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The Shadow Banking System - Survey and Typological Framework

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The Shadow Banking System - Survey and Typological Framework[1]

Even though the sector of Non-bank financial intermediaries (NBFI) or shadow banks represent a large part of the contemporary financial system, these institutions received almost no attention in macroeconomic studies so far. Their presence has significant influence on the conduct of monetary policy and systemic risk within the financial system. Therefore, it is important to understand the nexus within the shadow banking sector and connections with the traditional banking sector. This work will examine specific institutions involved in the shadow banking system and their development. A stylized banking sector including NBFI will be introduced and provides the starting point for subsequent research on monetary transmission.

Keywords: shadow banking, financial intermediation, financial architecture, monetary policy

JEL classification: G10; E44

I. Introduction

Financial innovations and development in banking have changed the way businesses and individuals borrow or invest money. Traditionally, commercial banks (depository institutions) were the dominant supplier of credit to firms and households. Banks use short-term deposits to issue long-term loans. This credit intermediation process (credit, maturity and liquidity transformation, as well as lot-size transformation) occurs on balance sheet. Issued loans are held as an investment in a diversified portfolio. However, traditional banking has evolved due to regulation, competition and innovation (see e.g. Pozsar (2008); Rosen (2009) and Blair (2010)). A series of regulatory changes and innovations eroded the competitive advantage of banks and led to the growth of the shadow banking system. The involvement of this hybrid aggregate of institutions and functions in the financial system has increased significantly over time. The gross size of the system has been estimated to be larger than the traditional banking sector. The shadow banking system should be considered as part of a banking system that evolved out of the traditional banking system and combines traditional and innovative banking.

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Therefore, it should be named parallel banking system rather than shadow banking. Shadow banking comprises institutions as finance companies, several managed funds, a complex array of instruments, such as asset backed securities and repurchase agreements, structures and markets that replicate core banking activities. In total, a complex chain of multiple relations between a number of institutions evolved. Each of these institutions perform a different slice of the intermediation process (see therefore Pozsar *et al.* (2010)). So far, regulation has focused on protecting investors rather than on the safety and soundness of the financial institutions. These institutions are therefore barely regulated, have few reporting obligations and need to meet only a few governance standards. They do not benefit from a safety net, like deposit insurance or official guarantees. There are two approaches to understand the growth of the shadow banking system (see also Pozsar & Sigh (2011) and Gorton & Metrick (2010c)).

One approach is to look at the system from the supply side. Due to regulatory constraints traditional banks faced competition from institutional investors, finance companies and broker-dealers. These non-bank financial intermediaries were able to offer higher interest rates through innovative products and insufficient regulatory constraints. Concerning capital regulation, banks were not able to compete with finance companies and broker-dealers, that have not been subject to tight capital regulation as commercial banks are. In order to expand credit issuance depository institutions have to expand existing reserves. The demand for yield uplift and regulatory arbitrage, forced and stimulated traditional banks to change in order to maintain themselves as an industry and stay competitive. As History shows, activity will always flow to the less regulated sector. Consequently, there was a shift from traditional loan issuance and funding (originate-to-hold) to a originate-to-distribute model. Instead of holding loans onto the balance sheet, the originator could easily sell and transfer them off balance sheet. Loans were transfered to specially created special purpose vehicles (SPV) or off balance sheet entities (OBSE). Issued loans were pooled, underwritten and sold as asset backed securities. The originate-and-distribute model allowed for risk associated with loans to be sliced, diced and dispersed (credit risk transfer). Traditional banks were able to free up capital, used to issue further loans to the private sector. This helped traditional banks to manage risk and provided regulatory benefits. The issuance of so called asset backed securities (ABS) grew considerably since the late 1980s, both in the U.S. market and across Europe, and reached its peak in 2007 with almost 3.000 billion Dollar outstanding U.S. ABS and 1.200 billion Dollar asset backed commercial paper. In the event of the crisis, these amounts outstanding decreased to about 1.500 billion Dollar (see, Stein, 2010, p. 45; Gorton & Metrick (2011), Gorton & Metrick (2010c) and Clement (2010)).

Furthermore, the growth of the shadow banking system was also driven by the demand side. For the last decades, there has been an exponential increase of assets

under management. Total market of assets under management accounted about 105 trillion Dollar in 2009 and currently 71,3 trillion Dollar. Managed funds and other institutional investors are important risk takers through investment in securities and other market debt instruments like asset backed securities (ABS), asset backed commercial papers (ABCP) and others. These institutional investors are also interested in safe alternatives to bank deposits, in order to store large amounts of liquid resources. Generally, deposit insurance works well. Still, it is limited to an relatively small level. Therefore, institutional investors, such as managed funds, cash-rich non-financial companies and states do not have any access to safe, short-term and interest earning investment. This led to the use and growth of the repurchase agreement market. A Repurchase agreement is defined as the simultaneous sale of a security combined with the agreement to repurchase the same collateral at a specific contracted date and price. Institutional investors appeared as a lender in order to store their liquid resources safe and backed by a collateral. The increased use of repurchase agreement transactions led in turn to an increasing demand of high quality collaterals. This growth in demand of collaterals can be posited as driver of securitization. The amount of resources engaged in the repo transactions increased. Since 2002, the volume doubled until 2008 and was estimated to about 10 billion Dollar in the U.S. and Euro Area. Double counting is possible, since the market is intransparent and there is little to no data available. High-quality structured products were used as collaterals to raise short-term liquidity in a repurchase agreements transaction. Both main forces (demand side and supplier side) were assisted by governmental decisions and regulatory changes that allowed securitization and repurchase agreements transactions, as well as innovative product design (see therefore, Gorton (2010), Gorton & Metrick (2010c), Clement (2010) and Committee on the Global Financial System - Bank of International Settlement, 2003, p. 8/9). Furthermore, specialization of financial intermediaries within the shadow banking system led to the growth of the system and benefits from economies of scale and further comparative advantages (Pozsar *et al.*, 2010).

So far, the financial system is insufficiently represented in macroeconomic studies. The sector of non-bank financial intermediaries (NBFI) received almost no attention. Financial institutions, respectively the financial sector can be understood as a connection between the central bank and the real sector. As NBFI represent a large part of the contemporary financial system, their presence might have significant influence on the transmission mechanism and the conduct of monetary policy, as well as the systemic risk. It is therefore important, to understand the nexus between the participants, in order to avoid financial imbalances. Literature so far concentrates more on a descriptive analysis: how the parallel banking system developed before and within the crisis. Often, important participants and instruments are presented, but yet an integrated framework or further explanation on interconnections are missing. This paper provides a review of the shadow banking system, that evolved within the last three decades symbiotically with traditional banking.

We will provide insight on how the system is composed, which entities participate and financial instruments are used. Therefore, the second section will provide a literature overview concerning recent research on shadow banking institutions and activities. In section three we will analyze the balance sheets and the development of the specific institutions of the shadow banking system. Furthermore we will examine instruments and transaction used by shadow banking institutions, e.g. repurchase agreements and ABS issuance. Based on these findings, section four will introduce a stylized shadow banking sector. This stylized simple model will include the institutions of the shadow banking system and how they are connected with each other. The framework provides a basis for subsequent research on the influence of the shadow banking system on monetary transmission, central bank actions and the possibility of systemic risk.

II. Literature

During the last decades an array of literature concerning shadow banking has come up. The term non-bank financial intermediary (NBFI) became due to its significant growth more and more object of research (see therefore, McCulley (2007), Clement (2010)). Already, Thorn (1958), Ettin (1964) and Patinkin (1961) made contributions to the issue of NBFI as a non-regulated financial intermediary and their influence on monetary policy. McCulley (2007) was first to use the term shadow banking, describing highly leveraged and unregulated financial institutions that do not benefit from a safety net or other official guarantees.

Adrian & Shin (2009), Farhi & Cintra (2009) as well as Financial Crisis Inquiry Commission (2010), Pozsar (2008) and Pozsar *et al.* (2010) provide an overview of the institutions and instruments engaged in the shadow banking system. Pozsar *et al.* (2010) and Pozsar (2008) were first to catalogue types of shadow banks. Therefore, they map and describe the shadow banking system as a daisy chain of financial intermediaries that conduct credit intermediation. They present the shadow banking system as a network of risk originators, securitization vehicles and risk bearers connected by using different financial instruments. The map of the shadow banking network is a complex framework fitted to the U.S. market. The Financial Crisis Inquiry Commission (2010) also describes the nature and scope of the shadow banking system. It therefore offers a definition of the system and an overview of important institutions and instruments. However, there is no closing explanation on interconnections and how the institutions interact with each other. Furthermore, just selected components (institutions and instruments) of the shadow banking system independently and not as a system are presented. The article also outlines the role of the shadow banking system in the event of the crisis. Farhi & Cintra (2009) discuss the interaction among different financial intermediaries within the shadow banking system. Though, the paper has a more descriptive character on how the

system evolved over time and which drivers led to the growth. It lacks an integrated framework to describe how the participants of the system interact. Furthermore, brief indications concerning improved regulation and supervision are made. Pozsar *et al.* (2010), Acharya & Richardson (2009), Financial Crisis Inquiry Commission (2010) and Farhi & Cintra (2009) introduce a general definition of the shadow banking system.

There is a multitude of work concentrating on the event of the crisis and the role of the shadow banking system within. Many analyses of the financial crisis highlighted the growth of the shadow banking sector and the collapse during the crisis. Blair (2010) examines the development of the shadow banking system and financial innovations from a more legal perspective. She points out that regulators are confronted with the growth of the new financial sector and mentions key drivers of development. Although, main institutions of the system are looked upon, they are not combined into a framework. Also, regulatory approaches as the Dodd-Frank Act are addressed. Adrian & Shin (2009) compare the shadow banking system respectively the marked based financial system with the bank based financial sector. The authors highlight the growth of the system and point out some implications for further regulation. However the system is described on a descriptive basis and lacks a framework to describe the interaction among shadow banking intermediaries. Rosen (2009) provides information about the evolution of the U.S. financial system as a shift from traditional banking to shadow banking. Furthermore, the author focuses on the role of the shadow banking system, increasing interconnectedness and leverage of financial intermediaries, and the crisis as a logical outcome. Stein (2010) provides a short overview of the securitization process, how it developed in the event of the crisis and how it is conducted within the shadow banking system. Stein also mentions single participants of the shadow banking system. However, these participants are not combined into an integrated framework. Furthermore, the article yields some regulatory approaches of securitization and suggests some implications for future regulation. Fuchita (2011) suggests implications to regulate shadow bank intermediaries and to enlarge the safety net. The existing literature so far concentrates on descriptive analysis: how the system developed before and within the crisis and what are important aspects that led to the growth of certain parts of the financial system.

Gorton & Metrick (2010c) document the development of the shadow banking system over the last three decades. The article describes the important features of the sector, as securitization, repurchase agreements and money market mutual funds, and the interconnection of these within the system. Just as the previous literature, the authors describe important features of the system. A simple framework with the basic structure of the system is shown, but does not cover all participants and instruments. Furthermore, the paper proposes principales for regulation and how to implement those. Like Gorton & Metrick (2010c), Krishnamurthy *et al.* (2011)

also analyzes the repo lending by money market funds as a major funding source of the shadow banking system, to understand the role of repos within the parallel banking system and a factor of the financial crisis.

III. Institutions and Entities

III.1. General Definition

Like traditional banks, shadow banks or non-bank financial intermediaries (NBFI) intermediate between borrowers and lenders of financial resources. They operate parallel to the formal banking system and provide credit, liquidity, and money-like financial instruments with slight regulatory structure that governs banks and other depository institutions that offers central bank liquidity or public sector guarantees. NBFI are highly leveraged in comparison by the formal banking system. They borrow short in rollover debt markets, and invest in longer-term and illiquid assets (Acharya *et al.*, 2010b, p. 319, Acharya *et al.*, 2010a, p. 2-3 and Blair, 2010, p. 3). The interaction of different intermediaries and the use of several instruments forms a intricate system. This broad definition encompasses broker-dealers (investment banks), insurance companies (including monolines), financial companies, managed funds, such as hedge funds, money market funds, various off balance sheet entities and other vehicles that aggregate and hold financial assets (Acharya & Richardson, 2009, p. 117 and Financial Crisis Inquiry Commission, 2010, p. 7 and 23). Off balance sheet entities in this context are not classified as financial intermediary, since they do not intermediate directly between borrowers and lenders. OBSE are in fact more of an auxiliary construction for the purpose of securitization.

Several instruments linked to the shadow banking system are mentionable. Shadow banks also issue loans to the private sector. Anyhow, other than traditional depository institutions they do not fund loans by accepting deposits. Special off balance sheet entities raise funds through issuance of financial market debt instruments backed by a pool of assets, like ABS, MBS, CDO and short-term ABCP. Furthermore, managed funds and other institutional investors receive liquid resources from households and businesses in exchange for deposit-like fund shares. They design a portfolio consisting of different financial market debt instruments and store remaining resources repurchase agreement transactions.

Following an approach similar to Pozsar (2008), we will classify the entities and instruments below in a more simple way into institutions and instruments involved in the issuance of loans (risk originators), creation of securities (loan warehousing and ABS issuance) and institutions that invest in these instruments (risk bearers). Risk originators, like depository institutions, finance companies and broker-dealer provide loans to the private sector, businesses and consumers. Entities involved in

loan warehousing and security issuance are OBSE. Investors of instruments issued by risk originators through OBSE are commercial banks, broker-dealer, managed funds, such as hedge funds and money market funds, and insurance companies. Some institutions may behave as risk originator or risk bearer, depending on the kind of transactions they undertake. For the purpose of the framework, important participants and instruments as well as their development will be analyzed.

III.2. Risk origination - Loan issuance

III.2.1. Depository institutions

The group of depository institutions or Monetary Financial Institutions (MFI) comprises credit institutions and all other financial institutions whose business is to receive deposits and/or close substitutes for deposits from entities and, for their own account, to grant credit and/or invest in securities (European Central Bank, 2004, p. 115 and Cohen, 2004, p. 48). Deposits are often payable on demand and issued to a large number of different businesses and individuals (private sector). Primarily, these funds are used for loans to the private sector. In the U.S. banking system the definition of depository institutions includes commercial banks, saving institutions and credit unions. Commercial banks account for about 80 to 90 % of the total assets of depository institutions in the United States. Therefore, only commercial banks will be taken into account. In the Euro Area the group of MFI includes credit institutions, central banks, money market funds and other institutions[2]. For the following remarks, only credit institutions will be taken into account.

Mainly, depository institutions issue loans to households, businesses and other customers. Furthermore, they invest parts of their funds in debt instruments as well as mutual fund shares. Currently, total assets of Euro Area credit institutions amount 31.073 billion Euro. The level of assets grew constantly from 2000 until the fourth quarter of 2008 up to a value of 30.556 billion Euro. Followed by a decline to 29.911 billion Euro in 2009 (fourth quarter)[3]. The observed credit institutions issue 50 to 55 % of their assets as credits to households, firms and other capital market participants. Total assets of U.S. commercial banks amount 12.631 billion Dollar in July 2011 (Board of Governors of the Federal Reserve System Table H.8.)[4]. U.S. commercial banks by comparison issue 75 to 85 % of their assets as loans to the private sector (see figures 6 - 9 appendix).

[2]See also `http://www.ecb.int/stats/pdf/money/mfi/mfi_definitions.pdf`
[3]See, `http://www.ecb.int/stats/money/aggregates/bsheets/html/index.en.html`
[4]See, `http://www.federalreserve.gov/releases/H8/default.htm`

The liability side of depository institutions is dominated by deposits. Credit institutions in the Euro Area found 50 % of their assets through deposits on the liability side. U.S. commercial banks receive funding through deposits up to an amount of 70 %. During the crisis 2007 - 2009 there had been no significant decrease of depository funding. Furthermore, credit institutions and commercial banks also fund themselfes through issuance of financial markt instruments, capital and reserves, and borrowings like interbank loans (see figures 6 - 9).

III.2.2. Broker-Dealer (investment banks)

Investment banking includes a rather heterogeneous set of activities, which can be classified as follows: (1) traditional investment banking, (2) trading and brokerage, and (3) asset management. Traditional investment banking can be considered as advisory work, assisting in transactions, such as merger, acquisition, or debt restructuring, and underwriting services, assisting in raising capital on financial markets. Trading and brokerage includes the purchase, sale and brokerage of securities either for their own account (proprietary trading) or the account of others (brokerage). Last, asset management and securities services imply managing investors money, using traditional (i.e. open end mutual funds) and alternative investment strategies (i.e. real estate funds, hedge funds etc.) (Iannotta, 2010, p. 1-2 and Morrison & Wilhelm, 2008, p. 21 f.).

Investment banks mediate between sellers and buyers of securities. They will sell issued securities in order to raise money that corporations need (Fleuriet, 2008, p. 34). Investment and commercial banking can be performed by one bank and is labeled "universal banking". In the past, universal banking was prohibited in some jurisdictions (e.g. USA). Therefore, the Banking Act of 1933 (Glass-Steagall Act) was enacted to prevent commercial banks from engaging in investment bank activities. The Financial Modernization Act of 1999 (Gramm-Leach-Bliley Act) repealed the existing separation between investment and commercial banks (Iannotta, 2010, p. 6; for further insight, see Barth *et al.*, 2000 and Barth *et al.*, 2008). Since 2011, depository institutions and especially broker-dealers are subject to the Volcker Rule (included in Dodd-Frank (Wall Street Reform and Consumer Protection) Act of 2010) that prohibits insured depository from proprietary trading and restricts the investment in hedge and private equity funds (see, `http://www.sifma.org/issues/regulatory-reform/volcker-rule/overview/`).

Broker-dealer balance sheets differ in a strong way from those of conventional depository institutions. Unlike depository institutions, investment banks or broker-dealers do not take deposits as main funding source. Their importance in the supply of loans has increased with securitization. In the 1960s already, broker-dealers got a number of companies to finance themselves through the issuance of com-

mercial paper (CP). Later on, securitization was one of the first activities where broker-dealers compete with commercial banks. On the assets side of the balance sheet, investment banks hold 25 % credit market instruments, such as commercial papers, asset backed securities, equity and shares, and different kinds of bonds (corporate/EM bonds and municipal bonds). About 50 % of the asset side are miscellaneous assets including loans. About 20 % of the liability side is owed by a parent or funded through direct investment (miscellaneous liabilities). Furthermore, 50 % of the broker-dealers balance sheet is funded through security credit due from commercial banks, households and the rest of the world, and 20 % through repurchase agreements (Board of Governors of the Federal Reserve System, 2011, L.129, see figure 10).

III.2.3. Finance Companies

Finance companies are either independent financial firms (consumer and commercial finance companies, leasing companies and factors) or captive financing subsidiaries of non financial corporations (e.g. Capital One, GMAC/Ally Finance) (Carey *et al.*, 1998, p. 848). In the United States, they are important suppliers of credit to businesses and consumers next to depository institutions (Financial Crisis Inquiry Commission, 2010, p. 28). However, unlike banks, finance companies do not take deposits. Instead, they must raise funds by issuing commercial paper and other short and medium term debt instruments to finance their loans (Tucker, 2010, S. 3). Finance Companies raise large amounts through issuance of debt instruments and lend credits in smaller amounts to borrowers. Depository institutions by comparison, collect deposits in small amounts and make large loans. Because, finance companies do not receive deposits, they are not subject to bank regulation and therefore, have no access to discount window or deposit insurance. There do not exist regulation constraints concerning the assets they hold or how to raise funds. They are therefore enabled to provide customized loans better than banking institutions (Mishkin & Eakins, 2008, W-2 and Dynan *et al.*, 2002, p. 7)[5].

The issuance of short and medium term debt instruments represents an important source of funding. The proportion amounts more than 60 % of all funding sources. In 2010, finance companies issued an amount of 879 billion Dollar in debt instruments, such as commercial papers. They also obtain funds by borrowing from banks (about 5 to 10 %) and the parent company (about 15 %) (captive finance comany). Finance companies operate from narrow equity base. The proportion of capital, surplus and undivided profits amounts less than 10 % (237 billion Dollar). Currenty, U.S. finance companies hold 1.810 billion Dollar of assets. About 65 to 75 % are issued as loans, such as real estate, business or consumer loans. In 2010

[5]See, `http://wps.aw.com/wps/media/objects/2095/2146070/CH26.pdf`

(third quarter) the amount of loans issued leveled up to 1.396 billion Dollar. Furthermore, finance companies invest about 25 % in other assets, as debt instruments (Board of Governors of the Federal Reserve System, 2011, L.127 and Board of Governors of the Federal Reserve System Table G.20, see figures 11 - 13)[6].

III.3. Risk bearers - wholesale funding

III.3.1. Assets under management - institutional investors and managed funds

Conventional assets under management

In this context, we define institutions that invest in debt instruments issued by risk originators. With the purchase of these instruments the risk associated with the underlying asset moved from the risk originator's balance sheet to the risk bearer. Depository institutions and broker-dealer may also act as risk bearers. They purchase debt instruments and hold them in a diversified portfolio on their balance sheet. Alongside these institutions, different institutions specialized in asset management can be defined as risk bearers, e.g. investment funds. The following section will describe types of assets under management, and especially mutual funds, money market funds and hedge funds, as shadow bank depositors.

Global fund management includes conventional funds, such as pension funds, mutual funds and insurance companies, and alternative funds, such as hedge funds, private equity funds and exchange traded funds. Conventional funds under management account about 71,3 trillion Dollar. Combined with alternative funds the global fund management industry totaled around 105 trillion Dollar by the end of 2009 (Maslakovic 2010a). Here, we will focus on mutual funds and particularly money market funds as conventional assets under management and hedge funds as alternative funds.

Mutual funds, as conventional asset management funds, invest in a diversified portfolio of securities, such as stocks, bonds, money market instruments, and/or combinations of these assets. The fund pools resources from investors, such as individuals, businesses, and other financial institutions through the sale of mutual fund shares. In this way, it is possible for mutual funds to refinance the portfolio of assets. Through collective investment, each investor benefits from professional investment management, diversification, liquidity, and other benefits. Fund shares are "redeemable", i.e. investors can sell their shares back to the fund (or to a broker acting for the fund) at any time. Basic types of mutual funds are stock (also called

[6]See, `http://www.federalreserve.gov/releases/g20/hist/`

equity), bond and money market funds (Investment Company Institute, 2010, p. 217; Investment Company Institute, 2007, p. 3)[7].

The total assets of investment funds amount worldwide 17.362 billion Euro (third quarter 2010). Following a decline of 27 % in 2008 mutual fund assets increased by 21 % in 2009. About 50 % of the mutual fund assets are accounted to the U.S. financial sector. 35 % of the investment fund assets are located in the Euro Area (European Fund and Asset Management Association - International Statistical Release and Supplementary Tables, see figures 14 a) and b))[8].

Money Market Funds (MMF) are collective investment schemes that invest in mainly short-term high credit quality and liquid debt instruments, such as government securities, commercial paper (CP), certificates of deposit (CDs), discount notes, and other short-term securities, or provide repurchase agreement (repo) financing. Mainly, MMF are classified upon the clients they serve and the securities they invest in (e.g. prime MMF, government MMF and treasury funds). MMF offer a bank like service: almost instant liquidity and predicative safe deposit-like money (save haven). Funds may be withdrawn any time with little or no penalty. By comparison with banks, money market funds earn a slightly higher yield relative to yields earned by deposit accounts. However, unlike depository institutions, MMF are not guaranteed by deposit insurance or similar government guarantees (Tucker, 2010, p. 2; Financial Crisis Inquiry Commission, 2010, p. 23).

The portfolio mix of MMF is affected by guidelines set by security regulators (and rating agencies). In the U.S. the Securities and Exchange Commission (SEC) regulates credit quality, issuer concentration and maturity of assets that MMF can hold in their portfolio in accordance with Rule 2a-7[9] adopted pursuant to the Investment Company Act of 1940. In Europe, MMFs comply with the Undertakings for Collective Investments in Transferable Securities (UCITS) Directive. The Committee of European Securities Regulators (CESR) published guidelines for harmonized MMF. Funds that comply with the UCITS Directive also adopt these guidelines. Dollar funds domiciled in Europe adopt the code of practice by the Institutional Money Market Funds Association (IMMFA). These guidelines are very similar to the restrictions under Rule 2a-7 (Baba *et al.*, 2009, p. 68; Fund and Asset Manager Rating Group, 2010, p. 2 and Gorton & Metrick, 2010b, p. 6/7).

Similar to mutual funds, 60 % of MMF assets are located in the United States and

[7]See also `http://www.sec.gov/investor/pubs/inwsmf.htm`

[8]See, `http://www.efama.org/index.php?option=com_docman&task=cat_view&gid=76&Itemid=-99`

[9]Rule 2a-7 includes restrictions to the portfolio mix concerning credit quality, diversification, maturity and liquidity as well as rules around ongoing operation, reporting and transparency.

30 % in the Euro Area financial system. The level of MMF global total assets accounted 3.359 billion Euro in 2010. Worldwide, MMF account for about 19 % of the mutual fund assets (European Fund and Asset Management Association - International Statistical Release and Supplementary Tables, see figures 15 a) and b))[10]. U.S. mutual funds engage about 40 % of available funds in credit market instruments. Shareholder of MMF shares are households, corporate business, state and local governments, other funds and insurance companies, and funding corporations. With about 45-50 %, households maintain the major proportion of MMF shares. Funding corporations hold about 25 % of the total U.S. MMF shares (see figures 16 and 17).

Alternative assets under management

Mutual Funds, more intended for retail clientel, are restricted under Rule 2a-7. Unlike mutual funds or in particular MMF, hedge funds are restricted to a small number of sophisticated customers and therefore, do not need to be registered (so-called "private adviser" exemption). The term "hedge fund" has no precise legal or universally accepted definition. According to the SEC, hedge fund refers to "an (unregulated) entity that holds a pool of securities and perhaps other assets that does not register its securities under the Securities Act and which is not registered as an investment company under the Investment Company Act" (SEC definition "hedge funds"[11]). Hedge funds invest in equity and use leverage and short selling to "hedge" the portfolio's exposure to movements of the equity market. They adopt a variety of investment strategies and styles (Sami, 2009 and United States Securities and Exchange Commission (2003)).

Lately, hedge funds have faced calls for stricter regulation. The Financial Stability Board (FSB) was established in April 2009 following the G-20 London summit. This new body was extended to all financial institutions important to global financial stability and included large hedge funds for the first time. Congress passed a major regulatory reform, that makes numerous changes to the registration, reporting, and recordkeeping requirements of the Investment Advisers Act of 1940 – the Dodd-Frank (Wall Street Reform and Consumer Protection) Act of 2010. Advisers to many private funds (hedge funds and private equity) in the USA must now register with the SEC (Title IV "Regulation of Advisers to Hedge Funds and Others") [12]. In 2009, the European Commission also published a proposal for a Directive on Alternative Investment Fund Managers (AIFMD) to establish EU level regulation. The directive enables hedge fund managers to conduct business in each member

[10] See, http://www.efama.org/index.php?option=com_docman&task=cat_view&gid=76&Itemid=-99

[11] Available at http://www.sec.gov/news/studies/hedgefunds0903.pdf

[12] See therefore, http://www.sec.gov/spotlight/dodd-frank/hedgefundadvisers.shtml

state through one registration. The AIFMD will effect about a third of the almost 90 % of EU-domiciled hedge funds assets (Maslakovic 2010b).

In 2010, the global hedge fund assets under management amount 1.920 billion Dollar. Still, this level is below the record of 2.150 billion Dollar at the end of 2007. The hedge fund industry has become more and more concentrated over the last years. In 2003 the top 100 hedge funds accounted for about 54 % of the total industry. Currently, 70 % of the industry total assets are under management of one percent of all hedge funds. With less liquid and more volatile markets hedge funds shrank their balance sheets by de-leveraging, simplifying their strategies and heading to core competencies (see figure 18; Maslakovic, 2010b).

III.3.2. Repurchase Agreements

In the run up to the financial crisis of 2007-2009 an increase in the level of repo transactions was denoted (see Gorton & Metrick (2010b)). The demand for repo grew with the rapid growth of institutional investors, such as mutual funds, pension funds, hedge funds, and other managed funds. These institutions do not come under deposit insurance. Therefore, institutional investors do not have access to a safe, short-term, demand deposit-like product, which earns interest, while retaining flexible. Furthermore, repurchase agreements transactions describe an important source of funding for e.g. dealer banks (Gorton & Metrick (2010a), see also King, 2008, for institutional features of the repo market, e.g. Duffie (1996), Garbade (2006), Federal Reserve Bank of New York (2010)).

Sale and repurchase agreements, or repos, present a type of short term funding, used by a variety of market participants, like institutional investors and non financial firms with large holdings to store cash safely, earn some interest and have ready access. Depository institutions and broker-dealer use repo transactions to finance inventories, to create leverage, to cover short positions or to hedge and speculate in interest rate movements. A repo transaction involves the simultaneous sale of a security (collateral) and the agreement to repurchase the security at a later date at an upon agreed higher price. Furthermore, institutional investors, such as different mutual funds, insurance companies or corporate treasures use these transactions either to invest surplus cash and earn returns, or to raise cash for investments (Hördahl & King, 2008, p. 38, see figure 1 for a simple model of the repurchase agreement structure). NBFI largely use repurchase agreements for funding (e.g. broker-dealer) or investment purpose (e.g. MMF). The difference between the purchase price and sale price is the interest rate, also known as repo rate. A repo transaction can also be viewed as a short term collaterlised loan, where the lender of the security posts an asset as collateral with a cash provider (Gorton & Metrick,

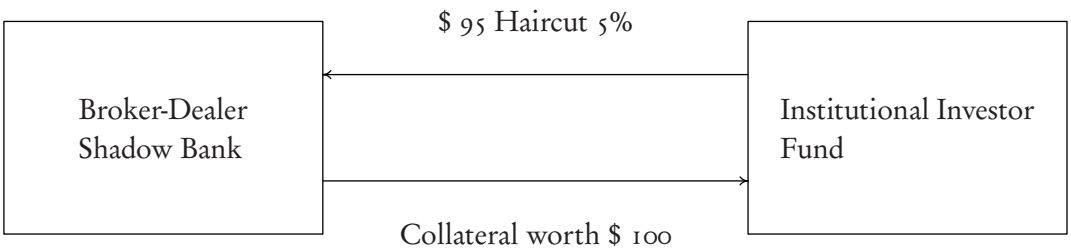

Figure 1: Structure of a repurchase agreement transaction. Author's drawing on basis of Krishnamurthy et al., *2011, p. 11*

2010a, p. 508 and Hördahl & King, 2008, p. 37).

Collaterals can be distinguished in traditional collaterals, such as treasuries and agency securities, and non-traditional collaterals, such as ABS, MBS, corporate debt, equity etc. Depending on the type of collateral the depositor may demand a margin or haircut. Typically, the borrower has to post a collateral in excess of the notational amount of the loan (overcollateralization). This haircut is defined as risk control measure applied to the underlying asset. The value of the collateral is calculated as marketable value reduced by a certain percentage. Haircuts are used to protect the depositor from losses due to declines in the market value (European Central Bank, 2011, p. 143). Repo haircuts vary with the risk of the underlying collateral. The haircut is defined as $(1 - C/F)$ with value of the collateral C and notational amount of the loan F. Prior to the crisis haircuts on non-traditional collaterals, especially ABS were extremely low (2 %). In the course of the crisis haircuts rose to more than 50 % (see also; Gorton & Metrick (2009); Stein, 2010, p. 46 and Krishnamurthy *et al.*, 2011, p. 8 f.).

Data available on repurchase agreement transactions is limited due to intransparency. Furthermore, double countings are possible. Available data on repurchase agreements in the Euro Area refers to liabilities of MFI. MFI (e.g. credit institutions) use repos for refinancing purpose. The amount borrowed in repo transactions by MFI constantly increased until October 2008 and reached a peak level of 310 billion Euro. Thereafter, there was a slight decline until January 2010 and increased up to an amount of 426 billion Euro currently (see figure 14)[13]. U.S. commercial banks and broker-dealers were able to borrow an amount of 2.215 billion Dollar using repo transactions in 2007 (3rd quarter). Followed by a sharp decline until 2009, the before mentioned institutions borrow now 985 billion Euro (1st quarter 2011). Major lenders in repo transactions are MMF (with a fraction of almost 60

[13]See, `http://www.bundesbank.de/statistik/statistik_eszb_indikatoransicht.php?liste=www_outstanding_amounts_42`

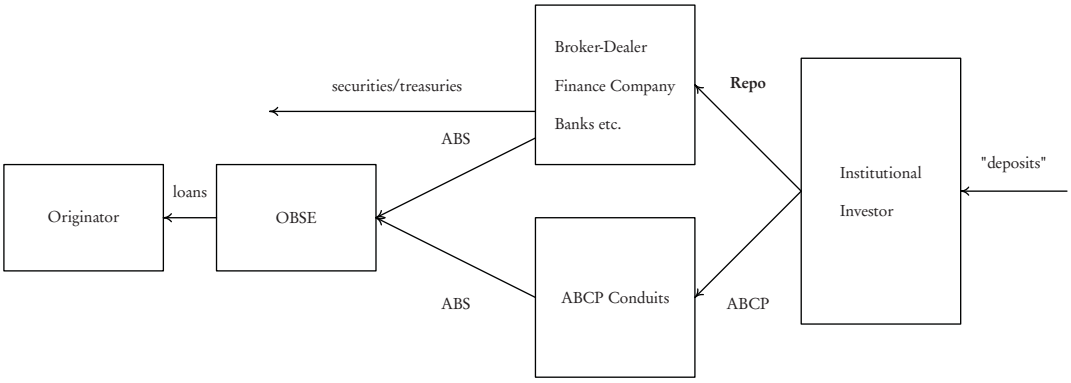

Figure 2: Funding of the shadow banking system via repurchase agreement transaction. Author's drawing on basis of Krishnamurthy et al., *2011, p. 2*

%), mutual funds, pension funds and others. The level of resources used in a repo transactions amount about 726 billion Dollar (1st quarter 2011) (see figures 19 and 20, (Board of Governors of the Federal Reserve System, 2011, Table L.207)).

III.4. Securitization process - loan warehousing and ABS issuance

While moving from traditional financing to shadow banking, there has been a rise in structured finance. Structured finance encompasses arrangements that serve refinancing and hedging of any economic activity beyond the scope of conventional forms of on balance sheet securities at low agency and capital costs. Securitization and credit derivatives are the two major classes of structured finance. For our purpose we will concentrate on securitization for funding purpose (Jobst, 2005/2006, p. 2). Securitization denotes a financing process where illiquid assets (loans and other receivables) are pooled and transformed into liquid financial instruments. Generally, the securitization process follows a particular pattern. The originator (e.g. bank, finance company) transfers a portfolio of assets to a special purpose vehicle (SPV) (pooling of loans). The SPV in turn issues rated securities backed by this portfolio (Sachverständigenrat, 2007, p. 108). This securitization process converts loans that have been held on-balance sheet into marketable securities that are sold and traded by the SPV. Banks, that sell their loans into the securitization

market, are able to distribute the risk associated with the assets across a wider range of investors, rather than taking on the entire risk themselves (credit risk transfer) (Stein, 2010, p. 44).

SPV, also known as Off Balance Sheet Entities (OBSE), are legal entities created for the purpose to transfer assets (loans) off the balance sheet of the originating firm (risk originator). These special purpose entities are thinly capitalized and have no management or employees. Administrative functions are performed by a trustee. Due to constrained business activity and limited ability to incure debt, OBSE might face the risk of shortfall of cash below what they have obligated to pay investors. Securitization transactions rely on the quality of the underlying assets. Therefore, in most transactions it is essential to design the right legal and financial structure to receive the requested rating. This structural support is usually referred to as credit enhancement and can be provided in a multitude of different ways. Following internal and external forms of credit enhancement could be provided: overcollateralisation, cash collateral account, letter of credit, credit insurance, financial guarantee insurance, and subordination. OBSE are created as bankruptcy remote. The insolvency of the originating firm does not have any impact on the OBSE. In case of bankruptcy procedure of the originator, their creditors can not seize assets of the OBSE. Furthermore, the OBSE itself, can not become legally bankrupt (for more information, see Gorton & Souleles, 2005, p. 560; Bär, 1997, p. 104; Schepers, 2006, p. 259 and Gorton & Metrick, 2010b, Deloitte und Touche GmbH Wirtschaftsprüfungsgesellschaft, 2011, p. 90).

We distinguish between true sale and synthetic securitization. In a true sale transaction the originator actually sells and transfers the legal title and the physical position of the underlying assets off the balance sheet to the SPV. The originator in turn receives a purchase price for the assets sold in the transaction. The off balance sheet entity issues securities backed by the assets purchased. This transaction allows the originator to free capital (asset swap of illiquid assets into liquid resources) and therefore, reduce capital requirements. With the liquid resources received, the originator can either meet liabilities or use them to issue new loans to the private sector. In a synthetic transaction the originator transfers only the credit risk not the legal title to the OBSE using credit derivatives. The physical position remains on the originator's balance sheet and no transfer of the legal title occurs (Deloitte und Touche GmbH Wirtschaftsprüfungsgesellschaft, 2011, p. 87). The sale of an asset position to an OBSE is generally a funded risk transfer, whereas, there are some instruments that solely transfer the credit risk, but do not provide funds at the time the risk is transfered. For further considerations, we will concentrate on securitization of asset portfolios via OBSE rather than direct transactions or single name transaction (Committee on the Global Financial System - Bank of International Settlement, 2003, p. 5).

Furthermore, ABS transactions are distinguished by payment structure, i.e. how the payment flow (interest rates and amortization) is treated. In a pass-through structure the cash flow generated by the underlying asset portfolio is pooled and distributed directly to the investor. With the investment made, the investor purchase a share of the payment flow. Regarding cash flow and risk, all investors acquire an equal position. Pay-Through-Structures on the other hand give the investor a proportional claim against the asset pool. Investors receive differing interests and amortization in a subordinated structure (waterfall principle). In the most common cases, OBSE issue tranches of securities to the market in a hierarchic structure (AAA first and following AA, A, BBB, BB and so on). Payments on assets as well as losses are distributed in a predefined order. This results in different risk profiles (rating) of the different tranches. The equity tranche (first loss piece), with the lowest rating, is exposed to the highest credit risk. Losses are first distributed to the first loss piece (FLP). On the other side, the senior tranche, with the highest rating, is exposed to the lowest credit risk. Payments are allocated in the senior tranche first (Deloitte und Touche GmbH Wirtschaftsprüfungsgesellschaft, 2011, p. 86ff., for a simple model of the securitization structure see figure 3).

Securities issued by OBSE in the securitization process are referred to as asset backed securities (ABS). They are defined as one major group of capital market structured finance products, mostly used for refinancing purpose. ABS is also a collective term and includes all other classes. ABS in a wide sense are classified by their maturity, underlying pool of assets and the payment structure (pass-through or pay-through). Depending on the underlying asset class we differentiate between ABS in a narrow sense (traditional ABS), mortgage-backed-securities (MBS), collateralized-debt-obligations, and short-term asset-backed commercial papers (ABCP). The underlying asset pool of ABS in a narrow sense mostly consists of trade and credit card receivables, consumer credits and lease contracts. MBS, a large part of ABS, are ordinarily based on a pool of residential mortgages (RMBS) and commercial mortgages (CMBS) (Deloitte und Touche GmbH Wirtschaftsprüfungsgesellschaft, 2011, p. 10 and Ricken, 2008, p. 39). CDOs are securitized loan- and bond portfolios, including mezzanine tranches of securitzied portfolios (CLO - collateralized loan obligations, CBO - collateralized bond obligations, and CFO - collateralized fund obligations). The repeated securitization of ABS tranches is also known as resecuritization and can be carried out several times (see Pozsar (2008) Matryoshka CDOlls - multi-layered structured credit products) (Ricken, 2008, S. 56, Jobst, 2005/2006 and Deloitte und Touche GmbH Wirtschaftsprüfungsgesellschaft, 2011).

Also, asset backed securities are classified by their defined time to maturity into term transactions (traditional ABS, MBS and CDO) and short-term ABCP-programs. ABCP constitutes a short term, not market-listed debt instrument, backed by collaterals. Depending on maturity, OBSE are also classified into OBSE for term transactions and ABCP conduits. Term transactions have a minimum time to ma-

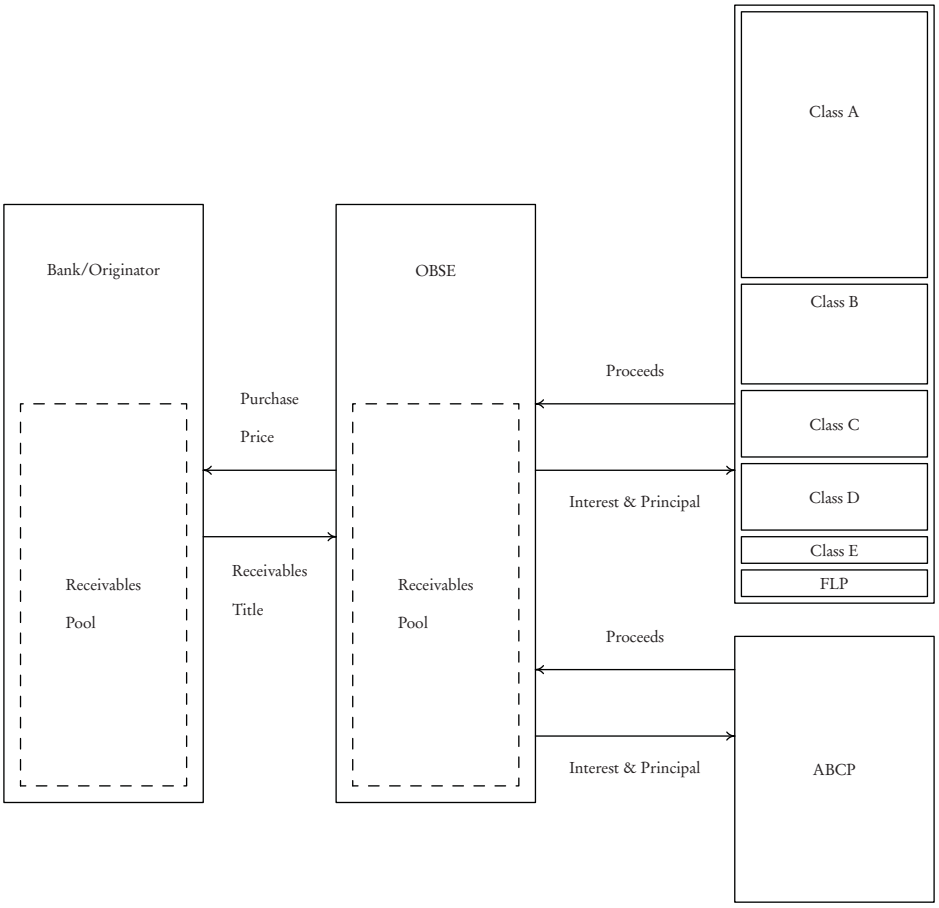

Figure 3: Simple securitization structure of asset backed securities and asset backed commercial papers with OBSE (FLP - First Loss Piece). Author's drawing based on Deloitte und Touche GmbH Wirtschaftsprüfungsgesellschaft, 2011, p. 108 and 111.

turity of two years and receive therefore a long term rating for any individual tranche (Ricken, 2008, p. 40 and Deloitte und Touche GmbH Wirtschaftsprüfungsgesellschaft, 2011, p. 91). Short-term ABCP are normally used to refinance long-term assets. Therefore, ABCP-programs and associated conduits are set up permanently to issue revolving ABCP. In general, OBSE for term transactions are set up as single-seller entities. ABCP conduits are OBSE that finance the purchase of receivables primarily through issuing short term debt instruments (ABCP). These conduits are generally built as multi-seller conduits. Usually, ABCP-conduits form a holding structure, where one OBSE purchases assets of many originators and another OBSE issues the short term debt instruments. There is a number of securitization program types and combinations of credit and liquidity support mechanisms (Ricken, 2008, p. 40/41; for more specific details on ABCP conduit types, see DBRS, 2009, p. 8-11 and Moody's Investor Services, 2003.).

In the beginning of 2008, the issuance of securitized debt instruments sharply decreased (see figures 21 and 22). After 2008 the issuance in Europe and the U.S. evolved differently. Volumes in the U.S. market sharply decreased, but slowly increased in 2009 and 2010. Furthermore, it is observable that the U.S. market was the major issuer of securitized products. In the U.S. market, the peak of asset backed securities outstanding was reached in 2007 with almost 3.000 billion Dollar ABS and 1.200 billion Dollar ABCP outstanding. Important underlying assets have been home equity - commercial and residential mortgages - (about 30 %) and others to be securitized in CDOs (about 45 %). In the 1990th the major underlying collaterals have been credit card loans with about 50 %. They amount currently about 10 %. In the Euro Area the issuance of asset backed instruments also sharply decreased in 2008. Also, mortgages and real estate loans can be considered as major underlying and rangined between 53 % (2010) and 76 % (2010) of total issuance. Compared to the U.S. market, CDO account a relativly small fraction. As well as the long-term securitization market, the ABCP market reached the peak in 2007 and then constantly decreased (see figure 21).

IV. Simple Framework of the shadow banking system

IV.1. Traditional banking and shadow banking

In macroeconomic studies, the financial sector is so far insufficiently represented. Non-bank financial intermediaries or shadow banks received almost no attention so far. However, NBFI represent a large part of the contemporary financial system and are estimated to be larger than the traditional banking sector. NBFI have significant influence the monetary transmission mechanism (see Smaghi (2010)). Furthermore, shadow banking institutions may be considered as a source of systemic risk either directly or indirectly, through interconnectedness with the traditional

banking system (see FSB - Financial Stability Board (2011) and Weidmann (2011)). Understanding the nexus between the participants is key to avoiding future financial imbalances. To achieve a more resilient financial system it is necessary to map the relevant financial value chain, to identify shadow banks and their specific risk. To receive a better understanding of the financial sector and how this interconnectedness of different institutions within the system and with traditional banks influence monetary transmission and financial stability, the NBFI sector should experience greater attention. Therefore, we introduce a simple framework of the shadow banking system that is supposed to constitute an starting point for subsequent research on the significance and influence of the non-bank financial intermediaries. Following the previous findings about major balance sheet positions and structure, the model will picture the basic structure of the system. It comprises the main institutions involved in credit issuance and risk origination, loan warehousing and securitization, and the wholesale funding. Also, the framework will focus on the main instruments used by the shadow banking institutions in the intermediation process, such as issued asset backed bonds and repos. With the presented model we will be able to show the main interconnections within the system and traditional banks.

Traditionally, banks appear as intermediary between lender and borrower of financial capital (see figure 4). In the first step, the depository institutions accept deposits from consumers and businesses. These deposits can be withdrawn with little or no penalty any time. The bank in turn uses these deposits to fund loans and mortgages issued to borrowers and receive a collateral in exchange. Through the flow of funds into and out of the banking system, banks have the ability to create vast amount of money. This credit intermediation process provides information and risk economies of scale (diverse loan portfolios and reduced costs of monitoring and screening). Credit intermediation involves credit, maturity, and liquidity transformation. Liquidity transformation refers to the use of liquid liabilities in order to fund illiquid positions of the asset side. Maturity transformation can be specified as short-term funding of long-term loans. Credit transformation is defined as enhancement through use of priority or guarantees. Traditional depository institutions are generally enhanced by government sector guarantees, e.g. insured deposits, loan guarantees and state guarantees (Pozsar *et al.*, 2010, p. 8, Gorton & Metrick, 2010b, p. 2 and FCIC p. 10).

Like traditional banks, NBFI also provide credit intermediation, but without access to a central bank or public sector guarantees (official enhancement). Furthermore, the credit intermediation process is sliced and performed through a daisy-chain of entities and binds shadow bank intermediaries into a network. Within the system, risky, long-term loans are transformed into seemingly credit-risk free, short-term, deposit like instruments (e.g. fund shares). The securitization process of the

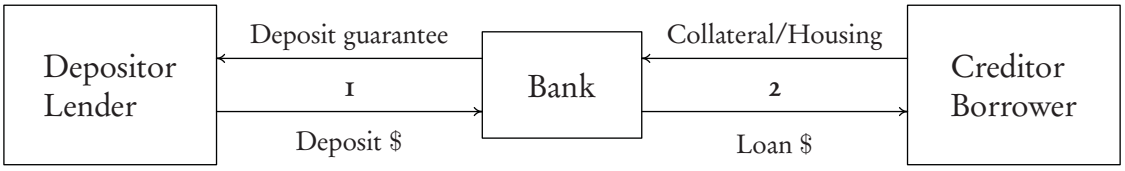

Figure 4: Traditional banking intermediation process. Author's drawing based on Gorton & Metrick, 2010b, p. 45.

shadow banking system explains why there are fewer deposits made by the private sector than loans issued. Actions of the shadow banking system are not directly and officially enhanced by official guarantees. Shadow banks within the system benefit from economies of scale and further comparative advantages (Pozsar *et al.* (2010), Pozsar & Sigh (2011) and Stein (2010)).

In the shadow banking system (see figure 5), loan issuance and funding process is sliced into loan issuance, loan warehousing, ABS issuance and funding, and conducted by different specialized institutions. Loan issuance in the shadow banking sector is not only conducted by banks, but also by broker-dealers and finance companies. These shadow banks in a narrow sense do not collect deposits as a funding source of loan origination and therefore, heavily rely on funding through repo, commercial paper and other debt instruments (e.g. ABCP, ABS etc.) (Pozsar *et al.*, 2010, p. 48). Compared to traditional banking, depositors do not entrust their money only with banks. They invest their sources with specialist non-bank financial intermediaries, called shadow bank depositors, like money market funds and similar funds. These are institutional investors invest according to the investment strategy in a portfolio of loans and ABS, ABCP, and CDO. A significant part of their funds is used for repurchase agreement transactions with broker-dealers, finance companies and others (Krishnamurthy *et al.*, 2011, p. 10).

IV.2. Stylized (shadow) banking sector

IV.2.1. Loan origination and securitization

Within the stylized banking system we set banks and shadow banks in a narrow sense (broker-dealer and finance companies) as loan originators. Their task is to originate/issue loans to the private sector, as households, firms and other financial market actors.

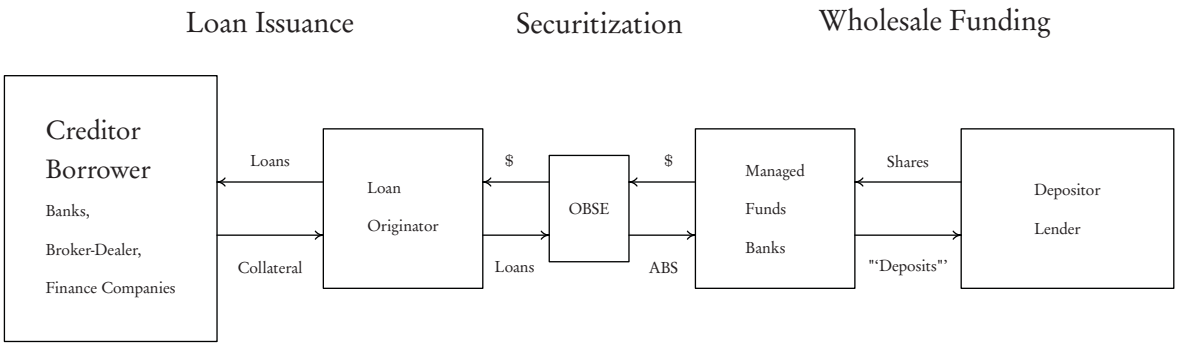

Figure 5: Simplified image of the shadow banking credit intermediation chain. Author's drawing based on Gorton & Metrick, 2010b

Commercial banks are assumed to have the following assets: required reserves rD, where D are the deposits of the non-bank sector and r is the required reserve rate, loans L_b supplied to the private sector (households and firms $L_b = L_b^h + L_b^f$), loans L^s supplied to shadow banks in a narrow sense (broker-dealer and finance companies), loans issued to other banks (interbank loans) K^s, debt instruments/bonds issued by OBSE B_o^b and institutional investors/funds B_i^b, and excess reserves E. Liabilities of commercial banks are deposits D, loans issued by other banks K^d, surplus and capital C_b, and $repo^b$ issued by institutional investors or the central bank. Furthermore, banks grant credit enhancement on form of credit lines to OBSE L^o. As a contingent liabilities they cannot be included and do not appear on the balance sheet. Commercial banks are also able to sell parts of the loan portfolio to OBSE in exchange with with liquid resources reserves, hence the sold loan position moved off the balance sheet $-L_b^o$. These liquid resources are used for new loan origination. Therefore, liquid resources are enclosed in the balance sheet position loans issued by the bank L_b. The relationship between interbank and central bank loans is defined as follows $K^s + K_c = K^d$. For the sake of simplicity, required reserves hold with the central bank rD and deposits D of the private sector will be consolidated to $(1-r)D$ on the liability side of the balance sheet. The balance sheet of commercial banks reads:

$$L_b - L_b^o + L^s + B_o^b + B_i^b + K^s + E = (1-r)D + repo^b + K^d + C_b$$

Shadow banks (in a narrow sense) encompass broker-dealer and finance companies. They play an important role in the credit market. Their loan issuance is not regulated, as they do not receive deposits or hold reserves with the central bank. Shadow banks are assumed to have the following assets: loans to the private sector L_s (households and firms $L_s = L_s^f + L_s^h$), debt instruments/bonds issued by OBSE B_o^s and institutional investors/funds B_i^s, and a limited amount of bank deposits D_s. On the liability side shadow banks are financed by repurchase agree-

ment transactions $repo^s$ with institutional investors/funds, issuance of commercial papers to institutional investors/funds CP, loans issued by banks L^s, and surplus and capital C_s. Like banks, shadow banks in a narrow sense are also able to sell parts of the loan portfolio to OBSE $-L_s^o$ and receive liquid recourses in exchange. Their balance sheet reads as:

$$L_s - L_s^o + B_i^s + B_o^s + D^s = repo^s + CP + C_s + L^s$$

OBSE serve solely for securitization purpose. They purchase parts of a loan portfolio or the whole pool of loans $L_b^o + L_s^o$ in exchange with liquid resources (asset swap). The purchase of loans is refinanced through issuance of structured debt instruments (ABCP, ABS etc.) to commercial banks, shadow banks and institutional investors. The process of purchasing loans and selling debt instruments occurs unu actu. In case of credit failure, OBSE have access to credit lines granted by commercial banks to meet their claims. Their balance sheet reads as:

$$L_b^o + L_s^o = B_o$$

IV.2.2. Shadow bank depositors (wholesale funding)

Managed funds or institutional investors play an important role for the refinancing of banks and shadow banks in a narrow sense. We therefore name them shadow bank depositors. In our framework we assume, that shadow bank depositors have the following assets: debt instruments issued by OBSE B_o^i, issued by firms B_f, all surplus and capital $C = C_f + C_b + C_s$, and commercial papers issued by shadow banks CP. Furthermore, they offer repurchase agreements to banks and shadow banks. The asset side is financed through the issuance of fund shares to the private sector B_i. We assume that the private sector will not actively manage a portfolio of financial assets, but transferring this task to funds and therefore, gain claims out of fund shares. Their balance sheet reads as follows:

$$B_o^i + B_f + CP + repo_i + C = B_i$$
$$C = C_f + C_b + C_s$$

IV.2.3. Private sector and central bank

Households possess a given endowment of financial funds, (NFW - Net financial wealth) an endogenous outcome of an intertemporal consumption-saving decision

as it represents the accumulated stock of savings. Households could invest these funds in physical assets like housing H, financial assets/shares of managed funds B_i^h, and deposits D^h. Typically, housing will be financed by loans issued by commercial banks and shadow banks in a narrow sense L^h. Housing will serve as a collateral. The household balance sheet reads:

$$D^h + H + B_i^h = NFW + L^h$$

Firms possess a physical capital stock PC, deposits D^f, and shares issued by managed funds B_i^f. Deposits of the firm are used for transaction purpose only. These assets are financed by refinancing debt instruments B_f, loans issued by commercial banks and shadow banks L^f, and surplus and capital C_f. The balance sheet reads as follows:

$$PC + B_i^f + D^f = L^f + B_f + C_f$$

Central bank holds loan receivables towards commercial banks K_c and issues repurchase agreements $repo_c$, only to commercial banks. Furthermore, the balance sheet discloses minimum reserves rD and reserves R from commercial banks. The balance sheet reads:

$$K_c + repo_c = rD + E$$

The following common relationships apply:

Loans:	$L_b + L_s = L_b^h + L_b^f + L_s^h + L_s^f = L^h + L^f$
Reserves:	$K^s + K_c = K^d$
Fund Shares:	$B_i = B_i^f + B_i^h + B_i^b + B_i^s$
OBSE issued securities:	$B_o = B_o^b + B_o^i + B_o^s$
Deposits:	$D = D^h + D^f + D^s$
Repo:	$repo_i + repo_c = repo^s + repo^b$

Aggregation of all balance sheets results in the equation:

$$PC + H = NFW$$

We introduced a calculus of the shadow banking system in order to provide a foundation for subsequent research. Prospectively, the resulting balance sheet equations of the main institutions can be used to outline the interconnections between single participants. Based on these findings, we will be able to derive optimal decisions about structure and size of the institution's balance sheet. In subsequent research equilibrium conditions can be determined.

V. Summary

The present literature on non-bank financial intermediaries so far does not fully describes the system as an integrated framework. Most work concerning shadow banking systems concentrates on a descriptive analysis of the system in the event of the financial crisis 2007 - 2009. Furthermore, detailed information about effects of interconnections with the traditional banking system and within the shadow banking system on financial stability and monetary transmission are not given sufficiently. The paper provides a simple framework of the shadow banking system and describes main institutions and transaction made by the participants. To design a basic framework with reference to Pozsar (2008) we structured the system as follows in risk originators, loan warehousing and securitization, and risk bearers. An analysis of empirical data identifies significant balance sheet positions and their development over the last decade, and also emphasizes the development in the course of the crisis 2007-2009, according to the empirical results. The framework is able to show possible interconnections between the shadow banks and the traditional banking sector, and other participants within the shadow banking system. In comparison with recent literature the framework combines institutions into a integrated framework. We do not offer a mere descriptive analysis of single institutions and their development over time. The basic structure is designated as initial point for subsequent research on monetary transmission and operations, and how connections between banks and shadow banks might influence.

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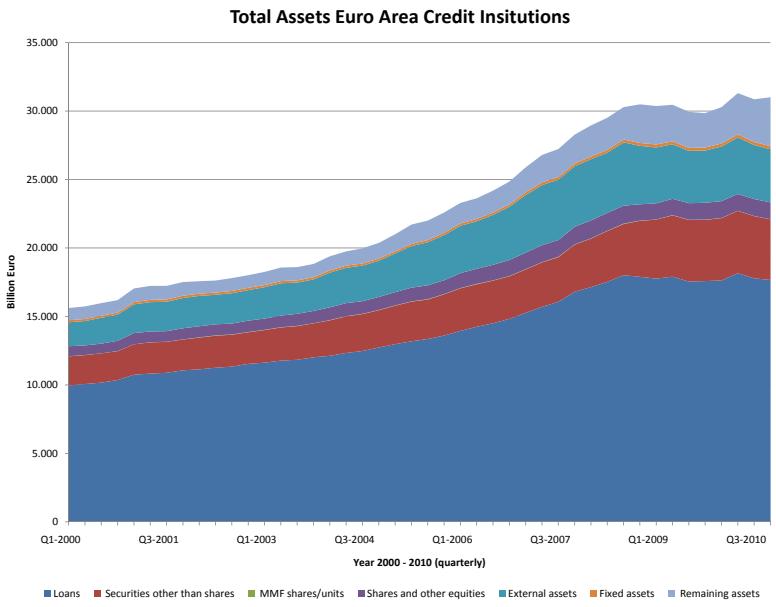
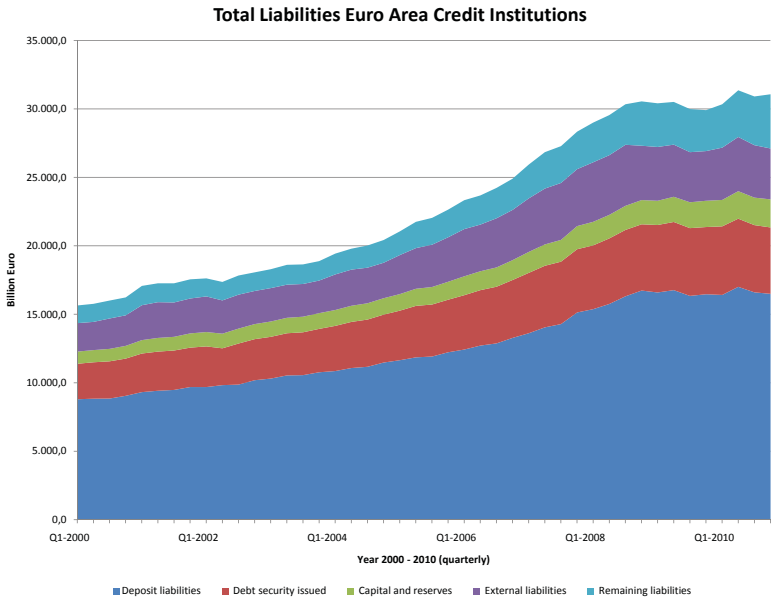
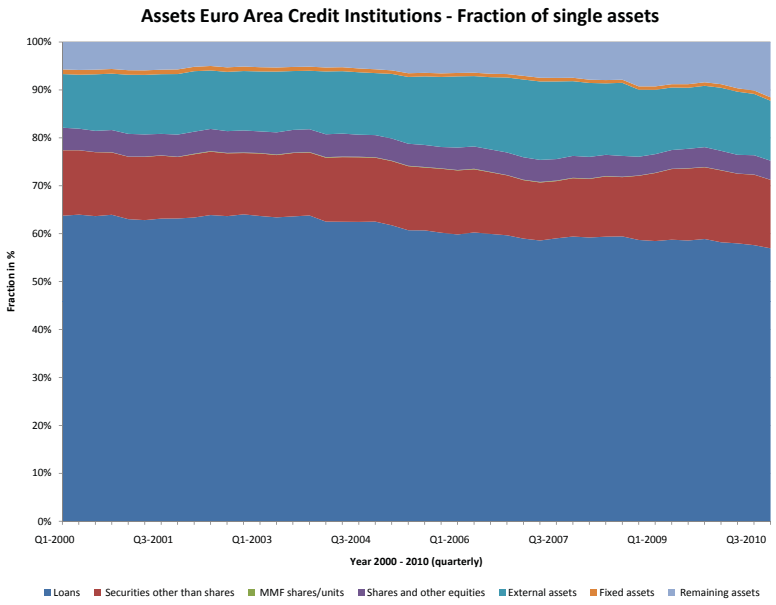


(a) Total assets credit institutions - level of assets.

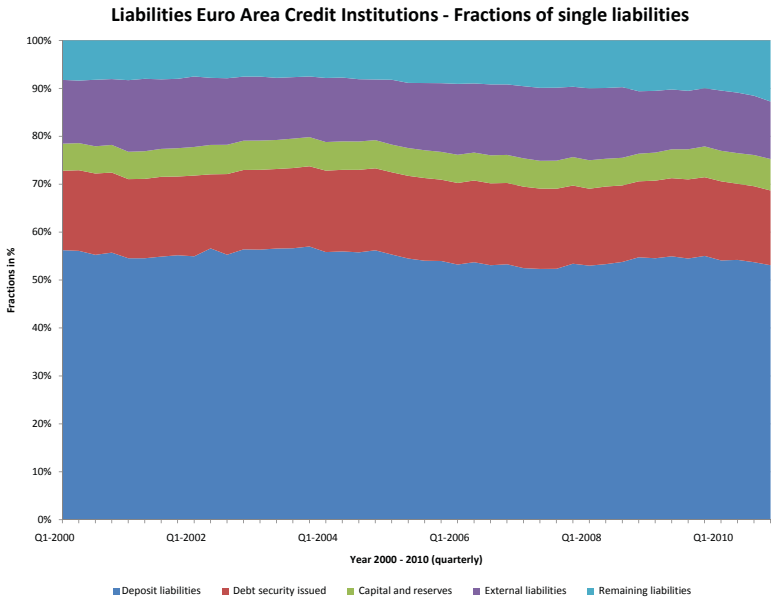


(b) Total liabilities credit institutions - level of liabilities.

Figure 6: Aggregated balance sheet of euro area credit institutions 2000 - 2010 (quarterly). Source: ECB monetary and financial statistics.

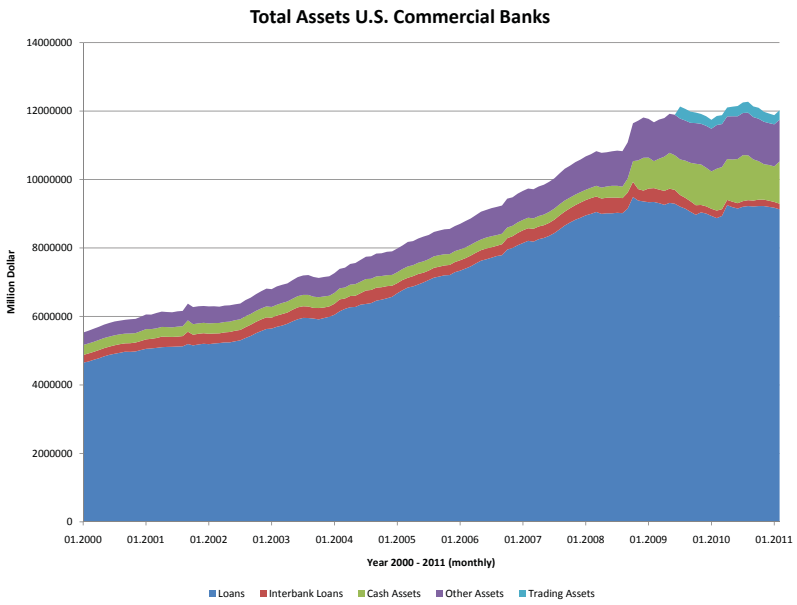


(a) Assets credit institutions - fractions of singe asset classes.

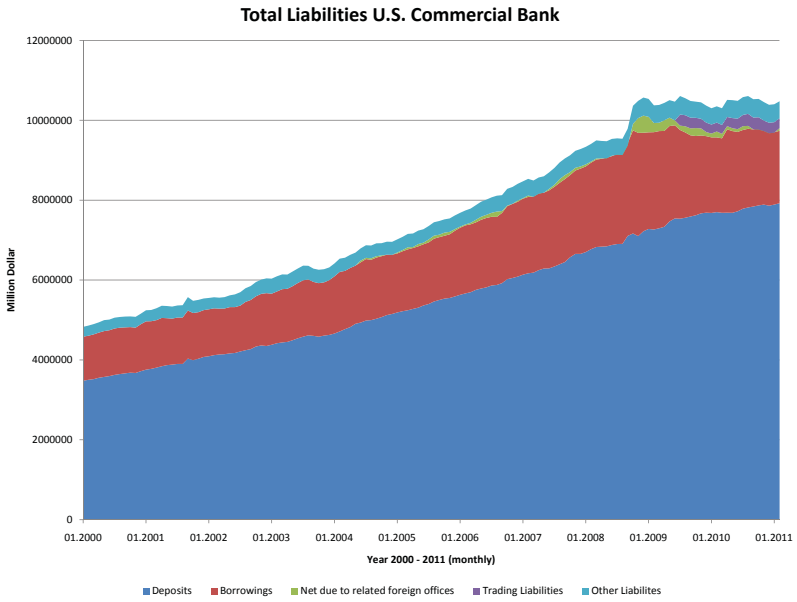


(b) Liabilities credit institutions - fraction of singe liability classes.

Figure 7: Aggregated balance sheet of euro area credit institutions 2000 - 2010 (quarterly). Source: ECB monetary and financial statistics.

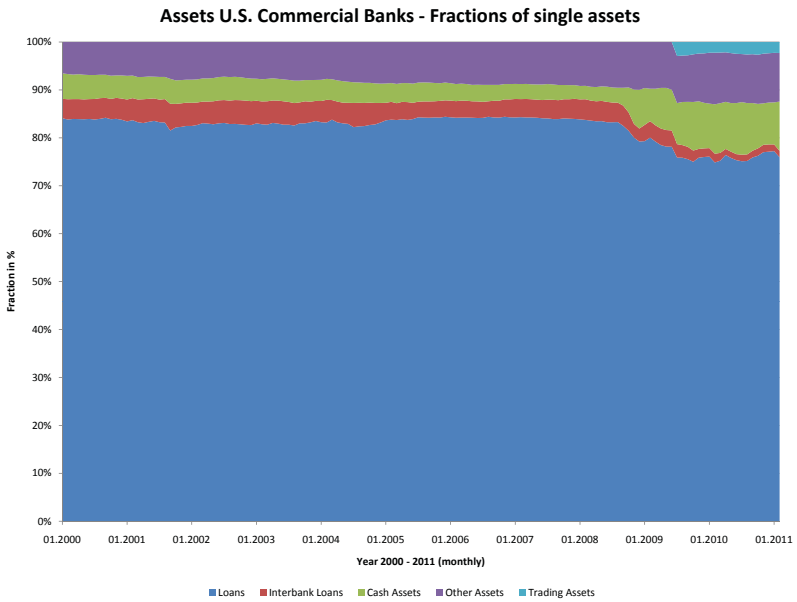


(a) Total assets commercial banks - level of assets.

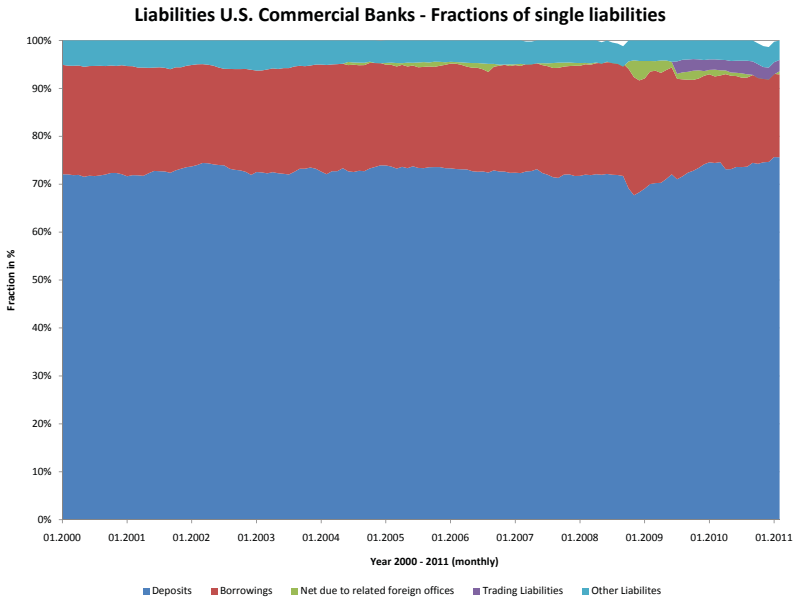


(b) Total liabilities commercial banks - level of liabilities.

Figure 8: Aggregated balance sheet of U.S. commercial banks 2000 - 2011 (monthly). Source: Board of Governors of the Federal Reserve System, Table H.8.

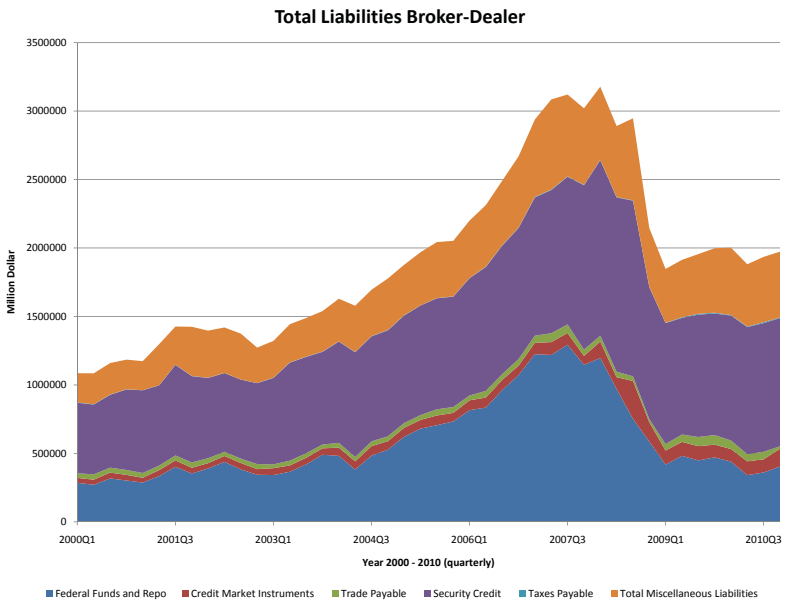


(a) Assets commercial banks - fraction of singe asset classes.

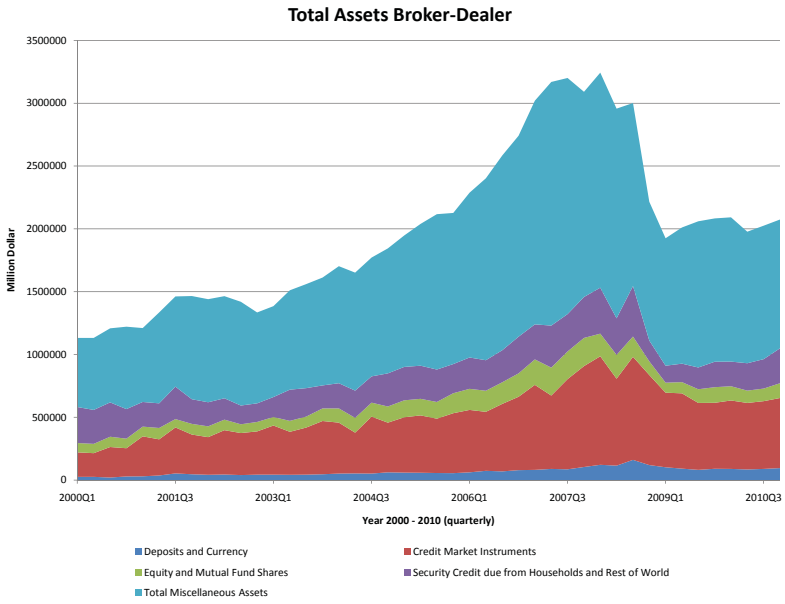


(b) Liabilities commercial banks - fraction of singe liability classes.

Figure 9: Aggregated balance sheet of U.S. commercial banks 2000 - 2011 (monthly). Source: Board of Governors of the Federal Reserve System, Table H.8.

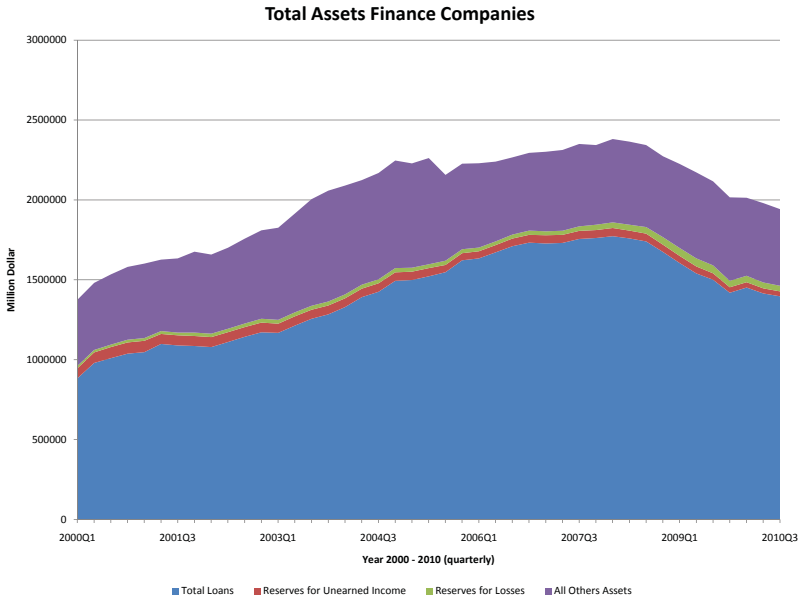


(a) Total assets broker-dealer - level of assets.

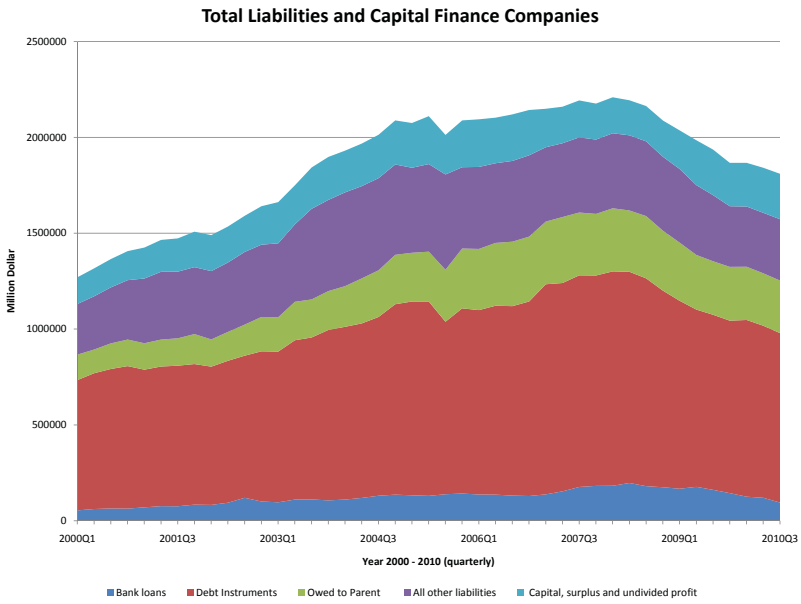


(b) Total liabilities broker-dealer - level of liabilities.

Figure 10: Aggregated balance sheet of U.S. Broker-Dealer 2000 - 2011 (quarterly). Source: (Board of Governors of the Federal Reserve System, 2011, Table L.129)

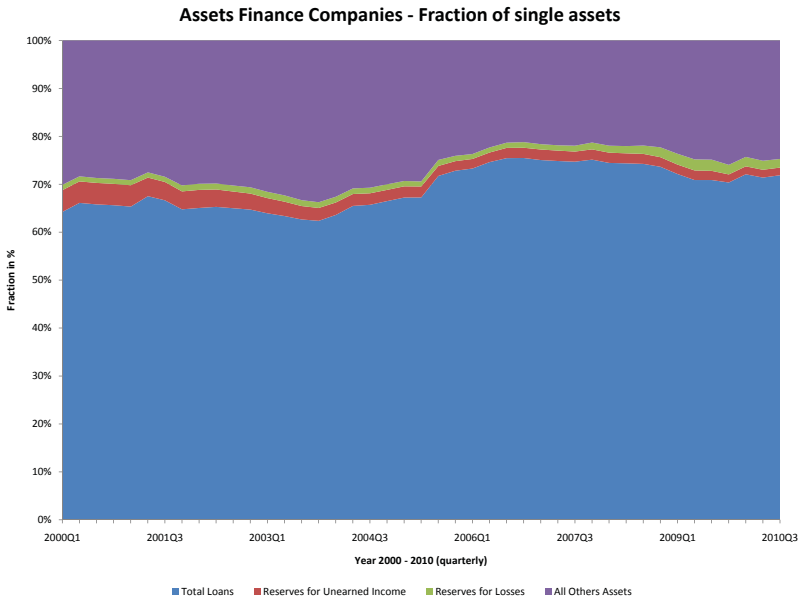


(a) Total assets finance companies - level of assets.

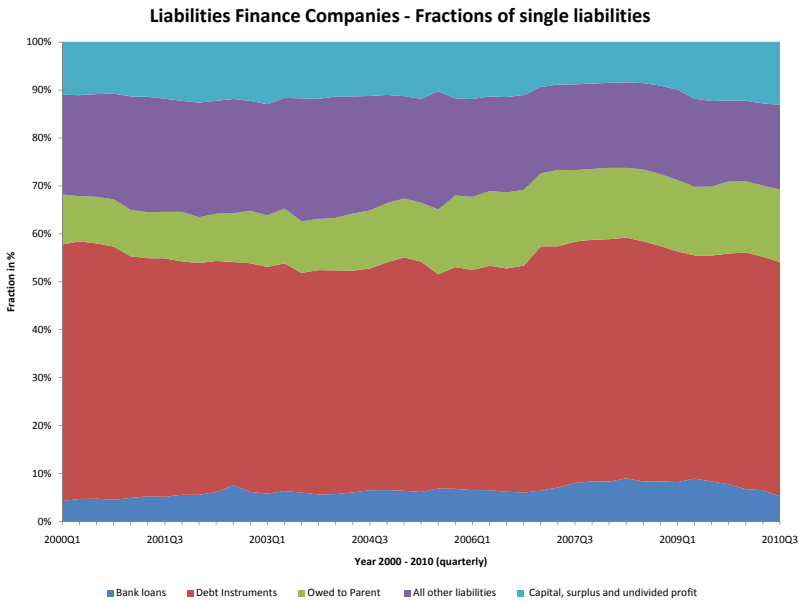


(b) Total liabilities finance companies - level of liabilities.

Figure 11: Aggregated balance sheet of finance companies 2000 - 2010 (quarterly). Source: Board of Governors of the Federal Reserve System, Table G.20 and (Board of Governors of the Federal Reserve System, 2011, Table L.127).

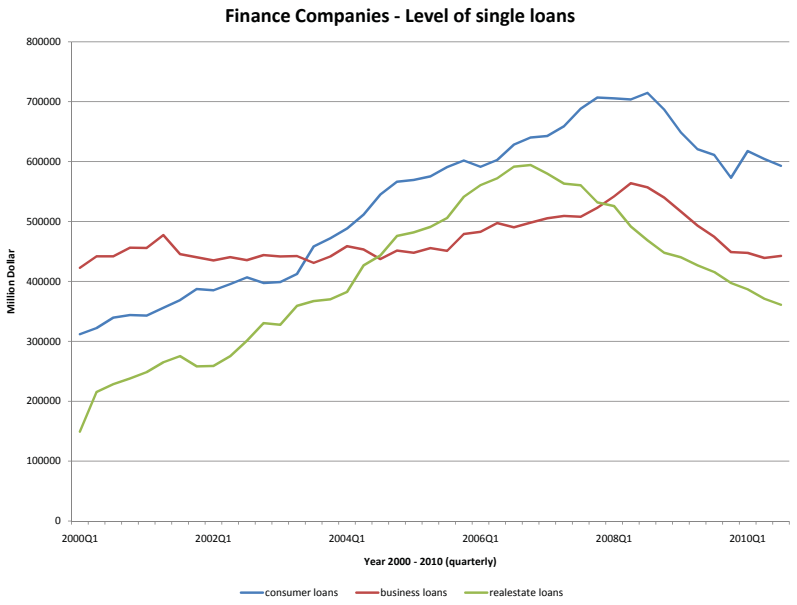


(a) Assets finance companies - fraction of single asset classes.

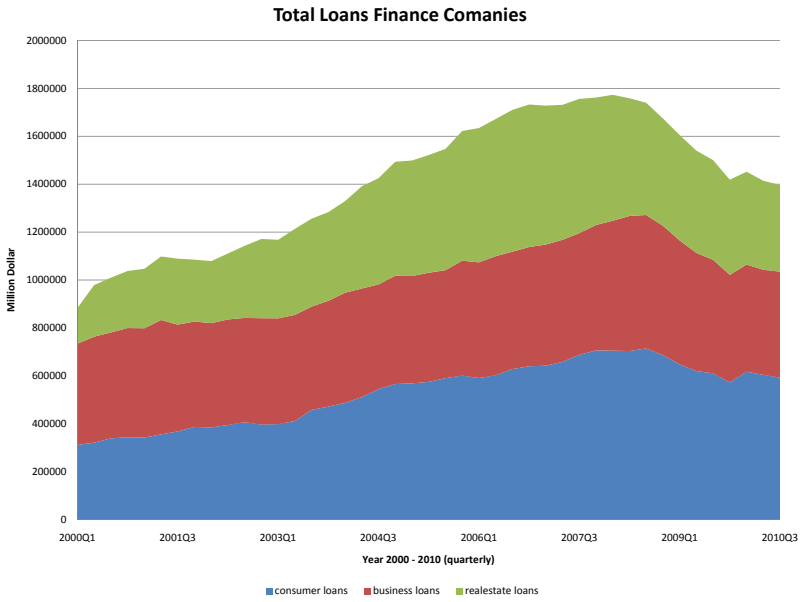


(b) Liabilities finance companies - fraction of single liability classes.

Figure 12: Aggregated balance sheet of finance companies 2000 - 2010 (quarterly). Source: Board of Governors of the Federal Reserve System, Table G.20 and (Board of Governors of the Federal Reserve System, 2011, Table L.127).

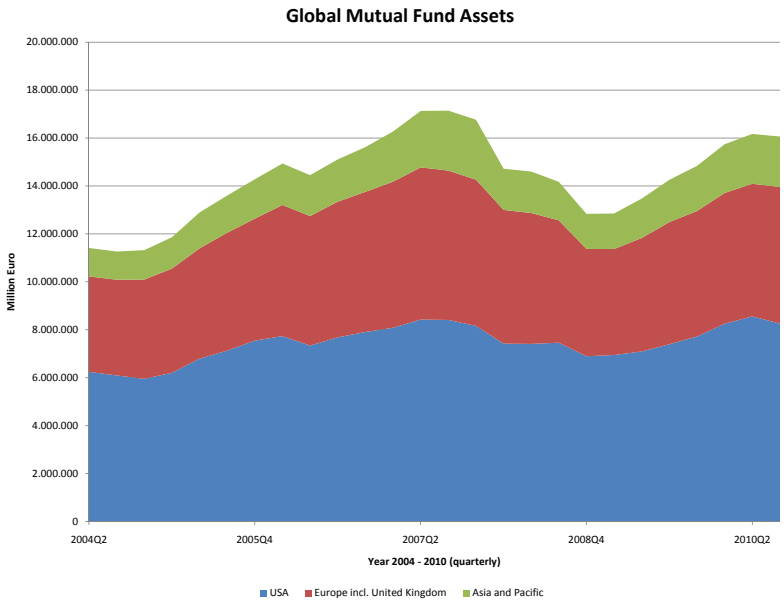


(a) Total loans issued by finance companies.

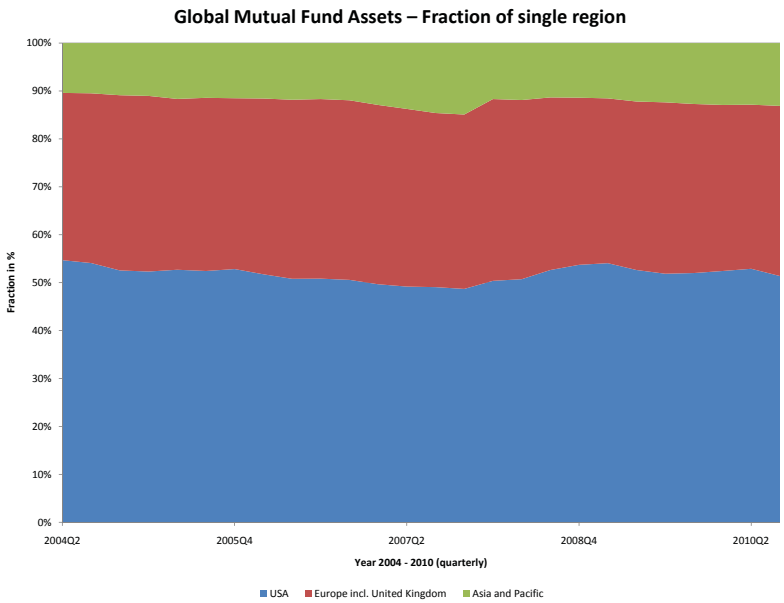


(b) Level of single loans issued by finance companies.

Figure 13: Loans issued by finance companies 2000 - 2010 (quarterly). Board of Governors of the Federal Reserve System, Table G.20.

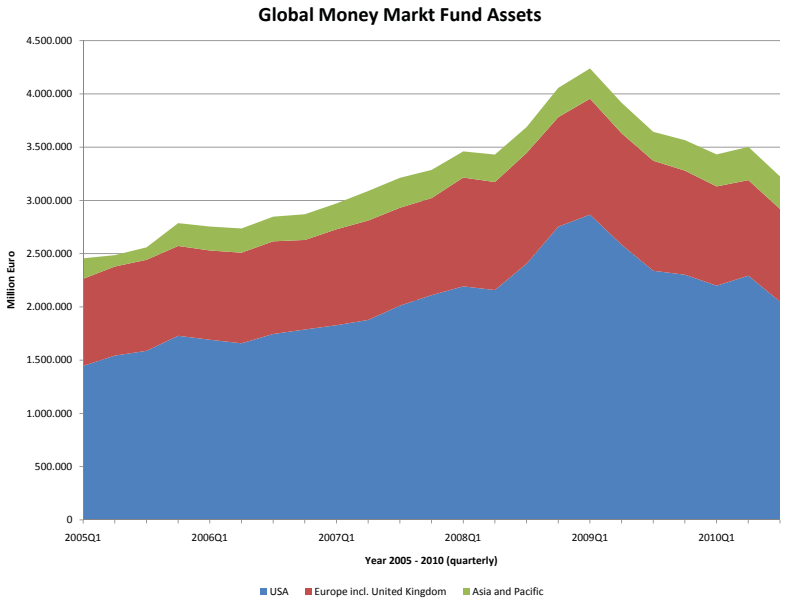


(a) Global mutual fund assets - level of assets.

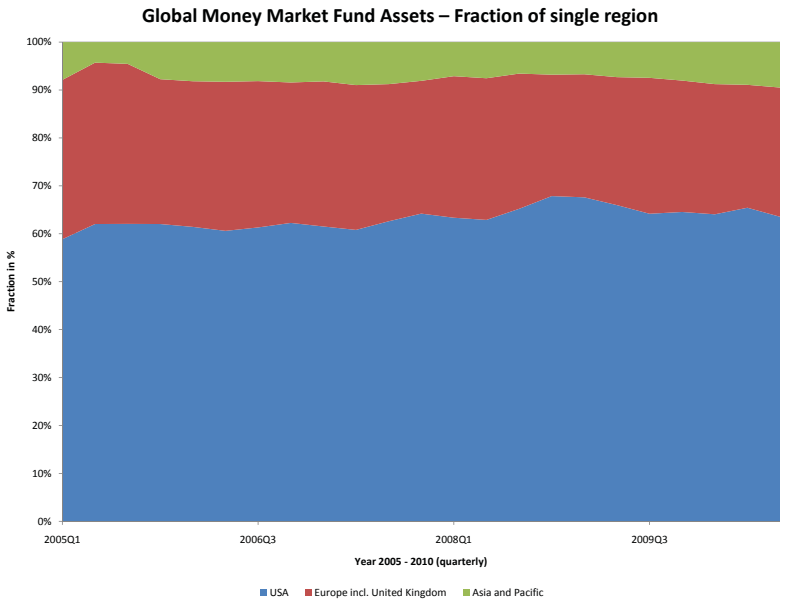


(b) Global mutual fund assets. Proportion of single region.

Figure 14: Global mutual fund assets. Source: European Fund and Asset Management Association (EFAMA) International Statistical Release 2004 - 2010 (quarterly).

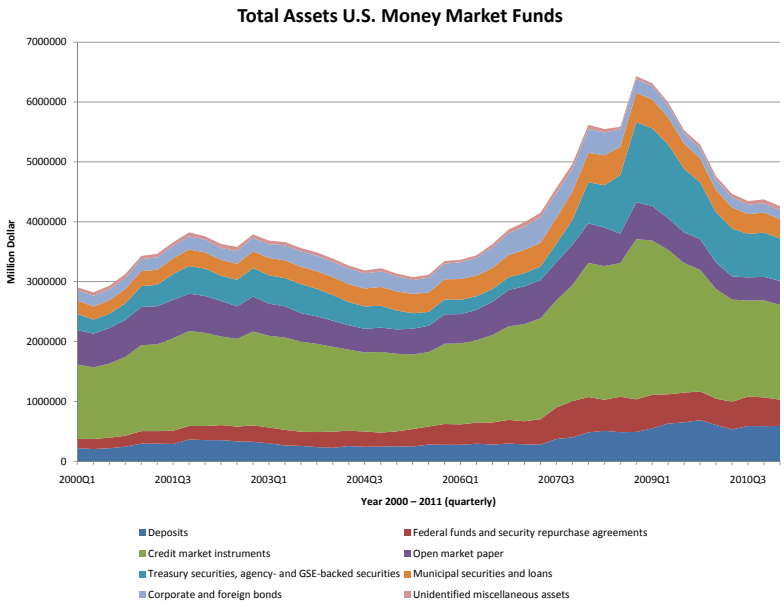


(a) Global money market mutual fund assets - level of assets.

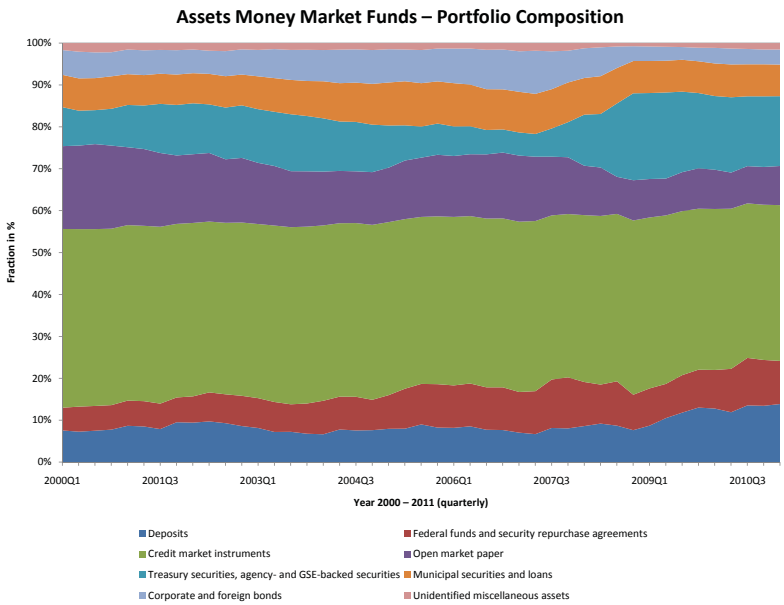


(b) Global money market mutual fund assets. Proportion of single region.

Figure 15: Global money market mutual fund assets. Source: European Fund and Asset Management Association (EFAMA) International Statistical Release 2004 - 2010 (quarterly).

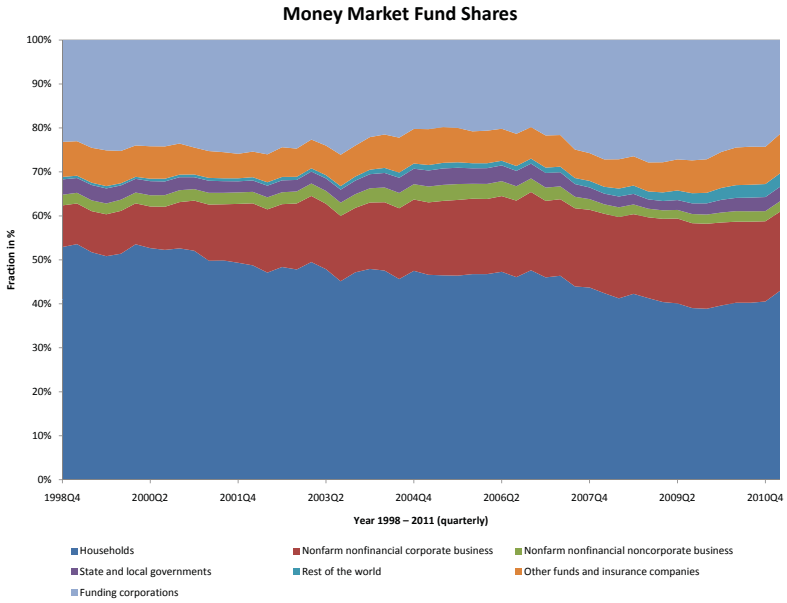


(a) U.S. MMF assets - level of assets.



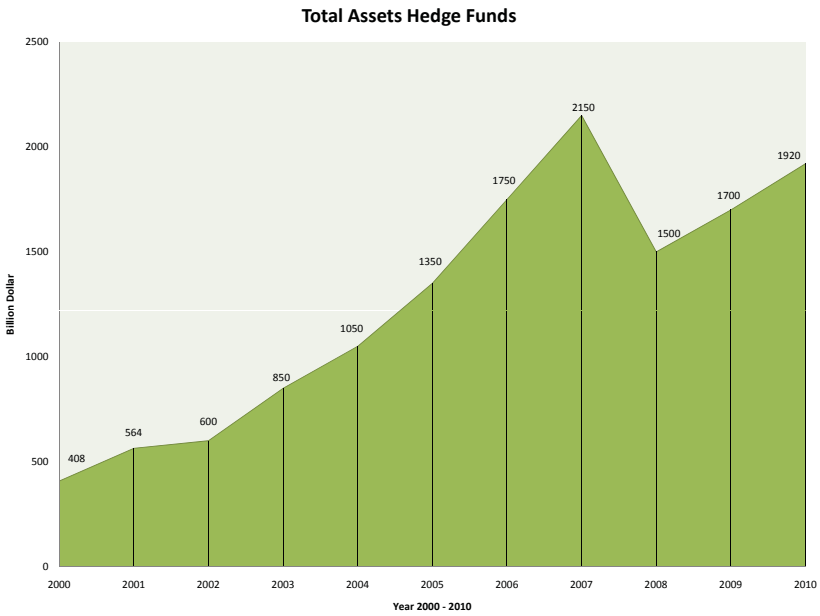
(b) U.S. MMF portfolio composition.

Figure 16: U.S. MMF aggregated balance sheet. Source: (Board of Governors of the Federal Reserve System, 2011, Table L.121).

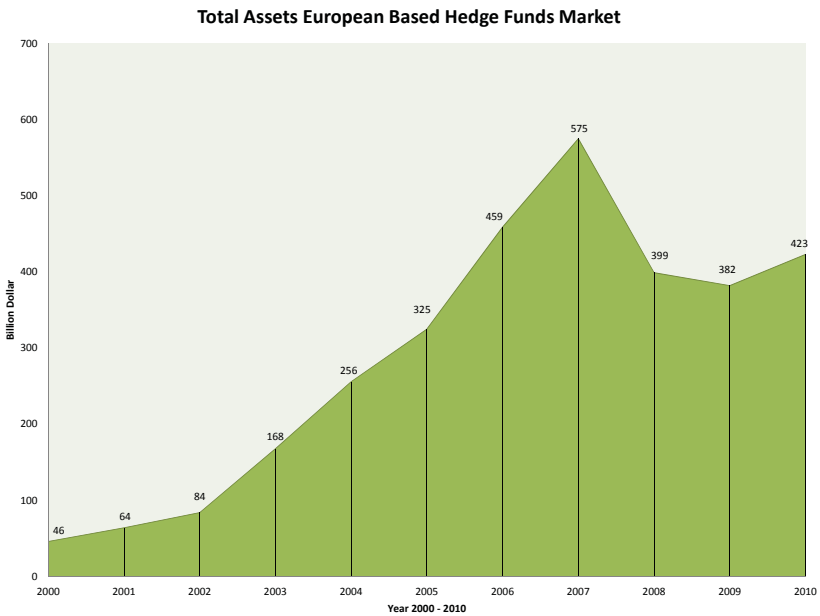


(a) U.S. MMF shares.

Figure 17: U.S. MMF shares. Source: (Board of Governors of the Federal Reserve System, 2011, Table L.121).

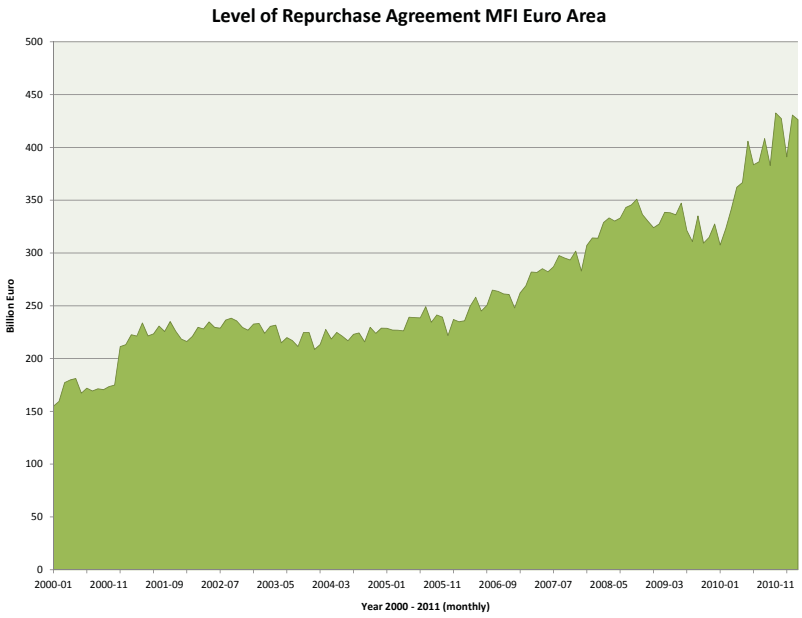


(a) Total assets hedge funds - level of assets.

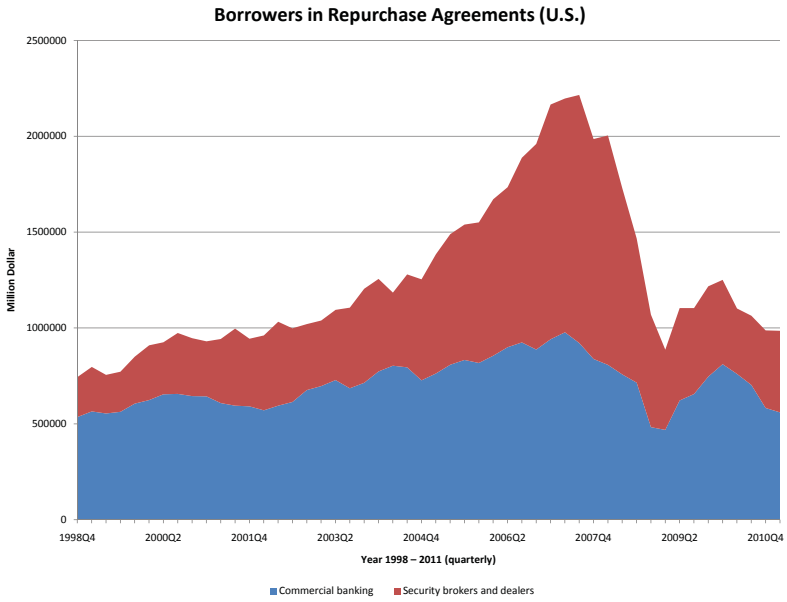


(b) Total assets of European based hedge funds.

Figure 18: Total assets hedge funds - Global and European based. Source: Maslakovic (2011).

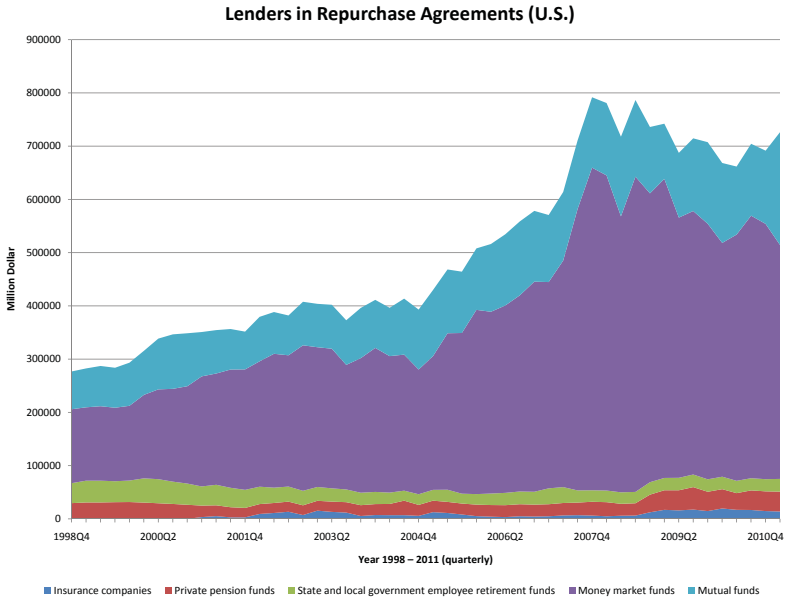


(a) Level of repurchase agreements of MFI Euro Area.



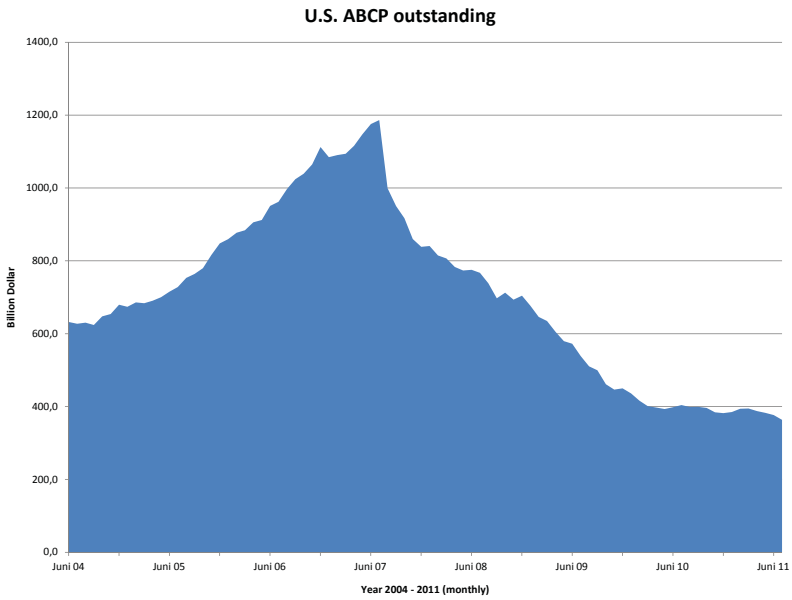
(b) Borrowers in U.S. repurchase agreements transactions.

Figure 19: Repurchase agreements transactions in U.S. and Euro Area. Source: Deutsche Bundesbank and (Board of Governors of the Federal Reserve System, 2011, Table L.207).

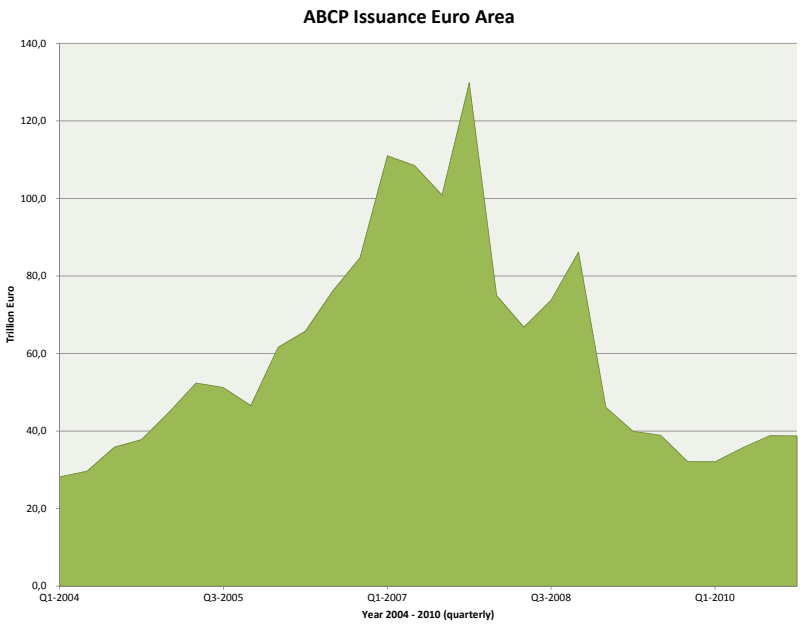


(a) Lenders in U.S. repurchase agreement transactions.

Figure 20: Repurchase agreements transactions in U.S. and Euro Area. Source: Deutsche Bundesbank and (Board of Governors of the Federal Reserve System, 2011, Table L.207).

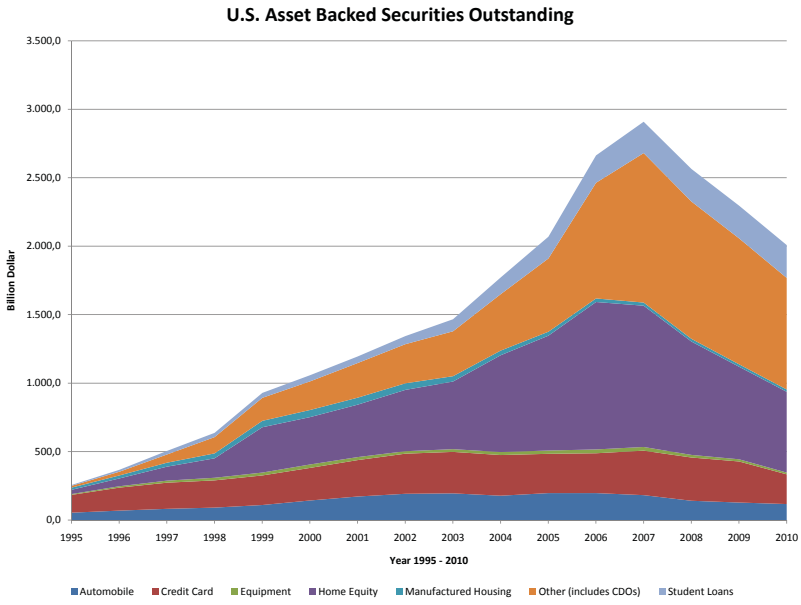


(a) U.S. ABCP outstanding.

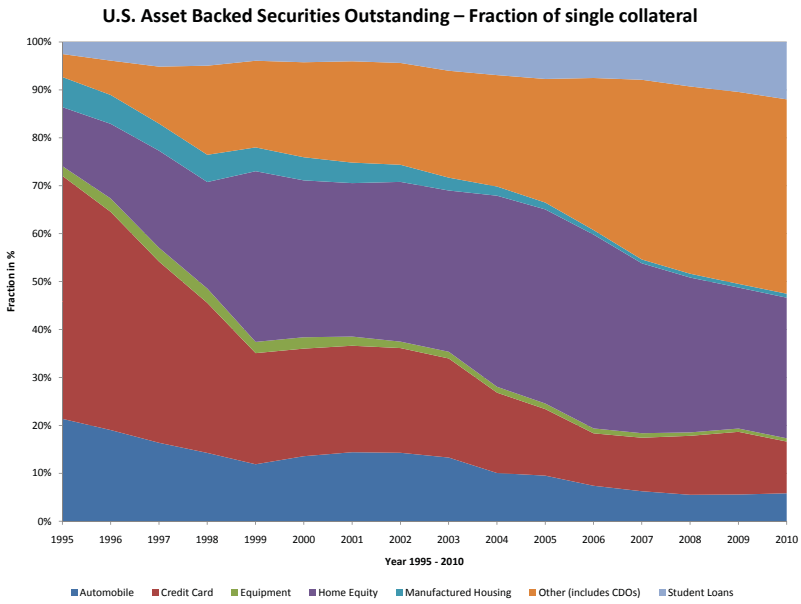


(b) Euro Area ABCP issued.

Figure 21: ABCP outstanding or issued. Source: Sifma and Association for Financial Markets in Europe (2010).

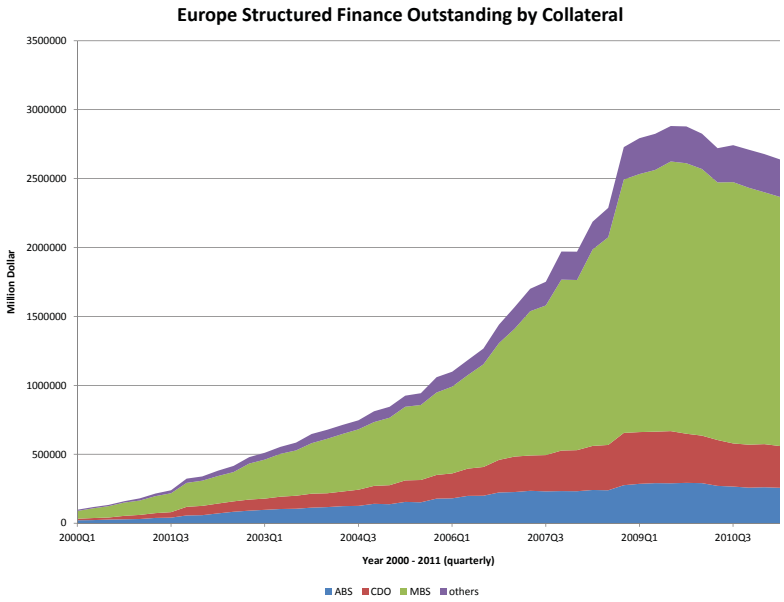


(a) U.S. asset backed securities outstanding by collateral.

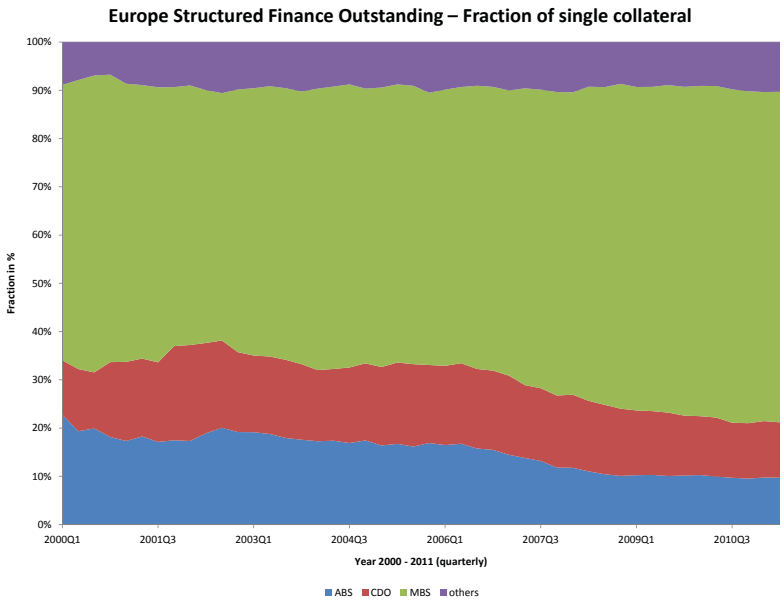


(b) U.S. ABS outstanding - Fraction of collateral group.

Figure 22: U.S. and European structured finance. Source: SIFMA.



(a) European structured finance outstanding by collateral.



(b) European structured finance outstanding - fraction of collateral group.

Figure 23: U.S. and European structured finance. Source: SIFMA.

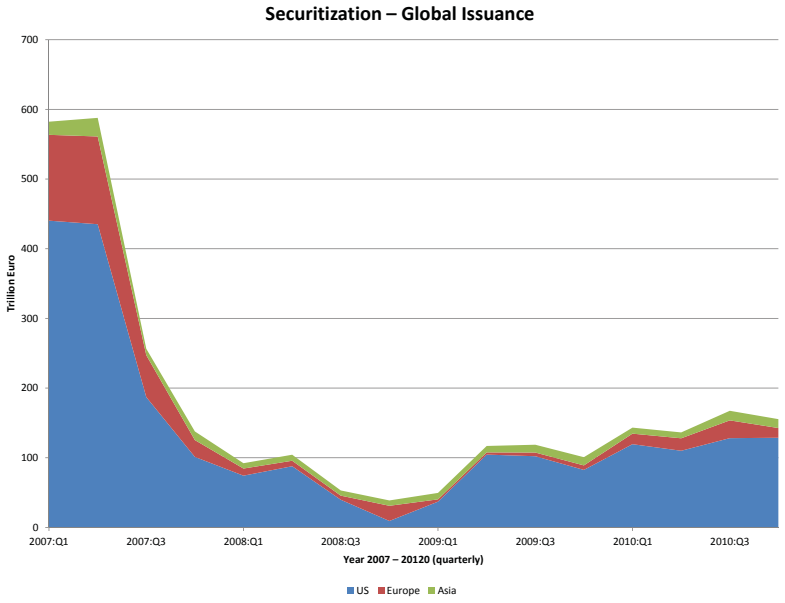


Figure 24: Global issuance of asset backed securities. Source: Association for Financial Markets in Europe (2010).