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BANK LENDING AND CREDIT CREATION AROUND THE FINANCIAL CRISIS:

Empirical Evidence in Eurozone Banks during 2006-2012

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ABSTRACT

This study examines the relationship between each asset type and the changes in amount of lending and credit creation before, during and after the financial crisis 2007-2009 in Euro zone banks. The data are gathered from the Bankscope database and contains 354 banks from 19 Eurozone countries. This study uses fixed effect panel regressions to investigate the impact of different types of assets on lending ability of banks during the financial crisis 2007-2009.

This study provides evidence that bank deposit and bank capital, both have positive relationship with bank lending during financial crisis. In other words, these two valuable types of asset can assist banks to continue to lend during the financial destress. In addition, bank capital has a positive relationship with bank credit creation during financial crisis. Thus, this study provides evidence that bank deposit and bank capital act as reliable sources of financing for Euro zone banks during financial turmoil. Furthermore, the results of the study show that liquidity risk has a greater influence on the large banks compare to smaller counterparts.

KEYWORDS: Bank liquidity, bank lending, bank credit creation, financial crisis.

1. Introduction

This research examines the effect of different types of assets on the amount of lending and credit creation in Eurozone banks during the financial crisis 2007-2009. Banks are deposit-taker financial institutions that make loans from the deposits and provide cash for depositors by transferring illiquid assets to the liquid assets, on demand. This scenario could work as long as depositors trust their banks. In situations when bank cannot meet the cash demand of depositors, for example when depositors lose their faith in their banks and demand for their deposits in a masse, banks have to sale their illiquid loans to meet the extra demand. This situation could lead the bank to bankruptcy. (Strahan 2012)

Several studies try to explain the recent financial crisis from different views and dimensions. The reason is that the latest financial crisis (2008) was the greatest shock to the financial system since the great depression in 1930s, and therefore it requires a deep studying to understand the factors that lead to the disaster, and the ways to fix those factors. Many papers covered the banking crisis topic and involved factors; however, more studies are needed to search for the quality assets that helped the banks to survive the crisis, and risky holdings which put the banks in the list of crisis's victims.

Rising problems and climbing delinquency in the first quarter of 2007 were the first signs of financial distress. When Bear Sterns faced financial problems in summer 2007, US were sinking in the crisis. In the beginning Europe seemed to be safe from US financial turmoil, but soon the low interest rates and scarce liquidity, spread the problem to Europe and made European financial institutions to search for liquidity. Later the mortgage backed securities lost their values, and Lehman brothers (one of the leading investment banks of Wall Street) collapsed. Banks' liquidity risk increased and financial system crushed. Central banks in respond to the equity needs of banks lowered the policy rates and supported the banking sector with the Trouble Asset Relief Program (TARP) in US and the Long-Term Refinancing Operation (LTRO) in EU. (Liikanen 2012). At the end of 2008 world trade declined and the countries' debt levels increased

as the result of supporting banking sector. The problem went further to Greece and then spread in PIIGS (Portugal, Ireland, Italy, Greece, and Spain) countries and Eurozone.

1.1 Purpose of the study

This research examines the effects of different asset types on the level of lending and credit creation among Eurozone banks during the recent crisis. Several studies cover the bank lending and risk management in US during the recent financial crisis; however, few studies cover this issue for the European banks. This study aims to fill this gap for the Eurozone Financial Institutions.

Banks in Eurozone hold significantly large sovereign debt. Thus, if one of the troubled countries cannot pay its debt the whole banking system of Euro area become insolvent. In addition, united currency, Euro, is the reason that spreads the problem from one country to the whole euro area and nation level tools lose their meaning in this matter. Therefore, whenever an economic problem arises in one of the Eurozone countries, it put the whole Euro area at risk. Compare to United States, Eurozone has a significantly larger banking system. Total assets of the banking system in Eurozone were over 300 percent of the total GDP of the area; however, this amount was less than 100 percent for the banks in the United States. Moreover, firms in Eurozone rely on banking system for financing more than firms in US. (Shambaugh 2012) Therefore, bank performance in Europe requires an especial attention and more specific study, especially during the recent crisis time period.

Cornett, McNutt, Strahan and Tehranian (2011) test the effect of different types of holding assets on banks' lending and banks' performance during recent financial crisis in US. They found that core deposits and capital act as a reliable source of financing for banks during financial distress; however, undrawn commitments reduce the lending ability of banks during turmoil time (2007-2009).

1.2 Structure of the thesis

The remained content of the thesis is organized as follows: Section two covers the literature review of the study with the focus on the relationship between liquidity risk, bank lending and bank credit creation, and different types of assets. Section three demonstrates the generic background of the study, including a summary of regulatory developments and theories of recent financial crisis. Section four introduces the theoretical background of the study with concentrating on the bank liquidity risk, bank lending and bank credit creation related theories. Section five, demonstrates the empirical tests, empirical hypothesis, data description, regression variables and empirical method. Finally, section six describes the empirical results and section seven provides the research conclusion.

2. LITERATURE REVIEW

In this section the most related literatures are summarized to help to get the better view of the different dimensions of liquidity risk exposures, loan supply and credit creation of banks. While several studies cover the bank lending and risk management in United States during the recent financial crisis, few studies cover this issue for the European banks. This section summarizes the most relevant studies about the relationship between each type of asset and liquidity risk, bank lending, and credit creation in individual subsections.

2.1 Bank Liquidity Risk and Type of Assets

Recent banking crisis made banks vulnerable to liquidity risk. In spite of a lot of regulations, especially in Euro area, banks faced a lot of challenges in order to overcome liquidity risk and in some cases they failed to survive. Liquidity risk refers to a type of risk that threatens the banks with low liquidity in their assets. In order to prevent liquidity risk banks should arrange their liquid assets on their balance sheet in the way that enable them to answer the demands (even unpredictable) for liquidity. There are two types of liquidity risk: First is day to day liquidity that refers to as the predictable liquidity. This type is the everyday demand of cash, which is the small percent of banks' deposits. The other type is liquidity crisis. This type of risk is unpredictable and it refers to the time when customers demand their deposits in a mess. In this situation banks have to borrow funds in higher interest than market interest rate in order to supply the demand for cash. This situation may lead to disability of banks to meet their dues and may end up with bank failure.

Banks transform the risk by exchanging the risky investments with the riskless ones. Banks reduce the risk by spreading the risk to different borrowers. In other words, banks are able to share the risk of lending by lending to the multiple borrowers, while the amount of liquidity creation and risk control may vary among different banks. (Berger & Bouwman 2009). Liquidity risk depends on the types of assets that banks hold. Some

assets can help the bank in liquidity creation especially during liquidity crisis, and some assets can make banks vulnerable to liquidity risk.

In spite of some conflicts of the relationship between capital and liquidity creation in recent studies, Berger and Bouwman (2009) find a positive association between banks' capital and bank's ability to absorb the risk. The results show that banks' capital increase the capacity of banks to tolerate the risk and this outcome is stronger for large banks compare to small banks.

On the other hand, the study by Diamond and Rajan (2001b) argues that more equity capital can discourage the liquidity creation by making the capital less fragile. They state that fragile capital helps banks to make more loans; nevertheless, less fragile capital has a reverse effect. The reason could be addressed to banks' monitoring ability, which increases by rising fragility. According to Gorton and Winton (2014) also, transposing the deposits by capital may have a negative effect on liquidity creation. However, this impact is not noticeable for big banks due to their access to the international capital markets. (Berger & Bouwman 2009) According to Diamond and Rajan (2001b) fragile capital allows the depositors to call back their deposits and also support the borrowers when they need liquidity. In addition fragile capital allows banks to fund themselves at a low cost.

The main results of many studies show that the capital increases the chance of survival for the small banks and improves the performance in large banks during the crisis time. These studies state that it is more safe and efficient for banks to keep more capital during crisis, although it will affect their ability of lending. (Berger & Bouwman 2013, Diamond & Rajan 2001a)

Banks can transfer liquidity risk by trading the deposits. Banks with lower deposits' transaction have a higher stock return volatility with unused commitments, and when the liquidity become scarce, deposit lending hedge become stronger. (Gatev, Schuermann & Strahan 2009) Gatev, Schuermann and Strahan (2009) show that banks make combinations of transaction deposits and loan commitments to reduce the

liquidity risk to minimum. According to Kashyap, Rajan and Stein (2002) banks make this combinations by using "risk management motivation". They state that banks can decline their cash in order to supply both depositors and borrowers. This can happen if depositors' demand and borrowers' demand do not have high correlation. Moreover, Kashyap et al. (2002) find that there is a positive relationship between unused loan commitments and transaction deposits.

Gatev et al. (2009) continue the study of Kashyap, Rajan and Stein (2002) and show that banks' liquidity risk increases by unused loan commitments and decreases by transaction deposits. In addition, they state that transaction deposits have a crucial role in liquidity risk management, specifically during the financial distress. They also indicate that banks with high transaction deposits have lower risk than other banks in spite of high undrown loan commitments. According to recent studies, risk taking increases by lower level of lending costs in economy. (e.g Noeth & Sengupta 2012)

Cornett et al. (2011) suggest that banks need cash and liquid assets to manage the liquidity risk. They also find the higher undrawn loan commitments, lead to the higher liquidity risk. Furthermore, they find that credit supply decreased and liquid asset increased, as the result of greater liquidity risk exposures, during the recent crisis. In other words, banks had to decline their credits to make liquid assets in order to absorb the liquidity risk. They conclude that banks, which were holding the assets with low market liquidity, had to increase their cash during crisis time.

2.2 Bank Credit Creation and Type of Assets

Bank credit is the amount of funds that bank is willing to give to an individual. Some type of assets can help the bank to continue to create credit during financial crises; however, some other type of assets can increase the credit risks for the banks. Credit risk is the risk of borrowers' failure to meet their obligations. In other words, it is the risk of increasing in amount of non-performing loans for banks. Kapan and Minoiu (2013) state that banks with less capital made more cuts of credit supply during the crisis. According to them bank capital is necessary for recovering the credit after the

crisis, and they suggest that banks should raise the quality and quantity of this feature in their balance sheet. They further state that all these findings provide supports for the Basel III proposal framework as they found that strong balance sheets help banks to continue to create credit during financial crisis (2007-2009).

Loan syndication can affect the credit supply during the recession with two possible scenarios: First, if banks hold larger share of loans that they created, then they have to decline the amount of loans they want to create during the recession. Second, if this amount of share reduces in respond to recession, then this increase in sharing risk can moderate the credit cycles. Syndicated loans allow banks to make loans with just keeping some proportion of them. Moreover, the bank receives an additional fee for lining up the syndication. (Ivashina & Scharfstein 2010b)

Cornett et al. (2011) test the effect of different types of holding assets on banks' lending and banks' performance during recent financial crisis in US. They found that banks' liquidity management led to decline in the ability of credit supply. According to Bruno and Shin (2015) asset price and exchange rate can reduce the risk premium by improving households and firms' balance sheet which affect both credit worth of the bank portfolio and quality of the bank portfolio.

Hoque (2013) examines the various factors that affect the banking sector during the crisis. He divides the crisis into two parts: the credit crisis, and the sovereign debt crisis. He shows that banks with more regulatory capital and tangible equity performed better during the sovereign debt crisis; however, these two factors had a negative effect on bank performance during the credit crisis. Moreover, while loans play significant role in banking performance during the credit crisis, core capital was the better resource of financing during the sovereign debt crisis. Furthermore, funding fragility is the better explanatory variable in the credit crisis, while it does not explain the banking performance during the sovereign debt crisis.

Hoque (2013) also shows that higher customer deposits led to a better performance during the sovereign debt crisis, but not in the credit crisis. He also states that Tier 1

capital results in higher risk for banks during the credit crisis; however, Tier 1 was a reliable source of funding during sovereign debt crisis.

2.3 Bank Lending and Type of Assets

Ivashina and Scharfstien (2010a) found that lending had a decreasing trend during the recent financial crisis and this trend is true for all types of loans. Some parts of this decline can be addressed to the drop in the loan demand of firms during the recession time and downward trend of interest rate. However, Ivashina and Scharfstien showed that there might be some effects on the supply side of this scenario. Ivashina and Scharfstien (2010a) state that unlike the decline in demand, decline in supply push up the interest rate and cause a noticeable fall in lending. They marked vulnerable banks according to two factors: First, the amount of short term debt to insured deposits, and then the drawdowns of the credit lines. Their analytical work suggest that banks, which faced more credit risk and less access to deposit, reduced their lending more than other banks.

Berrospide (2013) finds that if banks forecast the losses in future, they will hold more liquid assets. Moreover, he states that the liquidity risk can be measure in both on and off balance sheet by measuring the security losses, investment portfolios and expected loan losses, as well as unused loan commitments. In addition, he indicates that the security and the loan losses are better measurements for the asset management risk. He also states that “precautionary motive” causes more than 25 percent of the decline in bank lending during recent crisis. Precautionary motive is the desire to hold cash in order to absorb the risk during the unexpected financial situations. When panic starts, banks stop lending to each other and start storing the liquid reserves.

Berrospide (2013) also studies the effects of bank liquidity hoarding on bank lending during financial crisis (2006-2009). He finds that banks try to increase their liquidity in the periods that they forecast depreciation. Furthermore, he refers to loan loss reserves as another factor, which leads to increasing in amount of liquid assets in small banks.

Moreover, he suggests that there is an interbank circulation of core deposits for the banks, which decided to hoard the liquidity. His result indicates that banks, which hoarded, reduced their lending by 3-4 percent and he concludes that about 25 percent of reduction in bank lending is due to the liquidity hoarding.

Cornett et al. (2011) suggest that stable sources of financing plays an important role for banks and make them less vulnerable during financial. Cornet et al. (2011) introduced core deposits and equity capital as reliable sources of financing, and suggest that banks with more core deposits and capital among their assets, could continue to lend during the financial turmoil. They also state that core deposit is more important for small banks compare to large ones. The more core deposits and equity capital banks had, the more was their lending ability during the recent crisis. In contrast, the more banks depend on the wholesale sources of debt financing, the less was their lending ability. Furthermore, liquidity risk of banks with more amounts of unused commitments increased during the financial turmoil. In addition there is a positive relationship between the liquidity risk and the liquid asset growth, and a negative relationship between the liquidity risk and the loan growth.

According to Cornett et al. (2011) in order to absorb the liquidity risk banks increase their liquid asset, and decrease their lending amount. In other words, banks with less liquid assets increase their cash by cutting off the new commitments, loans and illiquid assets. In contrast, banks with stable sources of financing could survive and continue to lend during the crisis time.

According to Disyatat (2011) banks with a certain amount of capital can absorb the small shocks and continue lending, which prevent from spreading the shocks into the economy. However, banks with the capital bellow the certain amount would reduce the lending level. Thus, Disyatat concludes that banks can act as an absorber of economic shocks depends on the amount of their capital in their balance sheet.

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3. GENERIC BACKGROUND

This section provides the generic background of the study regarding to the different regulations European Central Bank published in order to secure the banking system during the financial turmoil, the special structure of banking in European Union, and recent financial crisis and its effects on Eurozone banking.

3.1 Regulatory Development

European banks and financial intermediaries were affected by terms and regulations over the time. The History of Regulations are presented in table 1.

Table 1: History of Regulations in EU

Year	Regulations	Details
1957-1973	Deregulating Entry	
1977	First Banking Directives	Harmonization of Banking Regulations
1974	Establishment of Basel committee	
1988	International Convergence of Capital Measurements and Capital standards (Basel I)	Setting the minimum standard of capital adequacy in order to improve the international banking stability Introducing minimum for Tier 1 and Tier 2 Capital introducing risk-weighted ration for assessing the capital adequacy introducing Target Standard Ratio
2001-2005	The Financial Services Action Plan	
2006	Basel II Framework	Calculation of Minimum Capital requirements for credit Introducing Risk Weighted Assets Introducing Capital requirements for Credit Risk Introducing the Operational Risk Defining the Market Risk
2011	Basel III Framework	Improves Basel I and Basel II

The Basel committee was stablished in 1974 with the aim of strengthen the European banking system. On 1988 this committee established their firs framework for banks. They introduced Tier 1 and Tier 2 Capital, the former refers to the banks' equity capital and the latter refers to the banks' supplementary capital. They set a minimum value for each of these Tier 1 and Tier 2 in order to achieve the minimum capital adequacy by banks. Moreover, they introduced the risk-weighting system, which allows banks to carry low risk assets. In addition, the committee set a minimum standard ratio, which has been set to be 8 percent for capital to weighted risk assets. (Basel Committee on Banking Supervision 2015)

The other framework by Basel committee has been established in 2006, Basel II, which introduces more comprehensive version compare with Basel I, while it includes the same key features of former framework. In addition to Tier 1 and Tier 2 capital, this framework introduces Tier 3 capital in order to use to cover the market risks in short term debts. Moreover, 2006 framework introduced a modified approach to calculate the risk-weighted assets by banks. Basel committee also stated that banks are allowed to use their own approach for credit risk rating if the banks' supervisor approves the method. Operational risk, which introduced in the 2006 framework, defined as risk of losses that arises from inadequate or failed internal processes that may lead to bank losses. Basel II also includes the market risk which defines as the on and off balance sheet losses in unstable market prices situation. (Basel Committee on Banking Supervision 2015)

Basel III framework was published in June 2011, by Basel committee with the aim of improving in banking sector in order to absorb financial shocks and improve the risk management. It is the more straighten version of Basel II with the more emphasis on internal and external shocks. Furthermore, Basel III includes a conservation to make sufficient buffers in order to save the banking sector during the financial distress. (Basel Committee on Banking Supervision 2011)

The authorities defined two minimum standards in Basel III: The Liquidity Coverage Ratio (LCR) and the Net Stable Funding Ratio (NSFR). The Liquidity Coverage Ratio (LCR) is for measuring the liquidity risk and the Net Stable Funding Ratio (NSFR) is

for measuring the maturity structure of assets. Recent financial crisis shows that banking system suffered from the lack of high quality capital during the financial distress, thus Basel III emphasis on the high quality capital. (Basel Committee on Banking Supervision 2011)

In order to reinforce the capital treatment for the complicated securities "risk coverage" remark mentioned in the Basel III. According to this remark, banks are responsible to provide more accurate credit analyses subject to securitization disposal. In addition, this remark requires banks to provide more capital in order to trade, doing derivatives-related activities and securitization in the trading book. Another aim of the "risk coverage" is to improve the credit risk of counterparts, thus it requires stricter exposure measuring and higher capital for exposures in the financial sector. (Basel Committee on Banking Supervision 2011)

Another supplement of this remark requires banks to make capital buffers in non-stressed periods (based on simple capital conservation rules), in order to minimize the losses during crisis period. Moreover, banks are required to rebuild these buffers, for instance by making a reduction in earnings or raise a new capital, in the case of draw down. (Basel Committee on Banking Supervision 2011)

The aim of this remark is to alarm banks to consider about their macro-financial environment. This is another way of ensuring about adequate buffer for bank protection during the stress period. According to the "Leverage ratio" remark, banks are responsible to provide leverage in on balance sheet and off balance sheet. The Base line level of the capital to protect the safety net is the leverage requirement. (Basel Committee on Banking Supervision 2011)

European banking authority set Basel III monitoring exercise on 30th of June 2011 and 158 banks submitted their data for it. The results show that 48 banks had 100 percent coverage in this study. "Risk weighted assets" remark required banks to improve the quality and transparency, as well as quality of their capital in order to strengthen the capital ratio. (Basel Committee on Banking Supervision 2011)

3.2 Recent Banking Crisis

Recent Financial crisis occurs within five stages: First US faced the Subprime crisis that occurs in 2007 to 2008. Before crisis US experienced an increase in amount of mortgage lending and as the result of this increase the housing prices climbed, so it was easy for borrowers to refinance their loans. Then the usage of mortgage-backed securities and collateralized debt obligations increased rapidly. Furthermore, the proportion of using the credit default swaps climbed. (Liikanen 2012)

The first signs of the problem occurred during the first quarter of 2007 with the falling of the property prices. In the beginning Europe seemed to be secure from the turmoil but low interest rates and lack of liquidity, spread the problem into European Financial institutions and forced them to search for yields. Second stage of recent financial crisis named as "Systemic crisis" occurred during 2008, when the mortgage backed securities lose in their value and Lehman brothers' collapse leaded to an increase in volatility. Banks' liquidity and counterparty risk climbed and interbank money market faced a shutdown. (Liikanen 2012)

Third stage is referring to as "crisis in economy" (2009-2010) the time when financial crisis spread into real economy, and world trade turned down. Loan losses raised, banks failed and needed urgent equity support. Central banks answer to this request by lowering the policy rates and supporting banks with extraordinary measures, such as TARP in US and LTRO in EU. (Liikanen 2012)

Banks faced some difficulties to sell the loans in syndicated markets. Furthermore, the banks' ability to supply liquidity eliminated. Banks experienced decreasing in capital and loan losses. Bear Stearns collapsed and sold to a very low price to J.P.Morgan Chase. U.S experienced the hugest bank failure after Washington Mutual broke down. The FDIC sold the assets and deposits after the losses to One West Bank and FSB. (Mishkin 2011)

The Federal Reserve increased its safety-net benefits to investment banks, and interrupted the commercial paper market. Moreover, Federal Reserve started to lending mortgage backed securities to banks in order to increase the banks' capital over the Troubled Asset Relief Program (TARP). In 2009, 140 banks failed in US and in spite of TARP program the small banks continued to fail even over 2010 at a high rate. (Mishkin 2011)

Berrospide (2013) argues that banks kept the liquidity, provided by Federal Reserve, in the form of reserves, instead of increasing the amount of lending. Moreover, Hancock and Passmore (2011) state that in the situation of high cost of capital and bank capital limitations, extra reserves were hoard by banks as excess reserves. Next stage includes Sovereign debt crisis when the debts of countries rose in addition to the recession. Greek faced the debt problem in April 2010 which made a new alarm for Europe and then financial tsunami transmitted to the Euro area. (Liikanen 2012)

According to Shambough (2012) Eurozone faced multiple crises. Multiple crises are not unfamiliar term for economic world; however, in Europe, euro is not only the currency of troubled countries but also many countries located in Eurozone, which means that external debt influence on domestic currency and makes the Eurozone situation different and more complicated than Asian and Latin America crisis. In addition the debt obligations of the infected countries in Europe mostly held by other countries in Eurozone.

Banks with poor economic performance experience non-performing loans and lower tax revenues. The nonperforming loans results in poor bank balance sheet and poor balance sheet affects the economic growth. Furthermore, Lower tax revenues put stress on the public finances. (Noeth & Sengupta 2012) Easy monetary policy, regulatory structure of the Europe and the asset price boom are three factors speeded the lending boom with higher risk taking in Europe. European banks borrow funds from US money markets and then invest them in other securities in US (shadow banking) for maturity transformation, and in order to increase this transformation they expand their balance sheets as well as the amount of leverage. There is a huge difference between the

European and US amount of leverage which is the result of various accounting standards or regulatory structure. Bruno and Shin (2015) states that this leverage ratio differences is because of adoption of Basel II by Europe which permitted European banks to expand their balance sheet rapidly.

According to Bruno and Shin (2015) asset price and exchange rate can reduce the risk premium by improving households' and firms' balance sheet which affect both credit worth of the bank portfolio and quality of the bank portfolio. Introduction of euro has the same effect on risk premium by affecting sovereign and private debt, which leads to increasing in lending by making improvements in the loan portfolios.

The European banks did not restrict their lending to the US banks. The introduction of euro made this opportunity for them to increase their lending inside and outside of Europe. There was a significant increase not only in capital inflows but also in asset prices in European banks which reached the peak around 2007-2008, the time of financial crisis in the US.

According to Noeth and Sengupta (2012) credit booms cause increase in the loan defaults and a sharp decrease in the asset prices. This impact was stronger for European banks compare to the US counterparts during recent crisis. As European banks were not secured from rapid deleverage, they faced shortage in dollar and in order to provide additional liquidity they demand support of Federal Reserve and European central bank to open the swap lines for them.

European banks use the wholesale dollar funding for deleveraging. Thus, when the wholesale dollar funding markets dried up, reducing leverage became more challenging for European banks. Therefore loan quality and asset prices declined; as the result their earning potential reduced significantly. Noeth and Sengupta (2012) indicate that European banks are more dependent on bank funding than the US banks. The reason is that US banks have access to capital markets, however, European banks rely on intermediate finance. Noeth and Sengupta (2012) show that deleverage difficulties has the greater effect on European banking sector compare to US counterparts.

There are some differences between the US banks and the banks in Europe. These differences made the financial situation worse in European banks during the financial crisis. Banks in Europe are larger than US banks in terms of GDP of the country. (In 2007 total assets of banks in EU were 300 percent of the GDP of EU, while American banks hold approximately 100 percent of the GDP of the US). Moreover, in contrast with US banks, European banks are not union. Therefore unlike the US, where the regulations have demonstrated by Federal Reserve, regulations in Europe have indicated by national governments and central banks of each country, individually. (Shambaugh 2012)

According to Shambaugh (2012) three crises occurred in Europe and affect the volatility and the currency union. First, "banking crisis", that led to banks' liquidity problems. Second, increasing bond yields, which led to "sovereign debt crisis". Finally, the "macroeconomic crisis" that occurred when the economic growth slowed down. Shambaugh (2012) states that all these three crises are interlinked with each other and this intensify the crisis result.

Sovereign debt holding of some countries in Europe is so large that supporting the failed banks leads to sovereigns' failure. Furthermore, banks' failure means lending reduction, which affects the economy growth. Weak economy growth again leads to sovereign debt crisis. (Shambaugh 2012) From another point of view, actions took in order to reducing the sovereign stress, worsen the economy growth and lead to damaging banks' balance sheet, and this cycle will get worse and worse.

In June 2011 recommendation for European banks to reach the specific capital adequacy (Basel III) published in order to improve the banks' ability to survive during the financial crisis. In addition, on December 2011 European Central bank in respond to the banking equity needs lowered the policy rates and supported the banking sector with the Long-Term Refinancing Operation (LTRO).

During the financial crisis when banks demand for the liquidity, European Central Bank (ECB) provides the long run refinancing operation for the European banks in order to prevent inter-bank lending and credit squeezing. (Noeth & Sengupta 2012) On December 2011, ECB provided low interest loans (1 percent interest) for the European banks and accepted the loans from their portfolio as collateral. LTRO provided loans for 523 banks with the value of 489 billion Euros for three years with the rate of one percent. (Noeth & Sengupta 2012)

The European Central Bank also provided some liquidity for the banks through main refinancing, with maturities of two weeks up to one month. Later ECB increased the length of maturity to three months until 2008, and six, twelve and thirty-six months since late 2011. Each of these new liquidity provisions supported the banks in Euro area especially in Ireland, Italy, Portuguese, Spain and Greece (PIIGS countries). (Noeth & Sengupta 2012)

By providing these low interest loans ECB aimed to make enough liquidity for banks to pay their debt in the first quarter of 2012, and also to enable them to keep lending to businesses in order to prevent from economic shutdown. Moreover, ECB assumed that banks would spend some proportion of this liquidity on government bonds and it would have a positive effect on debt crisis. (Noeth & Sengupta 2012) On 29 February 2012, EBC took LTRO2 into the action and provided 529 billion Euros for 800 banks. (Noeth and Sengupta, 2012) According to Berrospide (2013) the liquidity provided by TARP, counterpart of LTRO program in US, hoarded by US banks and did not lead to increasing in lending, which was the aim of this program.

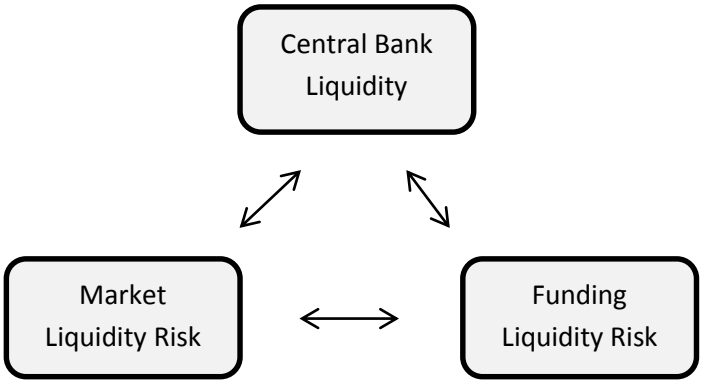
4. THEORETICAL BACKGROUND

Theoretical Background of the study put a magnifier over the recent theories about liquidity risk, credit supply and bank lending. Each concept will introduced and discussed shortly in this section.

4.1 Bank Liquidity Risk

Liquidity plays a significant role in banking system. There are three types of liquidity: Central bank liquidity, Market liquidity and funding liquidity. According to European Central bank "Liquidity in the economic literature relates to the ability of an economic agent to exchange his or her existing wealth for goods and services or for other assets". Inability of this exchange refers to as illiquidity. Central bank liquidity refers to the ability of central banks to provide sufficient liquidity for financial system. According to ECB Market liquidity defines as "the ability to trade an asset at short notice, at low cost and with little impact on its price". Last but not least, Funding liquidity refers to the ability of banks to meet their dues and liabilities. Liquidity risk refers to the probability of being illiquid. These three types of liquidity have liquidity linkages. (Nikolaou 2009)

Figure 1: Liquidity Risk



Due to the liquidity risk linkage when a liquidity risk leak into the system, it will incorporate the whole financial system. Funding liquidity is in the heart of this system. Banks provide liquidity by intermediate between liquid short term funding and illiquid long term loans. In other words banks are the link between depositors and investors. Banks provide liquidity for the investors by lending them the short term deposits, which were provided by depositors. This action makes the banks fragile and vulnerable to liquidity risk, which is providing liquidity to the depositors on demand.

One way to diminish this type of risk for banks is to hold enough liquid assets. However, banks are not willing to hold liquid assets due to the low returns. Therefore, banks have to choose a combination between high yield illiquid assets and low yield liquid assets. Banks can anticipate the demand of depositors to build this balance sheet; however, there is a situation when depositors decide to liquidize their deposits before the maturity. This situation is unpredictable for banks and they cannot satisfy the extra demand. This situation can put the banks at liquidity risk. Liquidity risk in one bank does not consider a problem unless this situation transmits to other banks and seize in interbank market. (Nikolaou 2009)

Banks are linked by the joint market for liquidity. Failure of one bank shrinks the market liquidity, which all banks are commonly linked to it. As the result liquidity shortage for all banks is the outcome of this scenario. Market illiquidity can lead to the whole changes of asset prices, balance sheet sizes, and pricing. In this situation Central Bank begin to act as the supporter of the entire economy. Although Central Bank has the right to make emergency liquidity, it has several limitations. Central bank can temporary provides the needed liquidity, but the real cause of liquidity risk should find and the trouble should detect from the source. (Nikolaou 2009)

Thus, the acts of Central Bank during the crisis could be important but not structural. However, in financial turmoil regulations and supervisions have crucial role. Supervisions and regulations can transfer the information evenly in the market and make a symmetric economy. (Nikolaou 2009)

4.2 Bank Credit Supply

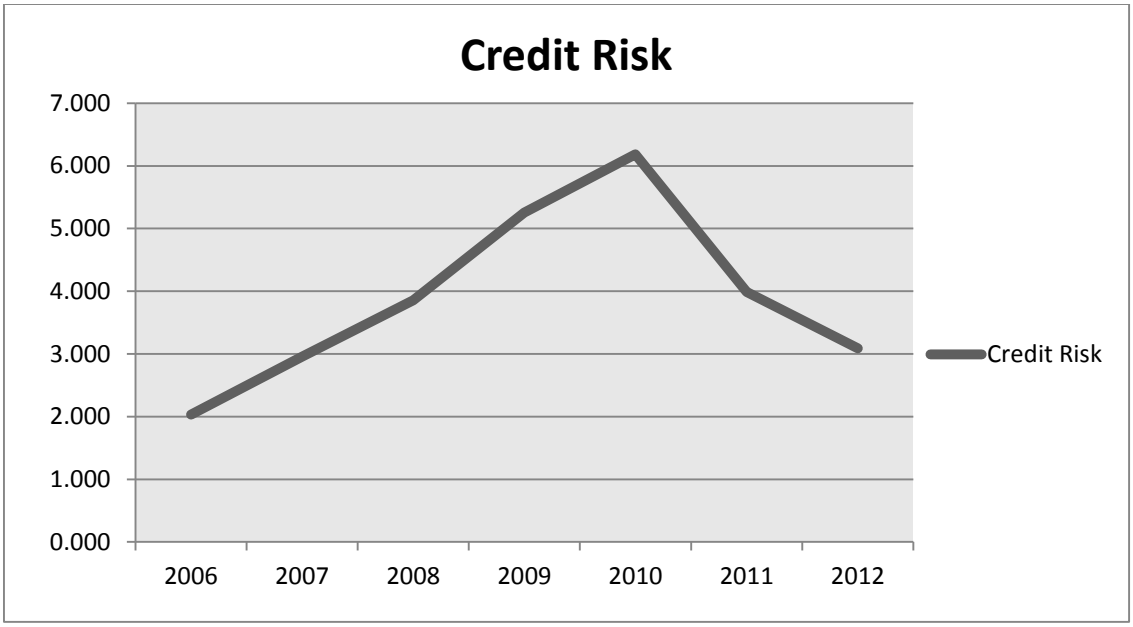
Bank credit refers to the funds that individuals or corporations can borrow from the bank. The credit derivatives market experienced a significant growth recently due to the customers demand for multiple credit cards. Credit is the total amount of fund a bank is willing to lend to an individual or an organization. Bank credit depends on two factors: The repay capacity of the borrower, and the available overall amount of credit in the bank. Some experts argue that financial crisis 2008 could be the alarm for easy to gain credit cards and suggest for more supervisions and obligations for credit supply, specifically for candidates with poor credit history. (Hirtle 2008)

The most noticeable feature of the credit derivatives is that the origination, funding, and holding and management of the credit are separated from each other. This separation aids in distribution of the credit risk. In other words banks that originate the credit to other institutions transfer the credit risk to these institutions. Therefore institutions can be exposed to the credit risk without originate or fund any credit. From another point of view, banks use this credit diversification as a credit protection to supply more credit and increase lending. (Hirtle 2008)

One of the most important banking risks is credit risk. Credit risk is the probability that the borrowers fail to meet their obligations and dues regarding to banks. In order to prevent from the credit risks managers should choose a logical combination of loans and securities. The diversify combination of these two can minimize the risk of credit lost for financial institutions. Loans are one of the riskiest assets on the balance sheet. Banks can lower their credit risk by allocate the higher return to the riskier assets. (Hirtle 2008)

Figure 2, shows the changes in average credit risk from 2006 to 2012 for Eurozone banks. According to the graph credit risk start to increase from 2006, before the crisis, from almost 2 and continue an upward trend and reach above 6 in value in 2010, one year after the crisis, and then start to decrease to almost 3 in 2012.

Figure 2: Credit risk (2006-2012)



Note: Average Credit risk is calculated from Total Loans/Total deposits formula. The data obtained from Bankscope. It includes 2006 to 2012 time period and data includes all banks of 19 Eurozone countries.

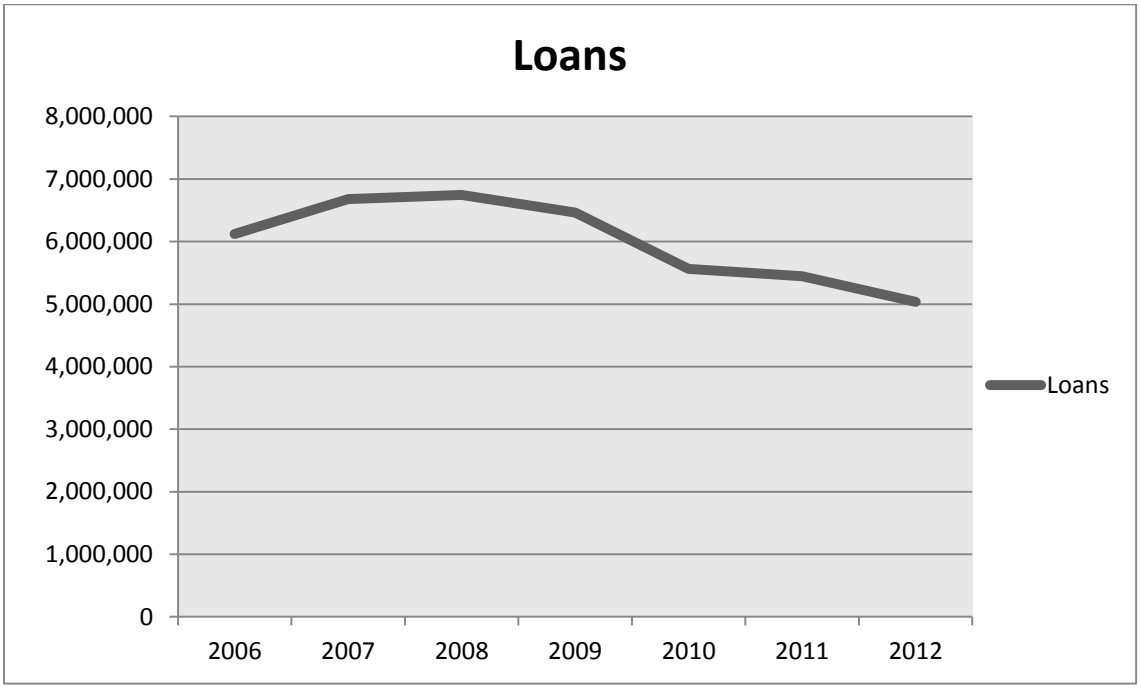
4.3 Bank Lending

Making loans is one of the primary ways that helps banks earn income. Banks lend the loans with higher interest rate that they received it as deposit from depositors and this difference provide yield for banks. Loans usually have fixed terms and fixed rate, due to the fact that if banks make the adjustable loans without penalty, then it would be difficult for banks to match this loan with their sources and it would increase the risk for banks. Loans typically are secured by banks' properties. (Signoriello 1991)

When there is a demand for the loan, banks check the credit history of the borrower and based on the type of demanded loan, poor or strong credit history, income evaluation and assets and debt evaluation of the borrower decide the amount of interest rate for the loan. Banks engage in many types of lending for example, mortgage loans, which is the type of loans for buying homes and properties, automobile loans, which is short with high rate and very profitable for the banks. The other type of loans is student loans, which is due to the high tuition fees of university especially in United States. The other

type of lending is credit card lending, which not all the banks engage in. This kind of loan has high interest rate because this kind of lending can be drawn at any time. (Signoriello 1991)

Figure 3: Average Lending Amount (2006-2012)



Note: Average loans are calculated from Total Loans data obtained from Bankscope. It includes 2006 to 2012 time period and data includes all banks of 19 Eurozone countries. The numbers are in thousands Euros.

Figure 3 shows the average amount of loans from 2006 to 2012, for 19 Eurozone countries. According to the table the amount of loans had lent by bank increased from 2006 to 2007, before the crisis period. However, it remained steady from 2007 to 2008 (beginning of the crisis) and then had the decreasing trend from 2008 to 2012, during and after the crisis.

5. EMPIRICAL TESTS

This section represents the main empirical tests used in this study. Main hypotheses of the study are explained and the data of the empirical part are represented. The models which are used in this study are discussed and the main variables are explained.

5.1 Empirical Hypotheses

The empirical hypothesis of this study constructed based on the previous related researches and their findings about banks' asset types and asset types effects on bank lending and bank credit supply. In this section the summary of related studies are gathered and the main hypotheses are represented based on the previous results.

- Bank capital and bank lending

Ivashina and Scharfstien (2010a) investigate a study for relationship between deposits and lending and their analytical work suggest that banks with less access to deposit, reduced their lending more than other banks. In addition, Cornett et al. (2011) investigate a study about bank liquidity and credit supply, find that more core deposits and more equity capital assist the banks in continuing lending during the crisis period. Disyatat (2011) also indicates that banks with more capital are able to absorb the risks and continue lending during the financial turmoil. Overall, most of the studies suggest a positive relationship between bank capital and bank lending, and also bank deposit and bank lending; therefore, the first hypothesis of this study is formed as following:

Hypothesis 1: *Bank deposit and bank capital have positive relationship with bank lending during financial crisis.*

- Bank capital and bank credit

The second hypothesis about bank capital and bank credit creation is based on Kapan and Minoiu (2013) study. They suggest that bank capital is crucial for recovering the credit after the financial distress. Furthermore, Kapan and Minoiu (2013) investigate a study and find that banks with lower amount of capital made more reductions in level of their credit. Cornett et al. (2011) also find a positive relationship between bank core deposits and credit creation, and also bank capital and credit creation. Based on these findings the second hypothesis of this study is formed as following:

Hypothesis 2: *Bank capital has a positive association with bank credit creation during financial crisis*

5.2 Data Description

This study examines the effects of different asset types on bank liquidity, bank lending and bank credit creation, over the financial crisis period. This study used a fixed effect panel model with data gathered from 19 Eurozone countries consists of Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Portugal, Slovakia, Slovenia, and Spain. The Euro currency is used for all data. The data is extracted from the Bankscope data base. All the banks with unavailable data are excluded from the sample. The used sample of banks consists of 354 banks, from 19 countries. This study covers 2006 to 2012 time period, which includes pre-crisis period (2006), during the crisis period (2007-2009), and post-crisis period (2010-2012).

In addition to banking data, macro-economic data have been used in this study consists of inflation, unemployment and GDP. Macro-Economic data are extracted from World Bank database. Banks have been divided into two groups according to bank size obtained from the Bankscope database, based on book value of the assets, as large and small banks. Large banks considered those banks with more than one billion Euros total assets, and small banks are those with less than one billion Euros. Table 2 shows the distribution of sample banks by year and total number of each type regarding to the periods, before, during and after crisis.

Table 2: Distribution of Sample

Period	Year	Small	Large	Total	Total Small	Total Large
Before the Crisis	2006	246	108	354	246	108
	2007	243	111	354		
During the Crisis	2008	239	115	354	717	345
	2009	235	119	354		
	2010	228	126	354		
After the Crisis	2011	226	128	354	675	387
	2012	221	133	354		

Note: The number of banks analyze between 2006 and 2012. The banks are divided into two groups of large and small banks. Large banks include banks with total asset more than 1 billion Euros and Small group include the banks with total asset less than 1 billion Euros at the start of each year. Total asset size is collected from Bankscope.

Table 3 shows variables that used in this study, variable classification, description and the source which the variable obtained. All dependent variables and bank control variables are calculated, based on the data obtained from the Bankscope database. Moreover, all Marco-economic control variables are obtained from World Bank database.

Table 3: Sample Variables

Classification	Variable	description	Source
Dependent Variables	ΔLiquid Assets/Assets	Δ*Liquid asset ratio*	Calculated
	ΔLoans/Assets	Δ*Loan ratio (t)*	Calculated
	ΔCredit/(Commit+Assets)	Δ*Loan commitment ratio (t)*	Calculated
Bank Control Variables	Illiquid Assets/Assets	Illiquid asset ratio	Calculated
	Commit/(Commit+Assets)	Loan commitments ratio	Calculated
	Deposits/Assets	core deposit ratio	Calculated
	Capital/Assets	equity capital ratio	Calculated
	Log Assets	Bank Size	Calculated
Macro Control Variables	GDP	GDP Growth Rate	World Bank
	Unemployment	Unemployment Rate	World Bank
	Inflation	Inflation	World Bank

5.3 Regressions Variables

The empirical part of the study investigates the relationship between the different type of asset holding by banks, and bank liquidity, bank lending and bank credit creation. ΔLiquid Assets/Assets, ΔLoans/Assets, and ΔCredit/(Commit+Assets) are dependent variables and Illiquid Assets/Assets, Commit/(Commit+Assets), Deposits/Assets, Capital/Assets are the asset types this study investigated. In continue the definition and expected sings of the variable are discussed.

- Dependent Variables

The amount of liquidity changes is calculated by ΔLiquid Assets/Assets (liquid asset ratio). Liquid assets of bank for each year are distracted from bankscope, changes from the previous year are calculated and divided by total asset of the same year. The amount of changes in lending is calculated by ΔLoans/Assets. Amount of loans for bank extracted for every year from Bankscope database and the changes from the previous year is calculated and then divided by the total assets. The amount of credit creation is calculated by ΔCredit/(Commit+Assets). Credit calculated from the aggregate amount of committed credit lines and loans, obtained from Banckscope. The changes of credit from previous year is calculated and divided by the aggregate of committed credit lines and total assets.

- Bank Control Variables

Capital/Assets and Deposits/Assets are the major control variables. Based on previous studies, positive relationship between amount of deposits and capital is expected with amount of bank lending. In other words, banks with higher level of deposits and capital are expected to have greater level of lending during financial crisis. Based on previous findings, a positive association is expected between amount of deposits and capital, and amount of bank credit creation. In other words, banks with higher level of deposits and capital are expected to create higher level of credit during financial crisis.

Different studies report the different relationships between liquidity and asset types e.g. capital, deposits, etc.). Therefore, this study investigates on this relationship without considering any expected sign. The other control variables are Illiquid Assets/Assets and Commit/(Commit+Assets), the negative sign is expected for relationship between illiquid assets and amount of liquidity. And a negative relationship between Commit/(Commit+Assets) and liquidity. Log Assets is the other bank control variable which control for the bank size.

- Macroeconomic Control Variables

Due to the different size of the countries included in the study, Inflation, GDP and unemployment are included to control for the macroeconomic effects in the models.

5.4 Empirical Method

As it is impossible to consider that all the observations are distributed independently over the time, this study uses the fixed effect panel regression in order to minimize the effects of unbiased explanatory variables. Three regressions are used in this study formulated as follow:

1. $$\Delta Liquid\,Assets_{i,t}/Assets_{i,t-1} = T_t^1 + ß^1 Illiquid\ Assets/Assets_{i,t-1} + ß^2 deposits/Assets_{i,t-1} + ß^3 Capital/Assets_{i,t-1} + ß^4 Commit/(Commit + Assets)_{i,t-1} + ß^5 Log\ Assets_{i,t-1}$$

2. $$\Delta Loans_{i,t}/Assets_{i,t-1} = T_t^2 + \gamma^1 Illiquid\ Assets/Assets_{i,t-1} + \gamma^2 deposits/Assets_{i,t-1} + \gamma^3 Capital/Assets_{i,t-1} + \gamma^4 Commit/(Commit + Assets)_{i,t-1} + \gamma^5 Log\ Assets_{i,t-1}$$

3. $$\Delta Credit_{i,t}/(Commit + Assets)_{i,t-1} = T_t^3 + \lambda^1 Illiquid\ Assets/Assets_{i,t-1} + \lambda^2 deposits/Assets_{i,t-1} + \lambda^3 Capital/Assets_{i,t-1} + \lambda^4 Commit/(Commit + Assets)_{i,t-1} + \lambda^5 Log\ Assets_{i,t-1}$$

First regression model tests how banks adjust their liquid assets during the financial crisis. Second regression estimates the bank lending changes over the crisis period and, the last regression tests the credit changes in the banking system. During the financial crisis banks lowered their amount of lending compare to before crisis period in order to increase their liquidity level. If capital and deposits act as reliable source of funding for banks γ^2 and γ^3 are expected to be positive. The reason is that banks with greater level of deposits and capital would perform better during the distress time. In addition if capital and deposits aid banks in credit creation during the crisis, then λ^2 and λ^3 are expected to be greater than zero, as well.

6. EMPIRICAL RESULTS

In this section empirical result of the study is represented. First the descriptive statistics of the total data is presented. In addition to total data, the descriptive statistics of the dependent variables of the model are presented for each examined period (before the crisis, during the crisis and after the crisis). Moreover, the results of the regressions are presented over the total time period of 2006 to 2012 for all banks. Furthermore, the result for regressions are presented and explained for separate time periods, 2006, 2007 to 2009, and 2010 to 2012. Further in this section the result of credit creation investigation reported for four different bank sizes (Large, medium, small and smallest) and explained in details. Last but not least, the results of all three regressions are reported and explained for two bank groups (large with assets more than 1 billion Euros and small with assets less than 1 billion Euros), in order to investigate all aspects of the topic from different dimensions.

6.1 Descriptive Statistics

Table 4 represents the descriptive statistics of all data used in the regressions for all banks during the whole period of 2006 to 2012. Table 5 shows the summary statistics of selected financial items for all banks regarding to bank size and sub periods. This table provides summary statistics for changes in liquid assets, loans and credit, during 2006, before crisis period, 2007 to 2009, during crisis period, and 2010 to 2012, after the crisis period. The banks are divided to small and large group .Small banks have the total assets up to 1 billion Euro and large banks have the total assets higher than 1 billion Euros.

Compare to before crisis period (2006), during crisis period (2007-2009) has the lower mean and median for both changes in loans and credits for both large and small bank groups. This can be explained by lower amount of bank lending and bank credit creation during the financial crisis.

Table 4: Summary statistics for all variables

	Mean	Median	Maximum	Minimum	Std.
Illiquid Assets/Assets	0.671	0.705	0.990	0.008	0.166
Deposits/Assets	0.485	0.483	0.904	0.001	0.146
Log Assets	5.888	5.697	9.097	4.511	0.792
Capital/Assets	0.100	0.094	0.499	0.007	0.041
Commit/(Commit+Assets)	0.033	0.023	0.693	0.000	0.036
ΔLiquid Assets/Assets	-0.002	0.000	0.503	-1.353	0.071
ΔLoans/Assets	0.037	0.038	0.623	-5.081	0.122
ΔCredit/(Commit+Asset)	0.033	0.037	0.718	-6.431	0.153
GDP	-0.132	0.587	19.482	-8.864	3.054
Inflation	1.740	1.899	20.295	-3.916	1.036
Unemployment	7.876	7.789	24.200	3.000	1.679

Note: ΔLiquid Assets/Assets= $(\text{Liquid Assets})_t$-$(\text{Liquid Assets})_{t-1}$/ $\text{assets})_{t-1}$, ΔLoans/Assets=$(\text{loans})_t$-$(\text{loans})_{t-1}$/ $\text{assets})_{t-1}$ and ΔCredit /(commit+Asset) =$(\text{committed credit lines+loans})_t$-$(\text{committed credit lines+loans})_{t-1}$/$(\text{committed credit lines+Total assets})_{t-1}$ are dependent variables. CAPITAL_ASSET= capital/ assets_{t-1} , COMMIT= committed credit lines/$(\text{committed credit lines+Total assets})_{t-1}$, DEPOSIT_ASSET= Total customer deposit/ assets_{t-1} , ILLIQUIDASSETS= Net loans/ Total assets_{t-1} , LOGASSETS= Natural Logarithm of total assets. GDP, Inflation and Unemployment are taken from World Bank website.

For large banks the mean and median of changes in ΔLoans/Assets before crisis are 0.071 and 0.069 respectively, while those measures are 0.006 and -0.001 for the crisis period. Nevertheless mean and median of lending for large banks are at their least amount after the crisis period (2010-2012) with -0.007 and 0.009 values, respectively. The mean (median) of changes in ΔCredit/(commit+Asset) for large banks are 0.074 (0.071) and 0.039 (0.047) before the crisis and during the crisis respectively. This value is -0.015 (0.007) for after the crisis period.

The mean (median) of ΔLoans/Assets for small banks is 0.072 (0.067) for before the crisis quarters, however; this value 0.056 (0.054) and 0.020 (0.016) for during and after the crisis quarters, respectively. The mean (median) of changes in ΔCredit/(commit+Asset) for smalls banks are 0.072 (0.069) and 0.053 (0.052) before

the crisis and during the crisis respectively. This value is -0.017 (0.014) for after the crisis period.

Table 5: Summary statistics of the banks' financial items over 2006 to 2012

	Mean	Median	Maximum	Minimum	Std.d
Panel A: Large banks during 2006					
ΔLiquid Assets/Assets	0.076	0.008	6.438	-0.195	0.621
ΔLoans/Assets	0.071	0.069	0.381	-0.193	0.071
ΔCredit/(commit+Asset)	0.074	0.071	0.372	-0.190	0.071
Panel B: Small banks during 2006					
ΔLiquid Assets/Assets	0.000	0.001	0.503	-0.321	0.058
ΔLoans/Assets	0.072	0.067	0.444	-0.036	0.048
ΔCredit/(commit+Asset)	0.072	0.069	0.259	-0.170	0.050
Panel C: Large banks during 2007-2009					
ΔLiquid Assets/Assets	-0.006	-0.001	0.499	-1.353	0.119
ΔLoans/Assets	0.043	0.045	0.345	-0.511	0.071
ΔCredit/(commit+Asset)	0.039	0.047	0.352	-0.495	0.079
Panel D: Small banks during 2007-2009					
ΔLiquid Assets/Assets	0.001	0.002	0.236	-0.335	0.051
ΔLoans/Assets	0.056	0.054	0.423	-0.227	0.051
ΔCredit/(commit+Asset)	0.053	0.052	0.718	-1.916	0.094
Panel E: Large banks during 2010-2012					
ΔLiquid Assets/Assets	-0.009	-0.004	0.403	-0.444	0.077
ΔLoans/Assets	-0.007	0.009	0.623	-5.081	0.272
ΔCredit/(commit+Asset)	-0.015	0.007	0.629	-6.431	0.338
Panel F: Small banks during 2010-2012					
ΔLiquid Assets/Assets	-0.005	0.000	0.384	-0.434	0.054
ΔLoans/Assets	0.020	0.016	0.306	-0.471	0.052
ΔCredit/(commit+Asset)	0.017	0.014	0.313	-0.467	0.055

Notes: ΔLiquid Assets/Assets= $(\text{Liquid Assets})_t$-$(\text{Liquid Assets})_{t-1}$/ $\text{assets})_{t-1}$, ΔLoans/Assets=$(\text{loans})_t$-$(\text{loans})_{t-1}$/ $\text{assets})_{t-1}$ and ΔCredit /(commit+Asset) =(committed credit lines+loans)$_t$-(committed credit lines+loans)$_{t-1}$/(committed credit lines+Total assets)$_{t-1}$ are dependent variables.

The mean (median) of ΔLiquid Assets/Assets for large banks is 0.076 (0.008) before the crisis time zone, while it is -0.006 (-0.001) during the crisis, and it is -0.009 (-0.004) after the crisis period. The mean (median) of ΔLiquid Assets/Assets for small banks is 0.000 (0.001) in before the crisis period, but 0.001 (0.002) during the crisis period, and -0.005 (0.000) after the crisis timeline.

6.2 Empirical Results

Table 6 shows the result of three regressions for all banks during 2006 to 2012 time period. The results suggest that core deposits are positively and highly correlated to both ΔLoans/Assets and ΔCredit/(commit+Asset), meaning that core deposits were the stable source of funding during the recent financial crisis. Moreover, the results show that capital is also positively and highly correlated to both ΔLoans/Assets and ΔCredit/(commit+Asset) demonstrates that core deposits also act as a reliable source of funding during the financial distress. Those banks with higher level of core deposit and capital did better to overcome their liquidity risk according to the empirical results. These results are proof for both hypotheses in this study. These results support the Cornett et al. (2011) findings that core deposit and capital assist banks when financial turmoil happen. There is a positive highly significant relationship at 1% level between unused commitments and ΔLoans/Assets. It represents that banks with higher level of commitments have a greater loan demand and this finding is also a support for Cornett et al. (2011) results.

The relationship between capital and Δloans is positively highly significant at 1% level, which supports the findings of Cornet et al. (2011) and Disyatat (2011), who observed a significant positive relationship between bank deposits and amount of lending in their researches. In addition, capital also has a positive relationship with changes in liquid assets and credit which is significant at 1% level. These results are proof for the findings of Kaplan and Minou (2013); however, these results are against the findings of Hoque (2013), who states that capital has a negative effect on bank performance during the credit crisis.

The relationship between unused commitments and ΔLoans/Assets and ΔCredit/(commit+Asset) are both positively highly significant at 1% level. It supports the Cornet et al. (2011) result that shows the positive relationship between loans and unused commitments, while is against the negative sign that they find for the association between unused commitments and credit changes. The relationships between core deposits and changes in loans and credit are positive and statistically highly significant at 1% level, which is a proof to the findings of Ivashina and Scharfstien (2010a). The relationship between illiquid assets and ΔLiquid Assets/Assets shows the negative sign and is significant in 1% level.

Table 6: Results of Regressions (2006-2012)

	ΔLiquid Assets/Assets	ΔLoans/Assets	ΔCredit/ (commit+Asset)
CAPITAL_ASSET	0.335***	0.549***	0.644***
	(0.008)	(0.005)	(0.010)
COMMIT	0.102	0.342***	1.309***
	(0.108)	(0.001)	(0.000)
DEPOSIT_ASSET	-0.033	0.183***	0.228***
	(0.271)	(0.000)	(0.000)
GDP	0.003***	0.004***	0.005***
	(0.000)	(0.000)	(0.000)
ILLIQUIDASSETS	-0.237***	0.341***	0.279***
	(0.000)	(0.000)	(0.000)
INFLATION	0.005**	0.012***	0.014***
	(0.014)	(0.000)	(0.000)
LOGASSETS	0.227***	0.399***	0.476***
	(0.000)	(0.000)	(0.000)
UNEMPLOYMENT	-0.004***	-0.016***	-0.013***
	(0.003)	(0.000)	(0.000)
Observations	2478	2478	2478
R-squared	0.157	0.318	0.304

Note: Fixed effect panel least square is used as estimator. ΔLiquid Assets/Assets= $(\text{Liquid Assets})_t$-$(\text{Liquid Assets})_{t-1}$/ $\text{assets})_{t-1}$, ΔLoans/Assets=$(\text{loans})_t$-$(\text{loans})_{t-1}$/ $\text{assets})_{t-1}$ and ΔCredit /(commit+Asset) =$(\text{committed credit lines+loans})_t$-$(\text{committed credit lines+loans})_{t-1}$/$(\text{committed credit lines+Total assets})_{t-1}$ are dependent variables. CAPITAL_ASSET= capital/ assets_{t-1} , COMMIT= committed credit lines/$(\text{committed credit lines+Total assets})_{t-1}$, DEPOSIT_ASSET= Total customer deposit/ assets_{t-1} , ILLIQUIDASSETS= Net loans/ Total assets_{t-1} , LOGASSETS= Natural Logarithm of total assets. GDP, Inflation and Unemployment are taken from World Bank website. P-values are

reported in the parenthesis, ***, ** and * denote the coefficients are statistically significant at 1%, 5% and 10%, respectively.

The relationship between illiquid assets and loan and credit changes shows the positive sign and statistically significance at 1% level. The size of the banks (Logassets) shows the positive sign in relationship with all three dependent variables. In addition, all macro variables have significant relationship with all three dependent variables at 5%-1% level. Unemployment shows the negative sign with all three dependent variables; however, GDP and inflation have positive association with dependent variables. This is the proof that all macro-economic factors play significant roles in this model and have significant impact on banks during the financial crisis. These results are general for the whole period, and in following sections in the study the specific results for each sub-period with regards to the bank-size will be discussed.

6.2.1 Effects of Different Assets before the Financial Crisis

The three regressions in this study have been ran for data belong to before the crisis period (2006), during the crisis period (2007-2009) and after the crisis time (2010-2012) separately, in order to estimate the effect of each asset type on ΔLiquid Assets/Assets, ΔLoans/Assets and ΔCredit /(commit+Asset) during each time period. The results are reported in table 7, table 8 and table 9.

According to table 7 capital has the significant positive relationship with ΔLiquid Assets/Assets before the crisis, however, no significant relationship is reported between capital and two other dependent variables. This is the proof that capital can help the banks to provide liquidity and assist them when the liquidity is scarce. Unused commitments have significant positive relationship with both ΔLoans/Assets and ΔCredit /(commit+Asset) at 10% and 1%, respectively. The relationship between unused commitments and changes in credit is higher and more significant. The relationship between core deposit (DEPOSIT_ASSET) and ΔLiquid Assets/Assets is negative and highly significant at 1% level, however, the relationship between core deposits and ΔCredit /(commit+Asset) is positive and again highly significant at 1% level.

Table 7: Regressions Results, period (2006)

	ΔLiquid Assets/Assets	ΔLoans/ Assets	ΔCredit/ (commit+Asset)
CAPITAL_ASSET	0.304***	0.005	-0.066
	0.000	0.948	0.346
COMMIT	-0.126	0.126*	0.296***
	0.108	0.081	0.000
DEPOSIT_ASSET	-0.084***	0.021	0.052**
	0.000	0.304	0.011
GDP	-0.002	-0.006**	-0.007***
	0.456	0.027	0.010
ILLIQUIDASSETS	-0.116***	0.133***	0.126***
	0.000	0.000	0.000
INFLATION	0.008*	0.021***	0.021***
	0.096	0.000	0.000
LOGASSETS	0.018***	0.004	0.002
	0.001	0.365	0.678
UNEMPLOYMENT	-0.002	0.003	0.005
	0.713	0.453	0.235
Observations	354	354	354
R-squared	0.204	0.234	0.250

Note: Fixed effect panel least square is used as estimator. ΔLiquid Assets/Assets= $(\text{Liquid Assets})_t$-$(\text{Liquid Assets})_{t-1}$/ $\text{assets})_{t-1}$, ΔLoans/Assets=$(\text{loans})_t$-$(\text{loans})_{t-1}$/ $\text{assets})_{t-1}$ and ΔCredit /(commit+Asset) =$(\text{committed credit lines+loans})_t$-$(\text{committed credit lines+loans})_{t-1}$/$(\text{committed credit lines+Total assets})_{t-1}$ are dependent variables. CAPITAL_ASSET= capital/ assets_{t-1} , COMMIT= committed credit lines/$(\text{committed credit lines+Total assets})_{t-1}$, DEPOSIT_ASSET= Total customer deposit/ assets_{t-1} , ILLIQUIDASSETS= Net loans/ Total assets_{t-1} , LOGASSETS= Natural Logarithm of total assets. GDP, Inflation and Unemployment are taken from World Bank website. P-values are reported in the parenthesis, ***, ** and * denote the coefficients are statistically significant at 1%, 5% and 10%, respectively.

Illiquid assets have significant relationship with all three dependent variables at 1% level. This relationship has negative sign with changes in liquidity and positive sign with changes in both loans and credit. Macro variables (GDP and inflation) show the significant relationship with dependent variables specially with ΔCredit /(commit+Asset) and ΔLoans/Assets; however, unemployment does not show any significant association with dependent variables before the crisis.

6.2.2 Effects of Different Assets during the Financial Crisis

Table 8 shows the result of three regressions during the financial crisis (2007-2009). According to the table, capital has a positive significant relationship with changes in loans, significant at 10% level. Thus again this is the proof that capital has a crucial role for enabling banks to continue lending during financial distress. Committed credit lines (COMMIT) also shows a significant positive association with ΔCredit/(commit+Asset) at 1% level. This finding shows that instead of credit creation (credit supply) the demand of credit increased during the recent crisis.

Table 8: Regressions Results, period (2007-2009)

	ΔLiquid Assets/Assets	ΔLoans/Assets	ΔCredit/ (commit+Asset)
CAPITAL_ASSET	0.025	0.371*	0.529
	0.941	0.064	0.117
COMMIT	0.096	-0.030	1.836***
	0.376	0.644	0.000
DEPOSIT_ASSET	0.065	0.132***	0.190**
	0.430	0.007	0.021
GDP	0.011***	0.005***	0.004***
	0.000	0.000	0.008
ILLIQUIDASSETS	-0.437***	0.461***	0.327***
	0.000	0.000	0.000
INFLATION	0.000	0.011***	0.007
	0.939	0.001	0.210
LOGASSETS	1.022***	0.437***	0.439***
	0.000	0.000	0.000
UNEMPLOYMENT	0.004	-0.007	-0.010
	0.643	0.133	0.204
Observations	1062	1062	1062
R-squared	0.426	0.619	0.545

Note: Fixed effect panel least square is used as estimator. ΔLiquid Assets/Assets= $(\text{Liquid Assets})_t$-$(\text{Liquid Assets})_{t-1}/\text{assets})_{t-1}$, ΔLoans/Assets= $(\text{loans})_t$-$(\text{loans})_{t-1}/\text{assets})_{t-1}$ and ΔCredit/(commit+Asset) =$(\text{committed credit lines+loans})_t$-$(\text{committed credit lines+loans})_{t-1}$/(committed credit lines+Total assets)$_{t-1}$ are dependent variables. CAPITAL_ASSET= capital/ assets_{t-1} , COMMIT= committed credit lines/(committed credit lines+Total assets)$_{t-1}$, DEPOSIT_ASSET= Total customer deposit/ assets_{t-1} , ILLIQUIDASSETS= Net loans/ Total assets_{t-1} , LOGASSETS= Natural Logarithm of total assets. GDP, Inflation and Unemployment are taken from World Bank website. P-

values are reported in the parenthesis, ***, ** and * denote the coefficients are statistically significant at 1%, 5% and 10%, respectively.

Deposits also has a significant positive relationship with both ΔLoans/Assets and ΔCredit /(commit+Asset) at 1% and 5%, respectively, showing that core deposits and capital play the important role as reliable sources of funding and helped banks the most to continue lending and making credit during the financial crisis. Illiquid assets show the significant relationship with all three dependent variables at 1% level. This relationship is negative with changes in liquid assets and positive with changes in loans and credit. Bank size (logassets) shows the positive significant association with all three dependent variables at 1% level. GDP has positive relationship with all three variables at 1%, while unemployment does not show any significant relationship in these regressions. Inflation has a positive significant relationship with changes in loans at 1% level.

6.2.3 Effects of Different Assets after the Financial Crisis

Table 9 presents the results of three regressions in after the crisis period (2010-2012). According to this table capital has a significant relationship with all three dependent variables at 1% level. Capital has a negative association with changes in liquid assets, whereas its relationship with changes in loans and credit has positive sign. Illiquid assets also have negative relationship with both ΔLoans/Assets and ΔCredit/(commit+Asset), fairly high and significant at 1% level. This shows that banks with more illiquid assets had to cut down on lending and credit supply after the crisis. Committed credit line (COMMIT) shows a significant positive association with changes in credit at 5% level.

In table 9 the association between Capital and ΔLiquid Assets/Assets is negative and highly significant at 1% level shows than banks with greater capital level have advantage to deal with liquidity buffers. In addition its significant positive relationship with ΔLoans/Assets and ΔCredit/(commit+Asset) indicates that capital was a reliable source of funding for banks to continue lending and produce credit even after the crisis.

Table 9: Regressions Results, period (2010-2012)

	ΔLiquid Assets/Assets	ΔLoans/Assets	ΔCredit/ (commit+Asset)
CAPITAL_ASSET	-0.941***	3.099***	3.849***
	0.003	0.000	0.000
COMMIT	0.118	0.021	1.346**
	0.517	0.966	0.024
DEPOSIT_ASSET	0.057	0.108	0.162
	0.272	0.433	0.345
GDP	0.006*	-0.005	-0.003
	0.081	0.612	0.814
ILLIQUIDASSETS	-0.077	-0.452***	-0.776***
	0.197	0.004	0.000
INFLATION	0.007	-0.021*	-0.015
	0.150	0.097	0.334
LOGASSETS	0.318***	0.085	0.043
	0.000	0.577	0.821
UNEMPLOYMENT	0.006	-0.012	-0.012
	0.119	0.239	0.360
Observations	1062	1062	1062
R-squared	0.413	0.425	0.417

Note: Fixed effect panel least square is used as estimator. ΔLiquid Assets/Assets= $(\text{Liquid Assets})_t$-$(\text{Liquid Assets})_{t-1}$/ $\text{assets})_{t-1}$, ΔLoans/Assets=$(\text{loans})_t$-$(\text{loans})_{t-1}$/ $\text{assets})_{t-1}$ and ΔCredit /(commit+Asset) =(committed credit lines+loans)$_t$-(committed credit lines+loans)$_{t-1}$/(committed credit lines+Total $\text{assets})_{t-1}$ are dependent variables. CAPITAL_ASSET= capital/ assets_{t-1} , COMMIT= committed credit lines/(committed credit lines+Total $\text{assets})_{t-1}$, DEPOSIT_ASSET= Total customer deposit/ assets_{t-1} , ILLIQUIDASSETS= Net loans/ Total assets_{t-1} , LOGASSETS= Natural Logarithm of total assets. GDP, Inflation and Unemployment are taken from World Bank website. P-values are reported in the parenthesis, ***, ** and * denote the coefficients are statistically significant at 1%, 5% and 10%, respectively.

6.2.4 Credit Production across Different Bank Size

Economic magnitude of different types of assets in credit production has been estimated in table 10. The third regression has been tested for four bank sizes: Large banks with total assets more than 1 billion Euros, Medium-sized banks with total assets between 500 million and 1 billion Euros, Small banks with total assets between 100 million and 500 million Euros and Smallest banks with total assets lower than 100 million Euros.

Table 10 shows the perfect evidence that liquidity risk has a greater influence on the larger banks. All the variables are greater and most of them are statistically highly significant at 1% level for large banks, compare to other bank-size. Credit changes has a negative relationship with capital which is significant at 5% level, in smallest banks; however, capital does not have any significant relationship with credit creation in other bank sizes.

Table 10: Effect of different types of assets on credit production

	Large banks	Medium banks	Small banks	Smallest banks
CAPITAL_ASSET	0.771	0.001	-0.258	-1.025**
	0.247	0.998	0.364	0.026
COMMIT	2.038***	0.766***	1.210***	0.468**
	0.000	0.000	0.000	0.017
DEPOSIT_ASSET	0.290**	0.179**	0.130**	0.073
	0.028	0.043	0.019	0.263
GDP	0.006**	0.001	0.004***	-0.002
	0.020	0.323	0.002	0.281
ILLIQUIDASSETS	0.939***	0.166**	0.179***	0.160**
	0.000	0.021	0.002	0.033
INFLATION	0.014*	0.013**	0.009**	-0.014**
	0.067	0.025	0.015	0.032
LOGASSETS	1.115***	0.092	0.156***	-0.223**
	0.000	0.358	0.007	0.024
UNEMPLOYMENT	-0.019***	-0.012***	-0.011***	-0.008**
	0.000	0.001	0.000	0.048
Number of banks	840	395	1039	204
R-squared	0.484	0.580	0.361	0.421

Note: Fixed effect panel least square is used as estimator. ΔCredit /(commit+Asset) =(committed credit lines+loans)$_t$-(committed credit lines+loans)$_{t-1}$/(committed credit lines+Total assets)$_{t-1}$ is dependent variable. CAPITAL_ASSET= capital/ assets$_{t-1}$, COMMIT= committed credit lines/(committed credit lines+Total assets)$_{t-1}$, DEPOSIT_ASSET= Total customer deposit/ assets$_{t-1}$, ILLIQUIDASSETS= Net loans/ Total assets$_{t-1}$, LOGASSETS= Natural Logarithm of total assets. GDP, Inflation and Unemployment are taken from World Bank website. Large banks (Total assets> 1 billion Euros), Medium banks (total assets 500 million to 1 billion Euros), Small banks (Total assets 100 million to 500 million Euro), Smallest banks (total assets < 100 million Euro). P-values are reported in the parenthesis, ***, ** and * denote the coefficients are statistically significant at 1%, 5% and 10%, respectively.

Committed credit lines have positive relationship with all bank sizes which is significant in 5% to 1%, while it is higher for large banks and the least for the smallest banks. Deposits have the positive relationship with credit changes in all bank sizes and this relationship increases when the bank size grows. Illiquid assets also show significant positive relationship with credit creation in all bank sizes; however, this association is the highest for large banks and lowest for the smallest banks. GDP, inflation and unemployment, all have higher association with bank credit creation when the size of the banks grows.

6.2.5 Effects of Different Financial Assets across Bank Size

Table 11 represents the result of all three regressions on small and large bank sizes. Banks ae divided in two groups of large banks with total assets more than 1 billion Euros, and small banks with total assets of lower than 1 billion Euros. According to table 11, committed credit lines (COMMIT) have higher influence on loan changes in large banks compare to small banks; however, they have higher influence on changes in credit in small banks compare to large banks. In other words, large banks with higher committed credit lines could continue to lend more loans than other large banks with lower amount of committed credit lines. While this statement is still true but in lesser extend for small banks.

There is a positive relationship between deposit and credit creation in large banks and it is significant at 5% level. There is also a positive relationship with slightly higher coefficient between deposit and credit creation in small banks, significant at 1% level. In addition small banks' capital also shows the negative and positive coefficients with ΔLiquid Assets/Assets and ΔLoans/Assets, respectively. Illiquid assets show a negative relationship (significant at 1% level) with changes in liquid assets in both large and small banks. However, the relationship between illiquid assets and changes in loans and credit is positive and significant at 1% level for both bank sizes.

Table 11: Result of regressions on small and large banks.

	ΔLiquid Assets/Assets	ΔLoans/Assets	ΔCredit/ (commit+Asset)
Panel A : Large banks (total assets> 1 billion Euro) (N=840)			
CAPITAL_ASSET	0.057	0.407	0.665
	0.865	0.455	0.247
COMMIT	0.177	1.063***	0.285***
	0.214	0.000	0.000
DEPOSIT_ASSET	-0.060	0.164	0.132**
	0.364	0.130	0.028
GDP	0.007***	0.005**	0.003**
	0.000	0.018	0.020
ILLIQUIDASSETS	-0.261***	0.865***	0.112***
	0.000	0.000	0.000
INFLATION	0.007*	0.012*	0.008*
	0.078	0.060	0.067
LOGASSETS	0.232***	0.898***	0.088***
	0.000	0.000	0.000
UNEMPLOYMENT	-0.003	-0.020***	0.005***
	0.226	0.000	0.000
Panel B : Small banks (total assets< 1 billion Euro) (N=1638)			
CAPITAL_ASSET	-0.167	0.071	-0.160
	0.236	0.551	0.389
COMMIT	-0.015	0.106**	1.141***
	0.798	0.032	0.000
DEPOSIT_ASSET	-0.049*	0.145***	0.142***
	0.090	0.000	0.000
GDP	-0.001*	0.002***	0.003***
	0.091	0.001	0.000
ILLIQUIDASSETS	-0.243***	0.264***	0.195***
	0.000	0.000	0.000
INFLATION	0.001	0.008***	0.009***
	0.602	0.000	0.002
LOGASSETS	0.059*	0.145***	0.157***
	0.051	0.000	0.000
UNEMPLOYMENT	-0.003	-0.014***	-0.011***
	0.056	0.000	0.000

Note: Fixed effect panel least square is used as estimator. ΔLiquid Assets/Assets= $(\text{Liquid Assets})_t$-$(\text{Liquid Assets})_{t-1}$/ $\text{assets})_{t-1}$, ΔLoans/Assets=$(\text{loans})_t$-$(\text{loans})_{t-1}$/ $\text{assets})_{t-1}$ and ΔCredit /(commit+Asset) =$(\text{committed credit lines+loans})_t$-$(\text{committed credit lines+loans})_{t-1}$/$(\text{committed credit lines+Total assets})_{t-1}$ are dependent variables. CAPITAL_ASSET= capital/ assets_{t-1} , COMMIT= committed credit lines/$(\text{committed credit lines+Total assets})_{t-1}$, DEPOSIT_ASSET= Total customer deposit/ assets_{t-1} , ILLIQUIDASSETS= Net loans/ Total assets_{t-1} , LOGASSETS= Natural Logarithm

of total assets. GDP, Inflation and Unemployment are taken from World Bank website. P-values are reported in the parenthesis, ***, ** and * denote the coefficients are statistically significant at 1%, 5% and 10%, respectively.

7. Conclusion

This study examines the relationship between each asset type and the changes in amount of lending and credit creation before, during and after the financial crisis 2007-2009 in Euro zone banks. The data are gathered from the Bankscope database and contains 354 banks from 19 Eurozone countries. This research is based on two main hypotheses. First, Bank deposit and bank capital, both have positive relationship with bank lending during financial crisis. Second, Bank capital has a positive association with bank credit creation during financial crisis. The results provide proof for both hypotheses. This research provides evidence that core deposits and capital act as a reliable source of financing for banks during financial turmoil. These two valuable types of asset enable banks to continue lending and create credits during financially distressed period. These results support the Cornet et al. (2011), Ivashina and Scharfstien (2010a), Kaplan and Minou (2013), and Disyatat (2011) findings.

These findings are also a proof that those banks with higher level of core deposit and capital did better to overcome their liquidity risk when the liquidity is scarce. This study also provide evidence that large banks with higher committed credit lines could continue to lend more loans than other large banks with lower amount of committed credit lines. Furthermore, the results support Cornet et al. (2011) that liquidity risk has a greater influence on the large banks compare to smaller counterparts. The results also represent that banks with higher level of commitments have a greater loan demand and this finding is also a support for Cornett et al. (2011) results.

In general, it seems that between the various types of assets hold by banks, deposit and capital can assist the banks the best when the economic situation is unstable. These results are the same for both US and Eurozone banks, although some assets, for example unused commitments, seems to has a negative effect on credit creation in US banks , but no significant effect has found in this study for the banks in Eurozone.

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