

The Evolution of US Banking and the 2007-2008 crisis

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QED master's paper

Introduction

In the last few years a great body of literature has been written about the banking crisis of 2007-2008. A large portion devoted to documenting and analyzing the malfunctioning of specific credit markets. Krishnamurthy (2010) and Gorton and Metrick (2009) are relevant here. Other authors focused on the reactions of the Federal Government and US Central Bank. While some authors focused on the financial instability, advances in securitization may have created, by adversely affecting the channel of information transmission. Relevant here are Gorton (2008) and Shin (2009). While the above studies are all necessary in understanding the crisis, because they are too narrowly focused, a big picture understanding is hard to get a grasp on. One of the aims of this paper is to achieve a broader understanding by attempting to bridge the disconnection in the literature. This is accomplished by discussing some of the main points in turn and then providing links.

There have been many changes in the structure of the US financial system in the last five decades. It is reasonable to assume that these changes, in particular changes in financial regulation, are important to understanding the recent crisis. The second aim of this paper is to discuss these changes and try to establish in what way they are relevant; something that is lacking from the current literature. The paper proceeds as follows: in the first section a historical overview of the US banking and finance is given, followed by discussions of securitization and analysis of the short term credit markets where the core of the crisis is located. Finally the actual crisis and US Central Bank reactions are discussed and analyzed.

Historical Overview of US banking, finance and financial regulation

In the 1930s, financial regulation was enacted as a result of the drop in the confidence in market decision making caused by the severe economic depression. What resulted was a

stable US financial structure produced by the combination of a domestically regulated financial sector and the international financial structures that emerged out of the Bretton Woods Agreement (Isenberg, 2006, p.368). This stability lasted until the late 1970s when a rapid rise in the price level, combined re-emergence of financial crises, began to diminish beliefs in the existing financial structure.

Financial regulation of the 1930s can be separated into two forms: functional and prudential. The purpose of functional regulation was to segment the financial system into distinct sectors, where distinct financial institutions were required to operate in one sector only. Segmentation was in the type of assets and liabilities institutions were permitted to offer and constructed as follows: commercial banks offered liabilities in the form of non-interest bearing demand deposits and savings deposits and invested in short term commercial and industrial loans; Savings and Loan associations (S&Ls) offered long term savings accounts and invested in home mortgages; long term funds were to be brokered by dealer/investment banks in freely functioning debt and equity securities markets.

since there was no overlap in liabilities and assets offered, there was no competition in these markets. In addition, there was geographic division. Commercial banks and S&Ls incorporated in one state could only operate in that state alone.

The lack of competition for assets and liabilities went a great deal in reducing the risks posed by financial contagion, which was the cause of the 1932-1933 banking crisis, ultimately resulting in an economic depression (Isenberg, 2006, p.370). For example, because commercial and dealer banks could not provide mortgage finance, any problems arising in the housing market affected only S&Ls. Problems did not spread further to commercial and/or dealer banks, impairing their ability to provide short and long term credit to commercial and industrial firms. The lack of competition for assets also meant that the financial system was constrained from financing a speculative explosion in asset prices (Wray, 1998, p.114). For example, because only S&Ls could invest in home mortgages, funds available to finance real estate speculation were limited.

Financial system segmentation promoted a need on the part of financial institutions to establish a well developed relationship with their legislated borrowers and clients, as they were the only potential source of profit. A developed relationship was in terms of understanding the risks involved in business operations and investment, resulting in the right form of credit being provided. Business operations and investment would be more efficient in terms of adding to long term output growth. This in turn increased the stability of the financial system as income and capital asset values would be more stable. The result was that the financial and productive sector became well suited to interact with each other (Isenberg, 2006, p.371).

Financial regulation was also prudential. This included the creation of deposit insurance corporations, deposit interest rate regulation, capital requirements and most importantly an enhanced role for the US Central Bank (Federal Reserve). The Federal Reserve was given more power to intervene in order to influence credit markets and to provide emergency funds in the case any financial crisis should emerge.

In the 1950s and 1960s financial innovation began to take place, resulting in serious challenges to the existing segmented financial structure. The most prominent was development of the commercial paper (CP) and Sale and Repurchase Agreement (RP) markets. Commercial firms with a surplus of short term funds looking to earn higher rates and firms in need of funds looking to borrow for less could lend and borrow directly to each other through dealer banks. Development of the CP and RP markets was aided with the introduction Money Market Mutual Funds (MMMFs) by dealer banks, marketed to households with small savings. These funds would be used to purchase CP and RPs. Commercial banks now had to compete with the dealer banks in both the market for bank assets (loans) and bank liabilities. MMMFs, CP and RP became investment substitutes to demand and savings deposits and CP and RP became substitutes for commercial bank loans. Division of the financial system which reduced intra market competition was now bridged (Isenberg, 2006). Commercial banks had a hard time adjusting because they were restricted from paying interest on demand deposits and had interest rate limits on savings deposits. These limits were contained in Regulation Q¹, one of the

provisions in Glass-Steagall Act passed in 1933. As such commercial banks faced an outflow of funds. Commercial banks responded by introducing The Certificate of Deposit (CD). CDs are essentially large denominated deposits carrying interest rates with no limits. CDs not only competed with CP and RP but also with S&L deposits, causing disruptions in that sector.

What arose is a situation where different financial sectors began to compete for funds and assets. Banking Regulation designed to eliminate such competition was gradually being bypassed. The source of the problem was that only one side of the financial relationship, between banks and borrowers was regulated. For example, commercial bank lending was restricted only to firms, but firms were not required to borrow from commercial banks (Isenberg, 2006, p.372). As finance and economics became more complex, due to increasing international trade, and the internationalization of financial markets, this one sided regulation would make the US financial system harder to operate as increasing competition began causing financial disruptions.

Another change during this period was the internationalization of financial markets, through the development of the Eurodollar market². In 1973 the Bretton Woods Fixed Exchange Rate system came to an end. The internationalization of banking and finance combined with freely floating exchange rates made National domestic financial systems more vulnerable to international economic problems either because of trade relationships or financial linkages. An example of financial linkages is US bank affiliates operating in the Euro dollar market by lending either to foreign banks, foreign companies or foreign governments. Economic problems arising in those countries would spread to US banks through loans made by their affiliates. The Mexican debt Crisis is a good example which in large part was the cause of the US commercial banking crisis of 1982; see Wolfson (1994, ch. 8). Another prominent example of the increase in financial instability due to the combination of floating exchange rates and financial internationalization is the Asian Financial Crisis. What began with disruptions in the currency market for the Thai Baht in 1997 spread half way across the world to disrupt financial activities in South America and Russia and then to the US with the near collapse of Long Term Capital Management (Isenberg, 2006, p.365).

Economic thought prevailing after the depression held that it was the inherent instability of the financial system, due to its tendency towards speculative lending that was the main cause of the Depression. Since regulation at the time, was disproportionately directed towards banking and finance, legislators most likely had the same view in mind. Theory of the time held that for the production economy to function properly, in terms of full employment and stable prices, a constrained financial system subservient to its needs must be established. The focus was on the proper interaction between banking and commerce, with commerce the main objective.

The roots of financial liberalization initially came with the revival of classical economic thought in the 1950s and 1960s. Among others, is Friedman (1953) who put the idea of financial speculation in a positive light, with the idea of 'stabilizing speculation'. It continued with such works as Shaw (1973), who argued for 'financial deepening' where regulation should have its objective the development sophisticated financial markets where the reaching of an individual's optimal risk/reward profile can be attained, by the elimination of transactions costs (Pollin,1998, p.168).

Banking deregulation began in 1980 with the passage of the Depository Institutions Deregulation and Monetary Control Act (DIDMCA) and the St. Germain Act of 1982. DIDMCA allowed for the phasing out of interest rate limits under Regulation Q, meaning that commercial banks and S&Ls to free compete for deposit funds. The St.Germain Act was introduced mainly to address the financial difficulties the S&Ls were experiencing. At the time Short term interest rates increased in the double digits in response to a double digit inflation rate. S&Ls suddenly became unprofitable as most of their assets were in the form of fixed rate long term mortgages, resulting in higher deposits interest rates compared to interest rates earned on mortgages. The problem was a maturity mismatch between assets and liabilities. The St. Germain Act addressed the problem by permitting S&Ls to invest in other forms of assets, such as commercial real estate, commercial loans, consumer loans and corporate bonds. These types

of loans, especially consumer loans were of shorter maturity; thereby allowing S&Ls to better align the maturity of their assets and liabilities.

The combination of these two Acts completely eliminated the segment markets on both the assets and liability sides of commercial banks and S&Ls (Isenberg, 2006, p.380).

Now all three financial institutions could compete for commercial and industrial loans. Dealer banks could compete by brokering CP and RA and offering MMMF.

In the coming decades dealer banks would soon compete for mortgages and other consumer loans with the development of securitization.

Deregulation persisted throughout the 1990s. In 1994 the interstate Banking and Branching Act (IBBEA) eliminated restrictions on interstate banking. Commercial banks could now operate in all states, eliminating geographic segmentation. Finally, the Gramm-Leach-Bliley Act (GLBA) enacted in 1999 completely repealed the Glass-Steagall Act (GSA). Provisions of the GSA were systematically repealed beginning in the 1980s, with the last remaining provision, separation of investment and commercial banking, finally repealed by GLBA.

Conceptually, Deregulation implies that regulation had already occurred and now in the process of being reversed (Isenberg, p.365). All of the Banking Acts of the 1980s and 1990s repealed other Banking Acts of the 1930s, enacted in response to the economic depression. The structure of the financial system that emerged following the passage of GBLA, therefore, was the same structure that existed prior to the 1930s.

The rise of speculative lending

The time period during 1945-1978 is referred to as the Golden Age. To understand why, a few economic statistics are necessary. With respect to the production economy, real GDP averaged 4.3%; real investment average 4.7%; the inflation rate averaged 2% and the unemployment rate averaged 4.3%; all annual figures.

This economic performance has not been produced combination has not been produced in any other equivalent length of time.

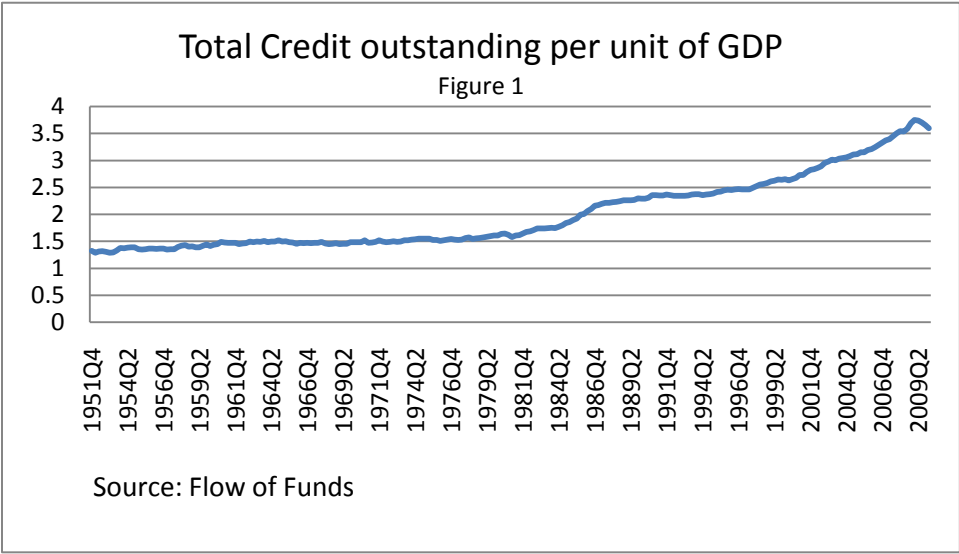
What about the financial system? There was no financial crisis except in 1966, with minimal government intervention to contain it. And Bank failures per year never exceeded 10 (Wray, 1998). The 1980s was by far a much different time period, especially for the financial sectors. Severe Financial crisis first gripped the commercial banking sector in the beginning of the decade, than spread to the S&Ls by mid decade and finally reached the dealer banks with the bankruptcy of Drexel Burnham Lambert, at the time the fifth largest dealer bank and the most active of the 1980s. By the end of the decade, 1273 S&Ls with 2437 billion in assets and 1569 commercial banks with 2683 in assets went bankrupt or forced to merge.

As already mentioned the financial system's tendencies towards speculative lending is considered one of the main causes of the 1930s economic depression and this idea seems to have been the basis on which financial regulation was designed.

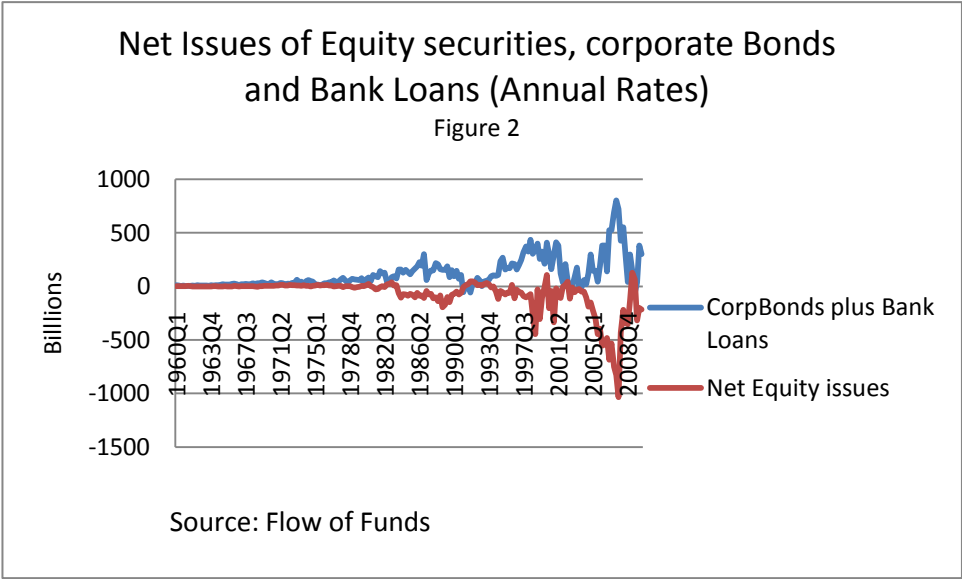
The question than is, has financial liberalization led to increases in speculative lending?

There is no question that the financial system is essential to the functioning of a capitalist production economy, by providing it with the quantity of monetary⁴ and credit instruments needed to operate. For an idea of this quantity, Figure 1 plots total credit outstanding per unit of production, measured in dollars. From the 1950s to the beginning of the 1980s this quantity was around \$1.5. Starting in the 1980s it began to increase and by early 2000 it doubled.

There were no significant changes in US economic dynamics requiring an increase in outstanding credit for any of this time period. In fact technological advances in communications and advances in operations management⁵ should have reduced the quantity of credit needed to produce one unit of production.



If the increase in credit was not for production purposes than where did it flow to?
 One definitive answer is the Stock Market in the form of bank loans and corporate bonds.
 Figure 2 plots net Equity issues against net issues of bank notes plus corporate bonds.

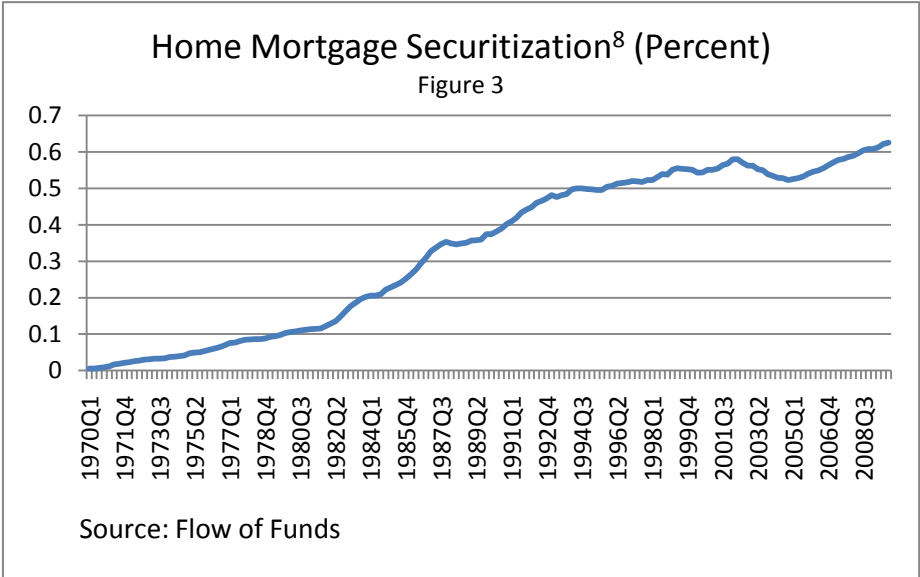


The correlation between the issuance of corporate bonds, bank loans and negative⁶ issues of equity securities is obvious in Figure 2. Beginning in the 1980s there have been three periods of large scale substitution of equity for debt and what should be noted is that all three periods were followed by recessions that have been more severe, in terms of the scale and duration of unemployment and loss of output, than what has been common in past recessions. Merger and Acquisitions (M&As) and private equity leveraged buyouts (LBOs) are the type of transactions behind debt for equity exchange. Although, M&As do involve equity for equity exchange, LBOs always involve significant debt for equity exchange. For example, the use of 10% cash and 90% debt in LBOs is typical. The debt is then put on the accounting books of the purchased firm. For production firms large scale substitution of debt for equity generates financial instability as increases in cash outflows, with no offsetting increases in cash inflows, starts eating away at income. This feeds back to the financial system through impacts on asset values, in this case corporate bonds and bank loans. At the end of the 1980s, this was the case. The collapse of the market for bonds used in LBOs, referred to as the junk bond market, was the direct cause of the bankruptcy of Drexel Burnham Lambert, a few large S&Ls, insurance companies and some prominent Corporations, who were taken over in LBOs, see Wolfson (1994, p.128-130). In fact investments in junk bonds were a major source of the overall S&L crisis. This is a good example of how commercial banks, dealer banks and S&Ls all were channelling funds towards one asset; something not possible if the financial system was segmented. In the 2007-2008 crisis, both dealer and commercial banks were channelling funds in the direction of residential real estate markets.

Transformations in banking and mortgage securitization

The origin of mortgage securitization can be traced to the S&L crisis of the mid 1980s. In order to reduce a double digit inflation rate, the Federal Reserve increased short term interest rates, with the Fed Funds⁷ rate eventually rising to 20%.

S&Ls, who primarily held fixed rate mortgages, funded through the issuing of short term savings deposits, started losing money as deposit rates rose above rates earned on mortgages. To get back to profitability S&Ls sold a large portion of their fixed rate mortgage portfolio in order to invest in other variable rate loans. The buyers were bankers at Salomon Brothers, then the third largest Investment Bank. The people there pooled these mortgages together and sold securities back by the pool. The security came to be called a Mortgage Backed Security (MBS). As Figure 1 shows securitization of home mortgages increased rapidly from then on. By 2008 over 60% of all outstanding home mortgages was securitized.



Securitization has had a profound impact on the nature of banking. In the early times commercial bank loans were the predominant source of both short and long term commercial and industrial financing. The development of the bond and equity markets, organized around dealer banks, took over as the main source of long term financing. The development of the Commercial Paper (CP) and Sale and Repurchase (RA) markets became a source of short term funds. Both are examples of securitization, where loans previously held on commercial bank

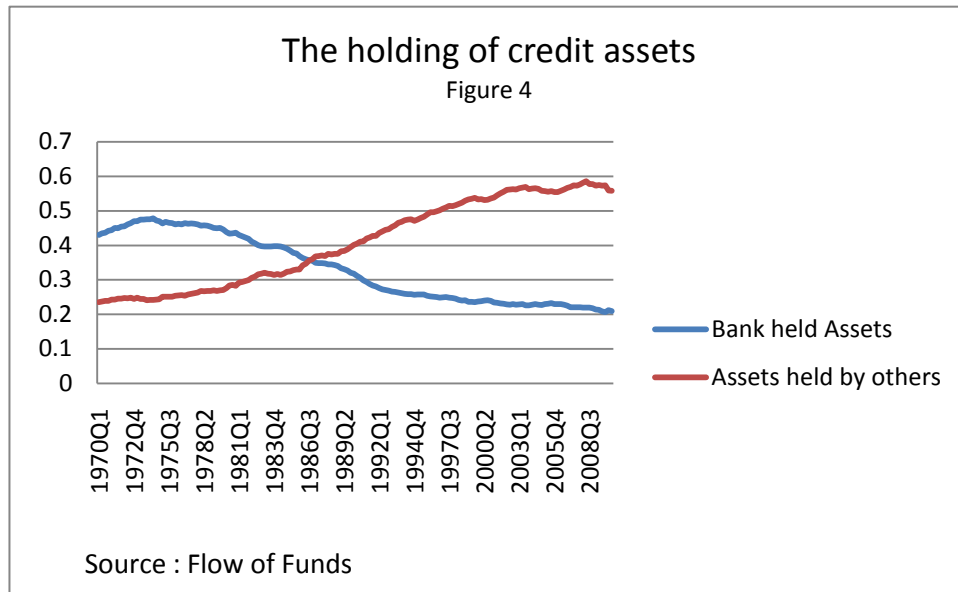
accounting books now possessed secondary markets, where a wide range of investors could participate.

In the following I discuss mortgage securitization. The creation a loan requires 3 functions: origination of the loan, holding of the loan as an investment and servicing the loan (collection of interest and principal payments) and somewhere in between is the gathering of information for risk management purposes. Traditionally, commercial banks, the principal originators of mortgages and other consumer loans performed all three functions. This financial structure is called a bank-based system. With advances in securitization, commercial banks no longer had to perform all three functions. They could retain the role of originators and servicers while passing the role of holding the loan to other institutions. This financial structure is referred to as a securities market-based system. Following definitions set forth by Pollin (1998, p.166), a securities market-based system is characterized by widely dispersed ownership of financial assets, with the existence of secondary markets where these assets can be bought and sold. A bank-based system is one where ownership of financial assets is held by a small number of universal banks. These banks issue liabilities against themselves and use the proceeds to purchase assets. As a result, they are the primary decision makers/intermediaries in the allocation of funds.

Loan Securitization works as follows: a commercial bank looking to sell a pool of loans it has previously originated sets up a legally independent financial entity called a Special Purpose Vehicle (SPV). This entity sells claims against itself in the form of debt securities and uses the proceeds to buy the pool of loans. It is legally independent of the commercial bank because all credit risk associated with the loans is transferred to the SPV, which in turn is transferred to the institutions that buy its liabilities. Legally independent also means that the commercial bank has no claims left on the pool of loans.

The US Financial system has had an ongoing transformation for the past five decades, moving from a bank-based system to a securities market-base system. This is clearly evident in

Figure 4. In 1975 bank type institutions, commercial banks, S&Ls and Credit Unions held close to 50% of all credit assets, while other institutions Private and Public pension funds, Insurance companies, and households, through MMMF, and foreign investors⁹ held close to 20%. By 2008 the position had reversed with the former collection of institutions taking over as the primary holders of credit assets. Also clear from Figure 4 is that the transformation accelerated in the 1980s.



A securities-based system, by distributing the holding of financial assets across a wider range of institutions and investors, increases financial and economic instability by spreading financial linkages where none existed before. Financial sectors that traditionally were segmented, because of the lack of access to all forms of assets, are more easily bridged within securities-based systems. This is also true of economic sectors which are initially segmented either geographically or because they don't rely on each other for production. Problems in one economic sector spread to other sectors through financial linkages. For example, foreign central banks with US dollar reserves became large investors in US home mortgages by purchasing MBSs, an asset class previously unavailable to them. If problems erupted in the currency

markets, forcing central banks to sell their MBSs, those problems would be transmitted to all US financial sectors holding MBSs and the US housing markets.

Another important banking function is the collection and processing of information for the purpose of risk management. When mortgages were provided solely by the S&Ls this function was performed very well for many decades. The exception is the S&L crisis of the mid 80s. S&Ls were relatively small and community based. As a result, they gained a strong understanding of local economic conditions and personal knowledge of local borrowers. As large commercial banks, with extensive branch networks spreading all over a certain State or when permitted all over the US, took over the S&Ls and started offering mortgages, the quality of personal and local economic knowledge declined. When commercial banks had the sole intention to originate than distribute the mortgages as MBSs, the quality disappeared all together. In its place evolved other credit assessment methods, with the most widely used being the FICO scoring system. A FICO score is a number summarizing a borrower's past credit history and represents an estimate of the probability of default. As MBSs became a dominant source of mortgage finance credit assessment was transferred to the Rating Agencies. In large part this was necessary as Pension Funds and Insurance companies could only buy securities carrying an investment grade rating from a nationally recognized Rating Agency. Rating Agencies using FICO scores replaced community based banks having access to localized knowledge.

Subprime Mortgages

Two pieces of legislation made possible subprime loans. The most important was the Alternative Mortgage Transaction Parity Act (AMPTA) adopted in 1982. In brief, this Act allowed mortgage features such as variable rates and negative amortization, both of which were the predominant features in subprime mortgages. The second Act was the Depository Institutions Deregulation and Monetary Control Act (DIDMCA). This Act was to phase out regulation Q over

a six year period, after which commercial banks and S&Ls could pay market rates on deposits. In addition interest rate limits on mortgages were to be eliminated. Higher mortgage rates would make subprime lending more attractive than it had been as higher profits could be earned.

Subprime mortgages were created and designed for the purpose of allowing poorer and higher risk borrowers access to mortgage finance.

Subprime loans are distinguished from prime loans based on the following credit attributes:

1. Loan-to-Value (LTV) of home Ratio greater than 80%
2. Debt Service-to-income, ratio greater than 50%
3. FICO score 660 or lower
4. Two or more 30-day delinquencies in the last 12 months

Most of the subprime mortgages originated after 2000 featured a loan-to-value of home ratio of 100%. In this case the lender provides a loan equal to the full value of the purchase price of the home. As a result, the lender has no excess collateral in the event that the borrower defaults and home prices fall. This is the main risk that subprime lenders faced and subprime mortgages were designed specifically to address this risk (Gorton, 2008).

Subprime lending began in the early 1990s. At its peak in 1999 total subprime originations was 160 billion and represented 13.2% of total mortgage originations. In comparison, during the last decade, the peak year was 2006 with total subprime originations of 670 billion, representing 21.3% of total mortgage originations. The primary feature that came to define subprime mortgages is the adjustable rate feature, called Adjustable Rate Mortgages¹⁰ (ARM). An ARM has for the first 2 or 3 years a fixed rate of interest, in most cases a below market rate, at the end of which the rate begins to float with reference to LIBOR or some other index. This new rate in many cases would be much higher than the initial rate. Borrowers pay a below market rate of interest for the first years because they could not offered the

monthly payments at the market rate. The difference would be added to the loan balance, resulting in a growing loan balance over time, hence the name negative amortization.

Essentially, borrowers are given a market rate mortgage and what can't be offered is borrowed add to the loan. After the 2 or 3 year period lenders have the option to refinance the mortgage or not. In the case they don't they take possession of the home and sell it for its recovery value. The increase in loan balance plus the increase in interest at the reset date makes the probability of default on borrowers very high. The only factor acting as a counterbalance to this risk is house price appreciation. In the case home prices rise, the borrower has built up equity in the home, the LTV has declined and the lender now has excess collateral. For mortgages with negative amortization features, home prices must rise above the additions to the loan balance. In this case, the LTV declines. With a declining LTV, the lender at the reset date is much more willing to continue to provide financing and at a smaller rate of interest as the risk of loss has declined. As home prices rise, a subprime borrower is on the path to becoming a prime borrower in subsequent refinancing.

As the above makes clear the feature that most distinguishes subprime mortgages from traditional mortgages is the sensitivity to home price appreciation (Gorton, 2008). Subprime lending was introduced in order to allow home ownership for people who have trouble affording it. Although, it is not clear how this would be achieved given the high degree of sensitivity to home prices. It is true that over the past 40 years home prices have appreciated, making the concept of subprime mortgages seemed tenable. But during that time the underwriting standards of mortgages was of high quality, permitting borrowers with solid credit histories, low debt-service to income ratios and fully documented income access to mortgages. At the same time annual mortgage originations were much smaller, meaning supply and demand remained in balance. From 2000 onwards these underwriting standards declined dramatically (Wray, 2000 p.31). In the period 2002-2006, 18% of all home buyers were subprime borrowers. For the housing market to remain stable as it did in the past, even in the face of such changes was not possible.

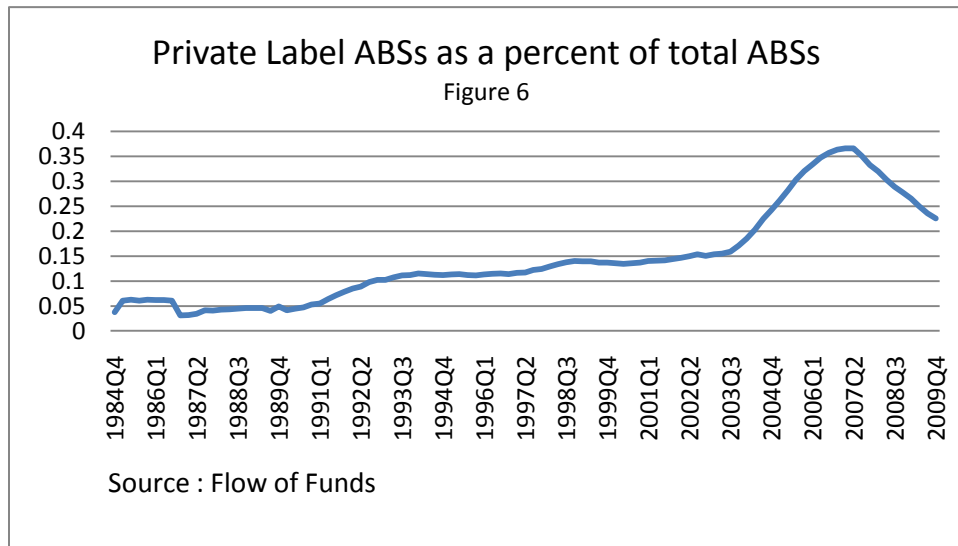
The variable rate feature of subprime mortgages in combination with large originations that occurred had one important impact: it put at risk many existing borrowers, who already had troubles making payments, to short term interest rates, controlled exclusively by the US central bank. There exists evidence that central bank policy changes do impact home sales (Howells and Hussein, 1999), all though not dramatically. Large fluctuations in the Fed Funds Rate does not produce large fluctuations in new home sales. But the combination of a large quantity of risky borrowers in the housing market, financed with variable rate mortgages from the financial markets may have changed that relationship. In 2004 when the Federal Reserve increased the Fed Funds rate from a close to 1% to around 5%, the impact on New Home Sales was undeniably high, see Figure 5.

The Market for Mortgage Backed Securities

In the 1990s securitization began to be established as an important and increasingly dominant source of mortgage and consumer finance. At the time the primary suppliers of MBSs were the Government Sponsored Enterprises (GSEs): Federal National Mortgage Association (FNMA), Federal Home Loan Mortgage Corporation (FHLMC) and Government National Mortgage Association¹¹ (GNMA). GSE MBSs are plain vanilla pass-through securities, where claims on interest and collateral are distributed equally among investors¹². In addition, mortgages backing GSE MBSs are legally required to be prime mortgages. GSEs established a kind of monopoly of the MBS market. Their position was strengthened by an implicit government guarantee of GSE debt. This guarantee extended to GSE MBSs that contained buy back provisions in the case of above average defaults in the mortgage pool¹³.

The GSE monopoly of the MBSs market began to be challenged with the rise of the dealer banks and the issuance of private label MBS. For example at the beginning of the 1990s 5% of all Asset Backed Securities (ABSs) were issued by the dealer banks. By 2006 that

percentage jumped to 35%. The growth in subprime mortgages and subprime MBSs was driven in part because the prime MBSs market was dominated by the GSEs.



Private Label MBSs in contrast to GSE MBSs generally have seniority structures. To illustrate, given a pool of mortgages 3 different securities are written, also called tranches. With the total inflow of interest payments the top security, called senior tranche, receives payment first; than the middle security, junior tranche receives payment; finally, the bottom security, called equity tranche receives payment. To look at it from a different angle, in the event of defaults within the mortgage pool, the equity tranche receives the first losses until all claims from that tranche are eliminated; Losses then work its way up to the senior tranche.

The purpose of the seniority structure is for the top tranche to be over collateralized, in the sense that losses are disproportionately¹⁴ taken by the bottom tranches; effectively protecting the senior tranche from large losses. As such, the senior tranche can carry a AAA rating and find a large source of demand from pension funds, insurance companies and MMMF. This is true of even subprime MBSs. Although, subprime MBSs have dynamic tranche structures

where claims on collateral of each tranche changed as a function of home equity creation (Gorton, 2008, p.22).

The main point is that the senior tranche of subprime MBSs becomes essentially riskless, even though it was backed by high risk assets. The financial system began creating securities of high quality and Gorton (2009) argues that the need for high quality securities to act as collateral in financial transactions was a major driving force behind subprime MBSs. The development of the Sale and Repurchase Agreement (RA or repo) and derivative markets, where the placement of collateral as margin is required, have placed heavy demands for quality collateral (BIS, 2001, p.3). Traditionally cash and treasury securities were acceptable forms of collateral but as demand increased other assets started finding acceptability. This came to include subprime AAA MBSs. Subprime AAA MBSs are important to understand, especially in their use as collateral, because as the following section discusses, it was in this role that they had the principal part in the 2007-2008 crisis.

The Repo and Asset Backed commercial paper (ABCP) markets

The recent banking crisis centered on the dealer banks, in contrast to past crises where banking institutions went bankrupt or were forced to merge. This is natural as the financial system moved to a securities base-market system, where the dealer banks are dominant financial institutions. Dealer banks also began to challenge commercial banks as asset holders. For example, by 2006 dealer banks held approximately 1/3 of total financial assets held by commercial banks, while by the end of the 1980s it was only 1/20 (Adrian and Shin, 2008, p.13). In what follows I discuss the repo market in some detail. A good understanding of the repo market is important as it has become a major source of financing for dealer banks for all kinds of credit assets, in particular AAA MBSs. The repo market was also the center of the 2007-2008 crisis. Near the end the ABCP market and its role is discussed.

Dealer banks use the repo markets as their main source of financing, with approximately half of their asset holdings financed using Repos (Hordahl and King, 2008, p.3). Repo is short for sale and repurchase agreement. A sale and repurchase agreement is the sale of a security coupled with an agreement to repurchase the same security at a specific price at the end of the contract (Hordahl and King, 2008, p.1). The transaction in essence is a collateralized loan, where the agent giving up the security is the borrower and the agent taking in the security and exchanging cash is the lender¹⁵. Lenders are usually large institutional investors with short term cash, such as corporate treasuries, pension funds, MMMFs, commercial banks or other dealer banks. Almost all repos have one day maturities. The repo market can be used for long term financing as a repo loan is rolled over day after day.

Risk management tools in repo transactions are in the form of daily marking to market and margin requirements (Hordahl and King, 2008, p.4). But placing the security as collateral still remains the main tool. Margin requirement results in only a fraction of the current market value of the security provided as cash by the lender, i.e. the repo is over collateralized. The size of Margins indicates the perceived market risk of certain securities, with riskier securities requiring higher margins. When disruptions started occurring in the repo market, margins on some subprime MBSs went to 100%, meaning they were no longer acceptable as collateral.

Although a repo is essentially a collateralized loan, there is one important legal feature that distinguishes it from other types of collateralized loans and that is that the lender who obtains the security has control over it (Stigum, 1989, p.186). The lender if he wishes can sell the security in order to raise cash or can use the security in another repo transaction. The reusing of a security held as collateral is called rehypothecation¹⁶. Most typically, the lender will use the security in another repo transaction if a subsequent need for cash arises. Therefore, a repo participant can be at the same time a lender of funds in one repo transaction and a borrower in another. In such a case, a security acts as collateral for two loans.

An idea of the extent of rehypothecation in repo markets can be estimated by comparing the gross¹⁷ amount of 10 trillion in 2008 provided in Hordahl and King (2008) with the 2.2 trillion amounts taken from the Flow of Funds.

A high degree of rehypothecation, where a certain amount of securities act as collateral for a larger and large amount of repo loans, becomes destabilizing to the overall repo market. A panic by one borrower demanding collateral back starts a chain reaction that can affect many other participants. Another threat to stability is when a certain security loses its acceptability as collateral. All participants who borrowed against the security are faced with the immediate task of finding acceptable collateral. If a general panic is underway, the quantity of acceptable collateral is generally hoarded and not lent out, causing participants who cannot acceptable replacements to default. A good example of the risk posed by rehypothecation is the bankruptcy of Bear Sterns. Bear Sterns was acting as a third party to repo transactions by acting as a custodian of collateral, which they were in turn rehypothecating, i.e. using it in other transactions. This is a common way for dealer banks to raise funds. As the crisis spread to the repo markets, claimants to the collateral demanded it back, but Bear Sterns could not raise the cash to borrow it. This was a sort of bank run¹⁸ and was the main driver behind its forced merger with JP Morgan Chase.

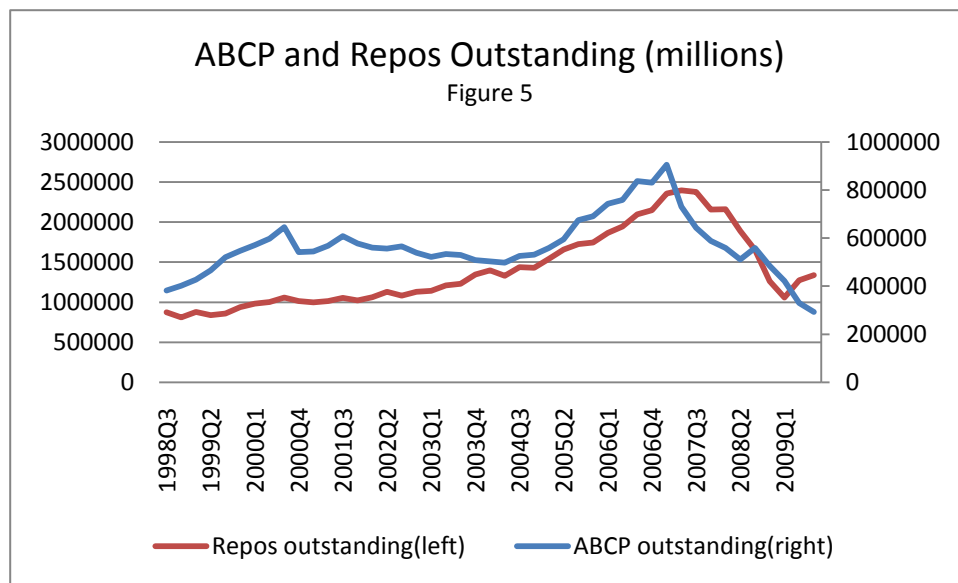
Another credit market that came to be used for the financing of MBSs is the Asset Backed Commercial Paper (ABCP) market. Commercial and dealer banks would set up what is called a structured Investment Vehicle (SIV). This institution, which is essentially an investment fund, sells commercial paper, medium term notes and other subordinated debt and equity capital, the proceeds of which it would use to buy tranches of the MBSs. The commercial paper had senior claims on the tranches, i.e., it was over collateralized. As a result, the commercial paper could be rated AAA and find an easy market for institutions with short term funds like MMMF, and Corporate treasuries (Kregal, 2007, p.12). The subordinated debt and equity capital were in most cases provided by the banks themselves. This was a form of credit enhancement. Two forms of credit enhancements were: outright guarantees of the commercial

paper in the case of above average losses on the MBS tranches and back up lines of credit to the SIVs in the case they could no longer continue to finance their portfolios in the commercial paper market. This is a serious risk as two-thirds of commercial paper have a maturity 5 days or less.

The Banking Crisis: Panic in the Repo and ABCP markets

The banking crisis began on August 7 2007 when French bank BNP Paribas halted redemptions from three of its structured investment funds because it could not properly value assets backing the securities. This caused other institutions to start questioning the collateral that was backing loans they had made and to start worrying about their finances (Cecchetti, 2008, p.8). It began with lenders in the ABCP market in August 2007 and then spread to the repo market around the first quarter of 2008.

As Figure 5 shows, lenders in both markets began pulling away large amounts of funds, by not rolling over both repos and CP.



The US Central Bank and its Response

The US Central bank was created in 1907 by the Federal Reserve Act, in response to the banking crises that were occurring during the late 19th century. In the 1930s it was blamed for having a role in the economic depression, first by helping finance the stock market bubble through loans it made to commercial banks; who in turn provided loans to dealer banks who then lend to stock market investors; Second, by not providing enough short term funds to commercial banks facing large scale deposit withdrawals in the 1932-1933 commercial banking crisis. That is, act as the Lender of Last Resort, the purpose for which it was created. From the 1930s onwards the Bank's primary role was to aid the US Treasury in its conduct of Fiscal Policy, by keeping treasury rates low.

The modern day US Central Bank was born out of the 1951 Treasury-Fed accord, where it was given full independence from the US Treasury to exercise its influence over short term credit markets.

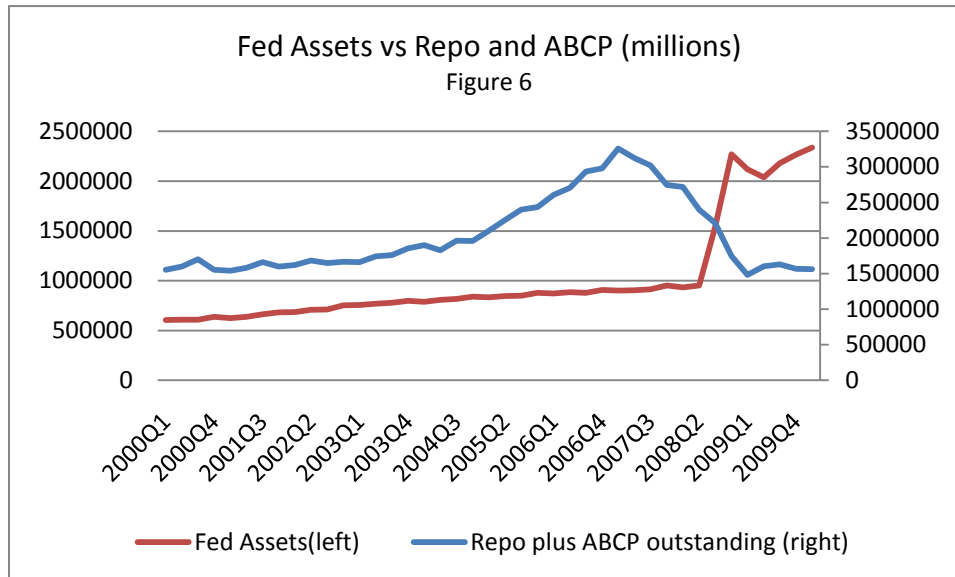
The Central Bank like any other banking institution has its own balance sheet¹⁹ consisting of liabilities and corresponding assets. Assets are generally securities and bank loans, while liabilities are primarily currency and commercial bank reserves. Traditionally, only commercial banks could borrow from the Central Bank either in the Fed Funds market²⁰ or at the discount window. The rate paid on loans from the Discount window is called the discount rate. Any loan obtained directly from the Fed is always collateralized through the pledging highly rated securities, which have traditionally been treasury securities and GSE MBSs. As the market for private label ABSs grew, the Central Bank began accept the AAA rated tranches of these securities as collateral (Cecchetti, 2008, p.3). The Central Bank conducts monetary policy by making changes to its balance sheet: it can increase its size²¹ or it can change its composition, keeping its size the same or it can do both. When responding to financial crisis, the same three options are available.

In response to the crisis, the Central Bank began by changing the composition of its balance sheet. From the end of 2007 to the end of the second quarter of 2008 it sold 300 billion of treasury securities and used the proceeds to make loans to commercial and dealer banks²². Loans to the dealer banks were done through the newly created Primary Dealer Credit Facility (PDCF). In addition, the program broadened the range of acceptable collateral backing these loans, to include private label ABSs not rated AAA. The purpose of this lending program was not the loans themselves but to address the broad decline in the acceptability of private label ABSs in the repo market, see Gorton and Metrick (2009). If repo participants knew they could always obtain loans for these securities from the Central Bank, than they should become more willing to accept them as collateral in repo transactions (Cecchetti, 2008, p. 19). The loans themselves addressed the run in the ABCP market, where banks offered back lines of credit, which were now being exercised.

The selling of 300 billion in treasury securities was to address the hoarding of treasuries that was taking place. The Term Securities Lending Facility (TSLF) was also introduced for this same reason. Under this program dealer banks could exchange ABSs for treasury securities. As ABSs were losing their acceptability as collateral, participants who borrowed against them needed to find quick replacements²³.

Actions taken by the Central Bank did calm repo markets for awhile (Hordahl and King (2008, p.40)). But on September 2008, Lehman Brothers went bankrupt, causing significant runs in both the repo and ABCP, with outstanding amounts declining by 1.5 trillion by the end of 2009. The Central bank reacted by increasing its balance sheet by 1.3 trillion, with 800 million in the form of loans to dealer and commercial banks, see Figure 6.

The bankruptcy of Lehman Brothers represents the heart of the 2007-2008 banking crisis, as the magnitude of the collapse in credit markets has not occurred since the 1932-1933 commercial banking crisis where close to half of all commercial banks went bankrupt. Central Bank intervention on this scale has not yet occurred. Had it not intervened the entire financial system would have collapsed as it could not sustain a 1.3 trillion dollar loss in financing.



Conclusion

The 2007-2008 crisis was a crisis in the ABCP and repo markets. This is natural since these two markets became a dominant source of bank financing replacing the traditional system that relied on deposits. When mortgages and other loans were provided by commercial banks and S&Ls, the risk of bank runs was eliminated through deposit insurance and as long as deposits remained within the banking system, any one bank facing an outflow could borrow in the Fed Funds market from the bank that was facing the corresponding inflow. The system was stable. As CP and repos replaced deposits for mortgage and other loan financing, deposit insurance no longer existed and access to the Fed funds market did not exist to mitigate large transfer of funds between institutions. Resulting in a system that became much more vulnerable to bank runs.

The main cause of the crisis was the collapse in housing prices and large scale mortgage defaults that occurred. This in turn caused MBS, backed by those mortgages and homes, to collapse. Therefore, residential real estate was the asset at the core of the crisis.

It must be noted that the entire financial system was involved in channelling large sums of funds towards residential real estate. Commercial banks acted as mortgage originators, dealer banks were then creating MBS and placing them with pension funds, insurance companies, MMMF, other investment funds and foreign institutions. In addition both banks held significant amount on their own books either outright or through SIVs.

Another important note is that the creation of AAA rated tranches of MBS increased the quantity of collateral that could be used to obtain loans from the Central Bank; thereby increasing the credit producing potential of the financial system.

All the different components of the financial system were now linked together channelling credit towards one asset. The 1930s functional regulation which imposed financial system segmentation was intended to break this link, as it was considered to be the cause of the economic depression of that time.

Notes

- 1 Regulation Q allowed S&Ls to pay a higher return on deposits than commercial banks were permitted to pay. The main objective of which was to guarantee a sufficient flow of funds to finance home purchases.
- 2 Eurodollars are US dollar deposits held outside the US banking system. The Euro dollar market is spread throughout the world with the largest center located in London. In this market large international banks lend and borrow dollars, with the prevailing interest rate called the London Interbank Offer Rate (LIBOR).
- 3 For causes and consequences of financial crises during the 1980s see Wolfson (1994, ch.8-9)
- 4 There is no absolute distinction between what constitutes as a monetary instrument and what constitutes as a credit instrument. For example, deposits held at commercial banks are at the same time both monetary and credit instruments. They are accepted as a means of payment for all transactions, but at the same time they are a liability of the commercial banks. Treasury securities, on the other hand, are credit instruments for most people. But among large financial and commercial institutions they are accepted in the settlement of some transactions. For these institutions treasury securities function as both credit and monetary instruments.
- 5 One of the most prominent being the Just in Time Inventory System, which reduced costs associated with inventory investment.
- 6 Net Equity issues are negative when common share ownership is eliminated. Eliminating common shares occur when managers of a corporation buy shares through the use of profits or debt and simply destroy them. A second way is when outside investors or internal management buy all the shares of a corporation with the intention of privatizing it.
- 7 The Fed Funds rate is the rate prevailing in the Fed Funds Market, where commercial banks lend and borrow excess reserves. The US central bank controls the Fed Funds rate and it is the base rate of all other short term interest rates.
- 8 Total Securitized mortgages include Government Sponsored Enterprise (GSE) securities.
- 9 Foreign Investors consist primarily of foreign central banks.
- 10 This type of mortgage is not simply a variable rate loan as the name might suggest.
- 11 Commonly referred as Fannie Mae, Freddie Mac and Ginnie Mae, respectively
- 12 MBSs where each security carries different claims to interest and collateral are called Collateralized Mortgage Obligations (CMOs). Securities here are also called tranches.
- 13 The implicit government guarantee was made explicit in September 2008 when the US Federal Government took over FNMA and FHLMC in response to rapidly decreasing GSE MBS prices. Foreign central banks were large sellers.
- 14 In other words, risk is spread disproportionately and as a result so is interest income. The senior tranche has the smallest share of interest income, while the equity tranche has the largest. Even though all three tranches are claims on the same mortgage pool, risk and return is spread unevenly, hence the term Financial Engineering.

- 15 From the lenders point of view the transaction is called a reverse sale and repurchase Agreement, or reverse repo.
- 16 For a broad discussion of the legal possibilities of rehypothecation see Johnson (1998).
- 17 If a participant has lent \$X in one repo and borrowed \$X in another using the same security, the gross amount would be 2\$X. The net amount is zero.
- 18 The depositing of collateral with Bear Sterns can be compared to the depositing of money with a commercial bank. In fact, the repo market organized around the dealer banks has come to be called the Shadow Banking System (Gorton, 2009).
- 19 For the type of assets and liabilities see (Ceccetti, 2008).
- 20 The fed funds market is a short term credit market where excess reserves of the commercial banking system are bought and sold. The Central bank intervenes in this market by either borrowing or lending funds in order to keep the fed fund rate at a specific target rate. Any transaction with the Central Bank is in the form of a repo, i.e. collateralized. Transactions among commercial banks are generally uncollateralized.
- 21 The Central Bank has the authority to create unlimited liabilities in the form of currency or bank reserves.
- 22 This was the first time the Central Bank provided outright loans to dealers.
- 23 A participant who borrowed by putting up an ABS as collateral, suddenly cannot borrow against it any more, can borrow a treasury security and replace the ABS as the acting collateral. In this case, the only cash that has to be raised is the margin required on the borrowed treasury security. If the panic subsides a short while after and the ABSs is again accepted as collateral, the above trade can be easily reversed.

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