NEAR EAST UNIVERSITY
GRADUATE SCHOOL OF SOCIAL SCIENCES
DEPARTMENT OF BANKING AND FINANCE
BANKING AND ACCOUNTING PROGRAM

Determinants of Liquidity of the US Banks:

Evidence with the Framework of 2008 Financial Crisis

HAKAR ABUBAKIR BAYZ

MASTER'S THESIS

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DEDICATION

I dedicate my thesis to my mother and my father for earning an honest living for us and for supporting and encouraging me to have faith in myself.

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ABSTRACT

Determinants of Liquidity of the US Banks: Evidence with the Framework of 2008 Financial Crisis

Optimizing liquidity to the level that benefits the bank is substantial function of bank manages because keeping high level of liquid assets would not generate return rather than harms the banks. On the other hand, obtaining optimal level of liquidity buffer has become a serious issue following the 2008 global financial crisis. Nonetheless, liquidity crisis in US banks didn't receive sufficient attentions by researchers. Given a sample of 12 largest banks in US and the time span covers 1999 to 2017 the present thesis scrutinizes the determinants of liquidity of US banks. Indeed, the expected determinants of banks' liquidity are categorized to internal (bank specifics) and external (macro variables) factors. In addition, this thesis examined the effect of 2008 global financial crisis on the choice of liquidity by banks. The outcome of panel analysis reveals some findings. In particular, concerning bank specific factors it's observed that bank capitalization inversely and size positively affect liquidity while the impact of the rest of bank factors were not statistically significant. Furthermore, it's revealed that economic growth is positively affecting liquidity. Lastly, financial crisis found to be inversely affecting banks' liquidity. US banks can obtain optimal liquidity buffer that maximizes the value of the banks and protects them from liquidity risk by using information or data about the volume of equity capital and economic growth. In addition, managing banks during financial crises varies from non-financial crises periods. US banks are recommended to store greater liquid buffer if they expect a financial crisis.

Key words: Liquidity, bank specific factors, macro variables, global financial crisis, US banking sector

ÖZ

Determinants of Liquidity of the US Banks: Evidence with the Framework of 2008 Financial Crisis

Likiditesini bankanın yararına olan seviyeye getirmek, banka yöneticilerinin önemli bir işlevidir çünkü yüksek likit varlıkların bankalara zarar vermekten ziyade getiri elde etmemesi nedeniyle. Öte yandan, 2008 yılı küresel mali krizinin ardından optimal düzeyde likidite tamponunun sağlanması ciddi bir sorun haline gelmiştir. Bununla birlikte, ABD bankalarındaki likidite krizi araştırmacılar tarafından yeterince dikkat çekmemiştir. ABD'deki en büyük 12 bankanın bir örneğini kullanarak ve 1999 ve 2017 yıllarını kapsayan zaman dilimi, ABD bankalarının likiditesinin belirleyicilerini incelemektedir. Nitekim, bankaların likiditesinin beklenen belirleyicileri, iç (banka özellikleri) ve harici (makro değişkenler) faktörlere göre sınıflandırılmaktadır. Ayrıca, bu tez 2008 yılında küresel finansal krizin bankalar tarafından likidite seçimine olan etkisini incelemiştir. Panel analizinin sonucu bazı bulguları ortaya koymaktadır. Özellikle, bankalara özgü faktörler ile ilgili olarak, banka sermayeleşmesinin likiditeyi ters yönde etkilediği ve geri kalan banka faktörlerinin etkisinin istatistiksel olarak anlamlı olmadığı gözlenmiştir. Ayrıca, ekonomik büyümenin likiditeyi olumlu yönde etkilediğini ortaya koymuştur. Son olarak, finansal kriz, bankaların likiditesini ters olarak etkilemektedir. ABD bankaları, bankaların değerini en üst düzeye çıkaran ve bunları sermaye ve ekonomik büyümenin hacmi hakkında bilgi veya veriler kullanarak likidite riskinden koruyan en uygun likidite tamponunu elde edebilirler. Ayrıca, finansal krizler sırasında bankaları yönetmek finansal olmayan kriz dönemlerine göre değişmektedir. ABD bankalarının bir finansal kriz bekledikleri takdirde daha büyük bir sıvı tampon depolaması tavsiye edilir.

Anahtar Kelimeler: Likidite, banka özel faktörleri, makro değişkenler, küresel finansal kriz, ABD bankacılık sektörü

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LIQD: Liquidity Proxy

LATA: The ratio of liquid assets/total assets

ROA: Return on Asset

BC: Bank Capitalization

SIZE: Size of Bank

NPL: Non-performing Loans

GDP: Economic Growth

CPI: Consumer Price Index

DM: Financial Crisis Dummy

OLS: Ordinary Least Squared

D-W: Durbin Watson test

CHAPTER 1

INTRODUCTION

1. 1 Brief on Banking System in US

As indicated by World Economic Forum (2018) the economy of the United States (US) is the biggest on the planet. With $18 trillion GDP, it speaks to a quarter offer of the worldwide economy (24.3%) and New York City is the known as the world's largest financial center as comes after London. Banking system in US comprises the Federal Reserve System, commercial banks, foreign banks, offshore banks, saving institutions and credit unions. Banking system in US is enjoying a considerable growth in the recent years. The growth can be seen in terms of total assets to reach more than $ 45 trillion (Federal Reserve Economic Data, 2018).
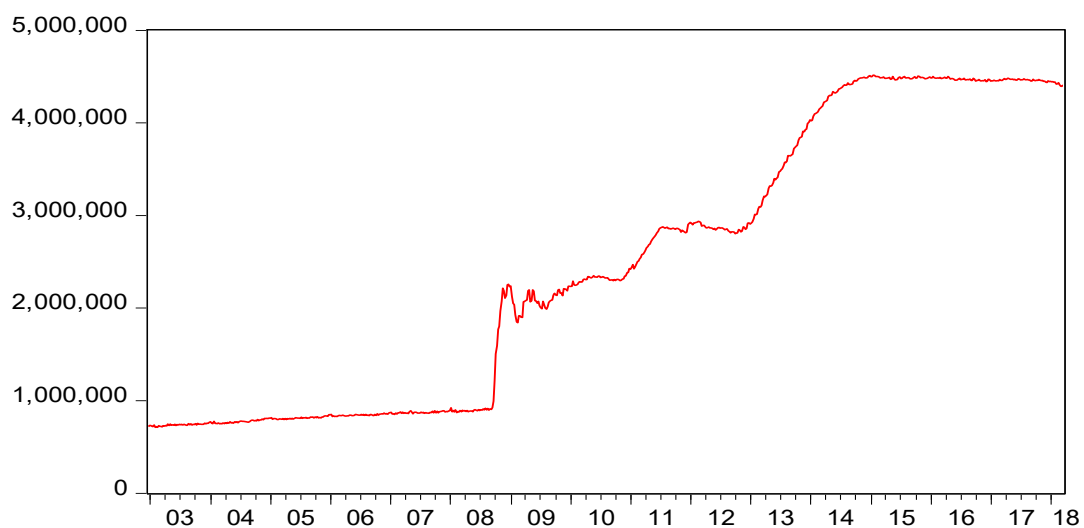
Figure 1Total US banks' total assets (Federal Reserve Economic Data, 2018).

Based on Litter et al. (2004) banks are recognized as the financial organizations that facilitate go-between capacity in the economy through directing financial resources from surplus (depositors) financial units to shortfall (borrowers) economic unit; thus it remained and will keep on being a critical foundation for any economy as they assume the most key job in the installments framework. Since the job of capital market in most creating nations is negligible, business banks turn into the most predominant monetary organizations. Of the primary elements of business banks is the profiting of funds (monetary) to its clients; for a bank to be in a situation to do as such, it must have created a strong liquidity position that sustain production.

According to Allen et al. (2010) the banking system helps in assignment of assets from those surplus depositors to those shortfall borrowers by changing moderately little liquid deposits in to large illiquid loans.

Bank for International Settlements (2008) explained liquidity as the capability of bank to fund increments in assets and meet out of this world outstanding, without bringing about unsatisfactory losses.

Another measurement of banking sector development is provided by The World Bank as measured by the ratio of internal credit to private area by banks to gross domestic product. Obviously, is can be noticed from the bellow figure credits provided by banking sector constitute a great proportion of overall economy of US indicating the substantial role of the banking industry in the development of economy in the country.
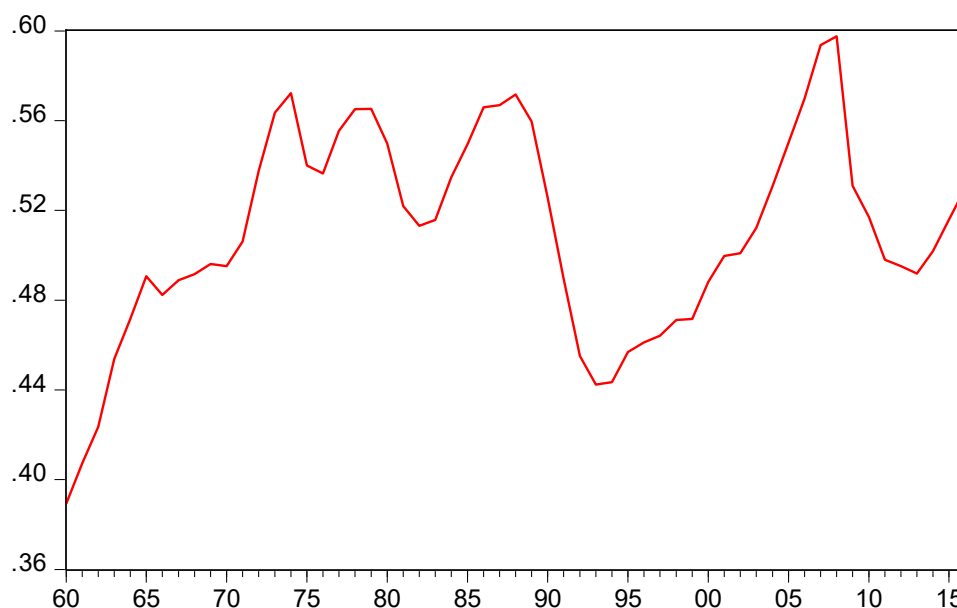
Figure 2 US banking sector development (World Bank, 2018).

1. 2 the 2008 Financial Crisis

Starting in early 20th century, the US government issued regulations (securitized mortgages) that forced banks to facilitate for more household to have their own houses (O'Quinn, 2008). Banks faced a series of problems of liquidity which caused severe losses on them. Consequently, the crisis initiated in US and spread quickly to other countries to be a global crisis (Franzese, 2013).

Since the great depression, during the 2008 financial crisis the US experienced deepest and longest recession. The effects of the crisis extended to all economic and financial fractions in the country as well as many firms and even households were extremely influenced (Khanal and Mishra, 2017).

Specifically, during the 2008 crisis banks had not sufficient liquid assets which make them to claim support from central bank. Even with the intervention of central banks many banks failed to sustain. This forced them into mergers or look for alternative solutions. In the meantime, a number of banks went bankrupt (Bernanke, 2008). Later on, European Central Bank

and US Federal Reserve introduced billions of dollars as overnight credit in to the market, but still some banks required extra liquidity.

According to (Franzese, 2013) not exclusively completed various American banks flop, yet whatever is left of the whole monetary chain was influenced. The agricultural, mechanical, transport, domestic, and so forth areas were influenced by the bankruptcy of these banks. Joblessness expanded and add up to request contracted on all good and service, Total expenditure, in this manner lessening singular salaries and decreasing assessment incomes, expanded the government spending shortfall over 500 Billion for 2008, and the public debt obligation surpassed 10 trillion, which is extremely risky for them.

In this way, the business part in all nations related with the American economy has been influenced by the collapse of the American financial sector related segment under the degenerate mortgage obligation and the failure to recoup it right now. The crisis is probably going to stretch out to whatever remains of the world, as occurred amid the Great Depression of the mid 1930s, which went on for about four years if the universal network and the pioneers of the world's major industrialized nations did not act.

1. 3 Statement of the Problem

The prime purpose of banks in the economy is to convert money from its surplus unit (short-term deposits) to its deficit unit (long-term loans). Banks causes liquidity in both assets and liability of the balance sheet. This ensures the depositors and borrowers while lending by banks regarding the potential liquidity needs by the depositors (Diamond and Dybvig, 1983).

In this sense, banks are inherently sensitive to liquidity risk. Nevertheless, liquidity creation is considered as a fundamental source of economic welfare in addition to risk (Calomiris and Kahn 1991). Banks are strongly exposed to maturity mismatch between deposits and loans. This makes liquidity to have an extremely inverse impact on the capital and earnings of banks. Thus, it becomes an important objective of bank managers to ensure the presence of

sufficient liquid assets to response to depositors' withdrawal demand or any unexpected need for cash at a lowest cost.

Optimizing liquidity to the level that benefits the bank is substantial function of bank manages because keeping high level of liquid assets would not generate return rather than harms the banks. Then, the level of liquidity and factors that driving it important matter to be investigated.

1.4 Objective and Significance of the Thesis

The prime goal of this thesis is to examine the factors[1] that are significantly impact the liquidity buffer of US banks over the time span of 1999 to 2017 with the consideration of the 2008 financial crisis. The factors that are believed to impact the liquidity of US banks are *internal factors* or bank specific factors and an e*xternal factor* namely GDP.

The study fills a gap in literature as it's the first attempt to examine the determinants of liquidity in the US largest banks. In addition, the study assists bank managers in liquidity optimization for the banks process. The results of this study would be important for strategy makers in the problem of prudential recommendation on liquidity that can be used in formulation of policy.

1.5 Research Question

The overall aim of the study is to answer the following two questions:

1. Among bank specific factors, what are the significant determinants of bank liquidity in US?

2. Among external factors, what are the substantial determinants of bank liquidity in US?

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[1] The explanatory variables have been selected based on theory and literature as we review in the following chapter.

1.6 Limitations and Scope of the Study

The scope of this thesis is limited by three points:

1. The study examines the impact of bank capitalization, size, non-performing loans, profitability, GDP, and the 2008 financial issues on the liquidity of US banks. Liquidity is measured by two different measured which will be demonstrated in later chapters.

2. The sample of the US banks is limited to 12 largest banks in US in terms of total assets.

3. The time span limited to the period of 1999 to 2017 (19 years) which covers the period of the 2008 financial crisis as well.

1.7 Thesis Structure

The rest of the thesis arranged as follows:

1. Chapter two: where contains the theoretical review on liquidity risk, the liquidity regulations, possible determinants of liquidity in addition to review of empirical studies on the determinants of literature.

2. Chapter three: the created sample and used data will be presented. In this chapter we further introduce econometric models accompanied with their variables description. Lastly, the methodology of the thesis will be demonstrated.

3. Chapter four: the results of conducting the models and methodology that introduced in chapter 3 will be presented.

4. Chapter five: consist of the summary of the thesis, implication policy, suggestions and recommendations.

CHAPTER 2

LITERATURE REVIEW

2.1 Theoretical Framework

2.1.1 Bank Liquidity

Various definitions of liquidity by many scholars in literature have been provided. Kyle (1985) states that assets are considered as liquid only if it can also be turned to cash by avoiding severe losses. Liquidity is described as the capability of financial institutions to attain all immediate legal demands for fund (Yeager and Seitz, 1989). Liquidity is about how fast assets can be converted to cash it's also known as marketability (Garber and Weisbrod, 1992).

(Aqel, 2006: 158) explained the Liquidity in the banking sector implies the contrast between the incomes accessible to it and the funds asset in various categories of assets inside the balance forced by customary banking assets. Banks are in a bounty of liquidity when the accessible assets are surplus to the bank's lending capacity; the bank needs to invest surpluses inside liquid asset, for example, securities, bank balances especially the idle balances. The researcher supported Al-Shammari (2012: 429) who states that banking liquidity is the capacities of the bank to fulfill its debts urgently, in relation to the cash existing to it and by transferring its assets to liquid cash rapidly by avoiding any losses.

According to Al-Hamid and Al-Muttalib (2002) Liquidity in its supreme sense implies cash money. Liquidity in its specialized sense implies the benefit's capacity to change to cash rapidly and without misfortunes. Since the target of liquid asset is to meet current or momentary commitments, liquidity is a

relative idea Express the connection among cash and asset simple to change to cash quickly and without losses, and between the obligations required to be met **.**

Based on Al-Shammari (2012) as far as financial aspects, liquidity implies the liquidity of the components of wealth (possessed by people and establishments) communicated in a specific money related esteem, for example, equipment; land, real estate, machine,... furthermore, the simplicity of exchanging them to different merchandise and ventures to fulfill the need of the individual holding them. It is planned to keep cash without investment to meet dire necessities.

Form a different perspective, (Bank for International Settlement, 2008) highlighted that liquidity is described as the capability of banks to rise account in assets and match its commitments as they become payable, through avoiding incurring of unanticipated losses.

Kleopatra and Nikolaou (2009) define the liquidity as non-obstructed flow of funds between central banks and commercial banks in one side and agents from financial system on the other side. Liquidity is also the magnitude of available capital in banks to meet short-term obligations (Delechat et al., 2012).

The common arguments in bank management literature point out that liquid asset is known to have some characteristics such as low risk such as treasury bonds, short maturity which is less volurnable to interest rate variation risk (Garber and Weisbord ,1992).

From the above descriptions of liquidity, it is observed that a bank must hold sufficient cash to meet the expected and unexpected demands from the customers. Furthermore, Moore (2009) argues that, banks must keep sufficient liquid assets to achieve the cash obligations of the costumers. If banks do not hold liquid asset to gratify the customers' request, they either have to lend at the interbank market rate where in addition to a high cost of

borrowing they leave themselves to a systematic lack of confidence in the market. Lastly, to meet the liquidity obligations financial institutions can utilize considerable number of sources such as consenting new deposits, borrow from central banks or other banks, and/or maturing assets.

Said (2013) explained that liquidity of the bank implies its capacity to meet its budgetary commitments to the depositors at the base dimension and whatever is left of alternate commitments, for example, lenders, borrowers and others, which requires the accessibility of liquid cash at the bank or the likelihood of acquiring them by exchanging a few resources of the bank and changing over them to cash rapidly and without losses.

Al-Husseini and Al-Douri (2000) mentioned liquidity in the banking sector is indicated as the Bank's capacity to attain its financial obligation, that comprise to a great extent of meeting depositors 'demands for withdrawal from deposits, taking care of borrowers' requests to address the issues of clients, the network and the workplace. Liquidity is of extraordinary significance to business banks an extra timeframe from the applicant when he needs to pull back his deposits since this will undermine certainty between the client and the bank.

While non-bank offices can consult with the loan boss while guaranteeing his privileges, there is the likelihood of asking for extra installment period without undermining certainty Impact on the wellbeing of the monetary position of the non-bank office.

Based on Moore and Bassis (2009) there are two fundamental customary strategies for calculating liquidity risk; these are liquidity hole/stream approach and liquidity proportions/stock methodology. The liquidity hole/stream approach is communicated as the distinction among resources and liabilities

This approach centers on looking at the fluctuation in bank's influxes and out flow to decide the measure of stores that are required amid a period. Here

stream approach regards fluid saves as a repository: the bank evaluates its liquidity chance by looking at the inconstancy in inflows and surges to decide the measure of stores that are required amid a period.

The second methodology for measurement liquidity risk is liquidity ratio/stock methodology; which concentrated on the asset and liability values of the balance sheet use ratio to recognize liquidity patterns. These proportions mirror the way that bank ought to make sure that proper, ease financing is accessible in a brief timeframe; this may include holding an arrangement of benefits than can be effectively sold (cash reserve, least required stores or government securities), holding critical volumes of stable liabilities (particularly stores from retail investors) or keeping up credit lines for other financial institutions.

2.1.2 Liquidity Risk

No doubt, converting short-run deposits in to long-run loans reflects the significance of liquidity for banks or any depository financial depositories and this process puts financial institutions in to exposure of liquidity risk.

Liquidity risk comes from the balance sheet of the banks in three main resources; first sources is from liability side, where it surrounded by a huge uncertainty on both magnitude of withdrawals demands and renewal of rolled interbank loans in particular when the banks are under the suspicion of financial distress and liquidity shortage, the second source of liquidity risk comes from asset side of balance sheet, when the magnitude of potential demand for loans in the future is unclear, the third source of liquidity risk is from off-balance sheet of the banks (Rochet, 2008).

Unlike the other potential risks that usually banks are facing, liquidity risk is associated with normal daily operation management of the banks. Banks ought to control this risk as they must reserve adequate liquid assets to stand by the promises and respond quickly to any expected loan obligations (Saunders et al., 2006).

Liquidity is defined in banking framework by the Basel Committee on Banking Supervision (BCBS) as the capacity of a bank provide accessible cash or to promptly discover cash all together attain its commitments whenever they are due for payment, without causing some sudden losses as explained in (BCBS, 2008).

The banks' asset and the interrelated liquidity commitments are essential since they can decide the shortcomings and qualities which are identified with the capacity of the establishment to manage its commitments at an opportune way. In the event that a bank has high liquidity, these moves won't cause any sudden losses however then again, on the off chance that the bank has liquidity issues, the offer of these benefits could prompt indebtedness.

Cash possessions means in cash or on record for any national bank have the capacity to be wellsprings of liquidity as well as the exceptionally reliable securities for instance the government bills and other different securities with transient developments. Additionally, transient securities are moderately more secure as compared to others and exchanged liquid markets that implies that these securities could be disposed everywhere volumes by avoiding misfortunes because of value changes.

Banks are also responsible for ensuring that there is a balance between assets, cash needs or withdrawals from depositors and loan demand in order to solve the problems of liquidity. It is the mandate of every bank to maintain its viability in terms of operation and competitiveness but this can only be achieved by maintaining the liquidity position of the banks to avoid banking insolvency. Many banks will be forced to borrow funds a way of solving liquidity problems and by doing so some extra cost incurred. This exercise of seeking solution to meet cash needs can be done by interbank market and the central banks as well as other sources but at an additional cost the affect the earnings in a negative way (Tursoy. 2018).

Besides, as indicated by Muranaga and Ohsawa (2002), liquidity risk is defined as the risk of being in a state of not able sell a situation at a convenient way and a sensible cost and they separate liquidity risk into implementation (cost of promptness) and opportunity cost which is known as the cost of waiting. From this definition unmistakably liquidity risk can emerge from the administration of the benefit positions and from the general financing system of the bank's exercises. In addition, it incorporates both the failure of subsidizing resources at proper developments and rates and the powerlessness to sell a benefit in a suitable time period and at a value which is close to its reasonable esteem.

Additionally as indicated by Goodhart (2008), the essentials in the banking sector liquidity position are the development change which alludes to the general developments of a bank's asset and liabilities. Furthermore, the natural liquidity of a bank's assets that alludes to the capacity of any resource for be sold with no huge losses and under any market situation. By and by these two elements that are referenced above are entwined.

Hence, measuring liquidity position of banks assists to detect liquidity risk exposure and to apply suitable management strategies to protect banks from liquidity risk and enhance the overall performance. Various mechanisms was developed to present the dimension of liquidity risk such as in terms of graphs and numbers while there are two basic conventional approaches to measure the liquidity risk. The first approaches called liquidity gap/flow where measures the liquidity risk as the dissimilarity among assets and liabilities and estimation of such in the future. In particular, this approach is emphasized on the comparison between the variability of inflows and outflows of the banks during a specific period.

Referring to Maaka (2013) specifically, the absence of assets that happened owing to the non-performing credits influenced the company's ability to attain the expanded commitments to satisfy investors. Accordingly, in spite of the mechanical developments, liquidity chance is as yet present and relies upon

a few elements. Another vital factor with respect to the liquidity position of a bank is its size, specifically, as upheld by the creator, the extent of the bank can influence the mentality towards discount financing.

Consequently, it determines the needed magnitude of reserve to protect banks from liquidity risk for that period (Melese, 2015). The second method for measuring liquidity risk is simply liquidity ratio derived from liability and asset proportions of the balance sheet tend to calculate the ratio to indicate liquidity trends.

However, the mentioned two approaches have their restrictions as it's impossible to precisely predict future in and out flows regarding the first approach. Regarding the second approach, although data is easily can be obtained, the calculated ratios do not overcome all or any liquidity risk most of the time (Vodova, 2013).

These ratios help the banks to ensure that proper low-cost funding is exists or can be afforded within a space of time. This includes allotment to the essence of maintenance of a portfolio assets that could be liquidated simply such as government securities, maintaining considerable quantities of constant liabilities and/or maintaining credit line with other banks or non-bank financial institutions (Moore and Bassis, 2009).

Allen et al. (1989) mentioned the entrance to the business sectors and the cost of the assets which are acquired. Besides, the significance of the company's size is determined by the financial prudence and the level which can be accomplished.

Nonetheless, as per Poorman and Blake (2005) it requires suitable relevant rations for the banks to measure liquidity position. Along these lines, the reason for this investigation is to analyze the impact of various liquidity procedures and furthermore to utilize liquidity ratio and also an administrative forced liquidity buffer.

From the reviewed above it's understood that liquidity risk is banks' very serious phenomenon. In fact, managers of financial institutions ought to be

aware about the liquidity level which enables the managers to predict the prospect distribution of net deposit drains. In this regards, banks can enter the money market to scrounge additional cashes to overcome the liquidity shortage.

Indeed, this process called purchased liquidity management and banks can access to additional funds by borrowing from request loans from central bank, selling government securities such as treasury bills or bonds, issuing fixed maturity deposit certificates, or by repurchase agreements at the cost of current market rate (Vodova, 2012).

Another mechanism to overcome the liquidity shortage is to benefit from the booked liquidity reserve in the central bank or by the regulation authority instead of seeking for debt in the money market. Moreover, in case of liquidity shortage banks can liquidate (sell) some assets to overcome the problem at the market price which may cause significant losses.

Nonetheless, in normal circumstances the reviewed solutions are efficient and can alter each other and/or can be applied together to cope liquidity problem by banks. However, when banks face liquidity crisis caused by unexpected deposit drains or liquidity shocks these methods are no sufficient to cope the problem (Saunders, Cornett and McGraw, 2006).

Aspach, Nier and Tiesset (2005) demonstrate three techniques for the banks to be processed against liquidity crisis. The banks can avoid liquidity shortages or crisis if they hold sufficient amount of liquid assets on their asset portion of the financial record such as such as cash or equivalent of cash such as government bonds and reserve repo trades. Holding cash or equivalent in balance sheet decreases the probability of occurring liquidity risk to the banks.

In fact, due to the asymmetric information and free-rider issues the mentioned two mechanisms may not work faultlessly in all circumstances this is why central banks usually acts as *a Lender of Last Resort* to offer liquidity support in the cases of sudden liquidity crisis in the whole financial system.

2.1.3 Liquidity management theories:

According to Al-Shama (2012) banks go about as mediators between depositors who make up the cash supply side of the managing an account framework and borrowers who shape the interest side of these funds.

This essential role isolated the funds choice from the speculation choice at the smaller scale level. Notwithstanding this financier job, business banks assume a similarly vital job in the first round, the job of exchange of development, whereby transient client stores are changed over into long haul advances, accordingly accommodating savers with the privilege to pull back their deposits when required, To get loans whose reimbursement dates agree with the dates of the profits of the financed task.

These decreasing jobs in their goals must be accomplished by fortifying the conviction of the gatherings of the capacity of the banks to complete adequately, subsequently the job of liquidity and its significance to the saving money framework.

Many studies and researches in the field of finance. They agree on some of the theories of liquidity management, and according to the studies four different approaches are identified: business loan theory, conversion theory, expected income theory, liability management theory. The first three theories have relationships with asset management. The latter theory has a relationship with management obligations. (Roussakis, 1997: 285) as follows:

1- Commercial loan theory:

This theory depends on the way that the liquidity of the business bank is consequently acknowledged through self-liquidation of its transient borrowings or for working capital financing, where borrowers reimburse their acquired assets after effective fruition of their business cycles. As per this theory, banks don't loan for land or shopper merchandise or put resources into specific stocks and bonds, for the length of the normal recuperation time frame in these territories.(Sayegh, Abu Hamad, 2006: 104).

This theory focuses on two processes, The first processes consists of the short term loans that constitute the source of liquidity and the second process includes the business working capital loans of which they are self-payable.. Application and reliance on this theory by the bank has a special importance that requires liquidity risk management by allocating the investment of short-term liabilities to short assets (Matz, 2011: 302).

2- Conversion theory:

It is proposed by the theory that Commercial bank is working to strengthen the initial reserve with the assets that are estimated to be transformed into cash in the necessary condition. These assets are categorized by their high trade ability, and can easily be converted to liquid cash in a short period based on Al-Husseini and Al-Douri, (2000).

This theory indicates that the banks can be in a proper liquidity situation if its asset can be conveyed to other banks before maturity. The drive of this process is not just to change but to utilize it, if can convert the resources to the central bank, such as, as the lender and the last resort (Gomez,2008, 195).

3. Expected income theory:

This theory depends on the way that the administration of a bank can depend on the borrower's normal pay in its liquidity arranging and hence thinks of it as the normal section of future borrowers. This enables the bank to concede medium and long haul improvements and in addition transient credits as long as the recompense of these loans originates from the normal standard livelihoods of borrowers in customary occasional portions, which makes the bank profoundly fluid, because of the relative consistency and uniformity of money streams. (Sayegh, Abu Hamad, 2006: 104)

In this manner, the Bank can design liquidity on the off chance that it depends on the advance installments booked by the client dependent on the eventual fate of the borrower, as the Bank be influenced by the potential benefits and reliability of the borrower as a most extreme assurance of adequate liquidity (Ibe, 2013: 40)

4. Liability Management Theory:

The liabilities aspect is the focus of this theory and indicates that business banks have the capability to collect liquidity from the liabilities side, such as asset side, by introducing new types of deposits, Including: credentials of payment that can be traded, which are non-personal certificates that can be disposed of by the holder of the sale and purchase. Accordingly, numerous banks have now centered on the territories of cash the board, back, or financing hazard in their different names, mirroring their insight to depend on acquired cash, since the qualities of the office is to decrease the danger of liquidity by concentrating on wellsprings of fund that is generally unstable. One of the improvements in the administration of assets is to give both the substantial abatement in the liquidity chance and the advantage of understanding this hazard, which centers around the arrangement of the term indicated in the liabilities (Matz, 2011: 317).

2.1.4 Theoretical Review of Bank Liquidity

In line with the context of this thesis, in the following sections we discuss how the independent variables related to the banking sector liquidity theoretically.

2.1.4.1 Bank Precise Factors

Profitability is the capability of banks to create revenues which exceeds the overall costs regarding the invested capital. Profitability soundness resists negative shocks and enhances the financial system stability (Athanasoglou, Brissimis and Delis, 2005). However, contradict reports on the relationship of profitability to banks' liquidity are observed in literature. Bourke (1989) states

that banks with high level of liquid assets are superior to the other operators in the market due to the financial market perceptions which allow them accessing to fund with lower costs and consequently they can increase profits. Meanwhile, others such as Goddard, Molyneux and Wilson (2004) argue that allotment of extra liquid assets enforces opportunity cost given the low return on liquid assets compared to other assets at which implies converse connection between banks' liquidity and profitability.

The tradeoff between liquidity and profitability implies that convey short-run securities to long-run or in other words loans increases profits but simultaneously increases liquidity risk as well, the converse is true. Thus, high level of liquidity ratio implies lower risk and lower profit for a bank (Hempel, Simonson and Coleman, 1994). Therefore, managers are facing a dilemma of profitability and liquidity. However, we can understand from the reviewed above that profitability inversely affects banks' liquidity.

Bank capitalization which is so called capital adequacy in this study measured by the ratio of shareholders equity to total assets. Actually, the ratio indicates for the likelihood of insolvency. Banks with smaller ratio are more exposed to banks' risks such as market risk, operation risk, liquidity risk, etc. however, banks with high level of capital adequacy can hedge bank risks efficiently. Basel I and Basel II accords specify the minimum capital adequacy for the banks to be 8% or more and obliges banks to manage their liquidity effectively (Greenspan, 1998). Banks capitals have a crucial role in preserving banks' safety and solidarity as well as banking system security. It acts as a buffer gate that prohibits any unanticipated losses to the banks, this may harm depositors fund given that banks operate in significant unstable environment at which put the banks to various risk exposures including liquidity risk (Moh'd and Fakhris 2013).

Common measurement of bank's size is the total assets of a bank. Banks with higher level of size are more likely to be under (too big to fail) principle,

that's they would benefit from their big size as it decrease the financing cost and tend to invest in risky assets (Giannotta et al. 2007). If banks feel themselves as large size, this stimulates them to not care about holding adequate liquid assets since they consider to be supported by central banks in case of liquidity shortage which implies that size is inversely affecting liquidity. Large banks tend to proceed high liquidity creation level to insure their operations, which in turn can face some losses while they sell some assets to satisfy the liquidity demands from their depositors while in case of small banks, where their operations limited to conventional intermediation and transformation events they hold small volumes of liquid assets. This indicates a positive affiliation between bank size and liquidity. (Berger and Bouwman, 2008).

Non-performing loans (NPL) refers to loans where the debtor fails to repay upon scheduled payment neither interest nor principal at least for 90 days. Another form of non-performing loan is when the maturity is over but the debt hasn't fully paid. Non-performing loans considered as default or very closed to default. In the case of non-performing loans, even though, the debtor makes his payments the odds are considered to be substantially lower. Radivojevic and Jovovic (2017) demonstrate that as the result of high competition among the banks credit risk increased by which impact banks' loan portfolios in the form of bad loan screening procedures and relaxing borrowing criteria.

These effects spread to wider scope as financial firmness of the banking system and economic stability. Indeed, the volume of non-performing loans measures the liquidity position of bank assets (Chakraborty, 2008). In addition to liquidity and profitability of the banks, Dinger (2009) argues that NPL as well as influence the psychology of banker in regard of their demeanor of assets towards credit conveyance and credit development. NPL

produce an awful impact on saving money survival and development, and if not oversaw appropriately prompts managing an account disappointments.

2.1.4.2 Macro Factors

The scope of the present study is extended beyond bank specifics as the contributing factor of banks' liquidity in US and scrutinizes the possible stimuli of economy on the choice of liquidity of the banks namely gross domestic product (GDP).

GDP measures the overall economic activities in a country. Booming period of economic creates high confidence in business cycle and all economic units regarding the returns in private sector. Economic expansion increases the investment level with the expectations of abnormal returns which in turn lowers the level of liquidity as the investors and business organizations are likely holding few liquid assets and bear less short-term liability associated with many costs and prefer to invest in risky assets to generate higher returns (Painceira, 2010).

Moreover, liquidity crisis and banking system instability are considered to be associated with variation of economic growth (Gaytan and Ranciere, 2001). Economic growth results in increasing in supply for loans. This results in an increase in the liquidity ratio. On the other hand, banks save liquid capital assets during the period of economic downturn or recessions and hoard lower liquidity buffers when the during the economic expansion period. Thus, banks reduce the liquidity buffers and lend more debt during the economic growth era which implies a destructive relationship association amongst the economic growth and liquidity (Aspachs et al. 2005).

2.2 US Banking Sector and the 2008 Financial Crisis

The 2008 global financial crisis is considered as one of the most severe financial and economic crisis in the history not only for US, for the entire world. Although the crisis began from housing market bubble in US, the influences of the crisis extended to other developed countries, indeed to the entire world. Franzese (2013) extensively reviewed the causes of the crisis and according to the study four major factors that cause the crisis and they are:

1. *The derivative market*: sub-prime mortgage backed securities were traded on over the counter (OTC) market as derivative instruments. The market is unregulated between the parties. The securities were traded between parties as swap transaction for the purpose of speculation without considering default.

2. *Credit rating agencies:* these agencies were not performing their jobs properly because of lack of competition where there were only a few agencies operating in the market and their ranking was biased.

3. *The Federal Reserve and interest rates:* US government intervention that that promoted the dream of owning a home for all Americans. Through Federal Reserve, various monetary policies such as changing the magnitude money supply and lowering the interest rate has been applied to support the housing project. Through which the US government facilitated for the households to buy a house but they failed to repay the debt.

4. *Lending and borrowing practices:* this considered the most influential factor for the crisis. The lending process had become blemished in the prior years to the crisis, and bad practice on the both sides of borrowers and lenders caused the numbers of failed mortgages that overly strained the markets. The leverage reached to 100% without intentions to make long-term debt payments.

In the periods of financial crisis, banks and all kind of financial institutions face difficulties to manage their capital assets, associated risk of lending, profitability, and liquidity (Živko and Kandžija, 2013). Singh and Sharma (2016) argue that many researchers point out negative impacts of financial crisis on the banks' liquidity. The authors further discuss that the financial crisis caused poor bank liquidity in two ways, *first:* the crisis increases the volatility of economic indicators which in turn creates unfavorable business environment for the banks, *second:* the crisis effects can extend to individuals such as losing their jobs and thus, the will not be able to repay their loans, this ultimately decline banks' liquidity. Moreover, the financial crises are known with severe impacts on banks' liquidity. Banks that hold excess liquid capital assets during non-crisis period are likely to be insolvent during the crisis period (Fadare, 2011).

As an immediate answer to the 2008 financial crisis, Basel Committee on Banking Management emphasized some principles in the form of full guidance to support the quality of bank risk management and direction. The committee constituted a supervisory staff to ensure completely applications of the new fundamentals by banks. According the former ratio banks is committed to hold sufficient liquid asset to encounter short-term obligations precisely 30 days period. However, the later ratio ensures banks to meet the liability obligations over 1 year period (BCBS, 2011).

Basel Committee, in 1988 established new amendments of mitigating and eliminating insolvency situation by implementing Basel applications which is centered on the risk management procedures for the management of bank operations. One of the suggestions was to propose a ration for minimum capital requirements which banks must need for operation.

The ratio is better known as the Crooke Ratio which addresses the issue of the minimum capital to be safety net for the indeterminate losses from the

asset activities. The Basel Committee highlighted the detail of BASEL 1, BASEL II and BASEL III in order to provide solutions to the liquidity issue which are very critical in the banking crises in the world.

In the Herstatt case, banks could not enable access the required liquid funding to meet the needs of the daily business activities. Even though the Central bank can be involved in the liquidity crisis as a way of meeting the cost and the needs of the business at large, sometimes it is very expensive and costly for the banks to seek assistance from the lender of last resort.

It is also not a wise idea for the banks to use the interbank market which is the market between banks. Banks which are experiencing insolvency situation have limited chances of getting loans and borrowings. A bank can dispose its assert on a fire sale in order to meet its obligations but sometimes loss in return might be experienced as well. It is the responsibility of the Central bank or authorities to verify, monitoring and assessing the liquidity position of some banks and take appropriate measures to meet their needs. The Central bank and interbank markets have the capacity to offer loans and borrowings to the banks but that exercise attracts a high interest rate.
 Most of the operation systems were mentioned in the Basel application to eliminate and solve the liquidity problems as well as bankruptcy in order to create a healthy economic situation and workable systems.

2.3 Empirical Evidences

Although because of the significance of liquidity issue to the banks, banks are seriously concerning to preserve optimal liquidity buffers in their balance sheet, the topic didn't get considerable attention by the academic scholars. Nonetheless, there are some empirical studies attempted to examine the impact of bank internal factors and external factors on the level of bank liquidity rather than theory and regulations. Hereby, we review as much as

possible empirical studies that related to the framework of this thesis and also available in relevant literature.

In Table 1, the summary of the reviewed empirical studies have been presented which is followed by their detail.

Aspachs et al., (2005) mentioned that the unconsolidated balance sheet of 57 UK banks (domestic and foreign banks) to scrutinize the determinants of banks' liquidity policy. The study aims to probe influences of both bank specific and macro variables on liquidity buffers of the banks by using fixed effects using the GMM procedure. Specifically the study used unbalanced panel data to investigate whether central bank LOLR policy may affect bank's liquidity buffers or not. The study explore a significance reliance of banks on LOLR policy that's in the case of liquidity crises when potential support from central bank raises banks hold less liquidity buffer. The study further provides evidence that countercyclical liquidity buffers are the outcome of financial restraints on banks' lending policy. Lastly, the study reveals that foreign banks and domestic banks in UK are subject to different financial constraints while managing liquidity.

Lucchetta (2007) conducted a study using 5066 European banks covering the period of 1998-2004. As the analysis approach the study adopted generalized least square (GLS) with firm random effect. The study shows that through European countries the interbank interest rate positively influences the kept liquidity by banks and the choice of a bank to be the owner in the interbank market. Moreover, the main factor that impacts the choice to borrow in the interbank market is the liquidity price variable. The study further figures out that there is an adverse correlation between risk-free Treasury bill rate and the choice of a bank to hold liquidity.

By a sample composed of a panel data of 1107 commercial banks in 36 evolving markets, Bunda and Desquilbet (2008) explore negative and

statistically significant influence of the 2000 financial issues on banks' liquidity ratios, while the liquidity ratios are positively capitalization ratio at which measured by (total equity to total asset). Another study within almost the same framework but in the different side of the world is conducted by Moore (2009). The study utilized an example of commercial banks from Latin America and the Caribbean.

Rauch et al., (2009) employed a comprehensive study on liquidity creation in state owned saving banks in Germany. Using the population of 457 banks owned by state of the Germany the study attempted to measure liquidity creation as well as to examine impact of monetary policy on liquidity construction. The study adopted dynamic panel regression model for the analysis and covered the period of 1997-2006. The study conclude several interesting results: tightening monetary policy expected to lower banks' liquidity buffer, banks' liquidity is positively related to savings quota, liquidity is positively related to its one period lag, raising unemployment rate is negatively concomitant with banks' liquidity, both size and profitability of the banks were found to be inversely affecting banks' liquidity.

Furthermore, another study by Delechat et al., (2012) attempts to examine the factors of bank's liquidity in Central America using an example of an approximately 100 commercial banks. The estimation method for this study was Correlation and generalized methods of moments (GMM) methodology. The study was able to show a correlation between the demand for precautionary liquidity buffers and (bank size, capitalization, profitability, and financial development).

Vodova (2011a), Vodova (2011b) and Vodova (2013) conducted three studies on the elements of bank's liquidity in Czech Republic, Slovakia, and Hungary respectively. Vodova (2011a) scrutinized the liquidity of commercial banks in Czech Republic as the function of 5 bank specific variables and 7

macro variables using panel regression approach. The result of the empirical study reveals some findings specifically, positive impact of capital capability, interest rate on loan, interest rate on interbank transaction, and non-performing loans on bank liquidity, while economic growth and financial crisis conversely affect the banks' liquidity. The relation between banks' size and banks' liquidity was unclear and other variables' effect were established to be statistically inconsequential.

Vodova (2011b) examined the explanatory factors of liquidity in Slovakia. The study's context covers commercial banks in Slovakia over time horizon of 2001-2010. For the purpose of analysis, panel regression analysis was adopted. The study point out that financial issues drops the liquidity buffer of the banks. Increase in profitability, size, and capital adequacy of the banks lowers banks' liquidity. However, as GDP and unemployment rate increases the liquid assets of the banks increases.

Moreover, Vodova (2013) examined the macro and bank factor determinants of commercial banks' liquidity in Hungary. In summary, findings indicate that capital adequacy ratio, profitability, and interest rate on loans are positively and size, monetary policy interest rate, interest margin, and interbank interest rate are negatively influencing the liquidity of the banks. However, the relationship between the economic growth and liquidity is ambiguous.

Mehmed (2014) employed a research on liquidity risk and its determinants. The research covers 17 commercial banks during the interval of 2002 to 2012 in Bosnia and Herzegovina. The empirical findings showed that among all the explanatory variables only the effects of reserve ratio and the ratio of loan to deposit are statistically significant. Interestingly the study reports that the impact of GDP growth is not statistically significant.

Among very recent studies concerning the factors that affecting the liquidity buffer of banks is conducted by Moussa (2015), where examined bank liquidity as the purpose of bank factors and economic issues in Tunisia. The study comprises an example of 18 Tunisian banks between the periods of 2000 to 2010. The findings suggest that financial performance, capitalization, ratio of operating cost to total asset, economic growth, CPI, and delayed liquidity are significantly associated with liquidity.

Waemustafa and Sukri (2016) argue that the volatility of liquidity risk is a signal for financial crisis. The study tended to examine the effect of external and internal influences liquidity risk of Islamic and conventional banks in Malaysia. Findings show that conventional banks maintain lower liquidity comparing to Islamic banks.

Lastly, Berger and Sedunov (2017) explored that liquidity creation is statistically and economically significantly related to GDP in US. The study further reveals that off-balance sheet liquidity creation matters more for big banks and on-balance sheet liquidity creation matters more for small bank and small banks liquidity creation generates more economic output per dollar than large banks.

Regarding the liquidity of US banks and its influences, studies have examined the impact of liquidity on US banks' profitability by Bordeleau and Graham (2010), the profitability and enactment measurement of US regional banks by Growe et al., (2014), Liquidity risk and US bank lending by Correa et al., (2014),

The researchers Bordeleau and Graham (2010) provided experimental confirmation about the connection between holding liquid asset and profitability position for a big sample of Canadian and US banks covering the period from 1997 to 2009. The adopted estimation method was GMM.. The authors argue that the finding is in line with the opinion that free market and

funding markets rewarding a bank, for holding liquidity, that way reducing its liquidity risk.

Correa et al., (2014) study the association between liquidity risk and bank lending across foreign affiliates banks and non-foreign affiliates banks in US. The study uses panel OLS regression for the purpose of estimation. The results suggest large U.S. banks without remote partners have loan development rates that vary cross-sectionally for the most part in accordance with their dependence on deposits in bank subsidizing. big U.S. worldwide banks have loan development rates that vary predominantly in connection to their utilization of liquidity management inside the boarder organization. Those banks that will in general obtain more from affiliation additionally have more steady household lending and credit development as liquidity hazard conditions decline.

Table 1 Summary of Empirical Literature Review

Studies	Country	Analysis Method	Major Findings
Aspachs et al., (2005)	UK banks	fixed effects using the GMM procedure	In the case of liquidity crises when potential support from central bank raises banks hold less liquidity buffer.
Lucchetta (2007)	5066 European banks	Generalized least square (GLS) with firm random effect	Negative relationship among risk-free Treasury bill rate and the decision of a bank to hold liquidity.
Bunda and Desquilbet (2008)	36 emerging markets	Panel Data	explore negative and statistically significant effect of the 2000 financial crisis on banks' liquidity ratios
Moore (2009)	Latin America and the Caribbean	OLS panel methodology	Liquidity is conversely related to business cycle, volatility of the cash/deposit ratio, and interest rate.

Rauch et al., (2009)	Banks in Germany	Dynamic panel regression model	Tightening monetary policy expected to lower banks' liquidity buffer, banks' liquidity is positively related to savings quota, liquidity is positively related to its one period lag, raising unemployment rate is negatively related with banks' liquidity, both size and profitability of the banks were found to be inversely affecting banks' liquidity.
Delechat et al., (2012)	Central America	Correlation and generalized methods of moments (GMM)methodology	There is a correlation between the demand for precautionary liquidity buffers and (bank size, capitalization, profitability, and financial development).
Vodova (2011a)	Czech Republic	panel regression approach	The study reveals positive impact of capital capability, interest rate on loan, interest rate on interbank transaction, and non-performing loans on bank liquidity, while economic growth,

			and financial crisis conversely affect the banks' liquidity.
Vodova (2011b)	Slovakia	panel regression analysis	The study points out that financial crisis drops the liquidity buffer of the banks. Inverse relationship between profitability, size, and capital adequacy and liquidity buffers.
Vodova (2013)	Hungary	OLS panel regression	Capital adequacy ratio, profitability, and interest rate on loans are positively and size, monetary policy interest rate, interest margin, and interbank interest rate are negatively influencing the liquidity of the banks.
Mehmed (2014)	Bosnia and Herzegovina	multiple regression analysis	Only the effects of reserve ratio and the ratio of loan to deposit are statistically significant.
Moussa (2015)	Tunisia	panel static and panel dynamic	Financial performance, capitalization, ratio of operating cost to total asset, economic growth,

			CPI, and delayed liquidity are significantly associated with liquidity.
Waemustafa and Sukri (2016)	Malaysia	multivariate regression analysis	The study provides some evidences that a few macro variables are affecting the liquidity risk.
Berger and Sedunov (2017)	United States	Instrumental variable approach	Liquidity creation is statistically and economically significantly related to GDP in US.
Bordeleau and Graham (2010)	United States	GMM	Their study figured out a nonlinear relationship between liquidity and profitability.
Correa et al., (2014)	United States	Panel OLS regression	The relationship between liquidity risk and bank lending mainly vary across foreign affiliate's banks and non-foreign affiliates banks in US.

CHPTER 3
DATA AND METHODOLOGY

Introduction

In the former chapter, we reviewed the theories and literature of liquidity risk as well as its determinants. Specifically, we focused to demonstrate the explained and explanatory variables. In this chapter, we emphasize the econometric model to examine the impact of independent variables on the liquidity ratios where the used data and adopted methodology will be illustrated.

3.1 Research Design

One of the major and significant initial steps of any research study is research design (Annavaram, Patel and Davidson, 2001). Research design allows researcher to enclose that the data is meaningful and lead to the credible results. The present study is designed to examine potential determinants of liquidity using the sample of largest banks in the US.
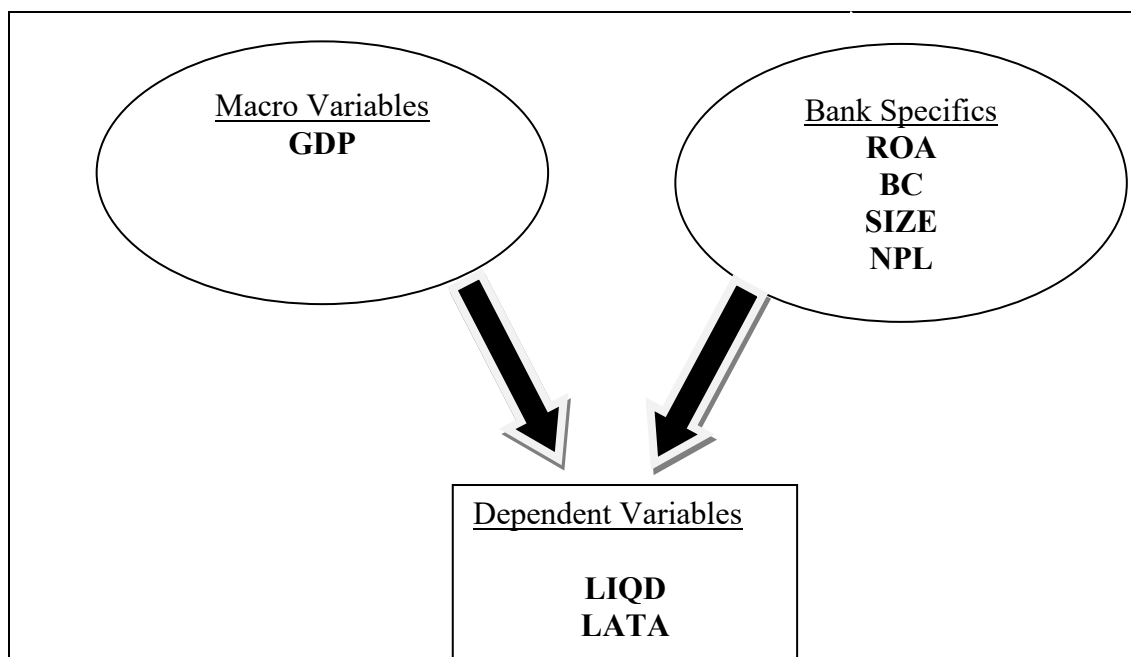
Figure 3Conceptual Model

3.2 Sample

The present study uses secondary data collected from Thomson Reuters' data stream which is very reliable source. However, the different ratios have been calculated manually using the obtained items of the banks' balance sheet and income statement. The sample consists of 12 largest banks in US and the time span covers 1999 to 2017. Thus, in this study we use panel data methodology with 228 observations. Panel data has some merits over time series data such as it allows the researchers to examine both time series and cross section data simultaneously. Further merit is to examine both time and individual dimensions and to examine dynamic properties of the data (Baltagi, 2005).

According to Federal Reserve Economic Research (FRED, 2018) total asset of all commercial banks in USA in 2017 were around 16.25 US Trillions of US dollars. As it can be seen in table 2, the total assets of sample banks in this study comprise 63.4% of overall assets of commercial banks. Thus, we

variables for this study are derived from literature, particularly from Barth et al. (2003); Vodova, (2011); Vodova (2013); Mehmed (2014) Cucinelli (2013).

Table 3 Variables of the study

Dependent Variables;	
LIQD	Liquidity Proxy
LATA	The ratio of Liquid Asset/ Total Asset

Independent Variables		Expected Sign
ROA	Bank Profitability	(-)
BC	Bank Capitalization	(+)
SIZE	Size of Bank	(+)
NPL	Non-performing Loans	(+)
GDP	Economic Growth	(+)
DM	Financial Crisis Dummy	(-)

3.3.1 Dependent Variables

We develop two different ratios as the representation of liquidity position of the banks as following:

1. LIQD= the ratio of Liquid Assets to Customer Deposits and Short-Term Funding
2. LATA= the ratio of Total Liquid Assets to Total Assets

Where, LIQD represents the liquidity position of a banks and their capability to meet their deposit commitments. Specifically, LIQD ratio measures the sensitivity of the banks to multiple kinds of assets. If the ratio is equal or greater than one, it means that the bank has adequate fund to serve its debt obligations. Else, deposit withdrawal demands would have higher influence

on the banks. LATA is another representative of banks' liquidity at which measures the ability of bank to overcome any liquidity shocks that's the higher the ratio the more efficient banks will be in this matter.

3.3.2 Independent Variables

The used independent variables are derived from literature as their relation to liquidity has been confirmed. In addition to the impact four bank specific factors two economic factors are also examined. The independent variables and their calculation are listed below accompanied by a brief description of the variables and their expected effects:

1. ROA= the ratio of Net Income to Total Assets
2. BC= the ratio of Total Shareholders' Equity to Total Assets
3. SIZE= Natural Logarithm of Total Assets
4. NPL= the ratio of Non-Performing Loans to Total Gross Loans
5. GDP= Natural Logarithm of Gross Domestic Products
6. DM= is a dummy variable which takes the value of 1 in 2008 year or otherwise

Where, ROA reflect the banks' profitability. Holding higher level of liquid assets may induce low returns for the banks because of imposing opportunity cost of capital. This implies converse relationship between liquidity and ROA. BC is the abbreviation of Bank Capitalization also called the capital adequacy which has been the important theme always under the surveillance of Basel accords. The relationship between liquidity and BC has been increasingly investigated after the 2008 financial crisis. However, the association between them still unclear as already discussed in the previous chapter. SIZE is the common measurement of the size of any financial and non-financial business organization and frequently examined as one of the determinants of banks' liquidity. Regarding the possible influence of SIZE as demonstrated in the literature review, can be positive or negative. NPL is the measurement of bad

loans associated with the fear to be default. The liquidity is anticipated to be negatively related to NPL. GDP is the major measurement of overall economic performance of a country. Considering mix reports about the influence of GDP by some scholars, its impact can be either positive or negative. Lastly, DM is the dummy for 2008 financial crisis which primarily generated from liquidity shortage. Thus, it's expected to inversely affect bank's liquidity.

3.4 Model Specification

Econometric model emphasized to examine the determinants of banks' liquidity. To do this OLS panel regression technique has been used and two models have been created. The developed econometric model of this thesis is formed as following the below equations:

$$LIQD_{it} = \beta 0 + \beta 1\ ROA_{it} + \beta 2\ BC_{it} + \beta 3\ lnSIZE_{it} + \beta 4\ NPL_{it} + \beta 5\ lnGDP_{it} + \delta\ DM + u_{it} \tag{1}$$

$$LATA_{it} = \beta 0 + \beta 1\ ROA_{it} + \beta 2\ BC_{it} + \beta 3\ lnSIZE_{it} + \beta 4\ NPL_{it} + \beta 5\ lnGDP_{it} + \delta\ DM + u_{it} \tag{2}$$

Where, LIQD and LATA are the dependent variables representing liquidity of bank i at time t. $\beta 0$ is intercept. $\beta 1$, $\beta 2$, $\beta 3$, $\beta 4$, $\beta 5$, and $\beta 6$ are the coefficients of the independent variables. δ is the coefficient of the 2008 financial crisis dummy variables and u_{it} is the disturbance error term.

3.5 Statistics and Econometric Mechanisms

In the present thesis, we attempted to perform the most common and appropriate statistics and econometrics tests to reach the objectives of the study. The tests are ordered as follow:

- Descriptive Statistics: Descriptive Statistics is known as a portion of mathematics concerning data gathering, analyzing, clarification, and demonstration of data.
  Statistical ways can be used to review or define a collection of data, this is named descriptive statistics. The test provides various measurements of the study's variables including normality which tested by Jarque-Bera criteria, minimum, maximum, skewness, and kurtosis.

- Unit Root Test: is conducted to check whether the variables are stationary or not. In other words, whether the series' mean, variance and covariance are steady over time. The Unit root properties or stationarity of a series extremely affects its behavior, for example if a series have unit root its shock persistency will be infinite. Further drawbacks of non-stationarity can be observed in spurious regression issue where if two variables are not relevant but trending over time when we regress one of them on the other one we can obtain high R-squared. With the presence of unit root problem in the series of a regression model, the traditional t-statistics and F-statistics will not follow t-distribution and F-distribution and consequently the hypothesis testing is will be misleading.
  In this thesis unit root test is based on Augmented Dikey-Fuller, Philip-Peron and Levin, Lin &Chu criteria.

- Correlation Analysis: Pearson's correlation test will be applied. There are two objectives to perform this test. First, we can examine the degree of association between the independent variables and the liquidity ratios. Second, we can investigate the multicollinearity problem as it can be

identified by checking the correlation between the independent variables. Another merit of correlation analysis is enabling us to detect multicollinearity issue. Following the assumptions of the classical linear regression model (CLRM), there ought to be no high connection among the independent variables in the model. Generally illustrated, multicollinearity issue is where there is an exact or around precise direct connection between independent variables. The results of multicollinearity are as per the following: If there is ideal collinearity among the informative factors, their relapse coefficients are uncertain and their standard mistakes are not characterized. In the event that collinearity is high yet not impeccable, estimation of regression coefficients is conceivable but rather their standard mistakes will in general be extensive. Therefore, the population estimations of the coefficients can't be assessed clearly.

Concerning the remedies to overcome the multicollinearity problem, many methods can be followed to overcome or at least reduce the issue's influences such as:

1. By using preliminary information
2. By using panel data [combination of time series and cross section data]
3. Removing one of the highly correlated variables
4. Including more relevant variables into the model
5. Converting data e.g. to logarithmic form

One or more of above rules can work based on the nature on data how much is sensitive to multicollinearity issue.

- Fixed-Random Effect Test: In statistics, a random effects model, also called a variance components model, is a kind of hierarchical linear model. It assumes that the data being analyzed are drawn from a hierarchy of different populations whose differences relate to that

hierarchy. In panel data analysis the term fixed effects estimator (also known as the within estimator) is used to refer to an estimator for the coefficients in the regression model including those fixed effects (one time-invariant intercept for each subject). The Hausman test allow as finding out whether fixed or random effect is the most appropriate or fit to our series before we apply the main estimation through OLS panel regression. In particular, in this thesis we follow Hausman test to examine fixed-random cross section effect. The Hausman test can refer to model specification test too. The hypothesis testing for Hausman test follows:

H_0: *random effect model is preferred*

H_1: *fixed effect model is preferred*

Particularly, the objective of this test is to look for the presence of any correlation between the explanatory variables and standard errors in the panel model. That's the null hypothesis refers to no correlation between the two.

- Autocorrelation or Serial Correlation Test: the test is one of the fundamental assumptions of CLRM that should be investigated in order to make reliable inference. The problem arises when the disturbances that enter into population regression function are not random or correlated and then on of the CLRM assumptions will be violated. Serial correlation can issue can arise because of several factors such as such as inertia or sluggishness of economic time series, omitting variable bias where an relevant and important variable has been excluded in the model, model specification bias where the model has been built without a theoretical support, the cobweb phenomenon, data massaging, and data transformation.

Consequently, presence of serial correlation in the OLS regression model will cause the model to be no longer efficient. Implying that the hypothesis testing cannot be correctly underperformed since the traditional t, F and X^2 tests are no longer following their distributions. However, the model remains unbiased and consistent. Thus, this situation calls for remedy. The remedies depend on dependency of the error terms on each other. Finally, in the present thesis examining the autocorrelation test will be relied on Durbin-Watson approach from regression model.

CHAPTER 4
EMPIRICAL FINDINGS

4.1 Descriptive Statistics

In this section descriptive statistics of explained and explanatory variables are presented which enables to have an overview of the variables being studied. It can be seen from Table 4 that the descriptive statistics precisely encompasses mean, median, max., min., standard deviation, skewness, kurtosis, and normality of the variables as well as number of observations. Each variable consists of 228 observations. The dependent variables of this study are liquidity and liquid asset to total asset ratio which are the measurements of liquidity position of the banks. The mean of LIQD and LATA are 0.169 and 0.112 respectively and their corresponding standard deviations are 0.154 and 0.098.

These values indicate for the efficiency of US sample banks which hold sufficient liquid buffer to match unexpected and expected financial obligations without extreme costs with very small fluctuations over time and across the sample banks.

Regarding the independent variables, on average the sample banks have 1% return on asset and associated with small risk as standard deviation of 0.005. Capital adequacy which abbreviated by BC (Bank Capital) is 10% on average implying that the sample US banks are holding assets comprising of 10% of shareholders' equity and 90% of debt. In our sample BC exceeds the

minimum amount of 8% which determined by Basel I and argued that banks with minimum amount of 8% capital can avoid various bank risks such as operational risk, capital risk and market risk. Non-performing loans 1.7% on average indicates that the US banks are secured from credit risk. Moreover, among all the variables only BC is normality distributed as according to Jarque-Bera technique the null hypothesis of normality cannot be rejected because the prob. value is 0.364.

Table 4 Descriptive Statistics

	LIQD	LATA	ROA	BC	lnSIZE	NPL	lnGDP
Mean	0.169	0.117	0.010	0.100	8.395	0.017	13.14
Median	0.112	0.086	0.010	0.100	8.240	0.012	13.16
Maximum	0.643	0.456	0.029	0.148	9.410	0.064	13.29
Minimum	0.011	0.008	-0.017	0.051	7.350	0.000	12.98
Std. Dev.	0.154	0.098	0.005	0.018	0.566	0.014	0.090
Skewness	1.299	1.219	-1.342	-0.102	0.470	1.337	-0.226
Kurtosis	3.825	3.840	7.928	2.585	1.857	4.057	1.966
Jarque-Bera	70.37	62.98	297.9	2.020	20.73	78.23	12.04
Probability	0.000	0.000	0.000	0.364	0.000	0.000	0.002
Observations	228	228	228	228	228	228	228

4.2 Unit Root Test

The unit root test aims to address stationarity of the variables. Stationarity is one of the preliminary tests that ought to be investigated before developing any econometric models. Variables are stationary if their mean, variance and auto-covariance are constant over time. If a series is not stationary in the regression analysis the hypothesis tests cannot be undertaken correctly where the assumption of asymptotically distribution is not valid and t-statistic is not following t-distribution and consequently the hypothesis tests are incorrect. Unit root causes spurious problem where in the regression analysis although two variables are totally unrelated if we regress one on other we gain high R-squared and the outcome will be misleading (Gujarati, 2009).

Table 5 Stationarity test at level

Variables		ADF	PP
LIQD	τ_T	46.1632*	38.9733**
LATA	τ_T	40.0834**	52.8713*
ROA	τ_T	39.9961**	50.1488*
BC	τ_T	33.4679***	28.9694
lnSIZE	τ_T	21.6949	48.9290*
NPL	τ_T	45.2634*	12.2110
lnGDP	τ_T	33.6637***	68.812*

Note: *Null Hypothesis: Data is not stationary. Asterisks (*), (**) & (***) denotes 1%, 5% & 10% significant level respectively. τ_T represents the most common model with intercept and trend.*

To perform the stationarity test this thesis uses Augmented Dickey Fuller (ADF), and Philips and Peron (PP) criteria. The mentioned criteria perform the unit root test using the flowing hypothesis:

H_0: Panel data has a unit root or is not stationary

H_1: Panel data has not unit root or is stationary

The lag length selections were automatic and based on Akaike information criterion. Obviously, it's concluded that based on different approaches the entire dependent and independent variables are stationary.

4.3 Correlation Analysis

It is already mentioned in the previous chapter, the correlation test is applied for two reasons; *first* to detect the strength of correlation associations between the explained and explanatory variables, and *second* reason is to examine the multicollinearity problem of this thesis econometric model. The result of the correlation analysis is presented in Table 7. Not surprisingly, the correlation between LIQD and LATA is 99.2% as both of the variables representing liquidity position of the banks. Nonetheless, this high correlation is not creating any specific issue to the models of thesis since they will not be at the same regression.

Profitability is negatively correlated to banks' liquidity by 21.5% or 19.9%, this implies that an increase in the profit lowers the liquid buffer of the banks. There is fairly high negative correlation between bank capitalization and liquidity proxies which is about 45%, this indicates that the higher the shareholders' equity the lower the liquid asset banks would keep. Total asset of the banks is positively and highly correlated to the liquidity by 56.6% and 53.2% respectively which is reasonable result as total asset increases banks tend to hold higher liquidity to match financial obligations. Moreover, very small and negative correlation association between non-performing loans and liquidity is observed. This can be because NPLs constitutes very small

proportion of overall loans made by the sample banks as reported in descriptive statistics section. Economic growth is negatively associated with banks' liquidity and change in consumer price index is positively correlated with liquidity.

One of the essential assumptions of classical regression model CLRM is the absence of multicollinearity problem in the regression model. Multicollinearity refers to the high (not perfect) correlation between the explanatory variables in a regression model. If a regressor is an exact linear combination of another regressor, then it said the model sufferers from perfect multicollinearity (Wooldridge, 2006). Churchill and Iacobucci (2005) argue that in the case of the presence of multicollinearity the volume of information about the impact of regressors on the regresand decreases. Regarding the volume of correlation that causes multicollinearity issue still not clear. Some author considers the correlation below 90% does not cause serious multicollinearity issue (Hair et al., 2006). While Malhotra (2007) argue that multicollinearity issue exists when the correlation among independent variables is greater than 75%. Therefore, we confirm that the models of the present thesis are not suffering from multicollinearity problem.

Table 6 Correlation Matrix between the Variables

	LIQD	LATA	ROA	BC	LNSIZE	NPL	LNGDP
LIQD	1						
LATA	0.992	1					
ROA	-0.215	-0.199	1				
BC	-0.457	-0.448	-0.046	1			
LNSIZE	0.566	0.532	-0.242	-0.198	1		
NPL	-0.014	-0.035	-0.418	0.323	0.423	1	
LNGDP	-0.158	-0.172	-0.263	0.618	0.285	0.388	1

4.4 Autocorrelation test

Another fundamental assumption of CLRM states that the covariance among error terms over time or cross-sectionals for panel data assumed to be zero. In other words, there should be not positive or negative correlations between disturbance terms (Brooks, 2008). Despite the fact that within the sight of autocorrelation the OLS estimators stay impartial, reliable, and asymptotically regularly circulated, they are not any more effective. As a result, the standard t, F, and $\chi 2$ tests can't be really connected. Consequently, medicinal outcomes might be called for.

In this thesis the test for autocorrelation relies on Durbin-Watson (DW) test. Indeed, in the DW test we test the hypothesis as:

H_0: There is no positive autocorrelation
H_1: There is positive autocorrelation

The rule of thumb states that If $d < d_L$ reject H0; If $d > d_U$ <u>do not</u> reject H0; If $d_L < d < d_U$ test is inconclusive. The corresponding values in the DW table for significance points of d_L and d_U at 0.01 level of significance and *K=7* are 1.603 and 1.746 respectively. In the regression model of this study, the obtained values of D-W in the both estimations are [2.026 and 2.007].

Table 7 Autocorrelation Test

Durbin Watson Value	Upper Value	Lower Value	Decision
2.026	1.746	1.603	Rejected
2.007	1.746	1.603	Rejected

Thus, since the values of D-W obtained from the models are greater than d_U [1.746] then we cannot reject the null hypothesis. Therefore, we confirm that the model is robust in terms of autocorrelation issue.

4.5 Fixed-Random Effect Test

Apparently, the data set of this thesis consists of both cross-section and time series dimension, and thus panel model adopted as the best econometric method of estimation. Common methods of panel regression are fixed-effect and random effect. As already mentioned in the previous chapter, to detect about which method is best fit to the nature of our data this thesis follows Hausman test. The test detects whether fixed-cross effect or random-cross effect is most suitable for the panel data.

Based on Hausman test the hypothesis testing formed as bellow:

H_0: Random effect model is appropriate

H_1: Fixed effect model is appropriate

As it can be seen from Table 8, the null hypothesis is rejected for model one but cannot be rejected for the both models implying that fixed-cross effect is

suitable for the first model and random-cross effect is appropriate for the second model. The next step will be regression analysis using random-cross effect.

Table 8 Hausman Test

Model		Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Panel A	Cross-section random	18.75	6	0.0046
Panel B	Cross-section random	0.000	6	0.9945

4.6 Regression Analysis

After taking into account the preconditions for panel regression such as unit root, and diagnostic or robustness checking of the models of this thesis such as serial correlation and multicollinearity and on the other hand Hausman test proposes both fixed-effect and random-effect model as the appropriate models we perform OLS panel regression. The regression analysis produced the following results:

Bank capitalization, the present thesis figured out it is conversely affecting the bank liquidity proxies. Precisely, the coefficients are -0.2% in panel A and not significant in panel B. This outcome is opposite our expectations and implies that if BC increases by one percent the liquidity level of banks decreases by almost -0.2%. The finding is consistent with the financial fragility theory that is higher capital proportions may swarm out deposits and

in this manner lessen liquidity creation. The finding is also parallel Diamond and Rajan (2000). They argue that in inclination of banks to move investors' funds to capital accounts in reason to meet higher capital necessities. However, investments in capital accounts are prone to monetary unpredictability and recurrent high points and low points. Additionally, in realities, capital investments are not protected and can't be pulled back as wanted. This without a doubt brings down liquidity creation.

Bank size, which measured by total asset of the banks is positively influencing the liquidity. If total asset of banks increase by 1%, the liquidity will raise by 0.9% or 0.15% according to the both models. This finding is pretty sense, that's large banks tend to proceed high liquidity creation level to insure their operations, which in turn can face some losses while they sell some assets to satisfy the liquidity demands from their depositors.

Moreover, In line with previous literature and our expectations, the present thesis observed that increase in economic growth raises liquidity of US banks. The coefficients of GDP are 0.26% and 0.08% and statistically significant at 5% level. This finding provides a strong evident for the effect of GDP on the liquidity option of the banks. Economic growth results in increasing in supply for loans. This results in an increase in the liquidity ratio.

Parallel to our anticipation, the impact of 2008 global financial crisis on the liquidity position of the US banks found to be negative and statistically significant. Accurately, holding other variables constant the crisis lowers LIQD by 2% and LATA by 1.94%. Although the coefficients are small but still these findings are statistically significant. This finding is also consistent with Aspachs et al., (2005) that state in the case of liquidity crises when potential support from central bank raises banks hold less liquidity buffer. Prior studies such as Fadare (2011) and Vodova (2013) found the same result regarding financial crisis. This implies that during the financial crisis the default risk will

be high and banks cannot trust the borrowers. The main reason behind this finding can be because of the reduction of interbank transactions during and following the crisis year.

Table 9 Panel regression random-effect results for Panel A and B

Variable	Panel A: Dependent variable (LIQD)		Panel B: Dependent variable (LATA)	
	Coeff.	t-Stat	Coeff.	t-Stat
ROA	-0.419	(-0.520)	-0.500	(-0.99)
BC	-0.193	(-1.758)***	-0.1937	(-1.785)***
LnSIZE	0.085	(2.342)**	0.015	(2.27) **
NPL	-0.033	(-0.094)	-0.228	(-1.01)
DlnGDP	0.266	(-2.723)**	0.081	(-1.72) ***
DM	-0.204	(2.5611)**	-0.194	(2.53)**
C	2.840	(2.684)*	0.948	(1.62)
R-squared	0.91		0.88	
Adjusted R-squared	0.90		0.87	
F-statistic	100.14		184.05	
Prob.(F-statistic)	0.000		0.000	
Durbin-Watson stat	2.043		2.103	

*Where: *, ** &*** indicate that the coefficient is significant at 1%, 5% and 10% level of significance respectively.*

Finally, the impact of the rest of the variables namely ROA and NPL are observed to be not statistically significant. That's ROA and NPL I have not a significant impact on the liquidity position of US banks.

F-statistic is also another indicator of the efficiency of regression model. It's indicates for the overall significance of the regression model. F-test will be undertaken by testing the null hypothesis of (the explanatory variables are jointly not affecting liquidity) against the alternative hypothesis that (at least

one of them is affecting liquidity). Obviously, there is strong evidence against the null hypothesis which is rejected at 1% level of significance both panel A and B.

In the both models R-squared or the coefficient of determination is considerably high which reflects the strength of the models. Precisely, for panel A the obtained R^2 is 91% and 88% for panel B. That's around 90% of the changes in the liquidity ratio of US banks can be explained by the explanatory variables of this thesis which are (profitability, bank capitalization, size, non-performing loans, economic growth and financial crisis).

CHAPTER 5
CONCLUSION

5.1 Summary of the Study

In nutshell Basel III amendment have been established as a measure of controlling the banking sector activities and many nations are planning to incorporate new aspects into the old document by 2027.The application takes into consideration the three pillars which addresses the way of mitigating liquidity problems in the banks and ways of managing the risk incurred. In 2007 there was a crisis whereby many large banks in developed countries faced bankruptcy. Basel III addresses other elements of eliminating liquidity problems in the banking sector in order to create a healthy economic situation.

The prime function of banks in the economy is to convert money from its surplus unit (short-term deposits) to its deficit unit (long-term loans). Banks create liquidity in both assets and liability side of the balance sheet. In this sense, banks are inherently sensitive to liquidity risk. Nevertheless, liquidity creation is considered as a fundamental source of economic welfare in addition to risk. Specifically, during the 2008 crisis banks had not sufficient liquid assets which make them to claim support from central bank. Even with the intervention of central banks many banks failed to sustain. The prime goal of this thesis is to examine the factors that are significantly impact the liquidity buffer of US banks. The findings of this study would be important for policy makers in the issue of prudential guideline on liquidity that can be used in formulation of policy.

The present thesis used a sample of 12 largest banks in US and the time span covers 1999 to 2017. Thus, in this study we use panel data methodology with 228 observations. The explained variables of this study are the ratio of ratio of Liquid Assets to Customer Deposits and Short-Term Funding and Total Liquid Assets/Total Asset. The determinants of liquidity in this study considered are profitability, bank capitalization, size, non-performing loans, GDP, and financial crisis. Correlation and OLS panel regression techniques are the main tools of analysis in this thesis.

In contrary to our expectation and in line with the financial fragility theory and Diamond and Rajan (2000) bank capitalization found to inversely influence liquidity buffers of US banks. This implies that higher capital facilitates the provision of bargaining power of banks and ensuring financial security in depositors and reduces chances of experiencing liquidity problems. Furthermore, consistent with prior literature and our expectations, it's found that economic growth is positively affecting US banks liquidity. The case can be because economic growth results in increasing in supply for loans. This results in an increase in the liquidity ratio. In line with previous literature and our expectations, the present thesis observed that increase in economic growth raises liquidity of US banks. Bank size, which measured by total asset of the banks is positively influencing the liquidity.

As anticipated, the impact of 2008 global financial crisis on the liquidity position of the US banks found to be negative and statistically significant. Prior studies such as Fadare (2011) and Vodova (2013) found the same result regarding financial crisis. This implies that during the financial crisis the default risk will be high and banks cannot trust the borrowers. Finally, influences of the rest of explanatory variables were not statistically significant. Meaning that they have do not have any effect on the choice of liquidity of US banks. Lastly, the panel regression models of the present thesis have high R-squared and are robust in terms of stationarity, multicollinearity and autocorrelation issues.

5.2 Implication Policy and Suggestions

Indeed, liquidity crisis in US banks didn't receive sufficient attentions by researchers. This gap provides an attractive opportunity for applying empirical researches in this respect. The present thesis is restricted by some limitations regarding sample size, time period, and the examined explanatory variables. Therefore, prospect researchers are recommended to set up more challenging models. For instance, by using other variables and creating large sample of US banks etc. Researchers also recommended extending the framework of this thesis to other countries.

The major objectives of the present thesis were to examine the determinants of US banks' liquidity to provide some guidance and implications to bank managers and decision makers by which they can manage banks more efficiently. Implication policies derived from the findings of the current study can be concluded as banks can obtain optimal liquidity buffer that maximizes the value of the banks and protects them from liquidity risk by using information or data about the volume of equity capital and economic growth. In addition, managing banks during financial crises varies from non-financial crises periods. US banks are recommended to store greater liquid buffer if they expect a financial crisis.

REFERENCES

Al-Hamid, A., and Al-Muttalib, A. (2002). Comprehensive Banks Operations and Management), Alexandria.

Al-Husseini, Falah Hasan Adai, Al-Douri, Mu'ayyad Abd al-Rahman Abdullah, (2000). Banking Management, Quantitative and Strategic Approach), Amman,

Allen, L., Peristiani, S., & Saunders, A. (1989). Bank size, collateral, and net purchase behavior in the federal funds market: empirical evidence. Journal of Business, 501-515.

Allen, N, Berger, Philip, M, John O 2010, The oxford hand book of banking, Oxford university press.

Al-Sayegh, Mohammed Jabbar, Abu Hamad, Reza Sahib (An Analytical Study of Banking Liquidity of a Sample of Jordanian Commercial Banks), Iraqi Journal of Administrative Sciences, Faculty of Management and Economics, Karbala University, 2006.

Al-Shama, X. (2012). Liquidity Management in Commercial Bank, Institute of Banking Studies Kuwait – 5 (2).

Al-Shammari, S R. (2012). Banking Department) Baghdad

Annavaram, M., Patel, J. M., & Davidson, E. S. (2001). Data prefetching by dependence graph precomputation. In Computer Architecture, 2001. Proceedings. 28th Annual International Symposium on (pp. 52-61). IEEE.

Aqel, Muflih (Banking Perspectives), Amman, 2006.

Aspachs, O., Nier, E. W., & Tiesset, M. (2005). Liquidity, banking regulation and the macroeconomy. Available at:

Athanasoglou, P. P., Brissimis, S. N., & Delis, M. D. (2008). Bank-specific, industry-specific and macroeconomic determinants of bank profitability. *Journal of international financial Markets, Institutions and Money*, *18*(2), 121-136.

Barth, J. R., Nolle, D. E., Phumiwasana, T., & Yago, G. (2003). A cross-country analysis of the bank supervisory framework and bank performance. Financial Markets, Institutions & Instruments, 12(2), 67-120.

Basel Committee on Banking Supervision. (2008). Liquidity risk: Management and supervisory challenges, Bank For International Settlements, Basel, Switzerland, February, Available at: http://www.bis.org/publ/bcbs136.pdf.

BCBS, J. (2011). Basel III: A global regulatory framework for more resilient banks and banking systems. Basel Committee on Banking supervision, Bank for International Settlements. Basel.

Berger, A. N., & Bouwman, C. H. (2009). Bank liquidity creation. *The review of financial studies*, *22*(9), 3779-3837.

Bernanke, B. (2008, May). Liquidity provision by the Federal Reserve. In *Speech at the Risk Transfer Mechanisms and Financial Stability Workshop, Basel, Switzerland, on May* (Vol. 29, p. 2008).

Bianchi, J., & Bigio, S. (2014). Banks, liquidity management and monetary policy (No. w20490). National Bureau of Economic Research.

Bordeleau, É., & Graham, C. (2010). The impact of liquidity on bank profitability (No. 2010, 38). Bank of Canada working paper.

Bourke, P. (1989). Concentration and other determinants of bank profitability in Europe, North America and Australia. *Journal of Banking & Finance*, *13*(1), 65-79.

Bunda, I., & Desquilbet, J. B. (2008). The bank liquidity smile across exchange rate regimes. International Economic Journal, 22(3), 361-386.

Calomiris, C. W., & Kahn, C. M. (1991). The role of demandable debt in structuring optimal banking arrangements. *The American Economic Review*, 497-513.

Churchill, G A and Iacobucci, D (2005). Marketing Research Methodological Foundations. 9th edition. *Thomson South-Western*, USA.

Correa, R., Goldberg, L. S., & Rice, T. (2014). Liquidity risk and US bank lending at home and abroad (No. w20285). National Bureau of Economic Research.

Cucinelli, D. (2013). The determinants of bank liquidity risk within the context of euro area. Interdisciplinary Journal of Research in Business, 2(10), 51-64.

Deléchat, C., Henao Arbelaez, C., Muthoora, P., & Vtyurina, S. (2014). The Determinants of Banks' Liquidity Buffers in Central America. SSRN paper.

Diamond, D. W., & Dybvig, P. H. (1983). Bank runs, deposit insurance, and liquidity. *Journal of political economy*, *91*(3), 401-419.

Dinger, V. (2009). Do foreign-owned banks affect banking system liquidity risk?. Journal of Comparative Economics, 37(4), 647-657.

Fadare, S. O. (2011). Banking sector liquidity and financial crisis in Nigeria. *International Journal of Economics and Finance*, *3*(5), 3.

Franzese, A. (2013). Financial Regulation and the Crisis of 2008. *University of Connecticut.* Honors Scholar Theses.

Garber, P. M., & Weisbrod, S. R. (1992). The economics of banking, liquidity, and money. *DC Heath*.

Gaytan, A., & Rancière, R. G. (2001). Banks, liquidity crises and economic growth. Available at SSRN. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=861004 .

Giannotti, C., Gibilaro, L., & Mattarocci, G. (2011). Liquidity risk exposure for specialised and unspecialised real estate banks: Evidence from the Italian market. *Journal of Property Investment & Finance*, *29*(2), 98-114.

Goddard, J. A., Molyneux, P., & Wilson, J. O. (2004). Dynamics of growth and profitability in banking. *Journal of Money, Credit, and Banking*, *36*(6), 1069-1090.

Gomez, Clifford.(2008). Financial Markets , Institutions and Financial services. Prentice-Hall of India Private Limited, New Delhi, India.

Goodhart, C. (2008). Liquidity risk management. Banque de France Financial Stability Review, 11, 39-44.

Greenspan, A. (1998, October). The role of capital in optimal banking supervision and regulation. In *Federal Reserve Bank of New York,"Financial Services at the Crossroads: Capital Regulation in the Twenty-First Century, Proceedings of a Conference,"* FRBNY Economic Policy Review (Vol. 4, No. 3).

Growe, G., DeBruine, M., Lee, J. Y., & Tudón Maldonado, J. F. (2014). The profitability and performance measurement of US regional banks using the predictive focus of the "fundamental analysis research". In Advances in Management Accounting (pp. 189-237). Emerald Group Publishing Limited.

Hempel, G.H, Simonson, D.G and Coleman, A.B 1994, Bank Management, 4th ed., John Wiley & Sons: New York

https://data.worldbank.org/

https://mpra.ub.uni-muenchen.de/21473/1/MPRA_paper_21473.pdf

Ibe, Sunny O.(2013). The Impact of Liquidity Management on the Profitability of Banks in Nigeria. Journal of Finance and Bank Management 1(1); June, pp. 37-48 .

Khanal, A. R., & Mishra, A. K. (2017). Stock price reactions to stock dividend announcements: A case from a sluggish economic period. *The North American Journal of Economics and Finance, 42,* 338-345.

Kyle, A. S. (1985). Continuous auctions and insider trading. *Econometrica: Journal of the Econometric Society*, 1315-1335.

Litter L.S, Silber W.L and Udell G.F 2004, Principles of Money, Banking, and Financial

Lucchetta, M. (2007). What Do Data Say About Monetary Policy, Bank Liquidity and Bank Risk Taking? *Economic Notes by Banca Monte dei Paschi di Siena SpA,* V 36(2), 89-203.

Maaka, Z. A. (2013). The relationship between liquidity risk and financial performance of commercial banks in Kenya (Doctoral dissertation, University of Nairobi).

Matz, Leonard.(2011). Liquidity Risk Measurement &Management. Xlibris Corporation, USA .

Mehmed, G. (2014). An Empirical Study on Liquidity risk and its determinants in Bosnia and Herzegovina. *Romania Economic Journal* (52).

Melese, N. (2015). Determinants of bank liquidity: empirical evidence on Ethiopian commercial banks (*Doctoral dissertation, Master thesis, Addis Ababa University*).

Moh'd Al-Tamimi, K. A., & Obeidat, S. F. (2013). Determinants of capital adequacy in commercial banks of Jordan an empirical study. *International Journal of Academic research in Economics and management sciences*, 2(4), 44.

Moore, W. (2009). How do financial crises affect commercial bank liquidity? Evidence from Latin America and the Caribbean. https://mpra.ub.uni-muenchen.de/21473/ accessed at 20.03.2018.

Moussa, M. A. B. (2015). The determinants of bank liquidity: Case of Tunisia. International Journal of Economics and Financial Issues, 5(1), 249.

Muranaga, J., & Ohsawa, M. (1997). Measurement of liquidity risk in the context of market risk calculation. Institute for Monetary and Economic Studies, Tokyo, Japan, Working Paper

O'Quinn, R. (2008). The US housing bubble and the global financial crisis: Vulnerabilities of the alternative financial system. *Joint Economic Committee Study*, 1-51.

Painceira, J. P. (2010). The Role of Banks in the Korean Financial Crisis of 1997: An Interpretation Based on the Financial Instability Hypothesis. In Minsky, Crisis and Development (pp. 302-317). Palgrave Macmillan, London.

Poorman Jr, F., & Blake, J. (2005). Measuring and modeling liquidity risk: new ideas and metrics. Financial Managers Society Inc. White paper.

Radivojevic, N., & Jovovic, J. (2017). Examining of Determinants of Non-Performing Loans. Prague Economic Papers, 26(3).

Rauch, C., Steffen, S., Hackethal, A., & Tyrell, M. (2008). Determinants of bank liquidity creation-evidence from savings banks. Working Paper: Germen.

Rochet, J. C. (2008). Liquidity regulation and the lender of last resort. *Financial Stability Review*, *11*, 45-52.

Roussakis, Emmanuel N.(1997). Commercial Banking in an Era of Deregulation. 3Ed., Printed in the USA

Said, Abdulsalam Leftah, (2013). (Banking and Banking Speciality) Baghdad.

Shammari, Sadiq Rashed, (Banking Department) Baghdad, 2012.

Singh, A., & Sharma, A. K. (2016). An empirical analysis of macroeconomic and bank-specific factors affecting liquidity of Indian banks. *Future Business Journal*, *2*(1), 40-53.

Tursoy, T. (2018). Risk management process in banking industry. https://mpra.ub.uni-muenchen.de/86427/1/MPRA_paper_86427.pdf

Vodov, P. (2013). Determinants of commercial bank liquidity in Hungary. *e-Finanse*, *9*(3), 64.

Vodová, P. (2011a). Determinants of commercial banks' liquidity in the Czech Republic. ratio, 50, 3.

Vodová, P. (2011b, October). Determinants of Commercial Bank's Liquidity in Slovakia. In Lessons Learned from the Financial Crisis. *Proceedings*

of 13th International Conference on Finance and Banking (pp. 740-747).

Waemustafa, W., & Sukri, S. (2016). Systematic and unsystematic risk determinants of liquidity risk between Islamic and conventional banks. *International Journal of Economics and Financial Issues*,6(4), 1321-1327.

www.fred.stlouisfed.org/

www.weforum.org/agenda/2017/03/worlds-biggest-economies-in-2017/ (Accessed at 02.03.2018).

Yeager, FC and Seitz, NE 1989, Financial Institution Management: Text and Cases, 3rd ed*., Prentice Hall Inc., Englewood Cliffs*, New Jersey.

Živko, I., & Kandžija, T. (2013). Impact of financial crisis on banking sector stability in Republic Croatia. Poslovna izvrsnost: znanstveni časopis za promicanje kulture kvalitete i poslovne izvrsnosti, 7(1), 129-143.

APPENDICES

Appendix A: Fixed-Random Effect Hausman Test

Correlated Random Effects - Hausman Test
Equation: Model 1
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	18.756657	6	0.0046

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
ROA	-3.798983	-4.082943	0.019168	0.0403
BC	-1.138490	-1.143450	0.004733	0.9425
LNSIZE	0.155727	0.164432	0.001302	0.8094
NPL	-0.346350	-0.577578	0.010596	0.0247
LNGDP	-0.459409	-0.465587	0.004722	0.9284
DM	-0.020444	-0.023373	0.000004	0.1263

Correlated Random Effects - Hausman Test
Equation: Model 2
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	0.000000	6	0.9945

* Cross-section test variance is invalid. Hausman statistic set to zero.

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
ROA	-2.495452	-2.682262	0.009985	0.0616
BC	-0.811830	-0.801774	0.002436	0.8385
LNSIZE	0.096264	0.099357	0.000625	0.9016
NPL	-0.235028	-0.397551	0.005202	0.0242
LNGDP	-0.301563	-0.301494	0.002271	0.9989
DM	-0.018209	-0.019943	0.000002	0.2000

Appendix B: Panel OLS Regression Estimation Output

Dependent Variable: **LIQD**

Method: Panel Least Squares

Date: 11/26/18   Time: 20:19

Sample (adjusted): 2001 2017

Periods included: 17

Cross-sections included: 12

Total panel (unbalanced) observations: 203

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ROA	-0.419409	0.806132	-0.520273	0.6035
BC	-0.193043	0.109767	-1.758654	0.0828
LNSIZE	0.085881	0.036660	2.342641	0.0202
NPL	-0.033259	0.352758	-0.094284	0.9250
LNGDP	0.266169	0.097745	-2.723108	0.0071
DM	-0.204691	0.079922	2.561119	0.0154
C	2.840269	1.056340	2.688784	0.0078
LIQD(-1)	0.586125	0.071199	8.232151	0.0000
LIQD(-2)	0.172616	0.069257	2.492393	0.0136

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.912260	Mean dependent var	0.168179
Adjusted R-squared	0.903150	S.D. dependent var	0.157984
S.E. of regression	0.049166	Akaike info criterion	-3.093921
Sum squared resid	0.442358	Schwarz criterion	-2.767496
Log likelihood	334.0329	Hannan-Quinn criter.	-2.961862
F-statistic	100.1423	Durbin-Watson stat	2.043190
Prob(F-statistic)	0.000000		

Dependent Variable: **LATA**

Method: Panel EGLS (Cross-section random effects)

Date: 11/26/18   Time: 20:17

Sample (adjusted): 2001 2017

Periods included: 17

Cross-sections included: 12

Total panel (unbalanced) observations: 203

Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ROA	-0.500781	0.505832	-0.990015	0.3234
BC	-0.193768	0.108501	-1.785853	0.0836
LNSIZE	0.015945	0.007000	2.277812	0.0238
NPL	-0.228838	0.225708	-1.013871	0.3119
LNGDP	0.081232	0.047171	-1.722077	0.0866
DM	-0.204419	-0.080611	2.535852	0.0127
C	0.948544	0.582094	1.629537	0.1048
LATA(-1)	0.676709	0.068608	9.863412	0.0000
LATA(-2)	0.209354	0.066883	3.130139	0.0020

Effects Specification

	S.D.	Rho
Cross-section random	0.000000	0.0000
Idiosyncratic random	0.034037	1.0000

Weighted Statistics

R-squared	0.883582	Mean dependent var	0.115289
Adjusted R-squared	0.878781	S.D. dependent var	0.100272
S.E. of regression	0.034911	Sum squared resid	0.236443
F-statistic	184.0513	Durbin-Watson stat	2.103263
Prob(F-statistic)	0.000000		

Unweighted Statistics

R-squared	0.883582	Mean dependent var	0.115289
Sum squared resid	0.236443	Durbin-Watson stat	2.103263

PLAGIARISM REPORT

ETHICS COMMITEE APPROVAL

YAKIN DOĞU ÜNİVERSİTESİ

BİLİMSEL ARAŞTIRMALAR ETİK KURULU

03.10.2018

Dear Hakar Abubakir Bayz

Your project "**Determinants of Liquidity of the US Banks; Evidence with the Framework of 2008 Financial Crisis**" has been evaluated. Since only secondary data will be used the project it does not need to go through the ethics committee. You can start your research on the condition that you will use only secondary data.

Assoc. Prof. Dr. Direnç Kanol

Rapporteur of the Scientific Research Ethics Committee

Note: If you need to provide an official letter to an institution with the signature of the Head of NEU Scientific Research Ethics Committee, please apply to the secretariat of the ethics committee by showing this document.