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THE FEDERAL RESERVE AND LEHMAN BROTHERS: WAS THE FAILURE AVOIDABLE?

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INTRODUCTION

The topic that I decided to discuss for my thesis regards the bankruptcy of Lehman Brothers and more specifically I wanted to analyse the relationship between the Federal Reserve, the US central bank, and Lehman Brothers, which was the fourth largest investment bank in 2008 and it was let fail. The reason why I decided to talk about these events after 13 years is mainly due to my starve for knowledge. In fact, during these three years, my colleagues and I never went through this financial crisis in details, and I truly believe that a student of finance must know the whole story about the 2008 financial crisis. Once I decided the topic to analyse, I was afraid of appearing ridiculous, since there are probably thousands of theses concerning the financial crisis of 2008. Therefore, after many research, I figured out that there was a lot of confusion around the bankruptcy of Lehman Brothers, since many people believed that the company had enough collateral for a loan and to keep operating, while others believed that its failure was necessary to avoid further damages later.

The Global Financial Crisis deserves special attention, since it is the most recent and most damaging crisis event. The effects, causes and aftermaths of this crisis can be applied to the current financial system. Many economists believe the crisis was the result of many events that stated back in the 70s with the birth of neoliberalism, where banks loosen their credit requirements for lower-income mortgages. The number of subprime mortgages issued started increasing in 2000s and all of them were guaranteed by Freddie Mac and Fannie Mae. The ease with which everyone was able to get a mortgage drove up the price of real estate, which led to a wave of speculation, and turned out being a real estate bubble. At the same time investment banks, which were looking for easy profit after the dot-com bubble, created new financial instruments such as, collateralized debt obligations, asset back securities, and mortgage back securities. Since subprime mortgages were bundled with prime mortgages, investors were not capable of understanding the risk of these new financial instruments. With the introduction of these new financial instruments the price of houses increased exponentially, leading, therefore, to a housing bubble. When the bubble started bursting the price of real estate dropped all of the sudden and the first mortgages owner started defaulting on their debts. These massive defaults accelerated the decline in prices of homes. Eventually, investors understood that the CDOs were worthless instruments and for this reason they tried to unload their portfolio, but there was no market for these contracts. In this environment, two investment banks, Lehman Brothers and Bear Stearns, collapsed due to their exposition in the subprime market. The answer to this situation by the Federal Reserve was to bail out some financial institutions involved in this wave of speculation, but as we already know, the 4th largest investment bank worldwide, Lehman Brothers, was let going bankrupt.

I decided to divide this paper into two chapters, the first one is divided in three paragraph which are the failure of Lehman Brothers, the historical contest and the aftermaths of this crisis. In the first paragraph I highlight all the main actions that led to the bankruptcy of Lehman and all the actions which preceded its failure. In the second paragraph I analyse all the relevant events which led to the financial crisis of 2008, such as the birth of new financial instruments and the dot com crisis. In the final paragraph I discuss the short term and long-term consequences of the crisis, some examples of them are the high unemployment in the months after the bankruptcy of Lehman and the Sovereign Debt crisis in Europe which started in 2010.

In the second chapter, which is divided in two paragraph, I discuss both whether it was correct to let Lehman Brothers and whether it Lehman Brothers could have been rescued. In the first paragraph I pretended to be an attorney of the United States of America where I prove that the failure was needed to preserve the global financial environment. On the other hand, in the second paragraph I discuss, through the balance sheet of Lehman Brother, how it could have been rescued, and how the money that could have received should have been spent.

At the end of the Paper there are the conclusions of this paper, where I summarize what is discussed in this thesis.

CHAPTER 1: WHY LEHMAN BROTHERS FAILED

1.1 LEHMAN BROTHERS' FAILURE

On September 15, 2008, Lehman Brothers Holding Inc. filed for bankruptcy. This event can be considered one of the most harmful events of the sub-prime crisis of 2007-2009, many people believe it worsened the crisis and the Great Recession that followed.

Why did Lehman Brothers fail? Lehman Brothers faced huge losses investing in the real estate market, in the period between 2007 and 2008, which jeopardized its solvency. In 2006, when the real estate market started weakening, with falling house prices and rising defaults on subprime mortgages, Lehman Brothers kept investing in it, while other financial institutions became pessimistic about the real estate disinvesting in it. In fact, in 2007 the company joined a consortium in the acquisition of Archstone, a real estate investment fund. Lehman financed $11 billion. What worsened the position of Lehman was the escalation of the Bear Stearns crisis. After the Bear rescue, confidence in Lehman eroded quickly. Investors started believing that what happened to Bear Stearns could have expanded to other investment banks. One of the most targeted companies was Lehman because of its heavy investments in the real estate market. Consequently, Lehman's price fell and premiums of credit default swaps on its debt rose. Between March and April 2008, the three rating agencies declassed Lehman. After the announcement of Q2 which reported a loss of $2.8 billion[1], Lehman replaced its president and CFO and it was obliged to write down some real estate assets. Once again, the three rating agencies downgraded Lehman: S&P from A+ to A, Fitch from AA- to A+, and Moody's from A1 to A2.[2]Press coverage of Lehman was negative. For this reason, Lehman's stock price fell to $17 by the end of July, while on March 18th its price was $46.[3]

Moreover, financial institutions no longer trusted Lehman, which led it to a liquidity crisis. Lehman held a liquidity pool consisting of cash and government securities. This

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[1] source 659768.PDF (stanford.edu) confidential information of Lehman Brothers INC.
[2] source Fitch cuts Lehman credit rating | Reuters
[3] source Ball L. (2016)- The Fed and Lehman Brothers

pool increased from $34 billion in February to $45 billion in May 2008. However, as confidence in Lehman fell, the firm began to face liquidity problems, but Lehman also experienced a problem that Bear did not. The problem concerned the repurchas[4]agreements, also known as repos, which are short-term funding. In a repo, one financial institution sells a security to another and agrees to buy it back for a higher price in the future. Economically speaking, a repo corresponds to a collateralized loan; one party receives cash for the period of the agreement and its securities serve as collateral, eventually the former will repurchase back the securities at a slightly higher price. The increase in the security's price is interest payment. Investments banks in 2008 used repos to obtain hundred of billions of dollars of cash from Banks. As collateral, also called a haircut, investment banks used their inventories of bonds, equities, and specially Mortgages back securities. The cash advanced in a repo is less than the value of the collateral. The goal of the collateral is to protect the cash lender in case of default of the borrower. The amount of the haircut depends on the liquidness of the security. Repos ranged from 1% for treasury bonds to 12% for convertible bonds. Lehman Brothers borrowed some money through repos issued by JP Morgan, which was worried about a possible default on the repos by Lehman, hence it started asking for billions of dollars as collateral. JP Morgan, moreover, was asking only for certain kinds of collaterals such as cash or liquid securities, hence the liquidity pool shrank. However, Lehman's liquidity struggles did not figure until the very last days of operation of the firm, in fact, the amount of liquidity on September the 9th was around $41 billion.

While things at Lehman Brothers were not going well at all, some executives in early 2008 started being worried about the firm exposure to real estate and its relatively low equity cushion. After the crisis at Bear Stearns, Lehman changed its modus operandi: in the period that goes from March to September 2008, the executives were seeking a raise in capital, a reduction of illiquid assets, and a merger with a stronger firm, as Merrill Lynch did. Some of the action that the executives at Lehman Brothers did are the following:

[4] Reinhart CM (2000) The mirage of floating exchange rates. Am Econ Rev 90(2):65–70

New Capital. In July 2008, Lehman raised a total of $6 billion through common stock and preferred stock. The firm's equity rose from $26 to $28.

Sales of illiquid assets. Lehman decided to sell some of its real estate assets both for decreasing risk and raising capital. The real estate asset pool decreases from $80.8 billion in February to $64 billion on May 31 and $45.8 billion on August 31.

The search for a strategic partner. Between March and September, Lehman Brothers were looking for a strategic partner that would either purchase a stake of equity or buy it entirely. More than 30 prospects were approached by Lehman, such as investment banks worldwide, private equity companies, Warren Buffett and Carlos Slim. Only one investor was interested which was the Korean Development Bank, but the two parties did not find a mutual agreement.

Sale of Investment Management Division. Finally, Lehman decided to sell off 55% of this division and was expected to raise $3 billion from this operation.

As in the Bear Stearns's crisis, Lehman Brother's decrease of confidence over the previous months culminated between September 9th and September 12th when all its liquidity was wiped out. Two main events determined Lehman Brothers' death blow. The first one was the announcement that the Korean Development Bank, on September 9th, ended the deal about investing in Lehman. That day the premiums on credit default swaps increased by 2% and S&P placed Lehman's rating on a negative watch. The stock price fell from $14 to $8.

The second blow occurred the day after when there was the announcement of its earnings in Q3, which was perceived negatively by the investors. On the afternoon of the same day, Moody's communicated to Lehman's executives that if they were not able to find a strategic partner by September 15th the company would have been downgraded once again. Fitch took a similar decision on September 11th. Lehman's stock price by the end of September 11th fell to $4. The firm started losing liquidity very quickly, moreover more than $20 billion of repurchase agreements did not roll, because of the elevated amount of collateral required. The liquidity of Lehman Brothers fell from $22 billion on September 9th to 1.4 billion on September 12th. It was clear that the liquidity by Monday, September 15th would hit the ground, and therefore, Lehman's Executive knew that the firm could not meet its obligations unless it was acquired or helped by the Federal Reserve.

The weekend of September 13-14 decided the future of Lehman Brothers. The Federal Reserve tried to fix an acquisition of Lehman by Barclays or Bank of America. During the summer Lehman tried to find many partners, but the only ones which were interested were Bank of America and Barclays.

Lehman Brothers approached Bank of America both in July and August, but the BoA's executives were skeptical about a possible acquisition. In September, however, Henry Paulson, which was the Secretary of the Treasury from 2006 to 2009, approached the CEO of Bank of America asking him to take another look at a possible negotiation with Lehman Brothers. On September 9th BoA started a due diligence review of Lehman's financial statement. At the same time, during summer, Lehman's executives approached Barclays, whose CEO declared himself to not being interested in a merger. However, Barclays' CEO, later on, saw a possible acquisition as an opportunity to expand Barclays' business in North America. Lehman's liquidity crisis was seen by Barclays as an opportunity to acquire at a very distressed price. The due diligence review of Lehman's financial statement began on September 12th, on the same day BoA lost interest in Lehman Brothers because it believed that a great proportion of Lehman's assets were overvalued and it started a negotiation with another investment bank which was better placed than Lehman, Merrill Lynch.

On the other hand, the negotiation with Barclays kept going on, with one obstacle: Barclays did not want to acquire some illiquid assets of Lehman Brothers, such as commercial real estate and private equity. For the acquisition of these illiquid assets, policymakers organized a consortium of 12 financial institutions and Paulson told the CEO of these institutions that the FED would have not contributed at all to rescue Lehman Brothers. By Saturday a deal was reached, Barclays would have purchased all of the Lehman enterprises, but the illiquid asset valued at $40 billion would have been financed by the consortium. On the 14th, the deal was null because of a problem that nobody saw: to approve the deal, the Federal Reserve required that Barclays guarantee all Lehman's obligation, but under UK law, these guarantees required a vote by shareholders, which would have taken from 30 to 60 days to organize it. Hence, it was obvious that the deal would have not gone any further.

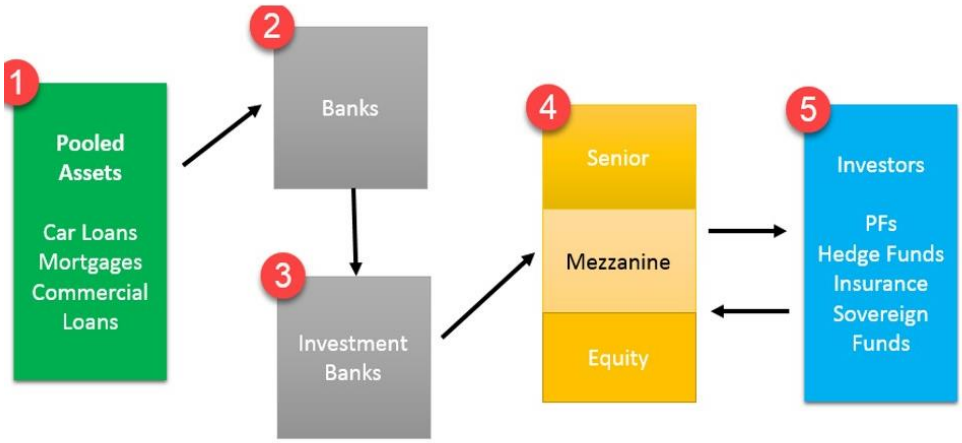
The 158-year-old Lehman Brothers filed for bankruptcy; the decision was taken in an emergency meeting which started at midnight in presence of most Lehman Brothers' key officials. Wall Street began with the news of Lehman Brothers bankruptcy and the key equity index immediately crashed 4%, the biggest single-day plunge since the 9/11 attacks. Lehman was the only large financial institution to file for bankruptcy during the crisis, while Bear Stearns and AIG, who faced a liquidity crisis as well, were saved by loans from the Federal Reserve.

1.2 HISTORICAL CONTEXT

The 2008-2009 financial crisis was the largest since the Great Depression of 1930. The two main causes of the global financial crisis were, mainly, the boom and bust of a residential housing bubble and the issuance of subprime mortgages. Before 2000, only the most credit-worthy (prime) borrowers could receive residential mortgages. Advances in computer technology and new statistical techniques lead to a quantitative evaluation of the credit risk for a new class of risky residential mortgages. Households with credit records could now be assigned a numerical credit score, FICO score (also known as Fair Isaac Corporation score), that would predict the likelihood of default on their loan payment. In addition, by lowering transaction costs, computer technology enabled the bundling of smaller loans (like mortgages) into standard debt securities, a process known as securitization. These factors allowed banks to offer subprime mortgages to borrowers whose credit records were not stellar.

The ability to cheaply quantify the default risk of the underlying high-risk mortgages and bundle them in standardized debt securities called mortgage-backed securities, MBS, providing a new source of financing for these mortgages. Mortgage-back security is an investment similar to a bond that is made up of a bundle of home loans brought from the banks that issued them. Whoever invests in MBS receives periodic payments similar to bond coupon payments. The MBS is like the asset-back securities, ABS, which are investment securities collateralized by a pool of assets. MBS and ABS allowed the creation of collateralized debt obligations, CDOs. The process on how a CDO work is summarized in Picture 1. The creation of CDOs involves a corporation called special purpose vehicle, SPV, which purchases a collection of assets such as corporate bonds, loans, and MBS. After that, the goal of the SPV is to bundle these assets into different classes which are called tranches. Generally, CDOs are divided into 4 tranches, listed from the least risky to the riskiest: super senior tranche, senior tranche, a mezzanine tranche, and equity tranche. When the least risky tranche is paid out, the next tranche starts to being paid out. The last tranche has the highest risk and is often not traded.

Picture 1. How CDOs Work



Collateralized Debt Obligations (CDO)| Step by Step Guide to How it Works (wallstreetmojo.com)

In addition, mortgage brokers which were the ones who originated the loans often did not evaluate properly whether the borrower was able to pay off the loan since they would distribute the loans to investors in the form of mortgage-back security. This model is called the originate-to-distribute business model, which was exposed to the principal-agent problem since the brokers acted as agents for the investor, but there was no alignment of interests. The agent once he was paid with his fee, he no longer cared about whether the borrower paid off his debt or not. Consequently, adverse selection became a problem. Risk-seeking investors lined up to obtain loans to acquire a house that would be profitable if the price of the real estate went up, on the other hand, if the price would have gone down, they could have just defaulted on the loan. In addition, the principal-agent problem also created the incentive for mortgage brokers to encourage households to take as many mortgages as possible. The agency problems went even deeper with commercial and investment banks, who were earning fees on underwriting mortgage-back securities and create credit products like CDOs since they did not have the incentive to make sure that the borrowers could pay off the debts. The insurance companies, such as AIG, were involved in this scenario since they earned large fees from writing financial insurances called credit default swaps, which allowed the holder of the bond to receive the payment in case of borrowers' default.

Credit-rating agencies, who rate the quality of debt securities in terms of the probability of default, were another contributor to asymmetric information in financial markets. In fact, at the same time, they advised clients, investment banks, on how to structure complex financial instruments, CDOs, and they were rating these identical products. Therefore, this situation arose a conflict of interest because of the large fees that they were earning from consultancy services on how to structure financial products, which were the same that they were rating. This meant that they did not have sufficient incentives to make sure their ratings were accurate. The result was that ratings were inflated, and they were far riskier than investors recognized.

However, the actual story of the crisis is a little bit more complex. This crisis stemmed from a systemic problem in the global economy, but we have more fundamental causes.

Extensive-Production to Intensive-Production

Between the two wars, industrialized economies suffered from low economic growth rates. In fact, in Europe, the average growth was 1.19% for Western European countries, 0,86% for Eastern Europe, and 2,84% for the United States. After WWII, the scenario changed dramatically, the growth rates rose world widely, this economic expansion that took place in industrialized countries was due to extensive production these countries used the resources to rebuild infrastructures, cities, and so on. The peak was reached in the 1970s. Once that this extensive production started to vain, the growth rates started to drop and the only way to drive them up again was intensive production, which is obtained through an increase of productivity. When industrialized countries faced the hardship of intensive production, they tried to expand the extensive production frontier with the financialization of the world economy within the framework of neoliberalism.

The rise of neoliberalism

In the late 1970 and at the beginning of 1980, neoliberalism started becoming very viral and it started replacing the Bretton Wood system, which was established in 1944. Under this system, gold was at the basis of the value of the U.S. dollar, and the other currencies were linked to the latter. The Bretton Wood system ended in the 1970s when Richard Nixon, the living president of the United States of America, no longer accepted the exchange of gold for dollars. The two main prime ministers associated with the rise of neoliberalism are Margaret Thatcher, the prime minister of the United Kingdom from 1979 to 1990, she was also known as "The Iron Lady" and Ronald Reagan, the United States president from 1981 to 1989. The main objective of neoliberalism was having supremacy of markets as well as a government that would have allowed a well-liberalized and unconstrained economy. This thought was widely accepted by large institutions such as the International Monetary Fund, IMF, and the World Bank. Therefore since the '80s, the financial industry was subject of a large liberalization. One of the most important acts in the deregulation of the financial industry was the Gramm-Leach-Bliley Act, which allowed the financial institution to engage in many more activities concerning banking, securities, and insurance operations. This wave of deregulation was followed by many mergers in the financial industry. In addition, from 1970 to 2012 the percentage of assets held from the five largest banks worldwide rose from 17% to 52%. Moreover, the total assets of the five largest banks (Citi, Wachovia, Wells Fargo, BoA, and JP Morgan) rose from 2.2 trillion to 6.8 trillion dollars from 1998 to 2007. Furthermore, the total assets of the largest investment banks (Merrill Lynch, Lehman Brothers, Bear Stearns, Morgan Stanley, and Goldman Sachs) increased from 1 trillion to 4 trillion in the same period.

The financial industry was moreover destabilized by the introduction and rapid expansion of derivatives between the '80s and the '90s. One example of derivatives established in those years were the collateralized debt obligations, CDOs, and the credit default swaps, CDSs. These products were largely unregulated.

Financialization of the World Economy

By the 1970s most of the countries dropped the Bretton Woods system and they started adopting a floating rate exchange rate. In 1970, 97% of the countries which were a member of the IMF had a fixed exchange rate, by 1999 only 11% were adopting it.[4]

The financial sector, moreover, was transformed even more by the deregulation given by neo-liberalism. We can conclude by saying that the Financialization of the world was more a political and ideological process than a natural and economic one. In these years developing countries were incorporated in this model and all of a sudden they started having a much more role in international trade and global economy than they were used to have. Even though these countries' financial and economic openness were quite limited, some emerging countries adopted export policies under the advice of WTO, World Bank, and IMF.

While in the Bretton Woods system capital movements were restricted and the interest rate was determined by the governments, now the restrictions on international capital flows and interest rates were eliminated, both in industrialized and developing countries.

Global Instabilities

The financial position of many countries during neoliberalism became unstable because of the numerous international capital flows, which were almost free, as well as the wide adoption of floating exchange rates by almost every country worldwide.

Moreover, thanks to the World Trade Organization, WTO, many limitations on trade were removed for developing countries, which contributed even further to this wave of liberalization.

This liberalization process turned out to have many collateral effects since the adoption of neoliberalism ideas, in the 1980s, more than 150 financial crises were faced. On the one hand, some countries such as Germany, China, and Japan, were accumulating many reserves they counted a large share of the global current account surplus.

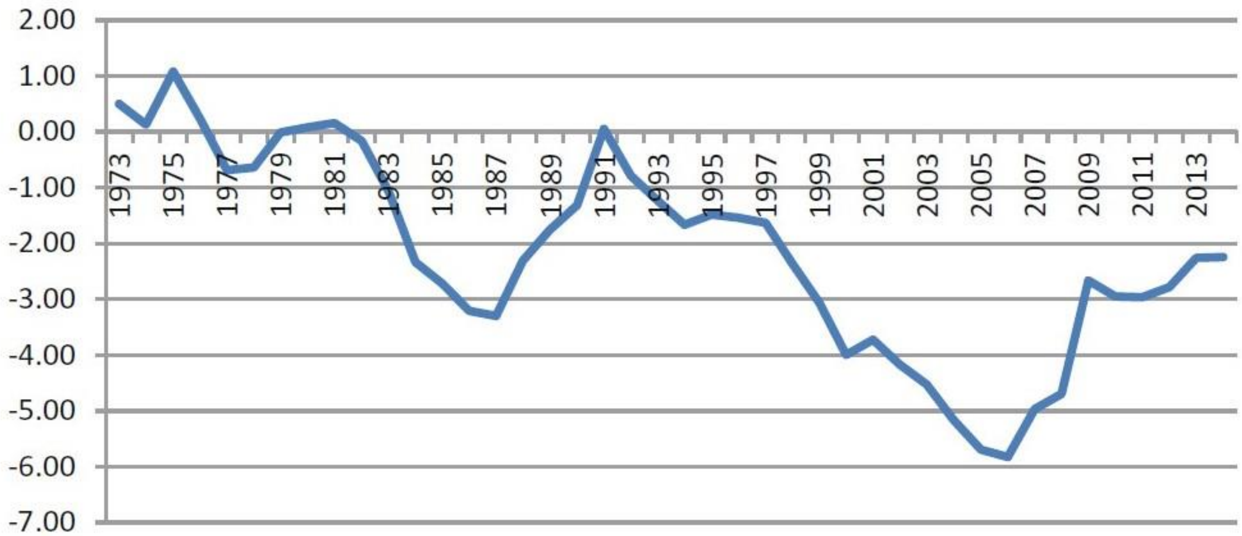
China, starting from 1980, wholly changed its economy being more propended to exports. This shift was possible mainly for 2 reasons: the depression of the exchange rate and the acceptance into the WTO. The aftermath of this open economy model was that exports accounted for more than 10% of China's GDP.

Japan's situation was way more different from the one of China. During the 1990s Japan faced a deep depression which still needs to be recovered. To recover from this terrible situation, the government adopted a loose monetary policy and voluntarily depressed the value of the Yen. As the domestic demand decreased and the number of export increased.

Instead, Germany started to have a positive current account surplus thanks to the euro and its peak was reached during 2008-2009.

On the other hand, the USA was the country whose deficit was the greatest.

Table 1. The deficit of the United States of America in percentage from 1973 to 2013



US Bureau of Economic Analysis 2015

We can see from table 1 that during the neoliberal era the current deficit was negative until 1991 when it hit a slightly positive value. In the period that goes from 2005-2007 the current world deficit was more or less 1.3 trillion dollars and the US alone accounted for 57% of the worldwide debt.

During the Bretton Woods system, the US dollar had a key role in international transactions, and it was considered also the greatest investment currency. During neoliberalism, the US dollar kept its dominant position, but it was further strengthened by the elimination of restrictions on international capital trades. The increase in value of the USD was followed by an enormous growth of the United States financial industry provoking the dot com bubble, in the last years of the XX century and the first ones of the XXI, and the housing bubble in the 2000s followed by a global financial crisis.

The monetary policy adopted by the Federal Reserve during the first years of neoliberalism strengthen even further the position of both the dollar and the financial industry. During the 1970s and 1980s countries that were exporting oil accumulated a large number of petrodollars, which are US dollars paid to an oil-exporting country, these funds were allocated to American investment and commercial banks. The petrodollars were the outcome of the crisis of oil in the 1970s when the cost of oil reached its peaks. On the other hand, developing countries were in dire need thanks to these oil shocks and the US commercial banks provided capital, which was denominated in dollars, for this reason, investment, and commercial banks because of lenders of foreign governments.

After few years there was a change in the US monetary policy, in 1979 the Federal Reserve raised interest rates intending to decrease inflation, which reached the double-digit. Interests in 1981 reached the value of 16%. This monetary policy had terrible outcomes for countries that were highly indebted to US dollars. In these years there were many financial crises such as the one in Mexico in 1982. Troubles kept getting bigger when the IMF and World Bank enforced neoliberal reforms such as no more restrictions on trades and international capital movements, the outcome of these decisions was the integration to the international financial industry of these countries. During those years the value of real exchange of US dollar rose by more than 50% in 2 years; US dollar became very attractive to global investors and the US economy has been covered by international capital, while at the same time, many developing countries found themselves without any capital, as a consequence the latter was obliged to tighten their monetary policy raising interest rates.

The Fed ended this monetary policy in 1985 and the real exchange of dollars came back to normality by 1987 and until 1991 the account deficit was close to zero, later on, the account deficit increased reaching its lower bound during the global financial crises.

Thanks to the unique role of the dollar being the dominant currency world-widely and the leading role of the US financial industry and the financialization of the world economy, it is normal that the United States attracts foreign capital throughout the world and runs current account deficit. However, this very structure of the world economy was the reason for the important global instabilities and eventually the 2008-2009 global financial crises.

In fact, since many funds allocated in the US stock market were foreign funds, it is normal that if there is a crisis in the United States, eventually it spreads out through the world, because it hits also the funds of foreign investors.

CRISIS' CONSEQUENCES 1.3

Consumers and businesses suffered because of the 2007-2009 financial crisis. The main aftermaths of the crisis hit the residential housing market, financial institution balance sheets, global financial markets, shadow banking system, the multiple failures of major firms, unemployment, and Sovereign Debt Crisis.

Residential Housing Prices: Boom and Bust. As cited previously in this paper one of the main causes of the 2008 financial crisis was the subprime mortgages. The subprime market ever since 2001 started having huge growth rates. Housing prices started to increase in value, and it meant that subprime borrowers were able to refinance their houses with even larger loans. In addition, since housing prices kept rising, subprime borrowers were not supposed to default on their mortgage because they could always sell their house to pay the residual debt and liquidate investors who purchased MBS.

The high demand for subprime mortgages, consequently, increased the demand for houses, whose price started increasing and the result was a housing price bubble.

As housing prices rose and profitability for mortgage originators and lenders was high, the standards to undertake a subprime mortgage fell to a lower level than before. In this way, high-risk borrowers started signing for subprime mortgages. People were able to get more than 3 mortgages without having the capabilities to repay them.

When asset prices rise too much, in this case, the residential housing price, they must come down. Since 2006, as we can see in Graph 2., the housing prices started losing their value. The decline in housing prices led to many subprime borrowers understand that the value of their debt obligation was higher than the house's value.

Graph 2. Composite Home Price Index

Source: S&P Dow Jones LLC

Deterioration of Financial Institutions' Balance Sheets. The decline in the US house prices leads to an increase in the defaults on mortgages. In this way the value of MBSs and CDOs collapsed, therefore, the value of banks' assets declined, leading to a decrease in the net worth. Since balance sheets were weakened, banks and financial institutions started the process of deleveraging, which includes the sale of assets and an increase in the restrictions for loans both to households and businesses. In conclusion, financial friction increased in financial markets.

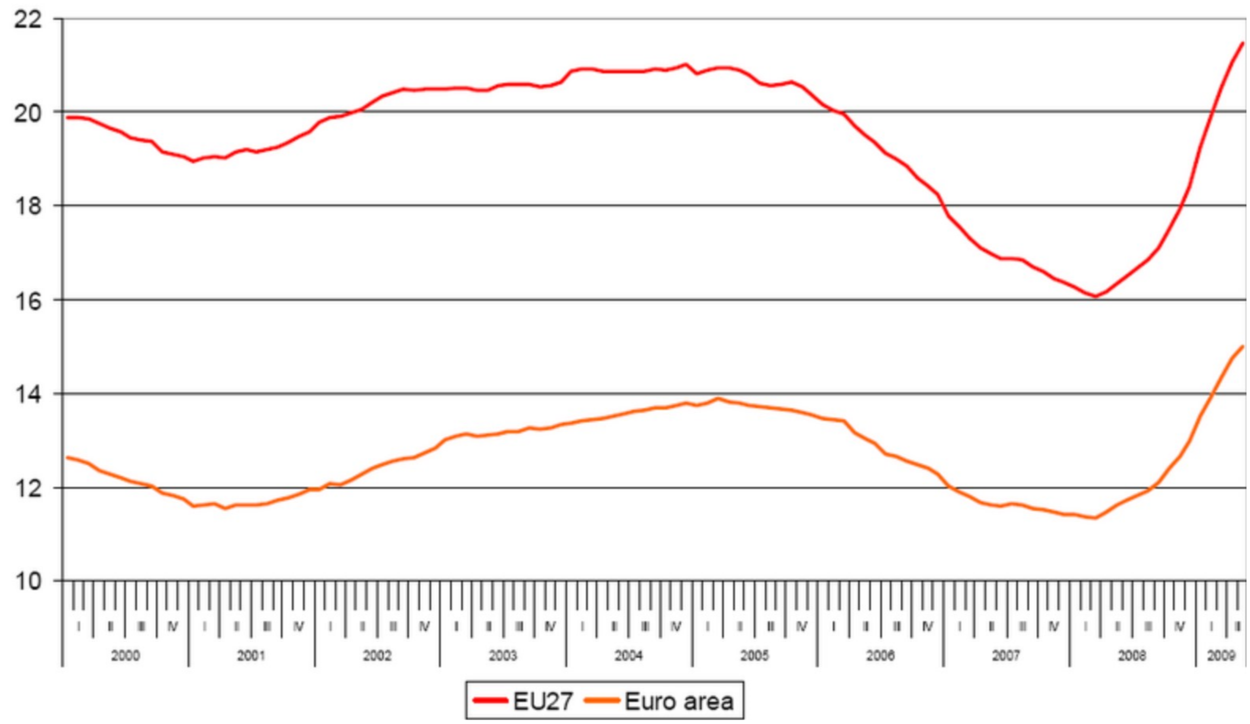
Run-on the Shadow Banking System. The sharp decline in value of sub-prime mortgages, MBSs, and CDOs led to a run on the shadow banking system, made of hedge funds, investment banks, no depository financial firms. These securities were funded through repurchase agreements. When borrowers of subprime mortgages started being insolvent on them, MBSs started losing value and consequently, the haircuts on the repos started increasing. At the beginning of the crisis, the haircuts were close to zero while, eventually, they rose to 50% of the amount of the repo. For this reason, raising funds in the Shadow Bank industry became very expensive, and financial institutions started selling off their assets. The fire sale of assets caused a further decline in financial institutions' asset values. This decline reduced the value of collateral, even more, raising the haircuts and forcing financial institutions to sell other assets to obtain more liquidity. In addition, the decline in asset prices in the stock market and the decline in the value of residential houses weakened firms' and households' balance sheets. The aftermaths of this situation were an increase in credit spread, higher cost of credits, tighter lending standards and a fell in consumption and investments.

Global Financial Markets Even though the financial crisis started in the United States, it quickly spread out all over the world. In 2007 Fitch and S&P downgraded MBSs and CDOs, at the same time BNP Paribas suspended the redemption of shares held in money markets, which had sustained large losses. The run on the shadow banking system became worse and worse. Despite the huge liquidity injection in the economy by the European Central Bank and Federal Reserve, banks were unwilling to lend each other money. Many financial institutions started failing and as a result, some countries such as Greece, Ireland, Portugal, Spain, and Italy had huge problems after the 2007-2009 crisis, leading, eventually, to the sovereign debt crisis.

Failure of High-Profile Firms Many firms due to the deterioration of their balance sheet because of the financial crisis were obliged to undertake drastic actions. In March 2008, Bear Stearns, one of the largest investment banks, which invested heavily in the subprime-related assets, was acquired by J.P. Morgan. In July 2008 Fannie Mae and Freddie Mac were propped up by the Federal Reserve because of the huge losses faced in holding subprime securities. As we already know Lehman Brothers in September 2008 failed. In the same month, Bank of America purchased Merrill Lynch. The federal reserve on 16th September issued a loan of 85 billion dollars to save AIG, an insurance company.

Unemployment The crisis had huge effects on unemployment, mainly for two reasons, the first one is the doubling of unemployment rates in some countries and the scarcity of jobs availability. Strong economies such as the US and UK slowly recovered from these unemployment problems, while other countries such as Greece, Spain, and Italy kept struggling. In these three countries where youth unemployment was high even before the crisis, the long-term unemployment was dramatically hit by the subprime crisis. In graph 3., we can see how the unemployment surged from 2007.

Graph 3. Unemployed people in Europe, in million, seasonally adjusted



Source: Eurostat

The Sovereign Debt Crisis The most popular account of the Sovereign Debt Crisis is given to the PIIGS countries which are: Portugal, Italy, Ireland, Greece, and Spain.

The main reason for this crisis is the incapability of these countries to manage their revenues. The thing that all these countries have in common is that they spent more than they received from taxes. Their fiscal irresponsibility was very high even when the economic cycle was favorable. For this reason, the interest rates on bonds soared to the point that they were no longer sustainable, hence these countries asked for support from the EU and the IMF. However, between the PIIGS countries, only Greece's fiscal policy led to the sovereign debt crisis, while the other countries had such fiscal imbalances because of the financial crisis of 2008. The attitudes of these countries toward the financial crisis were different, but they all led to the same point. For example, Spain and Portugal undertook counter-cyclical policies while Greece adopted pro-cyclical ones. Italian government neither release stimulus packages nor cut spending as expenditures increased. Spain's stimulus checks did not help the economy and the decision of Ireland to bail out its banks let the deterioration of its finances. PIIGS nominal salaries, before the crisis were almost as high as the ones paid in Germany, however productivity, continued to lag since the growth rates of Germany were high.

In addition to this situation, the current account deficit of all these countries was negative, except for the one of Ireland which was the sole country to have exports greater than imports. In a normal situation, to restore competitiveness, the solution would be the devaluation of the currency, to achieve the increase the exports and make imports more expensive, however, all of this was not possible because of the Euro.

Furthermore, as Eurozone countries are not in control of their currency, they had to borrow money from private financial markets at high-interest rates, for this reason, the government faced difficulties to obtain liquidity to purchase back government bonds which could have ended up being insolvent.

CHAPTER 2: INTERPRETATION OF THE FAILURE OF LEHMAN BROTHERS

In the second chapter of this paper, we are going to analyze whether the failure of Lehman Brothers was justified, or somehow Lehman Brothers through some financial help could have resiled from this situation. We will proceed in the first place with an analysis of why the failure was justified and later on we will proceed with an analysis of whether the company could have been bailed out.

2.1 WAS LEHMAN BROTHERS' FAILURE JUSTIFIED?

The decision that Lehman Brothers should have failed was taken by Henry Paulson, which was the Treasury Secretary, he was the one who followed the negotiation of Lehman over its last weekend and when he figured out that nobody was interested in the acquisition of the American investment bank, he decided that Lehman should have filed for bankruptcy.

Anyone would demand itself why Lehman Brothers and not AIG. One of the reasons why Lehman did not receive any financial help before its bankruptcy is due to the fact the symbolically the wounds of the American investment bank were self-inflicted, while the bankruptcy of a company such as AIG, which, at its peak, was 4 time larger in capitalization than Lehman Brothers, would have provoked a macroeconomic default whose aftermaths would have been catastrophic. A possible AIG bankruptcy would have caused a worldwide domino effect among the insurance companies and the financial system, furthermore, this domino effect would have spread to the banks. During a press conference, Tim Geithner, then New York Federal Reserve president, declared that the reasons why Lehman Brothers was not bailed out can be divided mainly into three points:

- Lehman Brothers was weaker than Bear Stearns, which was rescued in March 2008.
- The financial system, when Bear Stearns was rescued, was stronger than in September 2008 when Lehman was at its peak of liquidity crisis and for this reason, finding a private buyer was very difficult.

- The political climate was against rescuing another investment bank without being helped by a private company.

Another enormous problem of Lehman Brothers concerns its attitude to risks; back in 1998, the American investment bank was close to bankruptcy due to the huge investments in the Russian public debt. The European country defaulted on its debt and this condition stressed Lehman Brothers, which was saved after a huge relief by investors. Back then the risk management was not functioning at all, after that experience the company promised itself to undertake investments less dangerous. The risk management well behavior lasted until 2006 where they became once again overconfident. In 2007/2008 when their eyes were focused on the real estate assets they were not taking care of the high amount of money invested in high-yield assets and checking how the leverage lending business was going. These loans which can be considered very risky did not have enough collateral.

Another huge problem that led to Lehman's bankruptcy was the heavy investments in illiquid assets and there was an attempt to hedge against those illiquid investments.

In addition, we can say that many companies such as Bearn Stearns and Lehman Brothers back in 2006/2007 had a very bad approach to investments, remunerating their employees for taking excessive risks. Therefore, we can say that from one point of view it is not ethically correct to rescue some companies because of bets that did not go very well. Lehman Brothers' bankruptcy can be seen as the end of a vicious circle if the Federal Reserve had bailed out Lehman, other companies would have gone broke and at a given time frame the Fed would have stopped the bailouts. In this case, one bankruptcy is enough to let the other companies understand what is going on.

Moreover, the Federal Reserve believed that by September 2008 many investors lost interest in Lehman Brothers since its balance sheet well deteriorated. For this reason, a bailout can be considered a waste of time, effort, and public resources, since the reputation of the American investment bank was well gone and financial help probably could have helped in the very short term because of the lack of trust for Lehman Brothers. Once clients' and investors' trust is gone keep being in business in a very competitive industry can result difficult and harmful.

Therefore, the reasons why Lehman has not rescued concern primary politics. Henry Paulson, who decided the fate of Lehman, was scared of a potential political firestorm in case of a rescue.

The other reason is that policymakers did not believe that the bankruptcy of Lehman Brothers would have been such a disaster.

The Bailouts of 2008 caused many criticisms from politicians, economists, and media and we consider it as evidence of the failure of Lehman Brothers. Back in March 2008 after the rescue of Bear Stearns by the Fed there was a very high wave of criticisms. Paul Volcker, for example, called the rescue of Bear Stearns as a transfer of MBSs from an investment bank to the Federal Reserve. Vincent Reinhart who was an official at the Federal Reserve called the rescue "worst political mistake" and he said that the rescue compromised the credibility that the Fed gained over time.

The effect of media over the Lehman Brothers crisis played a crucial role over the last week of the American investment bank. Before May 7th all the attention was around the crisis of Fannie Mae and Freddie Mac, but during the week of September 8, all the attention was pointed to Lehman Brothers. Many papers were disappointed about a possible rescue of the American investment bank and the media presented this situation as an "aut aut" in which the two opportunities were either rescuing Lehman Brothers or letting it fail.

2.2 SHOULD LEHMAN BROTHERS HAVE BEEN RESCUED?

Before starting to discuss a possible bailout of Lehman Brothers we need to examine formerly the different ventures of the American investment bank and latterly we are going to examine its balance sheet.

Lehman Brothers were divided into three different segments each of which was operating world-widely. The venture for which Lehman was known the most is the investment banking division which oversaw underwriting companies willing to be listed and advise them during this process. The other two divisions were the investment management one, where managers were allocating funds of wealthy people and institutions in private equities and hedge funds, and the capital market division in charge of trading equities, derivatives, and fixed-income securities. In this latter division, we can find the employees which oversaw the origination of mortgages and investment in commercial real estate.

The corporate governance of Lehman was not coordinated with its different ventures. What we can say about it is that the company was structured based on a geographical distribution mainly because of the different tax burdens and the capital requirements of the different countries. The coordinator of all the subsidiaries was Lehman Brothers Holdings Inc. (LBHI) and it was the owner of the different assets of all the other companies which depended on it. In addition to these, some of the subsidiaries were owning other subsidiaries on their behalf. LBHI was the company in charge of managing the liquidity of the American investment bank, collecting cash from the profitable division, and handing it out to the ones which were short on cash. The structure of the corporation became relevant while it was becoming insolvent because some of the subsidiaries entered separate wind-downs in different countries. This condition created many disputes among the different ventures of the firm.

After the discussion of the corporate governance of Lehman, we can analyze the balance sheets of the main holding LMHI.

The balance sheet is for the Q2 of 2008 and there is also a comparison with how the situation in November 2007 was.

Picture 2. Lehman Brothers' Financial statement, assets side

LEHMAN BROTHERS HOLDINGS INC.
Consolidated Statement of Financial Condition
(Unaudited)

In millions	At May 31, 2008	At Nov 30, 2007
Assets		
Cash and cash equivalents	$ 6,513	$ 7,286
Cash and securities segregated and on deposit for regulatory and other purposes	13,031	12,743
Financial instruments and other inventory positions owned (includes $43,031 in 2008 and $63,499 in 2007 pledged as collateral)	269,409	313,129
Collateralized agreements:		
Securities purchased under agreements to resell	169,684	162,635
Securities borrowed	124,842	138,599
Receivables:		
Brokers, dealers and clearing organizations	16,701	11,005
Customers	20,784	29,622
Others	4,236	2,650
Property, equipment and leasehold improvements (net of accumulated depreciation and amortization of $2,697 in 2008 and $2,438 in 2007)	4,278	3,861
Other assets	5,853	5,406
Identifiable intangible assets and goodwill (net of accumulated amortization of $361 in 2008 and $340 in 2007)	4,101	4,127
Total assets	$639,432	$691,063

Source: Ball L. (2016)- The Fed and Lehman Brothers

In Picture 2., we can see the asset side of the balance sheet and we can see that the overall value of it decreased from $691 billion to $639, hence a decrease by more or less $52 billion.

The majority of these $639 billion, $606 billion, could be grouped into 3 main categories.

Financial instruments and other inventory positions owned, $269 billion, which includes the securities, derivatives, fixed income securities in the capital markets, all the investments in private equity, real estates, and the mortgage loans.

Collateralized agreements, $295 billion, can be divided into two subgroups, which are the securities purchased under agreements to resell, which are the reverse repurchase agreements, and securities borrowed. In this case, we can see how LMHI provided liquidity to other companies getting securities as collateral.

Receivables, $42 billion, are the money that companies owed to Lehman.

Picture 3. Lehman Brothers' Financial statement, liability side

LEHMAN BROTHERS HOLDINGS INC.
Consolidated Statement of Financial Condition (Continued)
(Unaudited)

In millions, except share data	At May 31, 2008	At Nov 30, 2007
Liabilities and Stockholders' Equity		
Short-term borrowings and current portion of long-term borrowings (including $9,354 in 2008 and $9,035 in 2007 at fair value)	$ 35,302	$ 28,066
Financial instruments and other inventory positions sold but not yet purchased	141,507	149,617
Collateralized financings:		
Securities sold under agreements to repurchase	127,846	181,732
Securities loaned	55,420	53,307
Other secured borrowings (including $13,617 in 2008 and $9,149 in 2007 at fair value)	24,656	22,992
Payables:		
Brokers, dealers and clearing organizations	3,835	3,101
Customers	57,251	61,206
Accrued liabilities and other payables	9,802	16,039
Deposit liabilities at banks (including $10,252 in 2008 and $15,986 in 2007 at fair value)	29,355	29,363
Long-term borrowings (including $27,278 in 2008 and $27,204 in 2007 at fair value)	128,182	123,150
Total liabilities	613,156	668,573
Commitments and contingencies		
Stockholders' Equity		
Preferred stock	6,993	1,095
Common stock, $0.10 par value: Shares authorized: 1,200,000,000 in 2008 and 2007; Shares issued: 612,948,910 in 2008 and 612,882,506 in 2007; Shares outstanding: 552,704,921 in 2008 and 531,887,419 in 2007	61	61
Additional paid-in capital	11,268	9,733
Accumulated other comprehensive loss, net of tax	(359)	(310)
Retained earnings	16,901	19,698
Other stockholders' equity, net	(3,666)	(2,263)
Common stock in treasury, at cost (60,243,989 shares in 2008 and 80,995,087 shares in 2007)	(4,922)	(5,524)
Total common stockholders' equity	19,283	21,395
Total stockholders' equity	26,276	22,490
Total liabilities and stockholders' equity	$639,432	$691,063

See Notes to Consolidated Financial Statements.

Source: Ball L. (2016)- The Fed and Lehman Brothers

As we can see from Picture 3., from November 2007 to 2008 decreased by $55 billion. On May 31st, 2008 the overall amount of liabilities were $613 billion and they were divided mainly into 4 categories.

Financial instruments and other inventory positions sold but not yet purchase, $142 billion, these were the overall Lehman's short position with a negative value and not repurchased yet.

Collateralized financings, $208 billion, these group of assets included the repurchase agreements and securities loans. This was the cash that the company owed to third parties.

Payables, $61 billion, this section include payments postponed by Lehman Brothers which owed to the other companies with which entered into transactions.

Long-term borrowings, $128 billion, this category includes debt that is due to more than a year and is unsecured.

To summarise, to define whether a company is solvent or not its assets must be greater o equal than its liabilities, and the equity must have a positive value. In the case of Lehman Brothers its net working capital, which is the difference between current assets and current liabilities, amounted to $26 billion and its equity was positive with an overall value of $26 billion.

However Lehman never shared the balance sheet for Q3, but many economists believe that the number of assets fell from $639 to $600 billion since the company kept selling illiquid assets. After that, there was a revaluation of Lehman's assets which were overvalued by $5.6 billion. In addition to these Lehman incurred the second straight quarterly loss of $3.9 billion. However, while the number of assets was decreasing, its equity rose from $26.3 billion to $28.4 since $6 billion shares were issued in June.

However, many analysts doubted Lehman's solvency, believing that Lehman inflated the value of its assets and it implies that its equity was negative.

For this reason, we should try to run a valuation of Lehman Brothers. As we already said, most of the assets of Lehman fell under three main groups, collateralized agreements, receivables, and financial instruments and other inventory positions owned. The first two classes of assets were cash that other companies owed to Lehman and therefore its valuation is objective. On the other hand, the assets which arose some suspects of overvaluation were the financial instruments, $269 billion, and a total of $249 billion was reported at fair value, which is the price at which the assets could be traded between willing parties. In addition to this, the American bank determined the fair value of assets under the assumption of 3 different levels, as it is shown in Picture 4. The first level follows the prices in the markets, such as stock prices, the second level derives the value of the assets through alternative sources which are reasonably transparent, while the third level, follows a subjective evaluation.

Picture 4. Estimation of Lehman Brothers' assets and liabilities at Fair Value

In millions	At May 31, 2008	At Nov 30, 2007
Level 3 assets	$ 41,344	$ 41,979
Less: Level 3 derivative liabilities	(3,433)	(3,095)
Level 3 assets (net derivatives)	$ 37,911	$ 38,884

Assets and liabilities measured at fair value on a recurring basis are categorized in the tables below based upon the lowest level of significant input to the valuations.

	Assets at Fair Value as of May 31, 2008			
In millions	Level 1	Level 2	Level 3	Total
Mortgage and asset-backed securities[1]	$ 347	$ 51,517	$ 20,597	$ 72,461
Government and agencies	11,002	15,986	-	26,988
Corporate debt and other	77	44,332	5,590	49,999
Corporate equities	26,785	10,606	10,158	47,549
Commercial paper and other money market instruments	4,757	-	-	4,757
Derivative assets[2]	2,597	39,395	4,999	46,991
	$ 45,565	$ 161,836	$ 41,344	$ 248,745

	Liabilities at Fair Value as of May 31, 2008			
In millions	Level 1	Level 2	Level 3	Total
Mortgage and asset-backed securities	$ -	$ 351	$ -	$ 351
Government and agencies	60,689	3,042	-	63,731
Corporate debt and other	5	8,339	-	8,344
Corporate equities	42,356	828	-	43,184
Commercial paper and other money market instruments	12	-	-	12
Derivative liabilities[2]	1,799	20,653	3,433	25,885
	$ 104,861	$ 33,213	$ 3,433	$ 141,507

Source: Ball L. (2016)- The Fed and Lehman Brothers

Somehow, we can assume that Level 1 and 2 valuations are reasonable. In this asset breakdown, we can see that the overall level of assets estimated with level 3 input is $41.3 billion, to this value we need to add $20,7 billion which were real estates held for sale. Therefore, the total value of assets that might have been inflated was $62 billion, we know for sure that the value of these assets was between 0 and $62 billion. The companies cited in chapter one which was involved in a possible acquisition of LMHI all together came up with the same idea that about $50-$70 billion of assets were inflated. The evidence suggests that the reports have a bias of $15 to $30 billion, therefore the true value of equity was a value between -$2 to $13 billion. We need to remember that this analysis was made in a hurry and we will never know the true value of equity of Lehman Brothers based on the fair value analysis. We need also to remember that between LB liabilities we had $18 billion of subordinated debt and added to the equity gives a positive value. This value suggests that a resolution of Lehman Brother was possible.

We now start discussing the feasibility of liquidity support by the Federal Reserve, because as we cited before the bankruptcy of Lehman Brothers was provoked by a liquidity crisis, in few words the American investment bank did not have the funds to keep going with its operations. In the first place, the Federal Reserve could have handed out some liquidity to Lehman to keep it solvent and to help it throughout a few weeks and months. In exchange for this financial help, Lehman would have handed out some collateral to protect the Fed's position. Later, the Fed executives and Lehman Brothers management could have worked out a way to resolve the firm's crisis in the long run. The goal, essentially, was to plan something less drastic than the bankruptcy.

To discuss this scenario we need to understand how much LBHI needed to be saved and what amount of collateral the company had.

If we look at the balance sheet of Lehman Brothers we see that assets and liabilities were more or less the same and its equity had a value close to zero, in addition, if we look at the balance sheet in May the company had unsecured debt of $128 billion in the long term, which means that Lehman assets were greatly larger than the short term liabilities and it implies that the company could have collected cash from the Federal Reserve since the value of its collateral was high. In this case, collaterals are the key to guarantee a possible rescue from the central bank, in this way the company can borrow money.

In addition, The Federal Reserve's assistance that Lehman Brothers might have needed to stay in business was around $88 billion, which could have borrowed through the Primary Dealer Credit Facility, PDCF, an institution set up by the Fed to provide overnight loans to primary dealers through their clearing banks in exchange for eligible collateral. The PDCF provided loans that settled the same business day and matured the following business day. The initial facility was shut in 2010[5]. The reason why the loan was possible was due to the high amount of assets that could have been employed as collateral by the PDCF, $131 billion[6].

During a liquidity crisis, a bank has a higher demand for cash than usual, because it needs to pay its short-term liabilities, it needs to satisfy the demands for withdrawals from clients, and for this reason, financial institutions may be out of cash.

The condition to understand whether a company has enough collateral to borrow money from the central bank is that the value of its asset must be greater than the difference between its liabilities and its long-term unsecured debt, therefore, by readjusting this inequality, we can conclude that we need that the sum between equity, which is equal to the difference between assets and liabilities, and long-term debt is greater than 0.

If we want to apply this scenario to Lehman Brothers, the sum of equity and long-term unsecured debt, by the end of August, was $156 billion of which $28 billion were equity.

We know that assets were overvalued by $15-30 billion, however, if we subtract 30 billion dollars from $156 billion, we still have a value largely greater than 0, which is $126 billion. For this reason, we can conclude that Lehman Brothers largely met the condition to secure a monetary rescue, which could have helped Lehman Brother's executives and the Fed to find a solution less drastic than the bankruptcy in the meantime. Once, that we have discussed the amount of collateral owned by LB, we need to discuss the liquidity needed by the American investment bank to keep being operative. The maximum amount of money needed by Lehman would have been the overall liabilities less the long-term unsecured debt if all liabilities came due at once. By August 31st, Lehman's aggregate liabilities were $572 billion, of which $128 billion were long-term debt. In this case, an upper bound for Lehman Brothers' cash needed was $444 billion. However, we know that the liabilities we due in different periods. Let's now look at the true assets of Lehman

[5] Investopedia Primary Dealer Credit Facility

[6]Ball L. (2016)- The Fed and Lehman Brothers

Brothers, considering an overvaluation of $30 billion, whose value, at the end of August, was $570 billion. The value of the assets is greater than $126 billion than the maximum amount of money needed by Lehman is all the liabilities were due on the same day and immediately. In This case, the excess of assets is 28% greater than $444 billion, the maximum amount of money needed by Lehman to pay off all its short-term liabilities. If we are willing to decrease the maximum amount of money needed by Lehman, we could match some items in the liabilities, such as repurchase agreements, with some items on the asset side, reverse repurchase agreements. We do not need to forget that the main role of Lehman Brothers as an intermediary was to take securities from firms in exchange for cash and sell the securities to others. For this reason, if counterparties terminated repos or securities loans, the American investment bank could reduce its loss of cash by terminating offsetting transactions.

On August 31, Lehman's reverse repos and borrowings to firms amounted to $273 billion, therefore if the company canceled the transactions, it could have raised $273 billion to pay off some liabilities. Removing this amount from both the overall amount of assets and its maximum cash need leaves the company with $297 billion in assets and $171 billion in cash needs. If we calculate the difference between 297 and 171, we see that the result is $126, and the outcome is that the liquidity support of $88 billion could have been overcollateralized by 45%.

Let's now take a look at a likely scenario that could have been applied to Lehman Brothers to keep staying in business. The scenario analyzed previously is a worst-case scenario where the American investment bank needed to pay all its obligation except for long-term debt. A proper estimation of the liquidity assistance needed by Lehman Brothers to keep being in business for the 4 weeks after September 15th is about $88 billion. This amount reflects initial cash of $1 billion and $89 billion of losses: these numbers derive from $66 billion from repos that do not roll and $23 billion from other liquidity drains.[7]

We will talk about the kind of assistance that the American investment bank could have received. The Federal Reserve could have kept Lehman in operation through PDCF, which

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[7] Ball L. (2016)- The Fed and Lehman Brothers

could have given to Lehman Brothers the liquidity to the whole enterprise due to the $126 billion of assets that could have been accepted as PDCF collateral. Before starting our likely scenario, we need to make some assumptions:

- From September 15th, Lehman cannot roll over any repos with collateral other than treasury and agency securities.
- Lehman Brothers can roll over repos with treasury and agencies. This assumption is possible to make because after LBHI bankruptcy LBI rolled most of its repos with treasury and agencies.
- Lehman continues to provide liquidity to its clients through reverse repos and securities borrowings, to maintain the business, the usual way.
- Lehman Brothers experience liquidity drains besides the loss of repos, including collateral calls and losses of cash at its prime brokerages.
- Lehman does not experience liquidity drains that were possible but were unexpected. For example, a loss of deposit by a bank subsidiary of Lehman Brothers.

After all these assumptions, we can estimate the liquidity assistance needed by the American investment bank to stay in business. The focus is mainly on the weeks between September 15 to October 13. Some estimation of liquidity drains that Lehman would have experienced are the following:

- Lost repos ($66 billion): On September 13 and 14, Lazard and Lehman Brothers analyzed Lehman's liquidity, from this estimation, the figures for non-Treasury collateral pledged in repos amounted from $73 to 80$ billion. From this number, let's assume we take the worst-case scenario; therefore we consider $80 billion, of which the 10% was due to more than 4 weeks horizon. For this reason, repos amounting to $72 billion, the 90% of $80 billion repos, were supposed to roll within 4 weeks.

- Since the value of haircuts on the collateral for LBHI was about 8%, we assume that also on these repos the haircut was the same and we can conclude that the liquidity loss of Lehman Brothers deriving from the repos amounts to $66 billion.
- Unsecured funding ($6 billion): one of the assumptions that we can make is that Lehman Brothers cannot roll its commercial paper, which is $2 billion. In addition, we assume that Lehman has to pay $4 billion of long-term debt. This amount is a guess which can be close enough to the true digit. Two weeks from September 15, Lehman had to pay $2 billion in long-term debt[8] and within three months it was supposed to pay $8.5 billion.[9]
- Collateral calls ($9 billion): due to rating downgrades, Lehman Brothers was supposed to pay a higher amount in collateral calls on derivatives. The New York Federal Reserve predicted that the collateral call for Lehman Brothers amounted to $9 billion.
- Commitments ($8 billion): The Federal Reserve of the state of New York in the money required by Lehman Brothers to keep operating we have $8 billion of on-boarding and other commitments.

Our analysis on how Lehman Brothers would have employed the $88 billion for the period which goes from September 15 to October 13 is over, now we are going to analyze the collateral that Lehman could have employed for borrowing with the PDCF.

If we consider the assets which were accepted by the PDCF we can see that Lehman had enough of them to borrow the money it needed at that time. This means that Lehman could have survived if it had free access to a loan from the PDCF. The collaterals which were accepted by the PDCF were generally high-rated securities, such as treasury bonds, investment-grade Mortgage Back Securities, and treasury and agency securities. However, on September 14, the Fed "begged" the PDCF to accept other securities close in quality to the one cited above, to alleviate Lehman Brothers' bankruptcy. In this scenario, the securities that were accepted by the PDCF were speculative-grade securities, equities,

[8] Lazard memo

[9] September 10 memo on funding Lehman brothers

and loans. Bloomberg, on September 29, analyzed the collateral collected by the PDCF that day, and out of $164 billion, only $46 were accepted the two previous weeks. Many companies took advantage of this situation and $18 billion were speculative-grade securities among which $1 billion had a D rating, $28 billion were unrated and $72 billion were equity.[10]

After Lehman Brothers bankruptcy, the PDCF lent money to LBI to keep it operating after the LBHI. Out of these assets, 72% were high-rating assets while the remaining 28% were unrated or speculative-grade assets.

One of the questions we may ask ourselves is: did Lehman Brothers have enough collateral to bear a loan from the PDCF?

In this case, we need to look at the assets side of the balance sheet of the American investment bank. Many of the assets of Lehman Brothers were mortgages, loans, and corporate loans, which after the PDCF expansion of collateral wanted by the Federal Reserve, could have been employed. Furthermore, some other assets owned by Lehman Brothers were corporate bonds, MBSs, and equity, none of them was used as collateral on September 15th. By that day the number of assets owned by Lehman which could have been used as collateral for a loan from the PDCF was the following[11]:

- Equities ($26 billion): In the Valukas paper the actual amount of equities owned by Lehman Brothers was $43.2 billion and this value included some securities which were not accepted as collateral by the PDCF. Hence, the employable amount of security was $26 billion.
- Corporate Debt ($41.7 billion): All the corporate debt owned by Lehman Brothers could have been used as collateral for a loan from the PDCF. In this category, we include both corporate loans and corporate bonds.
- Mortgage assets ($55 billion): This sum was made of both mortgages and mortgage back securities.
- Money Market Instruments ($4.6 billion)

[10] Bloomberg obtained these data through a lawsuit against the Fed under the Freedom of Information Act
[11] all the information concerning the number of assets eligible as collateral are taken from Valukas fn 5601

- Municipal Bonds ($3.5 billion).

The sum of all the eligible assets is around $131 billion, which is a valuable way larger than the estimation of money required to keep being in business for at least 4 weeks. Therefore, we can say that Lehman could have gotten assistance from the PDCF even if the amount of collateral was high. As we said earlier the amount after LBHI bankruptcy, the PDCF lent money to LBI and the haircut for all the securities besides treasuries and agencies was around 17%. Even with this amount of collateral Lehman Brothers could have been capable of getting liquidity. Therefore, what we can see is that Lehman Brothers was not bailed out mainly for political reasons; the decision-makers, such as Paulson, were not willing to face a hard criticism if they had rescued Lehman. Paulson was heavily criticized after the rescue of Bear Stearns, Fannie Mae, and Freddie Mac and in September he told to the other policy-makers the following: "I can't do it again. I can't be Mr. Bailout. just can't stomach us bailing out Lehman … will look horrible in the press, don't u think?".

As we cited earlier in this, the assistance of the Fed and the PDCF could have been useful for at most a couple of months, but this financial help could have helped Lehman Brothers' executives during a stressful situation. The possibility to keep operating for a longer period could have turned out to be useful for either completing the negotiation with Barclays, recovering by itself from a difficult situation, or eventually winding down for 1 or 2 years. Surely, if the Federal Reserve had assisted Lehman Brothers there would have been fewer damages than the bankruptcy of September 15.

Let's now analyze the possibility of an acquisition by the British investment bank Barclays. As we already said earlier, on September 14 there was the possibility to rescue Lehman Brothers through an acquisition by Barclays. The negotiation did not go through because of the different U.S. and British regulations concerning the funding. In fact, in the U.S. the approval by the shareholders for an acquisition is way quicker than in the U.K.

Without any financial help, Lehman Brothers could not survive until the deal was closed. The Federal Reserve, in addition, insisted about the fact that it was Barclays needed to find its way in guaranteeing Lehman's obligations, but under U.K law, this guarantee is subject to a vote by the company's shareholders and the FSA, the equivalent of the SEC, did not waive this requirement.

The Federal Reserve, instead of having such behavior, could have financed for a couple of months LBHI, letting Barclays's shareholders set up a meeting. As cited above funding from Federal Reserve was something completely feasible, since Lehman Brothers' collaterals were enough to cover a $88 billion loan. The Financial Services Authority wanted that the American investment bank had access to the PDCF loan.

On the other hand, some rumors suggest that the FSA was somehow osculating the acquisition of LBHI by Barclays. In this case, financial help by the Federal Reserve to Lehman would have been completely useless. However, Barclays' CEO, Hector Sants, said that the FSA did not have any problem in the possible acquisition of Lehman Brothers by Barclays.

We now analyze the survival of an independent Lehman Brothers. What if Lehman stayed in business but the negotiation between the American investment bank and Barclays did not go through? A possible answer to this hypothetical scenario is that almost surely no other firm would have stepped forward to purchase Lehman Brothers. The only other firm which showed a minimum interest in acquiring Lehman Brothers was Bank of America, which decided to purchase Merill Lynch. Hence, at this point, the only feasible outcome would have been to survive as an independent firm. In this case scenario, the possible outcomes are very different from each other and for this reason, it is not clear what would have happened. Perhaps one possibility is the market's loss of confidence in Lehman Brothers in an irreversible way, and this implies that eventually, the American investment bank would have gone bankrupt. As we analyzed earlier Lehman was solvent and probably, as this wave of bankruptcies during 2008 passed, Lehman would have regained the market's confidence. The crisis of Lehman Brothers stemmed from problems related to low capital and excessive investments in the real estate market. Few days before its failure Lehman tried to sell REI Global, which was Lehman's real estate investment trust. Through this strategy, the American investment bank tried to split the bad bank from the good one. Moreover, Lehman could have to get rid of some real estate assets through a special purpose vehicle to purchase them. The Federal Reserve created some SPVs to assist other financial institutions such as Bear Stearns and AIG. The Fed had in mind to create an SPV to rescue Lehman Brothers, however since executives at Lehman started getting rid of the "bad" assets, the Federal Reserve thought it was not necessary to issue one. In addition, Fed's executives believed that Lehman would remain independent and solvent.

If Lehman survived its liquidity crisis, it might have found investors to purchase some equity as it happened to Goldman Sachs and Morgan Stanley, who raised capital during the financial crisis from Warren Buffett and Mitsubishi. In June 2008, Lehman Brothers raised $6 billion of equity through a public offering. After this capital raise, more than 30 financial institutions and wealthy people were interested in investing in Lehman Brothers, however, no negotiation went through.[12] The last chance was the Korean Development Bank (KDB), which ended the negotiation on September 9 though. This incapability by the American investment bank to raise new capital was due to its liquidity crisis and the bankruptcy risk. The story could have taken another outcome if the Federal Reserve had helped financially Lehman Brothers, therefore, reducing the bankruptcy risk.

The Investment Corporation of Dubai (ICD) did not invest in Lehman Brothers due to the threat of bankruptcy.[13]

Probably, if Lehman Brothers survived during the week of September 15 other investors would have stepped up and the price for the company was relatively low, $3 billion, which is the price offered by Barclays.

Now we discuss the possibility of a wind-down. Even if the Fed gave liquidity support, there was a possibility that the firm could not survive by itself. In the end, the company would eventually have been forced into bankruptcy. Yet the outcome would have been different from the bankruptcy of September 15 the company would have had enough time to organize properly the wind-down. Lehman, during the wind-down, could have closed its trading positions, sold its assets and subsidiaries over a larger time frame. Furthermore, an ordinary wide down would have produced fewer damages to the word-

[12] Valukas, appendix 13

[13] Valukas, appendix 15

wide financial system, causing less panic in financial markets after September 15. In addition, the American investment bank would have had the opportunity to pay back the commercial papers hold by the Federal Reserve.

CONCLUSIONS

The Lehman Brothers case can be considered probably one of the most unfortunate financial crises. The failure of the American investment bank had enormous consequences on the international banking system and the financial system as a whole. The trust of investors toward the investment banking industry back in 2008 decreased. Behind what happened in 2008 there are many doubts and many behaviors which can be unjustified as well as difficult to understand. The distress of Lehman Brothers was caused, as cited before, by a lack of risk management by the financial institution. This hard situation could have been saved through financial assistance by the Federal Reserve and the PDCF since it is evident that the American investment bank owned enough collateral to be bailed out. If the bailed out had taken place probably the 2008 crisis never would have taken place, Lehman Brothers would have survived on its own, it could have been acquired by Barclays or it would have winded down after few months. We can speculate around all the scenarios for days, even months, but the true story is shortly summarized in this paper. We know that the lack of financial help by the Federal Reserve was mainly driven by the fear of political prejudices and the willingness by the Fed to stop an endless vicious cycle, where for more than a year many financial institutions were bailed out. In 2008 we saw that the "Too big to fail" concept is not always valid, and we also saw which are the consequences of letting a big financial institution fail. Letting the company keep operating could have been even more dramatic since there could have been the possibility that eventually Lehman Brothers would have gone bankrupt and probably the effects of the crisis of 2008 would have been much larger.

However, from the financial crisis of 2008 the banking system was subject to many regulations concerning the monitoring and the supervision of lending activities.

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