into the SBS via long-term bonds or MTNs.⁶³

4.2 Players

A lot of different institutions are active in the SBS. This chapter will give an overview of the most important ones.

4.2.1 Commercial Banks

Banks are a very important part of shadow banking. For the purpose of capital arbitrage and to realize short-term earnings, banks moved activities towards the SBS. They are active in multiple steps of the SBS.

Banks are part of bank holding companies, which have many different subsidiaries. Beside classical banking, these subsidiaries can also be engaged in a variety of different activities. This includes “securities dealing and underwriting, insurance, real estate, private equity, leasing and trust services, asset management, and so on.”⁶⁴ Bank holding companies and investment banks are active in all steps of the securitization process of shadow banking.⁶⁵ Furthermore, one important function of banks in the securitization process is, that they provide credit enhancement. “Credit enhancement are protection, in the form of financial support, to cover losses on securitized assets in adverse conditions.”⁶⁶ The protections made it possible to sell lower quality assets.⁶⁷

4.2.2 Government-sponsored Enterprises

Government-sponsored enterprises (GSEs) take a decent part in the SBS due to their business model. The largest and best-known ones are the Federal National Mortgage Association (Fannie Mae) and the Federal Home Loan Mortgage Corporation (Freddie Mac). The Government National Mortgage Association (Ginnie Mae) is not a GSE but is under government control. With the idea of stabilizing the housing market, the Federal Home Loan Bank System was established after the Great Depression. It was later mostly transitioned to

⁶³ Pozsar et al. (2010): P. 10-12

⁶⁴ Avraham et al. (2012): P. 65

⁶⁵ Cetorelli & Peristiani (2012): P. 59-60

⁶⁶ Mandel et al. (2012): P. 35

⁶⁷ Mandel et al. (2012): P. 35

the GSEs. Later, when owned partly private, the GSEs had two contradicting goals. First, they were meant to support the mortgage market as a public goal. Second, their private goal was to maximize the value for their shareholders.⁶⁸

GSEs do business in two different ways: they invest in residential mortgages and perform securitization of residential mortgages. Regarding their securitization business, GSEs buy mortgages from originators, pool them and process them to marketable MBSs. GSEs charge a guarantee fee, which promises investors a guaranteed repayment of the underlying assets. Regarding their investments into mortgages, they either hold their own MBSs, or they buy mortgages to hold. The money for these investments is collected via debt issues. Although they have no direct government ties, they can borrow at very low interest rates like the government. This allows them to earn on the spread between the yields from the mortgages and interests they need to pay on the debt.⁶⁹ The business model of the GSEs is shown in Figure 15.

Capital requirements were very low for GSEs, meaning 0.45% for their guarantees on MBSs and 2.5% for mortgages they held in their own portfolios.⁷⁰ GSEs exactly fit in the definition of shadow banks. They perform credit intermediation without being treated and regulated like a bank. One could say the GSEs are government-sponsored shadow banking.

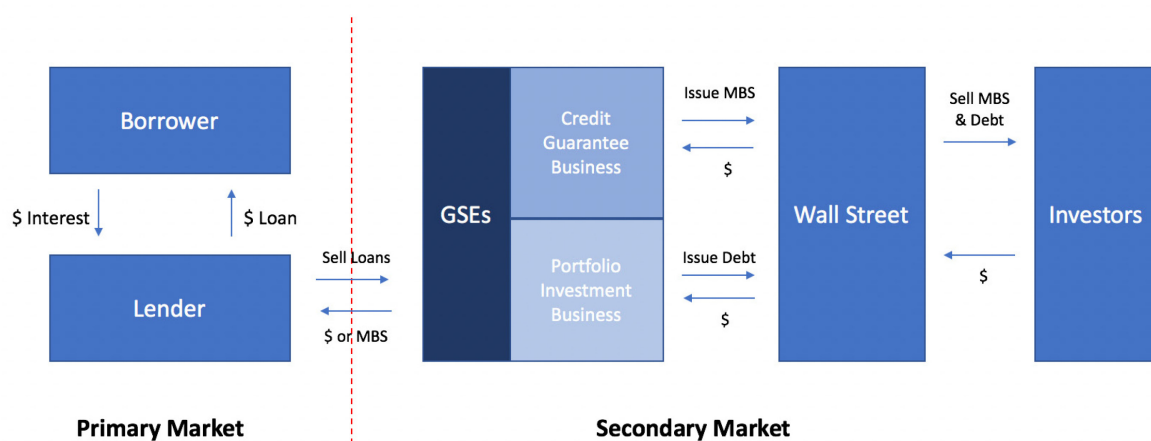


Figure 15: Government-sponsored Enterprise Business Model⁷¹

⁶⁸ Acharya et al. (2011): P. 15-19

⁶⁹ Acharya et al. (2011): P. 13/14

⁷⁰ Financial Crisis Inquiry Commission (2011): P. 38-41

⁷¹ Federal Housing Finance Agency (2017)

4.2.3 Rating Agencies

Rating agencies have quite an important role in the SBS. They are generally well known for giving credit ratings on government or corporate debt. Their ratings describe the safety of the debt. However, they also rate financial instruments like tranches of ABSs, MBSs, or CDOs, which are the core of the SBS. Especially due to the lack of transparency of these instruments investors rely on the ratings given by rating agencies. Investors trust them, while not knowing the quality or combination of the assets of the underlying security pools. Without rating agencies, the instruments would not be that easily marketable, if marketable at all. The rating agencies market is straightforward in a sense, that it consists of three players: Moody's Investors Service, Standard and Poor's and Fitch Ratings. The agencies earn money through the commissions they get for the requested rating. Incentives for Rating agencies are a point of critique. They get paid by the issuers of financial instruments. This a recurring relationship, since issuers need ratings frequently and pay huge amounts of fees for the ratings. On the other side are the investors, who pay fees to receive information about products. Rating agencies may rate in favor of one or the other.⁷²

4.2.4 Other

A huge variety of different players is active in the SBS. They can either be active directly in the SBS – as independent firms or as subsidiaries of financial holdings – or they may just invest in certain instruments of the SBS from outside. This includes hedge funds, investment funds, insurance companies, mortgage insurers or private investors.

4.3 Entities

Along the SBS intermediation chain, different entities are active. The most important ones are MMMFs, broker-dealers, and SPVs. Their functions will be described in this chapter.

4.3.1 Money Market Mutual Funds

MMMFs came into the world in the 1970s as a financial innovation. They gave investors the ability to earn higher returns than on bank deposits while being able to withdraw money daily. They were assumed of being exposed to relative low risks.⁷³ This was assumed because MMMFs keep a stable net asset value (NAV) of \$1 per share. The NAV can be realized because of the accounting method used. MMMFs do not value their assets on a market-

⁷² White (2010): P. 211-224

⁷³ Securities and Exchange Commission (2016)

value basis but historical costs. This allows them to keep the \$1. However, at the same time, it makes them prone to runs on their deposits. If a fund's costs are higher than its returns, investors will withdraw their deposits. This problem can be weakened by indirect credit enhancement through a sponsoring institution.⁷⁴ MMMFs invest into liquid short-term securities like CPs, repos, certificates of deposits or government securities. While MMMFs are at the core of the SBS due to their credit intermediation, they provide funds to other shadow banks and companies outside the SBS.⁷⁵ MMMFs are very important for the U.S. economy since they are the largest supplier of short-term money in the U.S.⁷⁶

4.3.2 Broker-Dealers

A broker-dealer is “any individual or firm in the business of buying or selling securities for itself (as a dealer) and others (as a broker).”⁷⁷ Broker-dealers have been active in capital markets for a long time and have always played an important role as market makers. They also served as underwriters. However, with the rise of securitization and the long intermediation chain of the SBS, their importance has also grown. Broker-dealers are involved in different steps of the SBS intermediation chain and serve as suppliers of credit.⁷⁸ Broker-dealers can be independent or are subsidiaries of investment banks or bank holding companies (BHC). Broker-dealers have large balances sheets, which on the asset side mostly consist of long positions and collateralized lending. The assets have a long maturity. On the liabilities side, they are funded via short-term markets, predominant through repos.⁷⁹

4.3.4 Special Purpose Vehicles & Special Investment Vehicles

SPVs, in Europe often referred to as special purpose entity (SPE), are legal entities, which are created by a sponsor (the owner) to fulfill a special task. The sponsor has the full control over the SPV but can do transactions, which are legally separated from the core firm. They are often used to realize regulatory arbitrage or to get cheaper financing. In the process of securitization, they are frequently used to pool assets sponsored by the originator and to sell the created securities to the market. An alternative to the SPV is the special investment vehicle (SIV). This highly leveraged entity is often used for regulatory arbitrage. It invests in long-term assets, it bought from the sponsor, while being financed through short-term

⁷⁴ Kacperczyk & Schnabl (2012): P. 2/3

⁷⁵ DB Research (2015): P. 1-5

⁷⁶ Kacperczyk & Schnabl (2012): P. 1

⁷⁷ Luttrell et al. (2012): P. 40

⁷⁸ Adrian & Shin (2009): P. 7

⁷⁹ Rosengren (2014): P. 4-7

instruments like ABCPs. Common forms are limited partners, trusts, and forms that are subject to special legislation like real estate mortgage investment conduits (RMIC), financial asset securitization investment trust (FASIT), real estate investment trust (REIT) or regulated investment companies (RIC).⁸⁰

The crucial difference between SPVs and SIVs is their behavior regarding risk transfer. While an SPVs passes the exposure of the loan to the investors who buy the ABSs, in an SIV structure, the assets and their risks stay with the sponsored bank, and are just hidden. They are not on the balance sheet of the sponsor and are exclusively used for capital arbitrage or hiding real leverage ratios.⁸¹

4.4 Instruments

A common instrument for the SBS on the assets side is securitization. On the liabilities side, the SBS heavily relies on short-term funding via repos or ABCPs. To be able to do bank-like intermediation the instruments are connected to an intermediation chain (cf. Figure 2).⁸² Also, derivatives play an important role in the SBS.⁸³ This chapter will describe the most common instruments and their functions. The instruments are characterized by a high level of opaqueness and complexity.

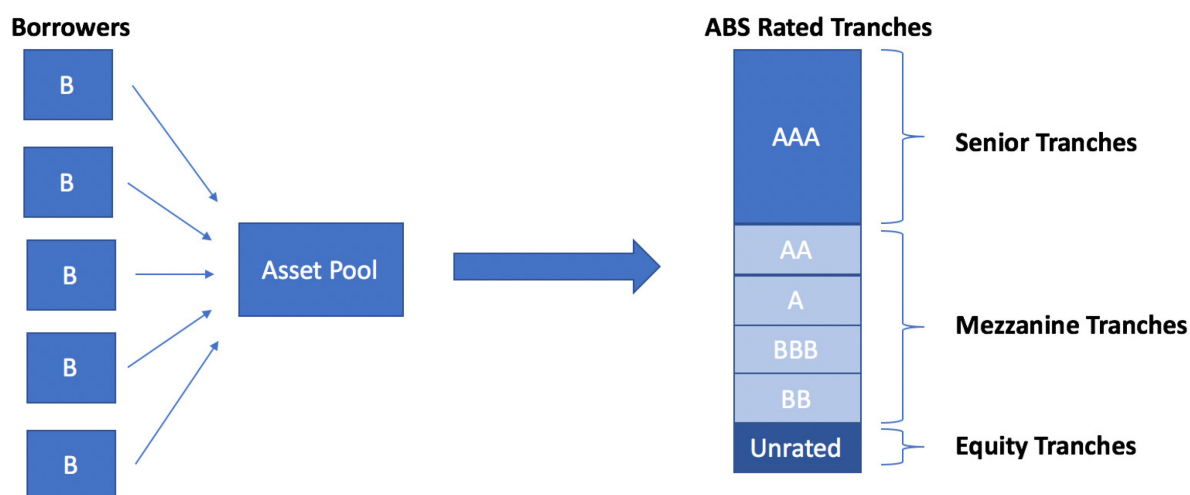


Figure 16: Creation of ABS⁸⁴

⁸⁰ Gorton & Souleles (2007): P. 549-552

⁸¹ International Monetary Fund (2008): P. 69

⁸² Financial Stability Board (2013): P. ii

⁸³ Pozsar et al. (2010): P.1

⁸⁴ Financial Crisis Inquiry Commission (2011): P. 73

4.4.1 Securitization

Securitization simply speaking describes a process of transferring assets, that are not easily or not at all marketable, into securities that can be sold in a secondary market. This can be done by different financial institutions like banks, insurance companies, finance or non-finance companies. Non-marketable assets are for example mortgages or car loans. For investors, this gives the opportunity to get access to cash flows of assets, even if access to the original assets would not be possible.⁸⁵

Securitization was initially meant to transfer risks from financial institutions to other parts of the economy by selling the claims to a range of different investors. This can spread the potential risks of the claims onto various sectors of the economy and will prevent a concentration of the risk in the financial sector.⁸⁶ The diversification of the risks leads to lower interest rates on mortgages or other loans.⁸⁷ Securitization is mostly done by GSEs but also can be done by private firms. It can be distinguished between agency securitization and private-label securitization. GSEs especially are the dominant part in regards to the securitization of mortgages.⁸⁸

In the process of securitization financial assets like loans, mortgages, accounts receivable or notes receivable are pooled together. The financial assets are used as collateral for the notes, which are issued as a result of the securitization process – the ABSs. They represent cash flows from the underlying assets, which are payment obligations to the issuer of the notes. The notes are often issued in different tranches, which are rated by rating agencies (cf. Figure 16). Various forms of ABSs exist, depending on the type of collateral which is used. If this happens to be a mortgage, they are called mortgage-backed securities (MBSs). These can be further differentiated into residual mortgage-backed securities (RMBSs) or commercial mortgage-backed securities (CMBSs). An advancement of the securitization process is the created of CDOs. In this case, the notes are issued against a pool of assets which may consist of ABSs, MBSs, real estate investment trust debt, bank loans, bonds or

⁸⁵ Fabozzi et al. (2006): P. 65

⁸⁶ Acharya et al. (2012): P. 515

⁸⁷ Brunnermeier & Pedersen (2008): P. 5

⁸⁸ Chernenko et al. (2013): P. 5-7

even other CDOs. For an underlying pool of bank loans, they are called collateralized loan obligations (CLOs). CDOs represent a repackaging of ABSs (cf. Figure 17).⁸⁹

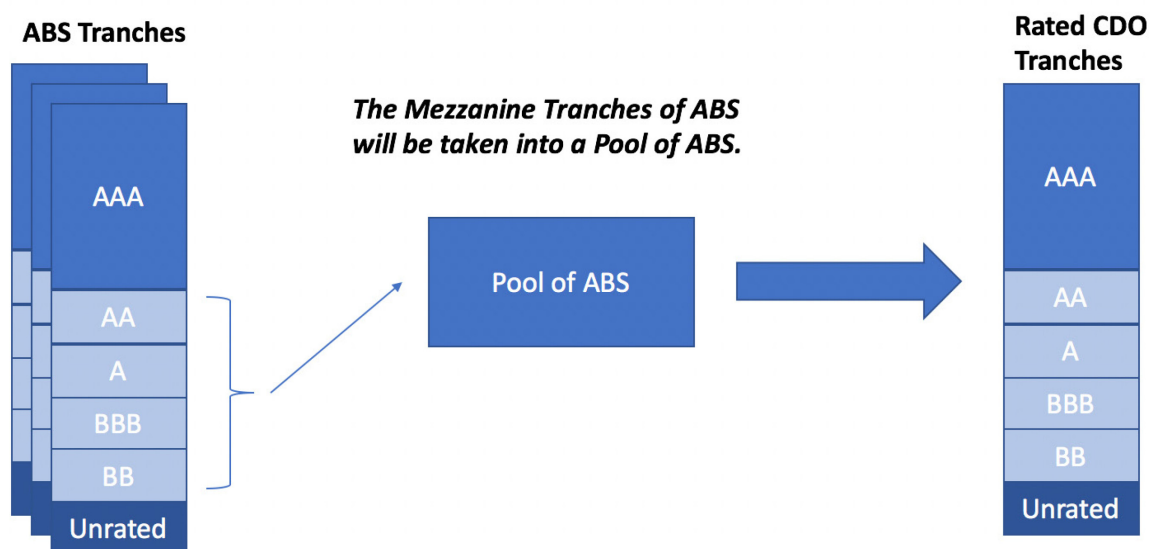


Figure 17: Collateralized Debt Obligations⁹⁰

CDOs are mostly divided into three different rated tranches: senior tranches, mezzanine tranches, and equity tranches. The tranches are mostly rated and differ in terms of risks. The equity tranches are not rated and often stay with the originator.⁹¹ It is possible to get a step further with CODs. CDOs-squared are CDOs, which are backed mainly by tranches of other CDOs.⁹² To come up with an even more complex instrument, another differentiation of the CDOs can be brought up: the synthetic CDOs. It is used to shift the credit risk of the underlying from the originator to investors via derivatives. In that case, assets are not sold directly to the SPV, but only the exposure to credit risks. SPVs are still used in this structure by selling the credit risk to the vehicles. It is often done through credit derivatives. The most common used forms are credit default swaps (CDSs) or total return swaps (TRSs).⁹³

The securitization process can potentially involve a long chain of processes, which makes the value of the financial product hard to estimate. This can lead to asymmetric information

⁸⁹ Fabozzi et al. (2006): P. 119/120

⁹⁰ Financial Crisis Inquiry Commission (2011): P. 73

⁹¹ Fabozzi et al. (2006): P. 120-122

⁹² Financial Crisis Inquiry Commission (2011): P. 203

⁹³ Fabozzi et al. (2006): P. 133-139

between buyers of the ABSs or CDOs and the sellers of these. The asymmetric information is not a big problem when buyers are optimistic about the state of the economy. However, when they are pessimistic about the future, this can lead to market brake-downs for the specific products.⁹⁴

Along the securitization chain, there are some serious information problems. There is asymmetric information “between the lender and the originator (predatory lending and borrowing), between the lender and investors, between the servicer and investors, between the servicer and borrower, between the beneficiary of invested funds and asset manager, and between the beneficiary of invested funds and rating agencies.”⁹⁵

4.4.2 Asset-backed Commercial Papers

ABCPs are a source of short-term funding. They are a type of CPs. CPs, in fact, are unsecured corporate debt, which the company promised to pay back. Historically these loans were given to solid firms with excellent credit ratings. ABCPs use a collateral – e.g. a financial asset.⁹⁶ ABCPs usually receive a liquidity enhancement from a commercial bank as a guarantee.⁹⁷

In the market for ABCPs, some frictions do exist. One problem arises from the over-reliance on credit ratings, which is also an issue in the repo market. The over-reliance is created through asymmetric information between asset managers and investors and results in a mispricing of the credit and liquidity risk. Another problem is the potential use of capital arbitrage. Banks receive liquidity puts via credit lines from the public sector. When trying to maximize these guarantees, they are given to off-balance sheet vehicles using ABCPs. These guarantees than are mispriced and do not reflect the credit and liquidity risk accurately.⁹⁸

4.4.3 Repurchase Agreements

A repo is also a source of short-term funding. It is structured as follows: an institution, that wants to borrow, sells a government security to a lender and agrees to buy it back later at a slightly higher price. The received money can be put into higher return investments. Therefore most of the received money can be invested minus a tiny “haircut.” The most

⁹⁴ Beltran & Thomas (2010): P. 29

⁹⁵ Adrian & Ashcraft (2012a): P. 24/25

⁹⁶ Financial Crisis Inquiry Commission (2011): P. 30

⁹⁷ Adrian & Ashcraft (2012a): P. 13

⁹⁸ Adrian & Ashcraft (2012a): P. 13

common form is a tri-party repo, where a financial intermediary brings together borrowers and lenders and monitors the transactions. Also, direct bilateral repos exist.⁹⁹

Repos allow institutions to use a high leverage, especially when haircuts are low. This can be risky, though, because fluctuations in haircuts will change the firm's ability to reach certain levels of leverage. A simple example should clarify this point. The assumed haircut is two percent. The institution that borrows needs to come up with \$100 worth of securities to get \$98. This means, for \$100 the borrower needs to have two percent of equity, which results in a leverage ratio of 50. If a shock hits the market and the haircut doubles to four percent, the maximum possible leverage ratio decreases dramatically to 25. The firm needs to double the amount of equity to borrow the same amount of money. It must either raise new equity or sell assets in this case.¹⁰⁰

For investors repos provide a deposit-like product, they can demand at nearly any time. Repos are especially interesting for creditors because they are excluded from Chapter 11. The U.S. Bankruptcy Code excludes repos from the automatic stay if a firm goes bankrupt. In the case of bankruptcy, creditors do not have to wait like every other creditor but can pull out their money.¹⁰¹

There are some frictions in the repo markets. First, there exists a substantial systemic risk, when a large dealer in the market cannot fulfill its obligations anymore. This leads to a counterparty risk for the clearing bank and eventually to problems in the whole market. Second, there is a strong reliance of repo investors on the credit ratings of the securities, which are used as collateral, and on the credit ratings of the counterparties. This over-reliance can lead to huge risks when complex instruments are accepted as collateral, and the rating proves to be wrong. The subprime crisis should later confirm this. Third, since repo markets are very short-term, investors can get in and out very quick. Huge MMMFs are an important player in the market. If some of them pull out huge amounts of money quickly, markets are not able to absorb the selling of assets used as collateral. This also affects other holders of the same type of securities, which lets their capital shrink too. The possibility of

⁹⁹ Financial Crisis Inquiry Commission (2011): P. 31

¹⁰⁰ Shin (2008): P. 15

¹⁰¹ Gorton & Metrick (2010): P. 276/277

daily unwinding of repo transactions attracts investors, and the use of a clearing bank leads to the funding of high-risk investments through repo markets.¹⁰²

4.4.4 Derivatives

“Derivatives are financial contracts whose prices are determined by or “derived” from the value of some underlying asset, rate, index or event.”¹⁰³ Derivatives are used to hedge risks and as speculation instruments. They allow institutions to buffer and investors to bet on price changes in the underlying assets. The best know forms are exchange-traded futures and options, and OTC swaps. While exchange-traded derivatives are regulated, OTC derivatives are not. The OTC derivatives market is a very opaque market, where large financial institutions take the role of dealers. They buy and sell derivatives from or to customers.¹⁰⁴

Derivatives can be used as an instrument to increase leverage. Derivatives traders can use equity swaps to get returns of the underlying securities, while not owning them. This way they do not need to bring up the funds to buy the securities. They only need a small portion of the value of the underlying security by using derivatives, but are exposed to the same risks and can get the same profits as if they would hold the security.¹⁰⁵

A very popular derivative, which got public attention during the subprime crisis, is the CDS. A CDS is an instrument to transfer risks. The purchaser of a CDS transfers the default risk of an underlying asset to the seller of the CDS. The seller gets a premium from the purchaser and has to pay additional money in the case of default. The purchaser gets protected against default, although a CDS technically is not an insurance. CDSs can also be used as a speculation instrument. In the case of a naked CDS, the purchaser can bet on the default of assets, while not actually owning the underlying assets.¹⁰⁶

The derivatives markets are regulated by the Commodity Futures Trading Commission (CFTC). Nevertheless, especially the OTC derivatives markets are not regulated at all.

¹⁰² Adrian & Ashcraft (2012a): P. 19/20

¹⁰³ Financial Crisis Inquiry Commission (2011): P. 73

¹⁰⁴ Financial Crisis Inquiry Commission (2011): P. 46

¹⁰⁵ Financial Crisis Inquiry Commission (2011): P. 49

¹⁰⁶ Financial Crisis Inquiry Commission (2011): P. 50

Through the Commodity Futures Modernization Act of 2000, deals between two sophisticated parties are not subject to any regulation.¹⁰⁷

4.4.5 Leverage

Leverage is not an instrument per se, but the instruments discussed above allow banks to increase their leverage. This is especially true for securitization, ABCP programs, SPVs & SIVs and repo markets. They allow banks to use risk-transferring mechanisms for capital arbitrage purposes. The freed-up capital can be invested in further risky investments. The instruments used in the SBS allow shadow banks to achieve higher leverage ratios than they would be able to in their normal regulated environment.¹⁰⁸

4.5 Economic Role

The economic role of the SBS is very similar to the role of classic banking. Since it also performs credit intermediation, indeed in a different way, it takes a role as financial intermediary. It provides new and different investment possibilities for investors, to which they had no access before.¹⁰⁹ It also provides new lending opportunities for some companies or households. They can be either entirely new, when banks were not willing to lend them before, or an additional opportunity to diversify lending channels. By this, the shadow banks theoretically increase information production and make financial markets more complete.¹¹⁰ They can help to create more efficient financial markets.¹¹¹

4.6 Risks

The SBS is generally exposed to similar risks like the traditional banking due to its similar intermediation function. Especially the crisis 2007-2009 exposed additional liquidity and credit tail risks. These risks are hidden in the long intermediation chain, which the SBS uses to perform credit transformation. The SBS imposes not only risks for the players themselves, but also a systemic risk for the financial sector as a whole – including traditional banks and insurance companies. Regulated financial institutions are engaged in shadow banking through off-balance sheet operations, broker-dealer subsidiaries or their activities in the derivatives markets. This creates a strong interconnection between the SBS and the regulated financial sector. In consequence, stress in one area has the potential to spill over

¹⁰⁷ Greenberger (2009): P. 9-10

¹⁰⁸ Acharya & Schnabl (2009): P. 83/84

¹⁰⁹ Pozsar et al. (2010): P. 11/12

¹¹⁰ Jackson (2013): P. 392

¹¹¹ Schwarcz (2011): P. 626-628

on both financial sectors. Crucial for shadow banking is the funding liquidity risk. With the use of off-balance sheet vehicles, ABCP programs and repo financing, institutions invest in long-term assets, while financing these operations through short-term lending. This creates a huge maturity mismatch between investments and funding. Furthermore, it makes institutions dependent on short-term funding. If short-term funding dries out, institutions could fail.¹¹²

Shadow banking is subject to four potential market failures. These are namely an information failure, a rationality failure, a principal-agent failure and an incentive failure. The information failure is created through the immense complexity and opaqueness of the SBS. The rationality failure has two dimensions. First, investors do investments based on models, that they can only partly understand. Second, a lot of the models that were used in the mortgage crisis, later proved to be wrong or overoptimistic. The principal-agent failures are created through the compensation schemes of shadow bank's employees. Wages are tied to short-term performance, but the long-term interest of the firms are ignored. The incentive failure is created through the absence of incentives for screening and information production. While earnings for shadow banks are fee-based, and risks are passed down the chain, incentives for proper screening are missing.¹¹³

4.7 Regulation

The SBS is very little regulated or in most areas not regulated at all. A prime example for that are the OTC derivatives, which were not regulated before the subprime crisis. A general regulation of shadow banking is difficult to achieve since it is not even clear what belongs to shadow banking.¹¹⁴ Many institutions, that are active in the SBS, are put into different buckets like banks or insurance companies. Shadow banking is an instrument for financial institutions to avoid the regulation, they are subject to.¹¹⁵ Chapter 6.3 will provide some ideas about what could or should be regulated regarding shadow banking.

¹¹² Brunnermeier & Pedersen (2008): P. 5

¹¹³ Schwarcz (2011): P. 631-636

¹¹⁴ Schwarcz (2011): P. 641/642

¹¹⁵ Adrian (2014): P. 3

5 Shadow Banking and the Subprime Crisis

With the bust of the housing bubble, the biggest financial crisis since the Great Depression started – the subprime mortgage crisis. This chapter will give an overview of what happened during the subprime crisis. The focus will be on the main mechanisms of the crisis and the role of shadow banking. There will be a description of the measures governments around the world used to deal with the crisis. Furthermore, the risks and instruments of shadow banking, which were mentioned in chapter 4.4 and chapter 4.6, will be discussed with some actual examples.

5.1 The Subprime Crisis

The subprime mortgage crisis can be broadly separated into three phases or events. First were the housing bubble and its bust. Second is the credit crunch, which finally led to the third phase – a global economic crisis. The causes of the subprime crisis are strongly connected to the causes of the growth in shadow banking. Nevertheless, the SBS itself is not the single cause but can be seen as an amplifying factor of the crisis.¹¹⁶

In the years up to 2006/2007 housing prices steadily increased, which accelerated in the recent years before the crisis. When housing prices started to decline, households defaulted on their mortgages. This was especially the case for subprime mortgages, which were mortgages for people with low credit ratings, who were not able to get conventional mortgages. The prefix “sub” should make it obvious, that those loans were clearly below prime level and riskier because of that. Lenders were creative regarding the structure of mortgages to be able to sell as many mortgages as possible. These mortgages were often designed to be frequently refinanced, or they started with very low payment rates which increased after a certain amount of time. In most cases, mortgages were basically unaffordable for these households after the increase. Origination standards had decreased dramatically. This was also the case for the assets, which financial firms bought to securitize. The low interest rate environment, which made investors look for possible investment opportunities, and foreign capital inflows in the U.S. housing market contributed to this. There are some arguments for the existence of a credit bubble, which helped to fuel the

¹¹⁶ Liikanen (2012): P. 4

housing bubble. This credit bubble was fueled by the availability of cheap money, and at the same time, a decline in lending standards.¹¹⁷

One could say, a crisis in the housing sector is nothing good, but it is not necessarily a disaster and is a problem of the housing sector. However, the crisis spilled over to the financial sector. A lot of financial products traded in financial markets were based on mortgage assets and subprime mortgages, which were extensively securitized near the end of the housing bubble. When these products were downgraded and more and more financial firms, which had invested in those products, got into trouble, investors escaped from these products and companies. Due to the high complexity and opaqueness of these products, risk exposures were unclear. Nobody trusted each other and everybody was very suspicious about potential risks, especially when the first firms reported huge losses or even failed due to their exposure to subprime mortgage products. This led to a credit crunch. Financial firms had difficulties or were completely unable to renew their short-term funding sources since money and repo markets broke down. Respectively haircuts rose dramatically. Governments decided to support different financial markets, financial institutions and in the end, even corporations, which had nothing to do with the financial sector. With the bust of the housing bubble, the freeze of the funding markets and financial institutions in trouble, also corporations lost funding, and overleveraged households got into trouble. The result was a global recession and economic crisis. Several institutions around the world got into serious trouble or failed. Several had to be supported with huge amounts of taxpayer's money. In Europe, the crisis turned into a sovereign debt crisis, after all, leading many EU members close to failing.¹¹⁸

5.2 The Role of Shadow Banking

During the subprime crisis, the SBS experienced a run on its instruments, which was similar to the run on traditional banks in the 20th century. Short-term liquidity markets dried up, and investors pulled out of mortgage-related financial products. The SBS was thought to be safe through private sector liquidity and credit puts, which in the crisis proved to be wrong.¹¹⁹ This chapter will look at the different instruments of the SBS and their behavior in the subprime crisis.

¹¹⁷ Brunnermeier (2009): P. 82

¹¹⁸ Liikanen (2012): P. 4-10

¹¹⁹ Adrian & Ashcraft (2012a): P. 1/2

5.2.1 Securitization

Securitization issuance completely collapsed during the crisis. ABSs and CDOs which included subprime mortgages were downgraded, and investors pulled out of these products. Securitization, intended to provide a risk transfer, was mainly used by financial firms for regulatory arbitrage and to generate short-term earnings. The SIV structure, which was used for those purposes, prevented the risk transfer and concentrated the risk within the financial sector.¹²⁰ The opaqueness of the products including subprime mortgages and the reliance on rating agencies made the products very sensitive to shocks. Securitization has a huge potential to fail due to its long intermediation chain and asymmetric information connected to this. For example, originators of the loans do not have incentives to perform proper screening, when they can sell the loans straight away to an investment bank or a GSEs. In the crisis one important friction regarding securitization was the “asymmetric information between investors and issuers, resulting in risk-sensitive costs of funding.”¹²¹ Furthermore, investors overly relied on the rating agencies. Ratings were more important than some other information for subprime MBSs. This gave an incentive for issuers of these products to pool risky opaque assets and create AAA-rated securities. Nobody would care about the underlying risks if the rating is good enough.¹²²

5.2.2 Asset-backed Commercial Papers

The ABCP market got under huge pressure and experienced a huge decline (cf. Figure 9). The trigger for this were the problems regarding subprime mortgages. More and more loans defaulted. Investors in the ABCP markets were concerned about the values of the collaterals, and many pulled out of the markets. This led to a huge increase in haircuts. Funding costs increased if funding was possible at all. The problems emerging in the ABCP market also had an influence on other parts of the financial sector, e.g. the interbank lending market. Sponsored banks had guaranteed for the obligations of their off-balance sheet vehicles, which were invested in subprime mortgages, and it was unclear to which risks they were exposed. Unknown counterparty risk concerns led to huge increase in haircuts in the

¹²⁰ Acharya et al. (2012): P. 35/36

¹²¹ Adrian & Ashcraft (2012a): P. 25

¹²² Adrian & Ashcraft (2012a): P. 23-26

interbank lending market.¹²³ A second shock for the ABCP market was the bankruptcy of Lehman Brothers in autumn 2008, which again hugely increased haircuts in ABCPs.¹²⁴

5.2.3 Repurchase Agreements

During the crisis, the repo market experienced a run. Like for the other instruments, also for repos, the unknown exposure of counterparties to subprime risks was the trigger. Repo haircuts rose, and investors pulled out their money. In repo terms, this meant not to renew the repo. This happened in multiple steps. The first shock occurred in August 2007, when markets became aware of losses through subprime exposure. Haircuts finally peaked after the failure of Lehman Brothers in September 2008.¹²⁵ It is crucial to recognize, that there was a huge difference between the bilateral repo market and the tri-party repo market. In the tri-party repo market haircuts stayed relatively stable during the subprime crisis. In contrast to that, one could observe a strong increase in haircuts in the bilateral repo market.¹²⁶ Although there was a run on the repo market, the influence on the crisis seems to be on the smaller side. This is the case since repo funding only accounted for a small amount of the funding through short-term instruments. In combination with the run on ABCPs, this led to some serious funding problems for shadow banks and other institutions dependent on short-term funding.¹²⁷ This does not mean, repo was not an important source of funding. Its drying up increased the liquidity problems of for example Bear Stearns and Lehman Brothers.¹²⁸

5.2.4 Others

Also, other entities experienced runs. For examples, MMMFs experienced runs on their assets. This was triggered by the Chapter 11 filing of Lehman Brothers. The MMMF Reserve Primary Fund (RPF) experienced a run due to its large holding of Lehman Brothers' commercial papers. This also triggered runs on other funds. The runs on MMMFs stopped after an intervention by the U.S. government, which decided to ensure all deposits in MMMFs.¹²⁹

¹²³ Kacperczyk & Schnabl (2010): P. 37/38

¹²⁴ Kacperczyk & Schnabl (2010): P. 39/40

¹²⁵ Gorton & Metrick (2009): P. 23/24

¹²⁶ Copeland (2014): P.40

¹²⁷ Krishnamurthy et al. (2012): P. 50/51

¹²⁸ Saguato (2015): P. 25/26

¹²⁹ Kacperczyk & Schnabl (2012): P. 1

Hedge funds, pension funds, and mutual funds had a sizeable influence in the crisis. In the search for higher yield investments especially hedge funds provided alternative investment opportunities and decent returns for investors. A lot of this was achieved by investments in mortgage instruments like ABSs or CDOs. In that way, they partly fueled the demand for those securities and through that the creation of the same.¹³⁰ During the crisis, many funds failed due to their exposure to the subprime mortgage market. They were the first institutions to fail and showed the impact of defaults in the subprime mortgage market. For example, the Swiss UBS Group closed its own hedge fund after \$125 million subprime losses in May 2007, U.S. Bear Stearns had to inject \$3.2 billion in two of their own hedge funds due to subprime exposure or French BNP Paribas froze three investment funds due to the inability to value structured investment products used. Hedge funds experienced substantial losses, through subprime exposures, fire sales of assets and margin calls.¹³¹

5.3 Mechanisms

Altogether the SBS experienced a huge run on its instruments and entities. The long intermediation chain created many asymmetric information problems. The huge opaqueness of the whole systems and the instruments led to uncertainty over risks. This was true for investors and institutions between each other. The run on the short-term funding instruments also affected the traditional banking sector. Many institutions were active in shadow banking and traditional funding. The business model of originate-to-distribute or rather to invest in long-term assets with very short-term money failed. The unavailability of short-term liquidity left many institutions failing or close to failing. In the end, the financial sector experienced an old-fashion bank run, just not on deposits, but on the new source of funding – the wholesale funding.

Four mechanisms amplified the shock through the crash in the housing market and led to the drying up of liquidity and the severe financial crisis. The four mechanisms are loss spirals and margin spirals, lending channels, runs on financial institutions and network effects.

5.3.1 Loss Spirals and Margin Spirals

Loss spirals describe a problem for leveraged institutions. When prices decline, the value of the institutions declines. To hold their leverage ratio, institutions need to sell assets at low

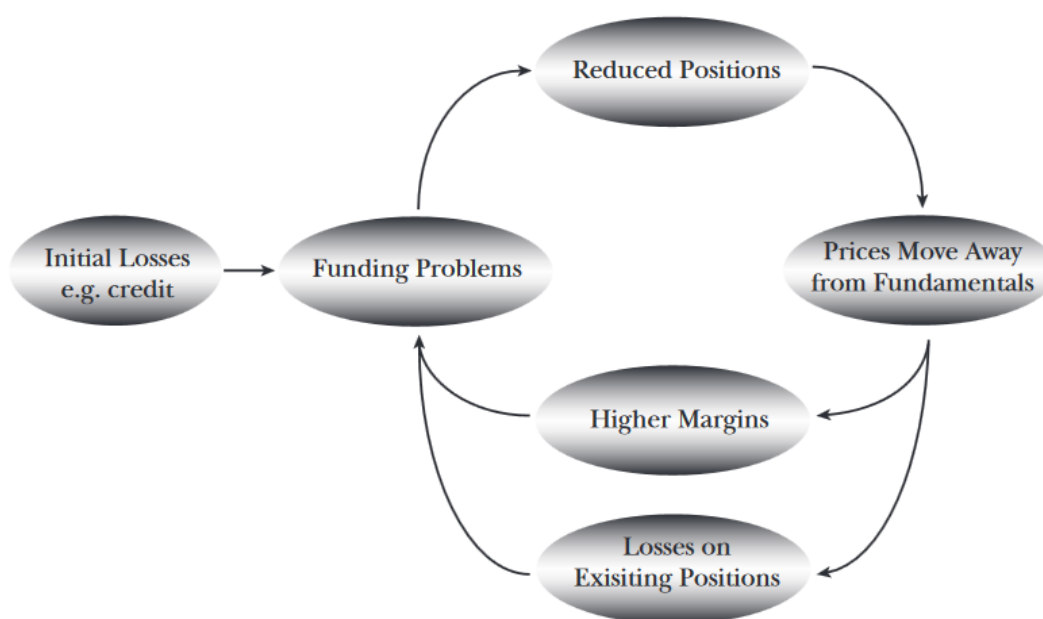
¹³⁰ Lysandrou & Nesvetailova: P. 27

¹³¹ Brunnermeier (2009): P. 83-86

prices. When institutions sell assets, prices decline further, which leads to even more selling. The loss spiral arises because multiple institutions have the same problem and outside investors wait until the spirals are over. Margin spirals fuel the loss spirals. As mentioned earlier, haircuts have an influence on the leverage institutions can achieve. When haircuts increase, institutions need to decrease their leverage. In the case of spirals, this leads to even more selling and a continuous decline in asset prices. Haircuts increase when prices partly decline because of asymmetric information. Lenders get more cautious about the asset they accept as collateral. They are afraid to receive bad assets. Illiquid assets are subject to bigger loss spirals. In the case of a shock, the price drop is larger, the more illiquid the market for the assets is. In the financial crisis, the prices of illiquid structured finance products sharply dropped.¹³²

Figure 4

The Two Liquidity Spirals: Loss Spiral and Margin Spiral



Source: Brunnermeier and Pedersen (forthcoming).

Note: Funding problems force leveraged investors to unwind their positions causing 1) more losses and 2) higher margins and haircuts, which in turn exacerbate the funding problems and so on.

Figure 18: The Two Liquidity Spirals: Loss Spiral and Margin Spiral¹³³

¹³² Brunnermeier (2009): P. 92-94

¹³³ Brunnermeier (2009): P. 93

5.3.2 Lending Channels

“When lenders also have limited capital, they restrict their lending as their own financial situation worsens.”¹³⁴ One mechanism is moral hazard in monitoring. Financial intermediaries are incentivized to perform proper screening of their borrowers as long they have a decent stake of their own money in play. Otherwise, they might not be interested in fulfilling the task properly. A second mechanism is precautionary hoarding. This happens, when institutions need funds for their own business purposes and are afraid of outside shocks. Precautionary hoarding is high when the probability of shocks is high and the possibilities to raise outside funds is assumed to be bad. Precautionary hoarding is, what happened in the interbank lending market during the crisis. Banks needed fund for their own off-balance sheet vehicles and were uncertain about possibilities in funding. Furthermore, it was not clear whether banks could get financing through interbank lending markets, because of the uncertainty of other bank’s exposure to the same problems. Interbank lending rates strongly increased.¹³⁵

5.3.3 Runs on Financial Institutions

The beginning of the 20th century was characterized by a lot of bank runs and panics. Even when there was a rumor that investments of a bank may have gone wrong, depositors ran to withdraw money from banks. When too many customers ran, the bank could not pay out the demanded money and went bankrupt. This refers to the liquidity risk mentioned earlier. Bank runs happened very frequently. Since only a rumor could be the trigger, even banks that generally were in a solid situation could have been affected. The ultimate consequence was a chain reaction of bankruptcies.¹³⁶

The huge problem with the frequent bankruptcies due to bank runs was, that they led to broader economic crisis. Efforts in the U.S. by the government were made to fix the bank run problem. One of the most important steps was the creation of the Federal Reserve System (the Fed) in 1913, modified by the Banking Act of 1935. This gave commercial banks a possibility to borrow from a central bank if liquidity was needed. After the Great Depression from 1929 – a huge economic downturn – the Banking Act of 1933 / Glass-Steagall Act of

¹³⁴ Brunnermeier (2009): P. 95

¹³⁵ Brunnermeier (2009): P. 95

¹³⁶ Krugman (2009): P. 153-156

1932 separated commercial banking and investment banking. The idea was to secure deposits by forbidding commercial banks to do, what were thought to be “risky investments.” The Banking Act of 1933 also established a deposit insurance through the Federal Deposit Insurance Corporation (FDIC). When it was established, the FDIC’s function was to guarantee for deposits up to \$2,500. The current level is at \$250,000. It operates as follows: if a bank goes bankrupt, the FDIC will pay out customers of the bank up to the guaranteed amount when the bank is not able to. It was meant to be for commercial banks only. All the above measures essentially helped to prevent the previously frequent bank runs, since depositor’s fear of losing their money was mostly eliminated.¹³⁷ The improvements from the separation of commercial banking and investment banking are in doubt, however. The prohibition of certain investments does not make banks sounder. It does not prevent them from making risky decisions in general. They can still make them in their limits.¹³⁸

The crisis showed that runs are not limited to banks. When looking at the wholesale funding market, the refusal to roll over ABCPs fulfills the same mechanisms like a run. It is a run on the issuer of the ABCPs. This happened to many institutions in the financial crisis. However, runs are not limited to debt. Also for the individual equity holder, it can be beneficial to run. An institution is assumed to be invested partly in liquid and illiquid assets. When equity holders run, the ones, who run first, get a full payout due to the liquidation of liquid assets. Those, who run when only illiquid assets are left, only receive part of their money.¹³⁹

5.3.4 Network Effects

The financial sector is complex, and it cannot be clearly distinguished between borrowers and lenders. Most institutions do both at the same time. The connection between financial institutions and unknown counterparty credit risk exposures “can create additional funding needs and potential systemic risk.”¹⁴⁰ For example, in the opaque OTC derivatives market participation only know their own contracts. They do not know the potential credit risk exposures of their counterparties. Even if multiple parties are fully hedged, they might not know this. They might want to insure against counterparty risk via a CDS. This describes, what happened after the failure of Lehman Brothers. “All major investment banks were

¹³⁷ Krugman (2009): P. 157/158

¹³⁸ White (1986): P. 51/52

¹³⁹ Brunnermeier (2009): P. 96

¹⁴⁰ Brunnermeier (2009): P. 97

worried that their counterparties might default, and they all bought credit default swaps protection against each other.” This obviously led to a huge increase in CDSs prices for the banks.¹⁴¹

5.4 Market Failures

During the crisis, a lot of failures, near failures and a downturn in the whole financial sector were observable. The interesting question now would be, what were the market failures during the crisis. There exist four main market failures. The first one is the excessive risk-taking of many financial and non-financial institutions in the financial sector. This was possible because government guarantees were mispriced. Financial institutions with high leverage have huge incentives to use excessive risks. The market should be able to price these risks correctly, however. This may cause some problems. When there exists only one real barrier against excessive risk, namely capital requirements, and the guarantees are mispriced, institutions have a high incentive to find loopholes in the regulation. Government guarantees are deposit insurance, indirect guarantees to get government support in the case of a failure through the TBTF regime, and guarantees and subsidies for the investment of the GSEs. Another problem is the corporate governance regarding large and complex financial institutions, which incentivizes employees and managers to create short-term earnings while ignoring long-term risks. In the crisis, banks shifted activities to off-balance sheet vehicles to avoid capital requirements. They moved activities into the SBS out of reach for regulators, while enjoying the same guarantees. They also bought underpriced protections against default in the form of CDSs and held huge amounts of risky non-prime mortgage instruments.¹⁴²

The second failure is the focus on a micro-prudential regulation and only considering the risks of individual institutions, but ignoring the systemic risk. Before the current crisis, systemic risk was basically ignored. The focus of regulation was on individual firms and their risks. Institutions, who lowered their risks, got capital requirements reliefs to make new risky investments. Risks were hidden in the financial sector and the shadow banking sector, while individual firms seemed to be relatively safe. Chapter 2.3 described three forms of systemic risk. Huge counterparty risks, for example, were built up by AIG through providing protection against defaults via CDSs. A failure of AIG could have had a domino effect. Fire-

¹⁴¹ Brunnermeier (2009): P. 97

¹⁴² Acharya et al. (2009): P. 11-15

sales of assets, especially when there are huge portfolios of the same assets (e.g. MBSs), can bring down the whole market and with it institutions with similar portfolios. Lastly, the run on the shadow banking endangers institutions in the financial sector since many were active in the traditional financial sector and shadow banking at the same time.¹⁴³

The third failure is the opaqueness of many financial institutions, financial products and especially derivatives. This led to huge externalities in the case of a single firm's failure. The TBTF regime incentivizes institutions to become large and complex financial institutions (LCFI). This way they could take more risk and be rescued when they fail. They are very complex and hard to supervise, since they often undergo different businesses, that fall under the authority of different regulators. When regulation does not capture this, institutions can take excessive risks without any buffers. Many products were opaque by design. For CDOs, CLOs or CDOs squared it is hard to access the underlying assets. Many of these instruments and derivatives are traded in the OTC market. Contracts are bilateral, and exposures to those instruments are mostly unknown. If one big player in the market fails, it raises concerns that others may fail and puts pressure on the whole market. Markets dominated by those institutions froze (e.g. credit derivatives markets in the crisis) and interbank lending came to a stop. Liquidity problems of certain assets or markets may show up because of more complex problems. The failure of the financial institution can also be fueled by excessive leverage or excessive risk taking. Furthermore, mispriced government guarantees may have an influence.¹⁴⁴

The fourth failure is the run on the shadow banking system, which due to its strong connection to the traditional banking sector, imposed huge stress on the latter and nearly brought down the whole financial industry. During the crisis, the SBS experienced a run on its instruments or to be more precise, there was a run on the wholesale funding markets. There were runs on subprime lenders, ABCP programs, MMMFs, and hedge funds. In contrast to commercial banking, any backstops like deposit insurance did not exist.¹⁴⁵

5.5 Regulation Flaws

The market failures mentioned in the previous chapter are strongly related to flaws in the regulation. First, the Basel I and Basel II regulation frameworks gave banks, through the risk-

¹⁴³ Acharya et al. (2009): P. 15-17

¹⁴⁴ Acharya et al. (2009): P. 18-20

¹⁴⁵ Acharya et al. (2009): P. 20

weighted assets structure, huge incentives and possibilities to mitigate those regulations. The approach using risk-weighted assets seems to be very problematic. Their use assumes the exogeneity of risk. This is a false assumption since risk is endogen in reality. When risk weights are set for a certain asset class, the risk might be low. When banks now have the incentives to invest in this class and a lot of money will be put into it, the risk will change. It can also change because the creators of these assets now see an increased demand, they might want to satisfy, and therefore the quality might suffer.¹⁴⁶ Endogeneity is especially risky because in times of a crisis it leads to a complete run on the asset class. Everybody just wants to sell it.¹⁴⁷ Systemic risk was ignored, and the supervision of institutions was faulty or incomplete for financial holding companies. Financial holding companies were sometimes able to choose their supervisors because they had different subsidiaries. These subsidiaries were active in various businesses, which were not subject to the same supervision authorities. AIG, for example, decided to use the Office of the Thrift Supervision (OTS) as a regulator.¹⁴⁸ Through the very complex regulation of the Basel framework, it is difficult to hold supervisors accountable for mistakes in the supervision.¹⁴⁹ Nevertheless, supervision was sometimes lax and chaotic, like in Northern Rock – a British bank which failed in the subprime crisis -, where regulators changed regularly.¹⁵⁰

The existence of a TBTF regime gave terrible incentives for the risk taking of LCFIs. Especially since it was obvious – after the support for the failed hedge fund Long-Term Capital Management in 1998 – that also non-financial institutions, engaged in financial markets, would receive support.¹⁵¹ The Basel approach also helped to create LCFI, because the complex regulation framework is beneficial for large institutions. These have more and better resources to deal with the regulation. In that way, it leads to a consolidation in the financial sector.¹⁵²

Furthermore, regulation failed to bring more transparency to the markets with regards to LCFI, OTC market operations of institutions¹⁵³ and the process of supervision in general.¹⁵⁴

¹⁴⁶ Caprio (2013): P. 26

¹⁴⁷ Danielsson et al. (2001): P. 5/6

¹⁴⁸ Financial Crisis Inquiry Commission (2011): P. 274

¹⁴⁹ Caprio (2013): P. 29

¹⁵⁰ Caprio (2013): P. 15/16

¹⁵¹ Acharya et al. (2009): P. 21

¹⁵² Caprio (2013): P. 30

¹⁵³ Acharya et al. (2009): P. 26

A quite common cause of the crisis is the repeal of the Glass-Steagall Act, which seems to be strange since in other countries like in Europe banks are traditionally universal banks.¹⁵⁵

5.6 Government Intervention

Around the world, governments supported financial institutions and prevented many of them from failing. Especially in the U.S., many interventions happened. This was due to the fact, that the crisis had its origination in the U.S. mortgage market. The Fed established many different lending facilities to provide liquidity to different financial and non-financial institutions in various financial markets. The Fed provided liquidity to a variety of different collateral in various quantities. The Term Asset-Backed Securities Loan Facility (TALF) was created in November 2008 to support ABS markets, the Commercial Paper Funding Facility (CPFF) in October 2008 for the CP market, the Asset-Backed Commercial Paper Money Market Mutual Fund Facility (AMLF) in September to buy ABCPs from MMMFs, depository institutions and bank holding companies, the Money Market Investor Funding Facility in October 2008 to support MMMF and other money market investors.¹⁵⁶ Through the Prime Dealer Credit Facility (PDCF) in March 2008 the Fed had also opened the discount window, which previously just depository institutions were able to use, for investment banks.¹⁵⁷ The Fed tried to stabilize markets with an even looser monetary policy than before the crisis and introduced instruments like the “Large Scale Asset Purchase Program” to support financial markets.¹⁵⁸

Apart from that, general market supporting activities, governments supported specific financial institutions directly with money, took over financial institutions or supported mergers between institutions. The only notable institution that failed, and was an exception from the TBTF regime, is the investment bank Lehman Brothers.¹⁵⁹

Instruments and players from the SBS or connected to the SBS and other institutions got support since they experienced run-like events and huge liquidity problems. Later legislative measures to prevent future crisis will be discussed later in chapter 6.1.

¹⁵⁴ Caprio (2013): P. 29/30

¹⁵⁵ Caprio (2013): P. 14

¹⁵⁶ The Federal Reserve System (2015)

¹⁵⁷ Brunnermeier (2009): P. 88

¹⁵⁸ The Federal Reserve (2016)

¹⁵⁹ Brunnermeier (2009): P. 84-91

5.7 Examples form the Crisis

This chapter will analyze some failures during the subprime mortgage crisis. It will describe what caused the failures and what can be potential implications to prevent similar failures in the future. All examples are closely connected to the SBS. The examples will be from American International Group (an American insurance group) and the Federal National Mortgage Association, one of the GSEs that was put under government control in the crisis.

5.7.1 American International Group

AIG is a multinational insurance and financial services company, which today serves over 90 million customers in over 100 countries. Its history started in 1919 in China. Over time it developed to one of the biggest insurance companies in the world. AIG provides insurance and investment products for individuals and professionals.¹⁶⁰ AIG was rescued by the Federal Reserve Bank of New York, the Fed and the U.S. Treasury Department on September 16, 2008. AIG lost nearly \$100 billion in 2008.¹⁶¹

Despite being an insurance company in the first place, AIG's focus shifted in the 2000s. AIG became heavily involved in financial markets and real-estate related products. This was accomplished mainly through two operations, which afterward led to the huge problems AIG faced during the financial crisis. The first business was the securities lending business. Subsidiaries of AIG like the life insurance business provided assets to AIG Global Securities Lending (GSL). In the next step, these assets were lent out to banks or broker-dealers for cash collateral. Cash collateral is typically used for liquid, short-term investments since they can be terminated at any time. AIG GSL instead used them for investments in illiquid, long-term instruments. This meant significant investments in real-estate products including subprime RMBSs and CDOs. AIG got into trouble when counterparties of AIG GLS decided to terminate lending agreements. AIG did not have enough funds for the called positions. At the same time, markets for RMBSs and CDOs were illiquid, which made it impossible to sell the assets, AIG had invested in, at acceptable prices. The only solution was capital provided by the Fed. Ultimately AIG's securities lending business lost almost \$21 billion in 2008. The losses in AIG GLS also implied substantial losses for the AIG subsidiaries that had provided the assets for lending. The second troubled business was AIG's CDS business. AIG was a writer of CDSs, which means they collected premiums and in the case of a default had to pay

¹⁶⁰ American International Group

¹⁶¹ McDonald and Paulson (2014): P. 2

the buyer of the CDSs. The written volume of CDSs was \$527 billion, while it had additional exposure in derivatives of \$1.5 trillion. The CDSs were written on different types of debt, like corporate loans, prime mortgages, CLOs or CDOs. The biggest problems occurred in the CDSs and CDOs, which were \$78 billion at the end of 2007. AIG also had written a huge portfolio on prime mortgages and corporate loans to provide capital arbitrage for European banks, but this was not the biggest problem, although AIG also made losses on this. The CDSs were traded in the OTC markets directly with counterparties. Derivatives in OTC markets are often set up with a zero market-value, which allows both parties to terminate the contract. When prices change over time, the value changes in a positive way for one party and in a negative way for the other party. To get back to a zero market-value, the party with the negative value must pay a collateral to the party with the positive value. It depends on the contract when those payments are made. In the case of AIG, they were often bound on a certain threshold combined with AIG's credit rating. There were no intermediate payments to stay at a zero market-value, which accumulated large amounts of unpaid losses at AIG. When AIG's credit rating went down, it received more and more margin calls from counterparties. Due to its CDS business, AIG had to report losses of \$11.5 billion in 2007, received huge margin calls in the shade of the failure of the investment bank Lehman Brothers and further downgrades and in total lost over \$30 billion on the CDS business. The U.S. government decided to help AIG. This was done by setting up the SPV Maiden Lane II and Maiden Lane III. While Maiden Lane II bought the remaining collateral from AIG's securities lending operations, Maiden Lane III bought the CDOs AIG had insured. This terminated the CDSs of these with their counterparties.¹⁶² AIG repaid the support from the Federal Reserve Bank of New York until 2012. The Federal Reserve Bank of New York reported a gain of \$9.4 billion with regards to both funds.¹⁶³ Although gains were reported, sources indicate that the assets from the funds were sold clearly below their par-value.¹⁶⁴

Overall AIG cannot be taken as an ordinary insurance company. Through its bets on real estate markets via the securities lending operations and its CDS operations, it becomes more exposed to bank-like risks. The securities lending business invested in long-term RMBSs and CDOs, while being funded through short-term lending. The same applies to AIG's CDS on

¹⁶² McDonald and Paulson (2014): P. 23-25

¹⁶³ Federal Reserve Bank of New York

¹⁶⁴ McDonald and Paulson (2014): P. 25

CDOs. This created a huge mismatch with regards to liquidity and maturity – a very familiar problem known from banks. Insurance companies, in general, are less vulnerable to financial shocks, because of their more conservative investments in liquid assets and a matching funding in terms of maturities.¹⁶⁵ Prior to the crises, AIG moved far away from being a classic insurance company. It became more of a bank with huge engagement in instruments of the shadow banking system. During the run on the SBS instruments, AIG's business model – financing illiquid, long-term investments through short-term wholesale funding – failed.

5.7.2 Federal National Mortgage Association

Fannie Mae is a GSE, that was put into government conservatorship on September 7, 2008. The main functions of GSEs were already described in chapter 4.2.2. For a quick recap: Fannie Mae was a publicly traded company that had two main objectives. It was expected to generate value for its shareholders as a private goal on the one hand and on the contrary to support mortgage markets as a public goal. Fannie Mae was active in the securitization of mortgages. It sold MBSs but also held portfolios of MBSs and mortgages. Fannie Mae was created in 1938, with the main focus on supporting mortgage markets and for that purpose buying mortgages. It held portfolios of these mortgages while earning from the spread between the mortgage interest and its funding costs. The mortgages had to meet certain underwriting standards of the Federal Housing Administration (FHA). Since 1970, Fannie Mae and other GSEs could buy conventional fixed-rate mortgages. At the same time, GSEs became allowed to do securitization. Mortgages were pooled, and assets against these pools were issued and sold to investors. GSEs guaranteed for the payments of the mortgage-related interests. Fannie Mae and the other GSE were supported by the government in many ways. For example, they did not have to pay local taxes or got credit lines. Capital requirements were very low, meaning 0.45% for their guarantees on MBS and 2.5% for mortgages they held in their portfolios. While this was significantly lower than what banks were required to hold, they were perceived as safe by investors. When short-term interest rates rose in 1979 and earnings from the spread vanished, the government stepped in and helped the GSEs with a tax relief. When capital requirements for banks became stricter after

¹⁶⁵ McDonald and Paulson (2014): P. 28-30

the Saving and Loan Crisis in the early 1990s, capital arbitrage increased. Instead of holding large portfolios, more loans were pooled and sold as MBSs.¹⁶⁶

Political goals always played an important role. The initial idea was the support of the mortgage market. Fannie Mae's task was partly to provide affordable housing for low- to middle-income households. The legislation described the goals as follows: "require that a reasonable portion of corporation's mortgage purchases be related to the national goal of providing adequate housing for low and moderate income families, but with reasonable economic return to the corporation."¹⁶⁷ Over the time there were numerous incentives to boost homeownership. The GSEs spent huge amounts of money for lobbying purposes. When they had problems to meet the set housing goals, they could purchase MBSs from other issuers.¹⁶⁸

Investment banks and other firms were active in securitization, as well. The GSEs were the leader in terms of leverage. They had a leverage ratio of 75:1, while even investments banks had leverage ratios of "only" around 30:1. For Fannie Mae and Freddie Mace combined this meant \$70.7 billion capital stood against \$5.3 trillion in MBS guarantees.¹⁶⁹ Over the years Wall Street closed-up to the GSEs regarding securitization volume. While GSEs securitized prime mortgages, Wall Street firms were active in securitizing lower quality mortgages, but also promised higher yields.¹⁷⁰ Fannie Mae first got into trouble, because regulators became aware, that the GSEs had overstated its earnings between 1998 and 2002, and had violated accounting rules. It resulted in a \$400 million penalty.¹⁷¹ From 2001 on, the GSEs became buyers of MBSs created by private securitization. They usually bought the safest tranches, but these also included higher risk mortgages. The purchases were made because of the attractive returns on these investments. Their regulator, the Office of Federal Housing Enterprise Oversight (OFHEO), basically looked away. While the investments in private-label MBSs were profitable at first, starting in 2007, they began to create huge losses. Subprime borrowers defaulted, and the related MBS lost their value.¹⁷² From 2006 on Fannie Mae began to be decently active in buying subprime mortgages and many other non-prime

¹⁶⁶ Financial Crisis Inquiry Commission (2011): P. 38-41

¹⁶⁷ Financial Crisis Inquiry Commission (2011): P. 41

¹⁶⁸ Financial Crisis Inquiry Commission (2011): P. 41/42

¹⁶⁹ Financial Crisis Inquiry Commission (2011): P. 65

¹⁷⁰ Financial Crisis Inquiry Commission (2011): P. 102

¹⁷¹ Financial Crisis Inquiry Commission (2011): P. 122

¹⁷² Financial Crisis Inquiry Commission (2011): P. 125

mortgages. Also this time, the OFHEO saw no problem in these actions. Fannie Mae's goal was to buy 20% of the subprime market until 2011.¹⁷³

Resulting from the latest activities, Fannie Mae reported a loss of \$2.1 billion for 2007. It said in 2008, it was not able to fulfill its goals – affordable housing, housing goals, and shareholder value – anymore. It should be mentioned, that the government related goals were mostly in the background. They were usually met easily. The more important drivers for the switch to more risky investments were compensations, the creation of investor yields and market share.¹⁷⁴ “At the end of December 2007, Fannie Mae reported, that it had \$44 billion of capital to absorb potential losses on \$870 billion of assets and \$2.2 trillion of guarantees on MBSs; if losses exceed 1.45%, it would be insolvent.”¹⁷⁵ “From January 1, 2008, through the third quarter of 2012, the two companies [Fannie Mae and Freddie Mac] lost \$229 billion” on their business activities.¹⁷⁶

The GSE system with conflicting goals, which basically made shareholders profit as long as things went well, but made the taxpayer jump in and take the losses when something went bad, failed in the end.¹⁷⁷ Nevertheless, it is just one part of the story. Supervision of the GSEs completely failed. GSEs were mostly able to do what they wanted to. Combined with its government connection, very cheap lending possibilities and an enormous leverage of 75:1, “they were run as the largest hedge fund on the planet.”¹⁷⁸ Until August 2010, \$148.2 billion were injected into Fannie Mae and Freddie Mac combined.¹⁷⁹

Fannie Mae was hugely active in the shadow banking system and competed with private-label securitization of large Wall Street firms. It was fueled by the boom in the U.S. housing market. Its connection to the government and its favorable lending conditions allowed Fannie Mae to become so extremely big. Without any capital requirements compared to banks and the perceived safety of its issued instruments, the GSEs were the biggest players in the U.S. mortgage market. As long as they achieved their short-run goals, nobody cared

¹⁷³ Financial Crisis Inquiry Commission (2011): P. 180/181

¹⁷⁴ Financial Crisis Inquiry Commission (2011): P. 183-185

¹⁷⁵ Financial Crisis Inquiry Commission (2011): P. 313

¹⁷⁶ Financial Crisis Inquiry Commission (2011): P. 323

¹⁷⁷ Financial Crisis Inquiry Commission (2011): P. 414

¹⁷⁸ Acharya et al. (2011): P. 3

¹⁷⁹ Acharya et al. (2011): P. 2

about what they were doing. The GSEs essentially didn't help to fix market failures, as government entities could do, but they completely changed the mortgage market.¹⁸⁰

6 Latest Developments

This chapter will describe the developments in the financial sector after the subprime crisis. This will include regulatory measures for traditional banking and shadow banking, as well as new developments in the SBS. Furthermore, the current regulation attempts will be under review, and potential regulation ideas will be provided. This chapter will also take a closer look at a little different type of shadow banking – the shadow banking sector in China.

6.1 Developments in the Aftermath of the Subprime Crisis

After the financial crisis, regulation changed to prevent the same from happening once again. This includes, as the most important ones: a modification of the Basel framework – Basel III –, the Dodd-Frank Wall Street Reform and Consumer Protection Act (Dodd-Frank Act) in the U.S., the European Market Infrastructure Regulation (EMIR), the Markets in Financial Instruments Directive II (MiFID II) and the European System of Financial Supervision (ESFS).

Basel III identifies the main causes of the crisis as excessive leverage in the banking sector, insufficient liquidity to compensate from exposures in the SBS and the strong interconnection between players in the banking sector.¹⁸¹ Basel III was meant to strengthen the soundness of the financial sector and to address the observed market failures. To accomplish that, it used micro-prudential measures to counter system-wide risks.¹⁸² Overall Basel III shares the same three pillar structure with its predecessor, while being more complex and modifying or tweaking a couple of things. For example, minimum capital requirements increased, and a conservation buffer and a countercyclical buffer were implemented. A liquidity coverage ratio and a net stable funding ratio are further implementations.¹⁸³ Although the Basel III implementation is not complete and many ratios will increase slowly, an even more stringent framework is planned, which is better known as

¹⁸⁰ Acharya et al. (2011): P. 1-11

¹⁸¹ Bank for International Settlement (2010): P. 1

¹⁸² Bank for International Settlement (2010): P. 2

¹⁸³ McNamara (2015): P. 2-9

Basel IV.¹⁸⁴ Although some measures were added and other calculations were tweaked, Basel III at the end of the day follows the same approach that had failed to prevent the subprime crisis. “What is remarkable is that following one of the most wrenching financial crisis in history, the approach to financial regulation is essentially more of the same – a bit higher but still complex capital ratio, supplemented by a liquidity ratio and possibly a low leverage ratio.”¹⁸⁵

The Dodd-Frank Act is a U.S. regulation, that was put into place in 2010 in the aftermath of the financial crisis. It provides new measures of regulation and supervision with the goal to make the banking sector more solid against shocks. The Dodd-Frank Act imposes more stringent capital requirements, customer protection (e.g. stricter disclosure duties for financial products), new supervision authorities like the Financial Stability Oversight Council (FSOC) or new resolution procedures for financial institutions in financial difficulties. It also includes the Volcker Rule, which prohibits banks from proprietary trading and involvement in hedge funds or private equity funds. Banks are not allowed to act as swap entities for credit default swaps, except when the swaps are cleared through a clearing house. All participants in the swap markets need to meet capital and margin requirements. Swap activities are allowed for banks if they are for the purpose of hedging. The use of a clearing house reduces the gross position size a bank has in the derivatives market compared to a bilateral clearing. In terms of rating agencies, a new department is created within the Securities and Exchange Commission to provide supervision of credit rating agencies. Securitizers or banks that bundle loans need to keep at least five percent of the credit risk on their books. However, there are exceptions: e.g. low-risk residual mortgages that meet certain criteria. This should give institutions incentives to use better loans in securitization because they need to deal with parts of the risks. This is in contrast to when they completely sell the loans and do not care about potential risks of the loans. Furthermore, in the case of a financial crisis or to be more precise, in the case of a liquidity shortage, the Fed should provide emergency lending to provide liquidity to financial markets. This money should not be provided to institutions that are prone to fail. This should ensure not to put taxpayer’s money at risk and to tighten the lender of last resort policies.¹⁸⁶

¹⁸⁴ PricewaterhouseCoupers

¹⁸⁵ Caprio (2013): P. 30

¹⁸⁶ Barth et al. (2015): P. 5-10

Similar to the U.S., the EU put reforms into place after the financial crisis. Especially the EU has initiated numerous reforms due to the sovereign debt crisis, which hit Europe right after the global financial crisis. The ESFS changes supervision and describes a layered system of national and EU supervision authorities for the financial sector. This includes macro- and micro-prudential regulation.¹⁸⁷ EMIR tries to counter the risks emerged in the derivatives markets. It “lays down clearing and reporting requirements for OTC derivative contracts and uniform requirements for the performance of activities of central counterparties and trade repositories.”¹⁸⁸ EMIR accesses financial institutions and non-financial institutions that meet certain thresholds of involvements in the OTC derivatives market. Transactions need to be cleared through a Central Counterparty (CCP), need to be recorded and submitted to supervisors. Furthermore, parties involved in OTC derivatives transactions need to implement risk mitigating techniques for transactions, which are not needed to be cleared through the CCP. EMIR also includes accounting rules for outstanding derivative contracts.¹⁸⁹ MiFID II is an advancement of the old MiFID to address problems observed during the financial crisis. The core components are external control & reporting, internal controls & governance, market structure, market transparency and investor protection.¹⁹⁰

6.2 Current Situation

In terms of regulation, a lot of measures were implemented. The main focus was not the SBS, but to strengthen bank regulation in most parts. Through this, the gap regarding capital requirements and liquidity requirements between regulated and unregulated institutions increased. This gives, even more, incentives for institutions to move activities into the unregulated spheres of the SBS.¹⁹¹

Nevertheless, some roads into shadow banking were blocked by regulators. For example, measures through the Dodd-Frank Act and other restrictions make the use of ABCP programs a lot more expensive for banks. The use of ABCP conduits as a pure capital arbitrage instruments, which moves risks off balance sheets, seems to be over. Nevertheless, it just limits the leverage and the potential risk that can be taken. The financial sector might find new ways to get around this. This could be to sell the first-loss tranches to a third party.

¹⁸⁷ European Parliament (2016)

¹⁸⁸ European Commission (2014): P. 1

¹⁸⁹ Ernst & Young (2014)

¹⁹⁰ Ernst & Young (2015): P. 1-3

¹⁹¹ Adrian & Ashcraft (2012a): P. 54

This would help the issuer to get the conduit off the balance sheet again.¹⁹² Regarding MMMFs there have been made some changes to reduce the probability of a run. For example, MMMFs must have a percentage of their investment in highly liquid assets. There are requirements on a daily basis, and requirements on a weekly basis. There are some discussions around the NAV of \$1, which MMMFs need to hold, but up to now, no further decision has been made. So far, changes to MMMFs are minor.¹⁹³ The over-reliance on ratings by rating agencies in terms of regulation and investments has proved as a decent problem during the crisis. However, cutting down the reliance, without giving a good alternative, will not do the trick. To fuel the competition between credit rating agencies under the current compensation scheme will worsen the problem of ratings in favor of the issuing bank.¹⁹⁴

The strong regulation constraints and the deleveraging of banks led to new developments regarding shadow banking. Institutional investors are engaged in bank-like lending activities stronger than ever before. Institutional investors are for example insurance companies or pensions funds. They became active in “commercial mortgages, project finance and infrastructure as well as direct lending.”¹⁹⁵ The lending is – like before – realized via SPVs. Figure 20 shows a possible structure for infrastructure lending. While private equity companies or hedge funds provide the equity for the SPV, insurance companies or pensions funds provide funds to the SPV. The new channels are fueled by a couple of factors. First, the low interest rate environment makes investors seek for potential investment opportunities with decent returns.¹⁹⁶ Second, the current strict regulation for banks enables some arbitrage opportunities. For example, insurance companies have lower capital requirements as banks for many types of investments. Also, pension funds have very low capital requirements.¹⁹⁷

¹⁹² Adrian & Ashcraft (2012a): P. 26

¹⁹³ Adrian & Ashcraft (2012a): P. 45-49

¹⁹⁴ Adrian & Ashcraft (2012a): P. 53

¹⁹⁵ Jackson (2013): P. 396

¹⁹⁶ Jackson (2013): P. 396

¹⁹⁷ Jackson (2013): P. 400

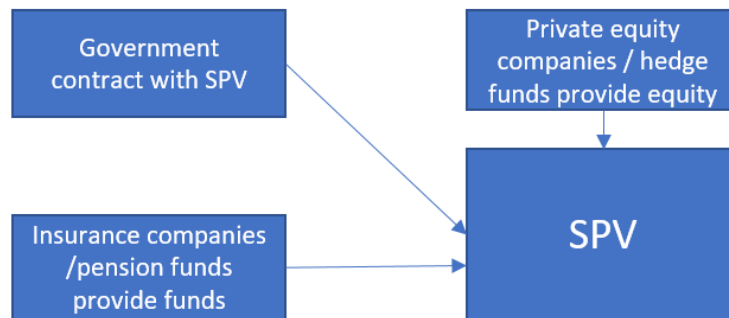


Figure 19: Infrastructure Lending Structure¹⁹⁸

Another new form of lending is credit platforms, which can be realized through a variety of different channels, e.g. receivables exchanges or peer to peer lending. Through this, individuals can provide money to firms or other individuals.¹⁹⁹

Hedge funds have recovered from the crash in the subprime crisis. Since regulators are trying to limit banks activities in proprietary trading through capital requirements or trading bans, this trading is expected to move to hedge funds. Since hedge funds are part of the SBS, proprietary trading would move into the SBS.²⁰⁰

The new instruments certainly have a decent potential for further growth. This will be dependent on the future developments of interest rates, the regulation of banks and other players, the performance of the new instruments and the confidence of investors. Furthermore, the risks associated with the instruments have to be priced correctly.²⁰¹

6.3 Regulation Attempts

As mentioned, regulators mainly focused on further tightening regulation of banks. They tried to fix the loopholes the subprime mortgage crisis has shown. Though, while focusing on even stricter rules for banks, they mostly ignore the shadow banking system. Some reforms do have an influence on certain instruments, like e.g. the ABCP programs. However, the system as a whole remains untouched. It has stabilized after the huge downturn in the financial crisis and keeps developing new instruments. The question arising from this is, whether the SBS should be regulated and how it could or should be regulated.

¹⁹⁸ Jackson (2013): P. 396

¹⁹⁹ Jackson (2013): P. 400-404

²⁰⁰ Jackson (2013): P. 404/405

²⁰¹ Jackson (2013): P. 405-409

Shadow banking has become an important part of the financial system. The SBS is not going to vanish but may increase further again. Shadow banking is in some way difficult to regulate because there doesn't exist one clear definition of shadow banking.²⁰² A lot of different entities and instruments are involved in the SBS. Due to its high connection to the financial sector, the potential market failures (cf. chapter 4.6) and the actual market failures in the crisis (cf. chapter 5.4) it seems to be necessary to regulate shadow banking. There is a wide range of different approaches to regulating the SBS.

It is crucial to recognize, that shadow banking is strongly connected to the traditional banking sector. Regulations of each sector have an influence on the other sector. That being said, to reduce incentives for moving activities from traditional banking to shadow banking, there are two methods possible. Either the regulation of the traditional banking should be loosened, or shadow banking should be regulated stricter. The gap between the two forms of banking creates massive incentives for capital arbitrage. A smaller gap would reduce this behavior.²⁰³ Concerning regulating the traditional banking sector, the current approach of regulation, using capital requirements and continuing to increase them, may not be the best. Excessive capital requirements and restrictive financial regulations fuel the opaque SBS. Lowering of capital requirements can lead to a drying of the liquidity provided to shadow banking.²⁰⁴ If the Basel approach, in general, will lead to a safer financial sector and reduces risks can be in doubt. The risk-weighted assets approach and the regulation gap leads to a growth of the SBS.²⁰⁵

Shadow banking is not a static structure. It changes over time, like the whole financial market. Aspects that were important in the run-up of the subprime mortgage crisis might not be that important in the future, while new aspects emerge. Regulatory policies need to adapt to these changes.²⁰⁶

The regulation of the SBS should aim to minimize systemic risk while keeping the efficiency of shadow banking. One key goal should also be to limit possibilities for regulatory arbitrage

²⁰² Schwarcz (2011): P. 642

²⁰³ Schwarcz (2011): P. 638/639

²⁰⁴ Plantin (2012): P. 38-39

²⁰⁵ Caprio (2013): P. 30-38

²⁰⁶ Adrian (2014): P. 20

and in that way, reduce the interconnection between the traditional banking system and the SBS.²⁰⁷

Gorton & Metrick (2010) propose to regulate securitization and the repo markets. Repo markets are vulnerable to runs, like the banks used to be without deposit insurance. Collateral for repo should be of high quality. Through the excessive use of securitization, a lot of low quality collateral was used.²⁰⁸ Kolm (2015) also argues in favor of a regulation of securitization and sees it as an alternative to capital requirements for shadow banks. By limiting securitization, the leverage potential of shadow banking institutions is limited. A regulation of this nature therefore “has the same effect as capital regulation.”²⁰⁹

Adrian & Ashcraft (2012) argue that the performed maturity transformation is the biggest point of the fragility of the SBS. This makes institutions prone to runs. In traditional banking, this was solved through public liquidity and credit bank stops. Banks and other private institutions should have provided these backstops for shadow banking. The crises demonstrated that these backstops failed and were priced completely wrong. They were too cheap. The SBS “needs less leverage, asset risk and maturity transformation to survive periods of extreme stress.”²¹⁰ Concluding their analysis, they argue, that regulation reforms for shadow banking should focus on providing transparent backstops that are priced correctly.²¹¹

Regarding the GSEs, the situation is complex because of the giant size and dominant role in the secondary mortgage market. Long-term they should pull back from the mortgage market. This would give the possibility to create a new efficient mortgage market. This will take time. The first step would be stop buying new mortgages and stop providing new guarantees.²¹²

Regarding the regulation of traditional banks, Caprio (2013) proposes a rejection of the risk-weighted assets approach and “an adoption of a simple, unweighted capital or leverage ratio.” This would eliminate the popularity of certain assets due to their effect to decrease capital requirements. This would also reduce the covariance between banks, which tend to

²⁰⁷ Schwarcz (2011): P. 638

²⁰⁸ Gorton & Metrick (2010): P. 289/290

²⁰⁹ Kolm (2015): P. 34

²¹⁰ Adrian & Ashcraft (2012a): P. 54

²¹¹ Adrian & Ashcraft (2012a): P. 54

²¹² Acharya et al. (2011): P. 132-142

have similar portfolios because of the risk-weighted assets.²¹³ A possibility to limit the TBTF regime could be the use of contingent convertible debt requirements, which could increase the incentives of managers for proper risk management.²¹⁴

Overall, there is no single solution for regulation shadow banking. Different measures are possible, and those need to be in coordination with changes in the regulation of traditional banks. Nevertheless, “regulation can help to control, but cannot completely eliminate those failures.”²¹⁵

6.4 Outlook: China

In China, the credit system was dominated by traditional banks. Banks were 100% owned by the government until 2004. Shadow banking began to develop in the early 2000s. Traditional banks are still the dominant part of the credit system since they enjoy many benefits and regulators act in favor of them. Nevertheless, banks had to fulfill strict requirements. This includes legal protection against competition, implicit guarantees, controls on deposit rates, control on loan rates and reserve requirements besides others. One problem was that banks favored lending to state-owned enterprises (SOE), but failed in lending to small- and medium-size enterprises (SME). This meant a possibility for other intermediaries to step in and serve the mostly ignored and insufficient served customers. The size of the SBS in China is not clear. Figure 21 provides some estimates.²¹⁶

	Estimate Period	\$ (trillion)	% of GDP
IMF	March-2014	3.2	35% of 2014
UBS	YE-2013	4.6 – 6.5	50 – 70% of 2013
Standard Chartered	YE-2013	0.7 – 2.0	8 – 22% of 2013
Bangkok Bank	YE-2013	6.0	70% of 2012
JP Morgan	YE-2013	7.5	81.2% of 2013
FSB	YE-2013	3.0	31% of 2013

Figure 20: Estimates of the Size of China's Shadow Banking Sector²¹⁷

²¹³ Caprio (2013): P. 31

²¹⁴ Caprio (2013): P. 31-33

²¹⁵ Schwarcz (2011): P. 637

²¹⁶ Elliott et al. (2015): P. 6-7

²¹⁷ Elliott et al. (2015): P. 9

Compared to other financial sectors around the world – when using the measure of the FSB for measuring the size of the SBS – shadow banking is relatively small in China compared to China’s GDP (cf. Figure 22). It not only differs in size but also in the way it is performed and what instruments are used. The Chinese shadow banking does not make use of securitization, CDOs or CDSs. There do exist some instruments similar to repos or other forms of lending, but there is, at least currently, much less leverage involved than in the U.S. or Europe.²¹⁸ Shadow banking in China is more about lending to deprived lenders. It is also about regulatory arbitrage because big state-owned banks have difficulties to serve these customers. The main business is re-lending. Non-financial companies borrow money from big banks to lend out the money further. They earn from the spread. This way they provide new lending channels for e.g. SMEs. This also helps to build the private sector in China, where traditionally the state sector dominates. The SBS contributes to overcoming asymmetric information. Big banks usually tend to lend money just to borrowers they are familiar with.²¹⁹

Similar like in other parts of the world, the SBS in China developed around the regulation and especially because the regulation was in place. Shadow banking in China is still growing and has a huge potential to grow even further, especially through China’s move towards more open financial markets.²²⁰ Regulators have tried to intervene to increase the transparency in the SBS, which – in contrast to the U.S. – generally is way more straight forward and less opaque. The need for funding channels, the old system did not pay attention to, will continue to fuel the SBS in China.²²¹ “The changes include some key areas: new model of financial market supervision, greater transparency on the operations hidden “in the shadow” and implementation of prudential regulations for the shadow banking institutions and products.”²²²

Country	Assets as % of GDP
Netherlands	760%
United Kingdom	648%
Switzerland	261%

²¹⁸ Elliott et al (2015): P. 16-22

²¹⁹ Du et al. (2015): P. 46/47

²²⁰ Du et al. (2015): P. 47

²²¹ Elliott et al. (2015): P. 23

²²² Lasak (2015): P. 315

United States	150%
China	31%

*Figure 21: International Shadow Banking Size Comparison*²²³

7 Conclusion

The shadow banking system developed parallel to the traditional banking system. It involves a strong connection to financial markets and splits up the intermediation chain into many different activities. Not only shadow banking developed but also banking changed its character. Traditional banking became significantly more fee-based and switched from an originate-to-hold model to an originate-to-distribute model. The developments of shadow banking and traditional banking are strongly connected. Shadow banking supported the creation of some new institutions. However, a decent portion of the growth was due to traditional banks moving their activities towards shadow banking. They were able to create large fee-based income streams through the SBS. Government policies strongly fueled the developments. Stringent capital requirements on the one side and deregulation, on the other hand, made banks move to the unregulated SBS. Regulatory arbitrage was one of the main motivations for banks. Through the GSEs, the government was strongly active in the SBS.

Although shadow banking is often seen as something bad, it can help to make financial markets more complete and provide new lending channels. This was shown in the case study about the Chinese shadow banking system.

During the subprime mortgage crisis, shadow banking experienced a run on its instruments. The strong interconnection between traditional banking and shadow banking became apparent. Institutions had become large, very complex and interconnected, and imposed a systemic risk to the whole financial system. Market failures became evident. This were excessive risk taking of financial institutions, the focus of micro-prudential regulation, the opaqueness of financial institutions and the run on the shadow banking. In the aftermath of the crisis, the regulators were mainly focused on fixing the regulation of banks. However, while increasing capital requirements and making banking regulation even stricter, they

²²³ Elliott et al. (2015): P. 17

increased the gap between banking regulation and shadow banking regulation. In this way, the incentives to move towards the SBS even increase. Not only the fact that the gap is increased, but also the general approach of banking regulation seems to be in doubt. Basel III became a more complex and slightly modified Basel II, which failed during the subprime crisis. The capital requirements through risk-weighted assets seem to be a huge point of failure, and a huge incentive and possibility for capital arbitrage. Also, other parts of the regulation like the TBTF regime provided huge incentives for excessive risk taking and are basically still active. Furthermore, the currently loose monetary policy makes investors seek for investment with decent returns. Since these can be easier found in the shadow banking, this fuels the SBS. Government policies through risk-weighted assets push banks into particular types of investments because institutions try to lower their capital requirements. This way, they tend to invest in the asset classes with lower risk weights.

The SBS will not vanish but has a place in the current financial sector. It seems to be useful to regulate the parts of the shadow banking, which are prone to runs the most. Also, the regulation in place should be simplified, and the whole approach needs to be changed to move forward to a more solid financial sector. Too much government interventions like through the GSEs can also lead to huge failures. The GSE system is not a simple intervention, but a total change of the secondary mortgage market. No matter how complex a regulation framework is, it will never be able to fix every potential market failure. There will always be loopholes. The costlier the regulation is for the financial institution, the higher are the incentives to find loopholes.

In my opinion, a lot of the current measures go into the wrong direction. The complex banking regulation does not help to make the financial system sounder. The approach should be much more simplified. Regulatory advantages for specific institutions should be minimized. Major differences in capital requirements between for example insurance companies and banks regarding a particular asset class, create huge unnecessary competitive advantages. Furthermore, there should be some measures to regulate parts of the SBS, which are likely subject to runs. A regulation of securitization might be useful. Nevertheless, a more simplified approach to banking regulation could decrease incentives to move activities into the SBS. The focus should be on managing the interconnection between financial institutions and lowering the systemic risk.

References

- Acharya, Viral V., Thomas Cooley, Matthew Richardson and Ingo Walter (2009): “Market Failures and Regulatory Failures: Lessons from the past and present Financial Crisis”, ADBI Working Paper Series No. 264. <https://www.adb.org/sites/default/files/publication/156119/adbi-wp264.pdf> (March 7, 2017)
- Acharya, Viral V., Matthew Richardson, Stijn van Nieuwerburgh and Lawrence J. White (2011): “Guaranteed to Fail – Fannie Mae, Freddie Mac and the Debacle of Mortgage Finance”, Princeton University Press
- Acharya, Viral V., Philip Schnabl and Gustavo Suarez (2012): “Securitization without risk transfer”, Journal of Finance Economics 107.
http://pages.stern.nyu.edu/~pschnabl/public_html/AcharyaSchnablSuarez2013.pdf (March 7, 2017)
- Acharya, Viral V. and Philip Schnabl (2009): “How Banks Played the Leverage Game”, Wiley
- Adrian, Tobias (2014): “Financial Stability Policies for Shadow Banking”, Federal Reserve Bank of New York Staff Reports, no. 664.
https://www.newyorkfed.org/medialibrary/media/research/staff_reports/sr664.pdf (March 20, 2017)
- Adrian, Tobias and Hyun Song Shin (2009): “The Shadow Banking System: Implications for Financial Regulation”, Federal Reserve Bank of New York Staff Reports, no. 382.
https://www.newyorkfed.org/medialibrary/media/research/staff_reports/sr382.pdf (March 7, 2017)
- Adrian, Tobias and Hyun Song Shin (2010): “The Changing Nature of Financial Intermediation and the Financial Crisis of 2007-09”, Federal Reserve Bank of New York Staff Reports, no. 439.
https://www.newyorkfed.org/medialibrary/media/research/staff_reports/sr439.pdf (March 7, 2017)
- Adrian, Tobias and Adam B. Ashcraft (2012a): “Shadow Banking Regulation”, Federal Reserve Bank of New York Staff Reports, no. 559.
https://www.newyorkfed.org/medialibrary/media/research/staff_reports/sr559.pdf (March 7, 2017)
- Adrian, Tobias and Adam B. Ashcraft (2012b): “Shadow Banking: A Review of Literature”, Federal Reserve Bank of New York Staff Reports, no. 580.
[http://staging.memofin.fr/uploads/library/pdf/sr580\[1\].pdf](http://staging.memofin.fr/uploads/library/pdf/sr580[1].pdf) (March 20, 2017)
- Avraham, Dafna, Patricia Selvaggi and James Vickery (2012): “A structural view of U.S. bank holding companies”, FRBNY Economic Policy Review / July 2012.
<https://www.newyorkfed.org/medialibrary/media/research/epr/12v18n2/1207avra.pdf> (March 20, 2017)
- AIG: “About us / History”. www.aig.com/about-us (February 4, 2017)
- Bank for International Settlement (1999): “Capital Requirements and Bank Behaviour: The Impact of the Basel Accord”, Basel Committee of Banking Supervision Working Papers.
http://www.bis.org/publ/bcbs_wp01.pdf (March 20, 2017)

- Bank for International Settlement (2010): “Basel III: A global regulatory framework for resilient banks and banking systems”, Basel Committee of Banking Supervision.
http://www.bis.org/publ/bcbs189_dec2010.pdf (March 7, 2017)
- Bank for International Settlement (2016a): “STANDARDS: Minimum capital requirements for market risk”, Basel Committee of Banking Supervision. <http://www.bis.org/bcbs/publ/d352.pdf> (March 7, 2017)
- Bank for International Settlement (2016b): “BIS Statistics Explorer – Derivatives Statistics”.
<http://stats.bis.org/statx/toc/DER.html> (March 7, 2017)
- Banks, Erik (2014): “Liquidity Risk – Managing Funding and Asset Risk”, Springer
- Barth, James R., Apanard (Penny) Prabha and Clas Wihlborg (2015): “The Dodd-Frank Act: key features, implementation progress and financial system impact”, Milken Institute.
<http://www.globalbanking.org/reports/The-Dodd-Frank-Act-Key-Features-Implementation-Progress.pdf> (March 20, 2017)
- Beltran, Daniel O. and Charles P. Thomas (2010): “Could Asymmetric Information Alone Have Caused the Collapse of Private-Label Securitization?”, Board of Governors of the Federal Reserve System – International Finance Discussion Papers – Number 1010 – October 2010.
<https://www.federalreserve.gov/pubs/ifdp/2010/1010/ifdp1010.pdf> (March 20, 2017)
- Bord, Vitaly M. and Joao A. C. Santos (2012): “The rise of the originate-to-distribute model and the role of banks in financial intermediation”, FRBNY Economic Policy Review / July 2012.
<https://www.newyorkfed.org/medialibrary/media/research/epr/12v18n2/1207bord.pdf> (March 20, 2017)
- Brunnermeier, Markus K. and Lasse Heje Pedersen (2008): “Market Liquidity and Funding Liquidity”, Princeton University. <https://www.princeton.edu/~markus/research/papers/liquidity.pdf> (March 7, 2017)
- Brunnermeier, Markus K. (2009): “Deciphering the Liquidity and Credit Crunch 2007-2008”, Journal of Economic Perspectives – Volume 23, Number 1 – Winter 2009.
https://www.princeton.edu/~markus/research/papers/liquidity_credit_crunch.pdf (March 7, 2017)
- Caprio Jr., Gerard (2013): “Financial Regulation after the Crisis: How Did We Get Here, and How Do We Get Out”, LSE Special Paper 226.
<http://www.lse.ac.uk/fmg/workingPapers/specialPapers/PDF/sp226.pdf> (March 20, 2017)
- Cetorelli, Nicola and Stavros Peristiani (2012): “The role of banks in asset securitization”, FRBNY Economic Policy Review / July 2012.
<http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.261.2962&rep=rep1&type=pdf> (March 20, 2017)
- Chernenko, Sergey, Sam Hanson and Adi Sunderam (2013): “Rise and Fall of Securitization”.
http://www.people.hbs.edu/shanson/ABS_2013-12-19.pdf (March 7, 2017)
- Copeland, Adam, Antoine Martin and Michael Walker (2014): “Repo Runs: Evidence from the Tri-Party Repo Market”, Federal Reserve Bank of New York Staff Reports, no. 506.
https://www.newyorkfed.org/medialibrary/media/research/staff_reports/sr506.pdf (March 20, 2017)

- Covitz, Daniel M., Nellie Liang and Gustavo A. Suarez (2009): “The Evolution of a Financial Crisis: Panic in the Asset-Backed Commercial Paper Market”, Federal Reserve Board.
<https://www.federalreserve.gov/pubs/feds/2009/200936/200936pap.pdf> (March 7, 2017)
- Danielsson, Jon, Paul Embrechts, Charles Goodhart, Con Keating, Felix Muennich, Olivier Renault and Hyun Song Shin (2001): “An Academic Response to Basel II”, London School of Economics – Special Paper Series No 130. <http://www.bis.org/bcbs/ca/fmg.pdf> (March 20, 2017)
- DB Research (2015): “Money market funds – an economic perspective”.
https://www.dbresearch.com/PROD/DBR_INTERNET_EN-PROD/PROD000000000351452/Money_market_funds_%E2%80%93_an_economic_perspective%3A_Matc.pdf (March 20, 2017)
- Department of the Treasury (2004): “Risk Based Capital Guidelines, Capital Adequacy Guidelines, Capital Maintenance: Consolidation of Asset-backed Commercial Paper Programs and Other Related Issues”.
<https://www.federalreserve.gov/boarddocs/press/bcreg/2004/20040720/attachment.pdf> (March 20, 2017)
- DeYoung, Robert and Tara Rice (2004): “How do banks make money? The fallacies of fee income”, Federal Reserve Bank of Chicago Economic Perspective Q4/2004.
https://www.chicagofed.org/digital_assets/publications/economic_perspectives/2004/ep_4_qtr2004_part3_DeYoung_Rice.pdf (March 7, 2017)
- Du, Julian, Chang Li and Yongqin Wang (2015): “Shadow Banking Activities in Non-financial firms: Evidence from China”.
http://www.cuhk.edu.hk/fin/event/symposium/SEFM_2016_paper_44.pdf (March 20, 2017)
- Elliot, Douglas, Athur Kroeber and Yu Qiao (2015): “Shadow Banking in China: A primer”, The Brookings Institute. https://www.brookings.edu/wp-content/uploads/2016/06/shadow_banking_china_elliott_kroeber_yu.pdf (March 20, 2017)
- Ernst & Young (2014): “The impact of EMIR”, Ernst & Young Accountants LLP.
[http://www.ey.com/Publication/vwLUAssets/EY_The_impact_of_EMIR/\\$FILE/EY-the-impact-of-EMIR.pdf](http://www.ey.com/Publication/vwLUAssets/EY_The_impact_of_EMIR/$FILE/EY-the-impact-of-EMIR.pdf) (March 20, 2017)
- Ernst & Young (2015): “Capital markets reform: MiFID II”, EYGM Limited.
[http://www.ey.com/Publication/vwLUAssets/EY-MiFID-II-client-brochure-the-world-of-financial-instruments-is-more-complex/\\$FILE/EY-MiFID-II-client-brochure-the-world-of-financial-instruments-is-more-complex.pdf](http://www.ey.com/Publication/vwLUAssets/EY-MiFID-II-client-brochure-the-world-of-financial-instruments-is-more-complex/$FILE/EY-MiFID-II-client-brochure-the-world-of-financial-instruments-is-more-complex.pdf) (March 7, 2017)
- European Commission (2014): “Emir: Frequently Asked Questions”.
http://ec.europa.eu/internal_market/financial-markets/docs/derivatives/emir-faqs_en.pdf (March 20, 2017)
- European Parliament (2016): “European System of Financial Supervision”.
http://www.europarl.europa.eu/atyourservice/en/displayFtu.html?ftuid=FTU_3.2.5.html (February 17, 2017)
- Fabozzi, Frank J., Henry A. Davis and Moorad Choudhry (2006): “Introduction to Structured Finance”, Wiley
- Federal Housing Finance Agency (2017): “About Us”. <https://www.fhfa.gov/AboutUs> (March 7, 2017)

- Federal Reserve Bank of New York: "Maiden Lane Transactions".
<https://www.newyorkfed.org/markets/maidenlane.html> (March 7, 2017)
- Federal Reserve Economic Data (2017a): "Money market mutual funds; total financial assets, Level", Federal Reserve Bank of St. Louis. <https://fred.stlouisfed.org/series/MMMFFAQ0275> (March 7, 2017)
- Federal Reserve Economic Data (2017b): "Asset-backed Commercial Paper Outstanding", Federal Reserve Bank of St. Louis. <https://fred.stlouisfed.org/series/ABCOMP> (March 7, 2017)
- Financial Crisis Inquiry Commission (2011): "The Financial Crisis Inquiry Report". http://fcic-static.law.stanford.edu/cdn_media/fcic-reports/fcic_final_report_full.pdf (March 7, 2017)
- Financial Stability Board (2013): "Strengthening Oversight and Regulation of Shadow Banking". https://www.investeurope.eu/uploadedFiles/Home/Political_Advocacy/Policy_Center/130829_FSB_Policy_recommendations_for_Shadow_Banking.pdf (March 7, 2017)
- Financial Stability Board (2015): "Global Shadow Banking Monitoring Report 2015".
<http://www.fsb.org/wp-content/uploads/global-shadow-banking-monitoring-report-2015.pdf> (March 7, 2017)
- Freixas, Xavier and Jean-Charles Rochet (2008): "Microeconomics of Banking", The MIT Press
- Gorton, Gary B. and Andrew Metrick (2009): "Securitized Banking and the Run on Repo", NBER Working Paper Series 15223. <http://www.nber.org/papers/w15223> (March 20, 2017)
- Gorton, Gary B. and Andrew Metrick (2010): "Regulating the Shadow Banking System", Brookings Papers on Economic Activity Fall 2010. https://www.brookings.edu/wp-content/uploads/2010/09/2010b_bpea_gorton.pdf (March 20, 2017)
- Gorton, Gary B. and Nicholas S. Souleles (2007): "The Risk of Financial Institutions – Special Purpose Vehicles and Securitization", University of Chicago Press.
<http://www.nber.org/chapters/c9619.pdf> (March 7, 2017)
- Greenberger, Michael (2010): "The Role of Derivatives in the Financial Crisis", Financial Crisis Inquiry Commissions Hearing.
http://digitalcommons.law.umaryland.edu/cgi/viewcontent.cgi?article=1036&context=cong_test (March 20, 2017)
- International Monetary Fund (2008): "Global Financial Stability Report – Containing Systemic Risks and Restoring Financial Soundness".
<https://www.imf.org/external/pubs/ft/gfsr/2008/01/pdf/text.pdf> (March 17, 2017)
- International Monetary Fund, Bank for International Settlements and Financial Stability Board (2009): "Guidance to Assess the Systemic Importance of Financial Institutions, Markets and Instruments: Initial Considerations". <https://www.imf.org/external/np/g20/pdf/100109.pdf> (March 7, 2017)
- International Swaps and Derivatives Association (2001): "Commodity Futures Modernization Act".
http://www.isda.org/speeches/pdf/Analysis_of_Commodity-Exchange-Act-Legislation.pdf (March 7, 2017)
- Jablecki, Juliusz (2009): "The impact of Basel I capital requirements on banks behavior and the efficiency of monetary policy", International Journal of Economic Science and Applied Research. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1517743 (March 20, 2017)

- Jackson, Patricia (2013): “Shadow Banking and New Lending Channels – Past and Future”, Suerf – The European Money and Finance Forum.
https://www.suerf.org/doc/doc_33e75ff09dd601bbe69f351039152189_2141_suerf.pdf
 (March 20, 2017)
- Kacperczyk, Marcin and Philipp Schnabl (2010): “When Safe Proved Risky: Commercial Paper During the Financial Crisis of 2007-2009”, Journal of Economic Perspectives – Volume 24, Number 1.
<http://www.nber.org/papers/w15538> (March 20, 2017)
- Kacperczyk, Marcin and Philipp Schnabl (2012): “How Safe are Money Market Funds”, NYU Stern.
http://pages.stern.nyu.edu/~sternfin/mkacperc/public_html/mmfs.pdf (March 20, 2017)
- Kolm, Julian (2015): “Securitization, Shadow Banking and Bank Regulation”.
https://homepage.univie.ac.at/julian.kolm/resources/Securitization_and_Bank_Capital_Regulation.pdf (March 20, 2017)
- Kothari, Vinod (2006): “Securitization – The Financial Instrument of the Future”, John Wiley & Sons (Asia) Pte Ltd
- Krishnamurthy, Arvind, Stefan Nagel and Dmitry Orlov (2012): “Sizing Up Repo”, NBER Working Paper Series 17768. <http://www.nber.org/papers/w17768> (March 20, 2017)
- Krugman, Paul (2009): “The Return of Depression Economics and the Crisis of 2009”, W. W. Norton & Company
- Lasak, Piotr (2015): “Regulatory responses to the Chinese shadow banking development”, Jagiellonian Journal of Management vol. 1 (2015), no. 4. www.ejournals.eu/pliki/art/6774/
 (March 20, 2017)
- Liikanen, Erkki (2012): “Final Report”, High-Level Expert Group on reforming the structure of the EU banking sectors. http://ec.europa.eu/internal_market/bank/docs/high-level_expert_group/report_en.pdf (March 7, 2017)
- Lopez, Jose A. and Marc R. Saldenber (2001): “The Development of Internal Models Approaches to Bank Regulation & Supervision: Lessons from the Market Risk Amendment”.
<http://www.frbsf.org/economic-research/files/saldenber.pdf> (March 7, 2017)
- Luttrell, David, Harvey Rosenblum and Jackson Thies (2012): “Understanding the Risks Inherent in Shadow Banking: A Primer and Practical Lesson Learned”, Federal Reserve Bank of Dallas Staff Papers, no. 18. <http://lamfin.arizona.edu/fixi/creditmod/papers/LRT12.pdf> (March 20, 2017)
- Lysandrou, Photis and Anastasi Nesvetailova: “The Shadow Banking System and the Financial Crisis: A securities production function view”, FESSUD Working Paper Series No 5.
http://fessud.eu/wp-content/uploads/2013/04/The-Shadow-Banking-System-and-the-Financial-Crisis-A-securities-production-function-view-FESSUD_Working-Paper-05.pdf (March 7, 2017)
- Mandel, Benjamin H., Donald Morgan and Chenyang Wei (2012): “The role of bank credit enhancements in securitization”, FRBNY Economic Policy Review / July 2012.
<https://www.newyorkfed.org/medialibrary/media/research/epr/12v18n2/1207mand.pdf>
 (March 20, 2017)

- McCulley, Paul (2007): "Teton Reflections", PIMCO. <https://www.pimco.com/en-us/insights/economic-and-market-commentary/global-central-bank-focus/teton-reflections> (March 7, 2017)
- McDonald, Robert and Anna Paulson (2014): "AIG in Hindsight", Federal Reserve Bank of Chicago. <https://www.chicagofed.org/~media/publications/working-papers/2014/wp2014-07-pdf> (March 7, 2017)
- McNamara, Christian M., Michael Wedow and Andrew Matrick (2015): "Basel III Overview", Yale School of Management. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2576939 (March 20, 2017)
- Neave, Edwin H. (2009): "Modern Financial Systems – Theory and Applications", Wiley
- Noeth, Bryan J. and Rajdeep Sengupta (2011): "Is Shadow Banking Really Banking?", Federal Reserve Bank of St. Louis. https://www.stlouisfed.org/~media/Files/PDFs/publications/pub_assets/pdf/re/2011/d/shadow_banking.pdf (March 17, 2017)
- Olson, Peter (2012): "Regulator's role in bank changes", FRBNY Economic Policy Review / July 2012. <https://www.newyorkfed.org/medialibrary/media/research/epr/12v18n2/1207olson.pdf> (March 20, 2017)
- Peterson Drake, Pamela and Frank J. Fabozzi (2010): "The Basics of Finance – An Introduction to Financial Markets, Business Finance and Portfolio Management", Wiley
- Plantin, Guillaume (2012): "Shadow Banking and Bank Capital Regulation", Toulouse School of Economics and CEPR. <http://www.gplantin.net/ShadowBankingAndBankCapital.pdf> (March 20, 2017)
- Pozsar, Zoltan, Tobias Adrian, Adam Ashcraft and Hayley Boesly (2010): "Shadow Banking", The Federal Reserve Bank of New York Staff Reports, no. 458. https://www.newyorkfed.org/medialibrary/media/research/staff_reports/sr458.pdf (March 7, 2017)
- PricewaterhouseCoopers: "Basel IV – The next generation of RWA". <http://www.pwc.com/gx/en/services/advisory/basel-iv.html> (February 27, 2017)
- Rosengren, Eric S., (2014): "Broker-Dealer Finance and Financial Stability", Federal Reserve Bank of Boston. <https://www.bostonfed.org/-/media/Documents/Speeches/PDF/081314text.pdf> (March 7, 2017)
- Saguato, Paolo (2015): "The Liquidity Dilemma and the Repo Market: A Two-Step Policy Option to Address the Regulatory Void", LSE Law, Society Economy Working Papers. https://www.lse.ac.uk/collections/law/wps/WPS2015-21_Saguato.pdf (March 20, 2017)
- Schwarcz, Steven L. (2011): "Regulation Shadow Banking", Review of Banking & Finance Law Vol. 31. http://scholarship.law.duke.edu/cgi/viewcontent.cgi?article=3121&context=faculty_scholarship (March 20, 2017)
- Securities and Exchange Commission (2016): "Money Market Funds". <https://www.sec.gov/spotlight/money-market.shtml> (March 7, 2017)
- Securities Industry and Financial Markets Association (2017a): "US Mortgage-Related Issuance and Outstanding". <http://www.sifma.org/research/statistics.aspx> (February 4, 2017)

- Securities Industry and Financial Markets Association (2017b): “US ABS Issuance and Outstanding”.
<http://www.sifma.org/research/statistics.aspx> (February 4, 2017)
- Securities Industry and Financial Markets Association (2017c): “US GFC Repo Index, Triparty Repo and Primary Dealer Financing (Repo / Reverse Repo)”.
<http://www.sifma.org/research/statistics.aspx> (February 4, 2017)
- Shin, Hyun Song (2008): “Reflections on Modern Bank Runs: A Case Study of Northern Rock”, Princeton University. http://www.imfmetac.org/Upload/Link4_734_106.pdf (March 7, 2017)
- Snowden, Kenneth (2010): “Is this your grandfather’s mortgage crisis?”.
<http://voxeu.org/article/your-grandfather-s-mortgage-crisis-lessons-1930s> (March 23, 2017)
- Swiss Re (2010): “Regulatory Issues in Insurance”, Sigma No 3/10.
http://institute.swissre.com/research/overview/sigma/3_2010.html (March 7, 2017)
- The Federal Reserve System (2015): “Credit and Liquidity Programs and Balance Sheet – Other Lending Facilities”. https://www.federalreserve.gov/monetarypolicy/bst_lendingother.htm (March 7, 2017)
- White, Eugene Nelson (1986): “Before the Glass-Steagall Act: An Analysis of Investment Banking Activities of National Banks”, Explorations in Economic History 23.
https://campus.fsu.edu/bbcswebdav/users/jcalhoun/Courses/Growth_of_American_Economy/Chapter_Supplemental_Readings/Chapter_22/White-Before_the_Glass-Steagall_Act.pdf (March 7, 2017)
- White, Lawrence J. (2010): “Markets – The Credit Rating Agencies”, Journal of Economic Perspective – Volume 24 – Number 2. <http://lamfin.arizona.edu/fixi/creditmod/papers/White2010.pdf> (March 17, 2017)